

# Introduction

Patrick A. Mello

*Willy Brandt School of Public Policy*

*University of Erfurt*

*Version: July 2019*

Citation: Mello, Patrick A. (2019) "Introduction." In: *Qualitative Comparative Analysis: Research Design and Application*. Washington, D.C.: Georgetown University Press (under contract).

*The causal relationships on which scholars now focus are different from those posited two decades ago, and many acknowledge forms of multicausality that previous work ignored.*

*Peter Hall*<sup>1</sup>

Social phenomena can rarely be attributed to individual causes. Instead, what we observe is often the result of a combination of several factors. For instance, how to explain the global rise of populism? Depending on who you ask, different accounts are suggested. But many observers agree that important drivers are, on the one hand, the socio-economic effects of globalization, and on the other hand, a general increase of uncertainty that often boils down to questions of identity and meaning. Importantly, to account for the electoral success of populist parties, both of these factors have to be present. Moreover, multiple pathways may lead towards the same outcome. While Argentina and Turkey both experience financial crises, the two countries' economic policies and contextual factors are quite different, suggesting the existence of different trajectories. To complicate things further, the explanation for the positive outcome (the phenomenon of interest) may not provide an explanation for the negative outcome. For example, we may have empirically

---

<sup>1</sup> Hall (2003, 383).

identified economic growth as a cause of democratization, but this does not allow us to say that the absence of economic growth means that countries will not develop democratic institutions.

Together, the characteristics of *conjunctural causation* (combinations of conditions), *equifinality* (multiple pathways), and *causal asymmetry* (outcome and non-outcome may require different explanations) describe the core of what is understood as “causal complexity” (Ragin 2008; Rihoux and Ragin 2009; Schneider and Wagemann 2012). Drawing on set theory and the language of necessary and sufficient conditions, Qualitative Comparative Analysis (QCA) is an empirical research method that is ideally suited to capture such causal complexity.

Originated by Charles Ragin in his seminal book *The Comparative Method* (Ragin 1987, reissued in 2014), QCA has undergone a dynamic evolution throughout the past three decades. Whereas some early applications of QCA were still carried out by hand, with researchers manually filling out spreadsheets, the method nowadays draws on a reliable spectrum of software-based solutions that reflect a high level of methodological sophistication. Moreover, scholars have developed a broad repertoire of QCA variants and “best practices” for applied research.

The evolution of QCA went hand-in-hand with its spread across the social sciences, including the fields of sociology, political science, international relations, economics and management, public policy, political geography, criminology, public health, evaluation studies, and many others.<sup>2</sup> Initial QCA applications were predominantly macro-comparative studies on welfare state development (Amenta et al. 1992; Hicks et al. 1995). Nowadays there are applications at all levels of analysis. Besides the country level, studies have focused on units of analysis such as regional governments (Blatter et al. 2010; Thomann 2015), political parties (Dardanelli 2012; Lilliefeldt 2012), policies and legal acts (Engeli 2012), non-state actors (Mello 2017), and individuals (Britt et al. 2000). Likewise, empirical studies cover a wide range of substantive issue areas including compensation inequality (Greckhamer 2011), stem cell regulation (Engeli and Rothmayr Allison 2013), conflict over scarce renewable

---

<sup>2</sup> For a general overview on trends in applied QCA research, see Rihoux et al. (2013). See also the reviews on applications in comparative welfare state research (Emmenegger et al. 2013), public policy (Hudson and Kühner 2013; Rihoux et al. 2011), and business research (Wagemann et al. 2016).

resources (Ide 2015), labor market policies (Vis 2011), trade relations (Gansemans et al. 2017), biodiversity conservation (Basurto 2013), allocation of government ministries (Oppermann and Brummer 2018), democratic war involvement (Haesebrouck 2017), and junior partners in coalition warfare (Schmitt 2018).

Recent methodology textbooks indicate that QCA has been widely acknowledged as a method that holds unique benefits for comparative research (Blatter and Haverland 2012; Gerring 2012; Goertz and Mahoney 2012; Moses and Knutsen 2012; Rihoux and Grimm 2006; Rohlfing 2012) and multi-method research designs (Beach and Pedersen 2013; Goertz 2017; Rohlfing and Schneider 2018). Unlike conventional statistical methods that focus on the “average effects of independent variables” (Mahoney 2010, 132), QCA explores the specific conditions under which outcomes occur. Therefore, causal relationships are expressed in the set-theoretic terminology of necessary and sufficient conditions, which is “increasingly viewed as substantively important” in social science research (Collier et al. 2010, 147).

While QCA has been recognized as a valuable addition to the social scientific toolbox, the method’s analytical protocol, available software, and standards required for peer-reviewed publications have become gradually more sophisticated. Clearly, these are welcome developments. But the methodological refinement has also created barriers for new users. Take the R software environment, which has become the new standard for conducting QCA studies.<sup>3</sup> While R provides a powerful platform of boundless possibilities, it can also be forbidding and frustrating, even for people with a background in computational analysis (for a “survivor’s guide to R”, see Gaubatz 2015). Others might be uncertain about whether QCA is a suitable method for their own research and the kind of data they have collected. Still others might have read a critique of QCA and are now unsure if the method can be fruitfully applied in their own project or whether they should look into alternatives.

