UNIVERSITÉ DE GENÈVE

Workshop Seminar:
Configurational Research with QCA and CNA

2-6 November 2015, University of Geneva, Switzerland

Prof. Dr. Michael Baumgartner and Dr. Alrik Thiem, University of Geneva

1 Short Seminar Description

This workshop seminar offers an intensive one-week introduction to causal modelling with *Qualitative Comparative Analysis* (QCA) and *Coincidence Analysis* (CNA), the two most prominent configurational/Boolean methods of causal discovery. Participants will not only be guided through the nuts and bolts of configurational comparative research as well as cutting-edge methodological innovations, but they will also learn how to make the most of the latest software tools and technical developments.

From the philosophical roots of regularity theories of causation to the empirical analysis of elaborate causal chains, this seminar will go beyond the standard template of configurational research taught in conventional QCA courses. Besides enabling participants to perform QCA in a correct and sophisticated manner, it will be shown, for example, why the vast majority of past QCA studies have run the risk of failing to find the underlying causal model, and why the "conservative solution" in QCA is anything but conservative. The seminar also provides an introduction to CNA—a novel generalization of QCA that is geared towards uncovering causal chains and common cause structures. Last but not least, students will learn why recent critiques discouraging the use of QCA lack traction. Individual consultation sessions will be offered in addition to help participants with the methodological aspects of their own research projects.

The two instructors are among the most active researchers in the field, publishing and teaching at the forefront of configurational research. As authors of the most powerful software programmes for QCA and CNA currently available, they also have an unrivalled familiarity with these tools, which will be made ample use of throughout the seminar.

2 Seminar Schedule

The full seminar schedule is provided below. Each day is divided into four modules, with each module lasting 90 minutes. On days 2 and 3 a consultation session is

added after the fourth module. Required and supplementary readings for each day will be made available to registered students three weeks in advance. Main readings in either category, required and supplementary, are marked with a "•" sign. A "+" sign marks additional reading that closely relates to the respective main reading below which it is listed.

Day	***Module and Topic(s) Covered***
Day 1; Monday, 2 November 2015: Theoretical Foundations ☞ detailed schedule	
09:00 - 10:30	**Module 1.1:** Theorizing about causation and the essentials of Boolean algebra
10:30 - 10:45	Break
10:45 - 12:15	**Module 1.2:** Regularity theories from Hume via Mill to Mackie
12:15 - 13:30	Lunch Break
13:30 - 15:00	**Module 1.3:** Discovering regularity theoretic causation
15:00 - 15:15	Break
15:15 - 16:45	**Module 1.4:** The basic work flow of QCA

Required readings

- Mackie, John L. 1965. "Causes and Conditions." *American Philosophical Quarterly* 2 (4):245-64.
- Quine, Willard V. 1952. "The Problem of Simplifying Truth Functions." *American Mathematical Monthly* 59 (8):521-31. ***Only read until Theorem 6***.
- McCluskey, Edward J. 1956. "Minimization of Boolean Functions." *Bell Systems Technical Journal* 35 (6):1417-44. ***Only read pages 1417-28***.
- Mill, John Stuart [edited by J. M. Robson]. 2006, 1973, [1843]. *A System of Logic, Ratiocinative and Inductive.* Toronto: University of Toronto Press, pp. 388-406, 434-453.

Supplementary readings

- Barringer, Sondra N., Scott R. Eliason, and Erin Leahey. 2013. "A History of Causal Analysis in the Social Sciences." In *Handbook of Causal Analysis for Social Research*, ed. S. L. Morgan. Dordrecht: Springer, pp. 9-26.
- Baumgartner, Michael. 2008. "Regularity Theories Reassessed." *Philosophia* 36 (3):327-54.
- Ducheyne, Steffen. 2008. "J.S. Mill's Canons of Induction: From True Causes to Provisional Ones." *History and Philosophy of Logic* 29 (4):361-76.
- Reiss, Julian. 2009. "Causation in the Social Sciences: Evidence, Inference, and Purpose." *Philosophy of the Social Sciences* 39 (1):20-40.

