

Preface

Over the past decade, Qualitative Comparative Analysis (QCA) has made major inroads into many areas of the social sciences, with applications from sociology and political science topping the list of publication figures. The development of software able to meet the growing demand for QCA, however, has been relatively slow and patchy. The QCA package for the R environment and this accompanying user's guide form the bundle of tools which fill this gap in three ways. First, with QCA, there now exists a user-friendly yet immensely powerful and flexible software solution covering the full spectrum of QCA. Second, this guide complements QCA's own internal documentation files by providing a comprehensive manual. And third, this guide offers a general introduction to performing QCA with the R environment for statistical computing and graphics.

The typographic conventions used in this book are intended to facilitate the flow of reading. Software and packages are identified by a sans-serif font: **Software**; R input code by slanted typewriter style: *input*; R output and general code by typewriter style: `output`; variables by italicized letters: *var*; sets (their negations) by bold upper case (lower case) font-weight: **S** (**s**); uniform resource locators (URLs) by typewriter style: `http://www.r-project.org/`; filename extensions by italicized lower case letters with a preceding dot: *.txt*; and explanations of R functions and some arguments by underlining: `sin()` finds the sine.

Terminology is important and should ideally be homogeneous, but different academic communities use different terms to mean one and the same QCA object. We adopt a set of definitions that will be used consistently throughout the text. A *condition*, or *condition set* is a set, or a combination of sets, that is meant to explain the outcome. An *outcome*, or *outcome set* is a set that is to be explained by the condition(s). Each binary-value set has two *literals*, one for its presence and one for its absence/negation. An *outcome value* is a truth value in the truth table indicating the degree to which the aggregate evidence is consistent with the statement that the configuration is sufficient for the outcome. If the outcome value is positive ("1"), the configuration is assessed as *true*. If the outcome value is negative ("0"), the configuration is assessed as *false*. A *configuration* is a conjunctive combination of all conditions in the truth table. A *combination* is any

conjunction or disjunction of conditions. The set of configurations which is to be minimized forms the *canonical sum*. A configuration which is part of a canonical sum is called a *fundamental product*. The *solution* results from the minimization of the canonical sum, and consists of one or more *minimal sums*. Each conjunctive combination in the minimal sum is called a *prime implicant*. Prime implicants that imply fundamental products which no other prime implicant implies are referred to as *essential prime implicants*, otherwise as *inessential prime implicants*.

When one of QCA's functions is introduced for the first time in a chapter, the full syntax is written out in a gray box as it would apply to the actual operation that is to be performed next. This not only presents readers with the full range of options they have available in this function, but also demonstrates the most efficient way to carry out the desired operation. For example, if the aim was to calibrate a crisp set S from a continuous base variable s , the following syntax box would appear before the actual input of code required by the user. The “is-greater-than” sign $>$ indicates where the input of code starts, while the “plus” sign $+$ signals the continuation of this input.

Full syntax:

```
> calibrate(s, type = "crisp", thresholds = 7, include = TRUE,
+ logistic = FALSE, idm = 0.95, ecdf = FALSE, p = 1, q = 1)
```

The above is the full syntax processed by QCA's `calibrate()` function, but only the following input is required by the user to achieve the desired result:

```
> S <- calibrate(s, thresholds = 7)
```

Often in the book we draw parallels and illustrate differences in the functionality between the QCA package and alternative software. Whenever mention is made of fs/QCA, QCA3, Tosmana or fuzzy, we refer to the latest versions available at the time of writing, this being fs/QCA 2.5, QCA3 0.0-5, Tosmana 1.3.2.0, and fuzzy st0140_2. Future updates may render these parallels and differences invalid.

The ideational spadework of this book was done during the 2011 Summer School of the European Consortium for Political Research (ECPR) at the University of Ljubljana, where I (Alrik) was lucky enough to meet a number of inspirational people. We thank Flavia Fossati for her help with the collection of QCA applications, and the participants of the 2012 ECPR Joint Sessions Workshop “Methodological Advances, Bridges and Limits in the Application of Qualitative Comparative Analysis” for useful comments and suggestions. Our editors at Springer Jon Gurstelle and Kevin Halligan ensured a smooth flow of this project. For financial support at various stages, we thank the Swiss Academy of Humanities and Social Sciences, the Swiss Study Foundation, and the Swiss National Science Foundation. This book has been typeset with the help of L^AT_EX, B_IB_TE_X, MakeIndex, P_STricks, and Sweave. Without these amazing tools,

its preparation would have been so much harder. We also thank their authors for making such great software freely available.

A lot of time and effort has been invested in developing the QCA package and in writing this book. If you use the QCA package in your work, please cite it as

Dușa, Adrian, and Alrik Thiem. 2012. *QCA: Qualitative Comparative Analysis*. R Package Version <current version number>.

We seek to keep QCA's functionality and design abreast of changes. Responsiveness to new developments and feedback by users are key in this endeavor. Readers of this book and users of our package are therefore invited to contact us with suggestions for improvements, comments, or questions at thiem@sipo.gess.ethz.ch and dusadrian@unibuc.ro.

Happy QCAing!

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