---

<sup>3</sup> As an indication of this, since 2014 the two-week QCA course at the ECPR Summer School in Methods and Techniques has worked exclusively with R (Duşa 2018; Oana and Schneider 2018). The R software environment is freely available for all operating systems: <https://www.r-project.org/>. Software alternatives to R include “fs/QCA” (Ragin and Davey 2017) and “Tosmana” (Cronqvist 2018). A comprehensive list of available software is maintained at the QCA community website: <http://www.compass.org/software.htm>.

This book seeks to overcome such barriers by providing a step-by-step introduction to QCA that emphasizes research design, practical application, and real-life examples from published studies. Beginners are taken through each step in the research process so that they can apply the procedures to their own projects. Experienced users will refresh their knowledge of QCA, including discussions of outdated recommendations given in prior textbooks, and learn about new ways to apply the method. Both groups will profit from many illustrated examples from published studies, and a compendium of suggestions to improve QCA research design, the interpretation of findings, and the presentation of results.

## How to Use this Book

This book provides a hands-on introduction to QCA. A unique feature of this book is that the substantive chapters contain ten one-page text boxes where the authors of published QCA studies revisit their personal experiences with QCA and decisions they faced when they conducted their study. The selected examples represent a diverse range of applications across the social sciences. These unique perspectives allow readers a look “behind the scaffolding” of published studies, which rarely make such decisions explicit. Table 1 lists the contributions from various scholars found in this book, their research field, and the QCA variant they applied.

Table 1: Info Boxes – Overview

<i>Study</i>	<i>Field</i>	<i>Type</i>	<i>Page</i>
N.N.	Political Science	Fuzzy-Set QCA	...
N.N.	Sociology	Fuzzy-Set QCA	...
N.N.	International Relations	Two-Step QCA	...
N.N.	Political Geography	Multi-Method QCA	...
N.N.	Business	Crisp-Set QCA	...
N.N.	Public Policy	Fuzzy-Set QCA	...
N.N.	Law	Multi-Value QCA	...
N.N.	Environmental Studies	Fuzzy-Set QCA	...
N.N.	Public Health	Multi-Method QCA	...
N.N.	Management	Crisp-Set QCA	...

The book is written for anyone interested in learning about QCA, how to use it properly, and how to make the most of their analytical findings. The book equally speaks to beginners, who may have heard about the method and want to understand

the basics, as well as experienced users who are familiar with QCA but want to learn more about seizing its potential. There are no prerequisites and the technical discussion will be kept to a necessary minimum. Instead, this book emphasizes matters of research design and the interpretation of analytical findings. The book includes a concise appendix where the major R functions are presented, to serve as templates. Moreover, the book is accompanied by online material that is freely available for download at the book's website [URL], which will be updated on a regular basis. The online content includes R scripts to complement the respective sections in each book chapter. Moreover, for each of the one-page text box examples from published studies, replication material is available (R scripts and data sets), so that readers can reproduce the findings and work with the data.

## A Brief History of QCA

At 30 years of age, QCA may still be considered a "novel" approach, at least when compared to statistical methods and historically informed case studies, which can trace their lineage to the 18<sup>th</sup> century (Moses and Knutsen 2012). Yet the method has undergone a substantial evolution since its inception by Charles Ragin (1987). At its core, QCA is grounded in the algebra of George Boole, a British 19<sup>th</sup> century mathematician and logician. Boolean algebra uses variables that occur in only two states: "true" (present) or "false" (absent). This conception proved central, for instance, to the development of electronic switching circuits and Boolean algebra was soon widely used across the applied sciences (Whitesitt 2010). What is more important for the aims of qualitative comparison is that Boolean algebra allowed for set-theoretic operations, the construction of truth tables, and their minimization to derive solution terms.

Naturally, the Boolean use of binary categories meant that QCA was limited to working with "crisp sets", where 1 indicated the presence of a condition and 0 indicated its absence. This drawback was overcome with the introduction of "fuzzy sets" to QCA (Ragin 2000), which allowed for graded set membership (any scores between 0 and 1).<sup>4</sup> Fuzzy logic was developed by Lotfi Zadeh (1965) as an extension

---

<sup>4</sup> Fuzzy sets combine *qualitative* and *quantitative* dimensions. Yet, the fundamental distinction remains: unless cases are exactly at the cross-over point of 0.5, they are either

of traditional set theory to tackle the problem of complex and imprecise concepts. Zadeh's work sparked a revolution in computer technology (McNeill and Freiburger 1993) and fuzzy sets have also made their way into the social sciences (Smithson and Verkuilen 2006), including linguistics (Lakoff 1973) and many other areas.

Another important step in the refinement of QCA was the development of *measures of fit* to assess the strength of the empirical support for set-theoretic relationships of necessity and/or sufficiency (Ragin 2006). The measure of set-theoretic *consistency* indicates the extent to which cases that share a specific combination of conditions also show the outcome of interest. In turn, *set-theoretic coverage* reflects how many instances of the outcome are accounted for with a given combination of conditions or solution term. These measures introduced straight-forward indicators to evaluate the analytical results of QCA. Later, these were complemented by additional measures of fit, including proportional reduction in inconsistency (Mendel and Ragin 2011), relevance of necessity (Schneider and Wagemann 2012), and an alternative calculation of consistency (Haesebrouck 2015).