Day 2; Tuesday, 3 November 2015: Crisp-Set QCA ☞ detailed schedule	
09:00 - 10:30	**Module 2.1:** A short introduction to R
10:30 - 10:45	Break
10:45 - 12:15	**Module 2.2:** From raw data to the QCA solution
12:15 - 13:30	Lunch Break
13:30 - 15:00	**Module 2.3:** Data deficiencies in QCA and how to deal with them
15:00 - 15:15	Break
15:15 - 16:45	**Module 2.4:** The three solution types of QCA
17:00 - 18:00	Consultation session

Required readings

- Baumgartner, Michael. 2015. "Parsimony and Causality." *Quality & Quantity* 49 (2):839-56.
- Ragin, Charles C. 1987. *The Comparative Method: Moving beyond Qualitative and Quantitative Strategies.* Berkeley: University of California Press, pp. 85-118.

Supplementary readings

- 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: University of Chicago Press, pp. 147-175.
- Rihoux, Benoît, and Gisèle De Meur. 2009. "Crisp-Set Qualitative Comparative Analysis (csQCA)." In *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*, ed. B. Rihoux and C. C. Ragin. London: SAGE, pp. 33-68.
- Schneider, Carsten Q., and Claudius Wagemann. 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis (QCA).* Cambridge: Cambridge University Press, pp. 151-177.

Day 3; Wednesday, 4 November 2015: Other variants of QCA ☞ detailed schedule

09:00 - 10:30	**Module 3.1:** Multi-Value QCA
10:30 - 10:45	Break
10:45 - 12:15	**Module 3.2:** Issues around Multi-Value QCA
12:15 - 13:30	Lunch Break
13:30 - 15:00	**Module 3.3:** Fuzzy-Set Theory and Fuzzy Logic
15:00 - 15:15	Break
15:15 - 16:45	**Module 3.4:** Fuzzy-Set QCA
17:00 - 18:00	Consultation session

Required readings

- Schneider, Carsten Q., and Claudius Wagemann. 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis (QCA).* Cambridge: Cambridge University Press, pp. 93-104.
- Thiem, Alrik. 2013. "Clearly Crisp, and Not Fuzzy: A Reassessment of the (Putative) Pitfalls of Multi-Value QCA." *Field Methods* 25 (2):197-207.

Supplementary readings

- Cooper, Barry, and Judith Glaesser. 2011. "Paradoxes and Pitfalls in Using Fuzzy Set QCA: Illustrations from a Critical Review of a Study of Educational Inequality." *Sociological Research Online* 16 (3):8.
- Ragin, Charles C. 2009. "Qualitative Comparative Analysis Using Fuzzy Sets (fsQCA)." In Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques, ed. B. Rihoux and C. C. Ragin. London: Sage Publications, pp. 87-121.
- Schneider, Carsten Q., and Claudius Wagemann. 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis (QCA).* Cambridge: Cambridge University Press, pp. 255-263.
- Thiem, Alrik. 2014. "Unifying Configurational Comparative Methods: Generalized-Set Qualitative Comparative Analysis." *Sociological Methods & Research* 43 (2):313-37.
- Thiem, Alrik. 2015. "Parameters of Fit and Intermediate Solutions in Multi-Value Qualitative Comparative Analysis." *Quality & Quantity* 49 (2):657-74.
- Vink, Maarten P., and Olaf van Vliet. 2009. "Not Quite Crisp, Not Yet Fuzzy? Assessing the Potentials and Pitfalls of Multi-value QCA." *Field Methods* 21 (3):265-89.

+ Vink, Maarten P., and Olaf van Vliet. 2013. "Potentials and Pitfalls of Multi-Value QCA: Response to Thiem." *Field Methods* 25 (2):208-13.

Day 4; Thursday, 5 November 2015: Critiques of QCA ☞ detailed schedule

09:00 - 10:30	**Module 4.1:** A closer look at model ambiguities
10:30 - 10:45	Break
10:45 - 12:15	**Module 4.2:** Does QCA suffer from confirmation bias?
12:15 - 13:30	Lunch Break
13:30 - 15:00	**Module 4.3:** Causal complexity in QCA and regression analysis
15:00 - 15:15	Break
15:15 - 16:45	**Module 4.4:** Beyond QCA: causal chains and common cause structures
17:00 - 18:00	Consultation session

Required readings

- Lucas, Samuel R., and Alisa Szatrowski. 2014. "Qualitative Comparative Analysis in Critical Perspective." *Sociological Methodology* 44 (1):1-79. ***Only read pages 1-27***.

+ Collier, David. 2014. "Comment: QCA Should Set Aside the Algorithms." *Sociological Methodology* 44 (1):122-6.

+ Fiss, Peer C., Axel Marx, and Benoît Rihoux. 2014. "Comment: Getting QCA Right." *Sociological Methodology* 44 (1):95-100.

+ Olsen, Wendy. 2014. "Comment: The Usefulness of QCA under Realist Assumptions." *Sociological Methodology* 44 (1):101-7.

+ Ragin, Charles C. 2014. "Comment: Lucas and Szatrowski in Critical Perspective." *Sociological Methodology* 44 (1):80-94.

+ Vaisey, Stephen. 2014. "Comment: QCA Works—When Used with Care." *Sociological Methodology* 44 (1):108-12.

Supplementary readings

- Clark, William Roberts, Michael J. Gilligan, and Matt Golder. 2006. "A Simple Multivariate Test for Asymmetric Hypotheses." *Political Analysis* 14 (3):311-31.

+ Thiem, Alrik, Michael Baumgartner, and Damien Bol. 2015. "Still Lost in Translation! A Correction of Three Misunderstandings Between Configurational Comparativists and Regressional Analysts." *Comparative Political Studies*, Advance Online, DOI: 10.1177/0010414014565892.

- Hug, Simon. 2013. "Qualitative Comparative Analysis: How Inductive Use and Measurement Error lead to Problematic Inference." *Political Analysis* 21 (2):252-65.

+ Thiem, Alrik. 2014. "Mill's Methods, Induction and Case Sensitivity in Qualitative Comparative Analysis: A Comment on Hug (2013)." *Qualitative & Multi-Method Research* 12 (2):19-24.

+ Hug, Simon. 2014. "We Need an Open Discussion of QCA's Limitations: A Comment on Thiem." *Qualitative & Multi-Method Research* 12 (2):24-7.

- Krogslund, Chris, Donghyun Danny Choi, and Mathias Poertner. 2015. "Fuzzy Sets on Shaky Ground: Parameter Sensitivity and Confirmation Bias in fsQCA." *Political Analysis* 23 (1):21-41.

- Paine, Jack. 2015. "Set-Theoretic Comparative Methods: Less Distinctive Than Claimed." *Comparative Political Studies* DOI:10.1177/0010414014564851.

- Thiem, Alrik. 2014. "Navigating the Complexities of Qualitative Comparative Analysis: Case Numbers, Necessity Relations, and Model Ambiguities." *Evaluation Review* 38 (6):487-513.

Day 5; Friday, 6 November 2015: Coincidence Analysis ☞ detailed schedule

09:00 - 10:30	**Module 5.1:** The CNA algorithm
10:30 - 10:45	Break
10:45 - 12:15	**Module 5.2:** The differences and commonalities of QCA and CNA
12:15 - 13:30	Lunch Break

13:30 - 15:00	**Module 5.3:** Working with the cna package for R
15:00 - 15:15	Break
15:15 - 16:45	**Module 5.4:** The causal chain problem

Required readings

- Baumgartner, Michael. 2013. "Detecting Causal Chains in Small-n Data." *Field Methods* 25 (1):3-24.

Supplementary readings

- Baumgartner, Michael. 2008. "The Causal Chain Problem." *Erkenntnis* 69 (2):201-26.
- Baumgartner, Michael. 2009. "Inferring Causal Complexity." *Sociological Methods & Research* 38 (1):71-101.
- Baumgartner, Michael, and Ruedi Epple. 2014. "A Coincidence Analysis of a Causal Chain: The Swiss Minaret Vote." *Sociological Methods & Research* 43 (2):280-312.
- Baumgartner, Michael, and Alrik Thiem. 2015. Identifying Complex Causal Dependencies in Configurational Data with Coincidence Analysis." *The R Journal* 7 (1).

3 Detailed Seminar Schedule

Day 1: Monday, 2 November 2015

The first module of the seminar introduces the basic objectives and designs of theories of causation, discusses various theory candidates, and presents the elements of Boolean algebra implemented by QCA and CNA. Module 1.2 then displays the details of the regularity theory of causation behind configurational methods and tracks its historical predecessors in the works of David Hume, John Stuart Mill, and John L. Mackie. In module 1.3 we turn to the problem of discovering causation as defined by modern regularity theories. We review Mill's famous method of difference, consider the problems of causal inference under epistemic uncertainty and of data confounding, and pinpoint the background assumptions required by configurational methods. Finally, module 1.4 introduces the basic procedural ideas that regulate QCA's inference from configurational data via truth tables to minimized Boolean functions (solutions formulas) and their causal interpretation. In particular, we present the details of QCA's algorithmic core: Quine-McCluskey optimization.