Evidently, the comparative logic of QCA was inspired by John Stuart Mill's methods of scientific inquiry, developed in *A System of Logic*, first published in 1842 (Mill 2006, Book 3, Chapter 8). Mill's methods include the method of agreement and method of difference, as well as the lesser known method of residues and method of concomitant variations (2006: 388-406). Mill also devised a joint method of agreement and difference (2006: 394-396). In some ways, QCA can be seen as a systematic application of the latter method, which Mill already regarded as an improvement over his more basic approaches (Mill 2006, 396).

However, it is important to note that QCA in many ways surpasses Mill's methods. First, whereas Mill focused on individual variables to identify a single cause for an observed phenomenon, QCA explicitly considers equifinality and conjunctural causation. Second, Mill's methods cannot account for the phenomenon of limited diversity, but this is systematically addressed in QCA's truth table procedure, which identifies all possible combinations of conditions and enables researchers to deal with so-called logical remainders (combinations without empirical cases). Third, the

---

"rather inside" or "rather outside" a given set. For a comprehensive discussion of crisp and fuzzy sets, see Chapter 2.

advent of fuzzy sets meant that graded set membership became feasible and measures of fit gave researchers ways to assess the strength of set-theoretic relationships. Both features are missing from Mill's methods. Finally, Boolean logic and minimization allow for a systematic comparative procedure that is not found in Mill's methods.<sup>5</sup>

While crisp-set and fuzzy-set QCA are the method's most popular variants, there are also several extensions and approaches aimed to overcome specific limitations of QCA. For instance, multi-value QCA (Cronqvist 2004; Cronqvist and Berg-Schlusser 2009) allows for multinomial concepts. This can be helpful where explanatory conditions cannot easily be dichotomized without losing important information (for example when data refers to geographical regions, marital or employment status, or age cohorts). Temporal QCA (Caren and Panofsky 2005; Hino 2009; Ragin and Strand 2008) overcomes the static nature of QCA comparisons by introducing notions of time and sequence. Two-step QCA (Schneider and Wagemann 2006) reduces the problem of limited diversity by distinguishing between remote and proximate explanatory conditions. Finally, fuzzy-set ideal type analysis (Kvist 2007) aims to understand the constitution of cases (rather than explaining an outcome), which are compared against preconceived ideal types rooted in theory.<sup>6</sup>

Finally, one of the most dynamic areas in QCA's evolution is software development. While the first version of the "fs/QCA" software was introduced already in 1986 (Drass and Ragin 1986), it was soon complemented by a range of different programs and packages for various platforms.<sup>7</sup> Although there is still a healthy stream of published studies using the fs/QCA or Tosmana programs, the most advanced software for QCA nowadays is based on the R environment.<sup>8</sup> Among other advantages, R can be tailored to suit specific needs, which means that besides the

---

<sup>5</sup> On Mill's methods, see also Sekhon (2008).

<sup>6</sup> Chapter 8 illustrates these variants with examples from applied research.

<sup>7</sup> The COMPASS website maintains a comprehensive section on software available for QCA: <http://www.compass.org/software.htm>

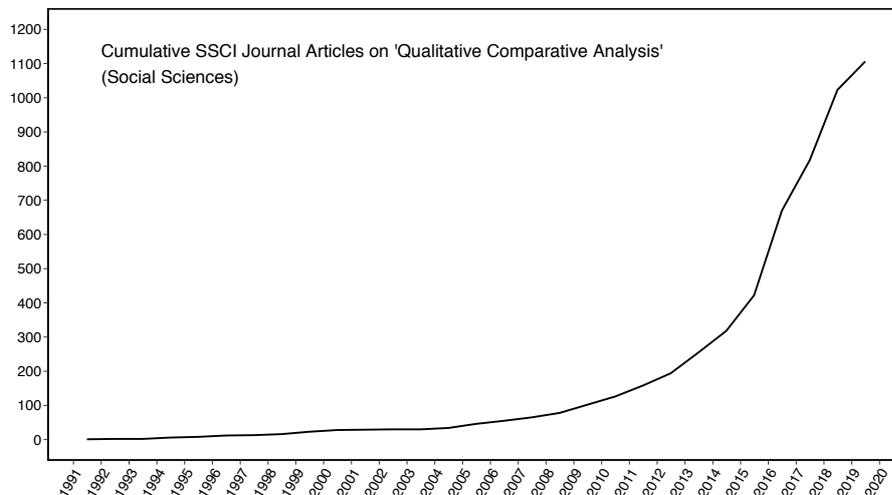
<sup>8</sup> Unless otherwise specified, this book refers to the R packages "QCA" (Duşa 2018) and "SetMethods" (Oana and Schneider 2018).

QCA procedure one can easily visualize the data and analytical results, and complement this with additional computational tests as needed.<sup>9</sup>

## Trends in QCA Applications

The dynamic development of QCA is mirrored in the number of academic publications using this research method. Growing slowly over the course of the 1990s, there has been an exponential increase in QCA studies since the late 2000s. In 2019, the Social Science Citation Index (SSCI) of the Web of Science listed about 1200 journal articles that referred to “qualitative comparative analysis” in one form or another.<sup>10</sup> The complete number of QCA applications will be even higher because many journals are not listed in the SSCI, especially non-English publications. The growth of QCA also shows in the citation numbers for Ragin’s *The Comparative Method*, which has accumulated about 9300 citations on Google Scholar (as of June 2019). Figure 1 shows the cumulative number of SSCI journal articles between 1987 and 2019.

Figure 1: Cumulative SSCI Journal Articles on QCA, 1987-2019

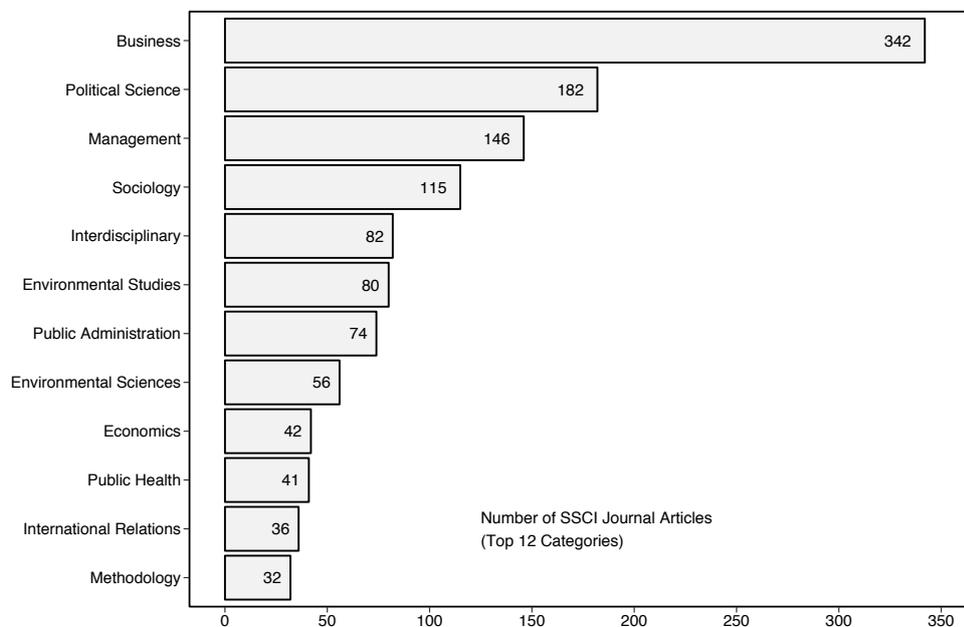


<sup>9</sup> For example, Ide (2018) and Schneider and Makszin (2014) precede QCA with statistical analyses in multi-method research designs and Mello (2019) complements the analysis of necessity with statistical tests of association.

<sup>10</sup> The broad majority of these studies are empirical applications, but the search criteria also yield studies that discuss the approach without applying it.

Which areas of the social sciences contributed to this growth? In which research fields is QCA most popular? Figure 2 differentiates the publication data from the Web of Science by research field for the top 12 categories in the SSCI. We can see that there are eight substantive fields with at least 50 publications on QCA in the time between 1987 and 2019. Business studies are a clear leader, with 342 studies in the time period. This is followed by political science, management (which could be combined with business, but is listed separately in the Web of Science), sociology, and a category for interdisciplinary studies. It should be noted that many journals are listed under more than one category, which leads to empirical overlap because articles may be counted towards several categories. Nonetheless, we can see that QCA is gaining in popularity not just in a few fields, but all across the social sciences.

Figure 2: SSCI Journal Articles on QCA, 1987-2019, by Category



## Qualitative Comparative Analysis and Its Critics

As discussed in earlier sections, scholars and practitioners have recognized QCA as a valuable approach to comparative research that helps to overcome the gulf between qualitative and quantitative research traditions. Yet, since its founding, the method has also spurred a diverse array of critiques. This may be precisely because of the method's *hybrid* nature – which propels criticism from scholars trained in statistical methods, who usually work with hundreds or thousands of observations, as well as

from those who conduct intensive studies on a handful of cases at most. While not being limited to a certain number of observations, QCA typically operates with 20 to 50 cases, which means it is situated right between these camps. While this section cannot offer an exhaustive treatment of the exchanges over QCA's value as a social scientific method, it aims to provide a concise summary of existing critiques and responses, and to clarify some common misunderstandings about QCA.<sup>11</sup>

To begin with, scholars with a background in quantitative methods have criticized QCA for its perceived inability to account for probabilistic relationships, confounding variables, and errors of measurement. Stanley Lieberman (2004, 13) argues that QCA essentially rests on "deterministic ways of thinking." Jason Seawright (2005, 24) sees QCA as a "major practical competitor" to statistics for the purpose of cross-case inferences, but concludes that "QCA is not an improvement over regression analysis". Simon Hug (2013, 252-55) criticizes the inductive use of QCA, arguing that such practice goes against the method's "original purpose". He also sees it as problematic that the method cannot account for measurement error, a pervasive problem in the social sciences. Qualitative researchers have taken issue with QCA's use of algorithms and the formalization of its analytical protocol. David Collier recommends that QCA "should set aside the algorithms", calling for a renewed emphasis on "case knowledge, process tracing, and the use of qualitative data" (Collier 2014, 123-24). Finally, Samuel Lucas and Alisa Szatrowski condemn what they see as a propensity to "reach faulty conclusions" with QCA (Lucas and Szatrowski 2014, 67).

The points raised by QCA critics have led to vigorous exchanges among the scientific community, with almost a dozen journal issues devoted in part or entirely to matters of set-theoretic methods.<sup>12</sup> Early critiques such as those from Lieberman

---

<sup>11</sup> See the complementary discussion in Chapter 9, where I revisit the state of debate, including a review of some more recent contributions.

<sup>12</sup> Journal issues with a focus on set-theoretic methods include (in chronological order): *Field Methods*, 2003, 15(4); *Qualitative Methods*, 2004 2(2); *Qualitative Methods*, 2005 3(1); *Studies in Comparative International Development*, 2005 40(1); *Political Research Quarterly*, 2013 66(1); *Sociological Methodology*, 2014, 44(1); *Qualitative & Multi-Method Research*, 2014, 12(1); *Qualitative & Multi-Method Research*, 2014, 12(2); *Field Methods*, 2016, 28(3); *Comparative Political Studies*, 2016, 49(6), *Quality & Quantity*, 2017, 51(5).

(2004) and Seawright (2005) have been persuasively refuted (Mahoney 2004; Ragin and Rihoux 2004). Lieberman's comment stems from a time before measures of fit were developed to account for imperfect set relations. With the introduction of these parameters it became clear that "QCA is not a deterministic method", as Carsten Schneider and Claudius Wagemann highlight (2012, 316). As for the comparison between regression and QCA, Charles Ragin and Benoît Rihoux underline that these methods are based on different assumptions and they are rarely "competing for the same turf" (Ragin and Rihoux 2004, 22). When they do, as can happen when there is an adequate number of cases for both methods to be applied fruitfully, there is something to be gained from a set-theoretic perspective that regression analysis cannot provide, as Vis (2012) shows.

As I have argued elsewhere (Mello 2014, 62), Hug is right about criticizing certain practices in QCA applications. This resonates with efforts to formulate "best practices" for QCA (Schneider and Wagemann 2010) and to hold empirical applications against these standards (Mello 2013). Yet, this does not mean that the method itself is flawed. Many critiques miss the mark because they fail to distinguish between QCA as a *method* and its *application* in empirical studies. To put it bluntly, the existence of flawed statistical analyses or badly done case studies does not mean that either approach is invalidated. As for some of the "qualitative" critiques, it must suffice here to highlight that "case knowledge" is absolutely essential for any QCA application and the combination with process tracing can make for effective multi-method research designs. In fact, this is a direction in which recent methodological work points (Goertz 2017; Rohlfing and Schneider 2018) and which should see a good number of future applications.<sup>13</sup>

## Overview of the Book

The book comprises nine chapters. As the book mirrors an ideal-typical research process, beginners should read the chapters in sequence. Experienced users who are interested in specific issues can directly move to the respective chapter.

---

<sup>13</sup> There are also some "internal" debates among QCA proponents, which revolve around the interpretability of solution terms and the use of different minimization algorithms, among other aspects (e.g., Schneider 2018). These will be discussed in the final chapter.

Chapter 1 presented the method's strengths and highlighted what sets QCA apart from conventional methods. The chapter also sketched a short history of the method since its inception 30 years ago, including a look at publication trends, and a brief discussion of critiques and responses. These points will be revisited in the final chapter of the book.

Chapter 2 lays out the distinctive characteristics of set-theoretic approaches, as opposed to the statistical paradigm and most quantitative methods. Starting with the distinction between *crisp and fuzzy sets*, the chapter introduces *Boolean operations*, formal notation, and the concepts of *necessary and sufficient conditions*. This ties in with a discussion of *causal complexity* and the concepts of *equifinality* and *conjunctural causation*.

Chapter 3 provides a hands-on guide to questions of *research design*, from the mode of reasoning to the formulation of research questions and theoretical expectations, and the selection of cases and conditions. Drawing on an original survey of published studies, this chapter derives a set of recommendations for separate stages of QCA research design and its combination with other methods.

Chapter 4 discusses the *calibration* of crisp and fuzzy sets, including crucial differences to standard quantitative approaches to measurement. The chapter presents different strategies to calibrate sets based on different kinds of qualitative and quantitative raw data (including field notes, interviews, statistics, reports, secondary sources) and closes with a non-technical description of the most common calibration techniques.

Chapter 5 introduces *measures of fit*, which help to assess and interpret QCA results. Using empirical examples, the chapter explains how set-theoretic *consistency* and *coverage* are calculated and how the resulting scores should be interpreted. With these in place, the chapter discusses additional measures like proportional reduction in inconsistency, relevance of necessity, and an alternative consistency measure.

The *truth table* and its Boolean *minimization* form the core of QCA. Chapter 6 shows how truth tables are constructed from the data matrix and how *solution terms* are derived from the minimization of the truth table. Using empirical examples, the chapter illustrates how researchers' decisions impact upon solution terms and closes with several "best practice" recommendations. The chapter also discusses the analysis of *necessary conditions*, which should precede the truth table procedure.

QCA emphasizes causal complexity. Yet, solution terms with multiple elements in various combinations can be difficult to interpret. Chapter 7 walks readers through several examples of QCA solutions to enable them to make sense of their own

findings and to avoid misinterpreting results. The chapter also spells out tests to determine whether identified set-theoretic relationships are robust.

While the book's emphasis rests on crisp and fuzzy-set QCA as the most popular variants, Chapter 8 introduces alternatives, namely *multi-value*, *temporal*, and *two-step QCA*, as well as *fuzzy-set ideal-type analysis*. The chapter discusses the advantages and requirements of each approach against the backdrop of empirical examples.

Chapter 9 summarizes the book's core points and derives a list of best practices. It also provides readers with directions to take in order to further develop their own applications. Picking up the threads from the book's introduction, The chapter closes with a review of notable trends and recent debates.

The Appendix presents the core R functions needed to conduct QCA, including reading and manipulating data, calibrating conditions, testing for necessary conditions, constructing a truth table, deriving solution terms, and visualizing results. Moreover, the book's website includes R scripts to complement the respective sections in each book chapter.

## References

- Amenta, Edwin, Bruce G. Carruthers, and Yvonne Zylan. 1992. "A Hero for the Aged? The Townsend Movement, the Political Mediation Model and U.S. Old-Age Policy, 1934-1950." *American Journal of Sociology* 98 (2): 308-39.
- Basurto, Xavier. 2013. "Linking Multi-Level Governance to Local Common-Pool Resource Theory Using Fuzzy-Set Qualitative Comparative Analysis: Insights from Twenty Years of Biodiversity Conservation in Costa Rica." *Global Environmental Change* 23 (3): 573-87.
- Beach, Derek, and Rasmus Brun Pedersen. 2013. *Process-Tracing Methods: Foundations and Guidelines*. Ann Arbor, MI: University of Michigan Press.
- Blatter, Joachim, and Markus Haverland. 2012. *Designing Case Studies: Explanatory Approaches in Small-N Research*. Basingstoke: Palgrave Macmillan.
- Blatter, Joachim, Matthias Kreuzer, Michaela Rentl, and Jan Thiele. 2010. "Preconditions for Foreign Activities of European Regions: Tracing Causal Configurations of Economic, Cultural, and Political Strategies." *Publius* 40 (1): 171-99.

- Britt, David W., Samantha T. Risinger, Virginia Miller, Mary K. Mans, Eric L. Krivchenia, and Mark I. Evans. 2000. "Determinants of Parental Decision After the Prenatal Diagnosis of Down Syndrome." *American Journal of Medical Genetics* 93 (5): 410-16.
- Caren, Neal, and Aaron Panofsky. 2005. "TQCA: A Technique for Adding Temporality to Qualitative Comparative Analysis." *Sociological Methods & Research* 34 (2): 147-72.
- Collier, David. 2014. "QCA Should Set Aside the Algorithms." *Sociological Methodology* 44 (1): 122-26.
- Collier, David, Henry E. Brady, and Jason Seawright. 2010. "Critiques, Responses, and Trade-Offs: Drawing Together the Debate." In *Rethinking Social Inquiry*, edited by Brady, Henry E. and David Collier. Lanham, MD: Rowman & Littlefield, 125-59.
- Cronqvist, Lasse. 2004. "Presentation of TOSMANA: Adding Multi-Value Variables and Visual Aids to QCA." *COMPASSSS Working Papers* (20).
- Cronqvist, Lasse. 2018. *Tosmana [Version 1.6]*. University of Trier.
- Cronqvist, Lasse, and Dirk Berg-Schlosser. 2009. "Multi-Value QCA (mvQCA)." In *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*, edited by Rihoux, Benoît and Charles C. Ragin. Los Angeles: Sage, 69-86.
- Dardanelli, Paolo. 2012. "Europeanization and the Unravelling of Belgium: A Comparative Analysis of Party Strategies." *Acta Politica* 47 (2): 181-209.
- Drass, Kriss A., and Charles C. Ragin. 1986. "QCA: A Microcomputer Package for Qualitative Comparative Analysis of Social Data." Center for Urban Affairs and Policy Research, Northwestern University.
- Duša, Adrian. 2018. *QCA with R. A Comprehensive Resource*. Cham: Springer.
- Emmenegger, Patrick, Jon Kvist, and Svend-Erik Skaaning. 2013. "Making the Most of Configurational Comparative Analysis: An Assessment of QCA Applications in Comparative Welfare State Research." *Political Research Quarterly* 66 (1): 185-90.
- Engeli, Isabelle. 2012. "Policy Struggle on Reproduction: Doctors, Women, and Christians." *Political Research Quarterly* 65 (2): 330-45.
- Engeli, Isabelle, and Christine Rothmayr Allison. 2013. "Diverging Against All Odds? Regulatory Paths in Embryonic Stem Cell Research Across Western Europe." *Journal of European Public Policy* 20 (3): 407-24.

- Gansemans, Annelien, Deborah Martens, Marijke D'Haese, and Jan Orbie. 2017. "Do Labour Rights Matter for Export? A Qualitative Comparative Analysis of Pineapple Trade to the EU." *Politics and Governance* 5 (4): 93-105.
- Gaubatz, Kurt Taylor. 2015. *A Survivor's Guide to R: An Introduction for the Uninitiated and the Unnerved*. Los Angeles, CA: SAGE.
- Gerring, John. 2012. *Social Science Methodology: A Unified Framework*. Cambridge: Cambridge University Press.
- Goertz, Gary. 2017. *Multimethod Research, Causal Mechanisms, and Case Studies*. Princeton, NJ: Princeton University Press.
- Goertz, Gary, and James Mahoney. 2012. *A Tale of Two Cultures: Qualitative and Quantitative Research in the Social Sciences*. Princeton, NJ: Princeton University Press.
- Greckhamer, Thomas. 2011. "Cross-cultural Differences in Compensation Level and Inequality across Occupations: A Set-Theoretic Analysis." *Organization Studies* 32 (1): 85-115.
- Haesebrouck, Tim. 2015. "Pitfalls in QCA's Consistency Measure." *Journal of Comparative Politics* (2): 65-80.
- Haesebrouck, Tim. 2017. "NATO Burden Sharing in Libya: A Fuzzy Set Qualitative Comparative Analysis." *Journal of Conflict Resolution* 61 (10): 2235-61.
- Hall, Peter A. 2003. "Aligning Ontology and Methodology in Comparative Politics." In *Comparative Historical Analysis in the Social Sciences*, edited by Mahoney, James and Dietrich Rueschemeyer. New York: Cambridge University Press, 373-404.
- Hicks, Alexander, Joya Misra, and Tang Nah Ng. 1995. "The Programmatic Emergence of the Social Security State." *American Sociological Review* 60 329-49.
- Hino, Airo. 2009. "Time-Series QCA: Studying Temporal Change through Boolean Analysis." *Sociological Theory and Methods* 24 (2): 247-65.
- Hudson, John, and Stefan Kühner. 2013. "Qualitative Comparative Analysis and Applied Public Policy Analysis: New Applications of Innovative Methods." *Policy and Society* 32 (4): 279-87.
- Hug, Simon. 2013. "Qualitative Comparative Analysis: How Inductive Use and Measurement Error Lead to Problematic Inference." *Political Analysis* 21 (2): 252-65.

- Ide, Tobias. 2015. "Why Do Conflicts over Scarce Renewable Resources Turn Violent? A Qualitative Comparative Analysis." *Global Environmental Change* 33 61-70.
- Ide, Tobias. 2018. "Does Environmental Peacemaking between States Work? Insights on Cooperative Environmental Agreements and Reconciliation in International Rivalries." *Journal of Peace Research* 55 (3): 351-65.
- Lakoff, George. 1973. "Hedges: A Study in Meaning Criteria and the Logic of Fuzzy Concepts." *Journal of Philosophical Logic* 2 (4): 458-508.
- Lieberson, Stanley. 2004. "Comments on the Use and Utility of QCA." *Qualitative Methods* 2 (2): 13-14.
- Lilliefeldt, Emelie. 2012. "Party and Gender in Western Europe Revisited: A Fuzzy-Set Qualitative Comparative Analysis of Gender-Balanced Parliamentary Parties." *Party Politics* 18 (2): 193-214.
- Lucas, Samuel R., and Alisa Szatrowski. 2014. "Qualitative Comparative Analysis in Critical Perspective." *Sociological Methodology* 44 (1): 1-79.
- Mahoney, James. 2004. "Reflections on Fuzzy-Set/QCA." *Qualitative Methods* 2 (2): 17-21.
- Mahoney, James. 2010. "After KKV: The New Methodology of Qualitative Research." *World Politics* 62 (1): 120-47.
- McNeill, Daniel, and Paul Freiberger. 1993. *Fuzzy Logic*. New York, NY: Touchstone.
- Mello, Patrick A. 2013. "From Prospect to Practice: A Critical Review of Applications in Fuzzy-Set Qualitative Comparative Analysis." 8th Pan-European Conference on International Relations, Warsaw, 18-21 September.
- Mello, Patrick A. 2014. "Fuzzy-Set Qualitative Comparative Analysis." In *Democratic Participation in Armed Conflict: Military Involvement in Kosovo, Afghanistan, and Iraq*, Basingstoke: Palgrave Macmillan, 46-62.
- Mello, Patrick A. 2017. "Qualitative Comparative Analysis and the Study of Non-State Actors." In *Researching Non-State Actors in International Security: Theory & Practice*, edited by Kruck, Andreas and Andrea Schneiker. Oxon: Routledge, 123-42.
- Mello, Patrick A. 2019. "Paths towards Coalition Defection: Democracies and Withdrawal from the Iraq War." *European Journal of International Security* (14 June): <https://doi.org/10.1017/eis.2019.10>.
- Mendel, Jerry M., and Charles C. Ragin. 2011. "fsQCA: Dialog Between Jerry M. Mendel and Charles C. Ragin." *USC-SIPI Report* (411): 1-43.

- Mill, John Stuart (2006) *Collected Works of John Stuart Mill: Volume VII*, Indianapolis, Liberty Fund.
- Moses, Jonathon W., and Torbjørn L. Knutsen. 2012. *Ways of Knowing: Competing Methodologies in Social and Political Research*. Basingstoke: Palgrave Macmillan.
- Oana, Ioana-Elena, and Carsten Q. Schneider. 2018. "SetMethods: An Add-on R Package for Advanced QCA." *The R Journal* 10/1 (July): 507-33.
- Oppermann, Kai, and Klaus Brummer. 2018. "Who Gets What in Foreign Affairs? Explaining the Allocation of Foreign Ministries in Coalition Governments." *Government and Opposition* (doi:10.1017/gov.2018.19): 1-19.
- Ragin, Charles C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley, CA: University of California Press.
- Ragin, Charles C. 2000. *Fuzzy-Set Social Science*. Chicago, IL: University of Chicago Press.
- Ragin, Charles C. 2006. "Set Relations in Social Research: Evaluating Their Consistency and Coverage." *Political Analysis* 14 (3): 291-310.
- Ragin, Charles C. 2008. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Chicago, IL: University of Chicago Press.
- Ragin, Charles C., and Benoît Rihoux. 2004. "Replies to Commentators: Reassurances and Rebuttals." *Qualitative Methods* 2 (2): 22-24.
- Ragin, Charles C., and Sarah I. Strand. 2008. "Using Qualitative Comparative Analysis to Study Causal Order: Comment on Caren and Panofsky (2005)." *Sociological Methods & Research* 36 (4): 431-41.
- Ragin, Charles, and Sean Davey. 2017. *fs/QCA [Version 3.0]*. Irvine, CA: University of California.
- Rihoux, Benoît, Priscilla Álamos-Concha, Damien Bol, Axel Marx, and Ilona Rezsöhazy. 2013. "From Niche to Mainstream Method? A Comprehensive Mapping of QCA Applications in Journal Articles from 1984 to 2011." *Political Research Quarterly* 66 (1): 175-84.
- Rihoux, Benoît, and Heike Grimm, ed. 2006. *Innovative Comparative Methods for Policy Analysis: Beyond the Quantitative-Qualitative Divide*. Boston, MA: Springer.
- Rihoux, Benoît, and Charles C. Ragin, ed. 2009. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*. Thousand Oaks, CA: Sage.

- Rihoux, Benoît, Ilona Rezsö-hazy, and Damien Bol. 2011. "Qualitative Comparative Analysis (QCA) in Public Policy Analysis: an Extensive Review." *German Policy Studies* 7 (3): 9-82.
- Rohlfing, Ingo. 2012. *Case Studies and Causal Inference: An Integrative Framework*. Basingstoke: Palgrave Macmillan.
- Rohlfing, Ingo, and Carsten Q. Schneider. 2018. "A Unifying Framework for Causal Analysis in Set-Theoretic Multimethod Research." *Sociological Methods & Research* 47 (1): 37-63.
- Schmitt, Olivier. 2018. *Allies that Count: Junior Partners in Coalition Warfare*. Washington, DC: Georgetown University Press.
- Schneider, Carsten Q. 2018. "Realists and Idealists in QCA." *Political Analysis* 1-9.
- Schneider, Carsten Q., and Kristin Makszin. 2014. "Forms of Welfare Capitalism and Education-Based Participatory Inequality." *Socio-Economic Review* 12 (2): 437-62.
- Schneider, Carsten Q., and Claudius Wagemann. 2010. "Standards of Good Practice in Qualitative Comparative Analysis (QCA) and Fuzzy-Sets." *Comparative Sociology* 9 (3): 397-418.
- Schneider, Carsten Q., and Claudius Wagemann. 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*. New York, NY: Cambridge University Press.
- Seawright, Jason. 2005. "Assumptions, Causal Inference, and the Goals of QCA." *Studies in Comparative and International Development* 40 (1): 39-42.
- Sekhon, Jasjeet S. 2008. "The Neyman-Rubin Model of Causal Inference and Estimation via Matching Methods." In *The Oxford Handbook of Political Methodology*, edited by Box-Steffensmeier, Janet M., Henry E. Brady and David Collier. Oxford: Oxford University Press, 271-99.
- Smithson, Michael, and Jay Verkuilen. 2006. *Fuzzy Set Theory: Applications in the Social Sciences*. Thousand Oaks: Sage.
- Thomann, Eva. 2015. "Is Output Performance All About the Resources? a Fuzzy-Set Qualitative Comparative Analysis of Street-Level Bureaucrats in Switzerland." *Public Administration* 93 (1): 177-94.
- Vis, Barbara. 2011. "Under Which Conditions Does Spending on Active Labor Market Policies Increase? An fsQCA Analysis of 53 Governments between 1985 and 2003." *European Political Science Review* 3 (2): 229-52.

- Vis, Barbara. 2012. "The Comparative Advantages of fsQCA and Regression Analysis for Moderately Large-N Analyses." *Sociological Methods & Research* 41 (1): 168-98.
- Wagemann, Claudius, Jonas Buche, and Markus B. Siewert. 2016. "QCA and Business Research: Work in Progress or a Consolidated Agenda?" *Journal of Business Research* 49 (7): 2531-10.
- Whitesitt, J. Eldon. 2010. *Boolean Algebra and its Applications*. Mineola, NY: Dover.
- Zadeh, Lotfi A. 1965. "Fuzzy Sets." *Information and Control* 8 (1): 338-53.