Day 2: Tuesday, 3 November 2015

Day 2 begins with a short introduction to the R environment and its basic functionality in module 2.1. In module 2.2, participants recap the material from module 1.4 by performing their first crisp-set QCA in an ideal data context from beginning to end with the QCA package for R. Important differences between the QCA package and popular QCA software like fs/QCA (Ragin and Davey, 2014) and Tosmana (Cronqvist, 2011) are also highlighted. Module 2.3 then introduces ways to handle certain data deficiencies that are ubiquitous in applied research with QCA. In this connection, students learn about the *consistency* and *coverage* measures, and limited empirical diversity—the fact that certain cases which could theoretically exist are absent in the data. Finally, module 2.4 presents the three different solution types in QCA, and explains why only one of them, namely the parsimonious solution, reflects causation.

Day 3: Wednesday, 4 November 2015
Since about the early 2000s, QCA has become a family of different variants that are defined by their underlying set type. Crisp-set QCA has at its root bivalent factors whose levels underlie sets in which cases can only be members or not. Both multi-value and fuzzy-set QCA extend crisp-set QCA in different directions, the former on the dimension of the number of levels a factor can have, and the latter on the dimension of the degree to which cases can be elements in the respective set formed by each level of a bivalent factor. In module 3.1, students learn about multi-value QCA, how it relates to crisp-set QCA, and why it still leads a niche existence in both methodological and applied research. Module 3.2 is concerned with specific problems of multi-value QCA. In particular, it discusses extensions of the consistency and coverage measures, and explains why the transformation of multi-value data to conventional crisp-set data akin to regression-analytic practices is counterproductive. Fuzzy-set QCA is the topic of modules 3.3 and 3.4. First, the basics of fuzzy-set theory and logic are introduced before students learn about fuzzy-set QCA proper. As on day 2, this day is structured around alternating theoretical and practical slots in which students directly apply the theoretical material in computer exercises. ☜

Day 4: Thursday, 5 November 2015
Criticisms of QCA are the topic of day 4, the aim of which is to sensitize participants to what can go wrong in methodological and applied research with QCA if the algebraic foundations of the method and its search targets are not properly respected. In module 4.1, a closer look is first taken at the issue of model ambiguities, a problem that, until recently, has gone unnoticed in the QCA literature, with serious consequences. We show why and how this problem occurs, to which extent it affects applied research, and what can be done to alleviate it. In module 4.2, we confront two prominent studies which have argued that QCA suffers from confirmation bias (Krogslund, Choi and Poertner, 2015; Lucas and Szatrowski, 2014), and demonstrate why these studies lack methodological traction. To what extent QCA and regression analysis are different when it comes to the concept of causal complexity is discussed in module 4.3. Considerable confusion about the relation between QCA conjunctions and OLS interactions persists in the methodological literature, and we clarify in this module how the two are distinct from each other. The last module on day 4 prepares students for day 5. In module 4.4, we demonstrate that the restriction of QCA to single outcomes presupposes that there are no causal dependencies among the exogenous factors. ☜

Day 5: Friday, 6 November 2015
The aim of the final day is to pave a way for overcoming QCA's restriction to single-outcome structures. After all, causes of ultimate outcomes being linked in chains or causes having multiple parallel outcomes are very frequent in the world we live in. To uncover such structures, day 5 introduces Coincidence Analysis (CNA). Module 5.1 presents the algorithmic protocol of CNA, reviews its theoretical foundation, and introduces complex solutions formulas. In module 5.2, we highlight the differences and commonalities of QCA and CNA: both methods analyze the same type of data and have the same search targets, but while QCA implements Quine-McCluskey optimization, CNA draws on its own custom-built optimization routine, which does not force CNA to make recourse to counterfactual reasoning in cases of

limited diversity and does not require an outcome specification as input. Module 5.3 is then devoted to acquiring familiarity with the cna package for R and to giving students the opportunity to explore possibilities of making use of CNA in their own research. The seminar ends with module 5.4 presenting the causal chain problem, in virtue of which to every causal chain there exists a common cause model that is empirically indistinguishable from the chain. That means the inference to causal chains is systematically underdetermined by empirical data.

4 Instructor Details

Michael Baumgartner is a Swiss National Science Foundation professor at the Department of Philosophy of the University of Geneva. His research focuses on questions in the philosophy of science and logic, more specifically, on aspects of causation and causal reasoning with QCA and CNA, regularity theories, interventionism, determinism, logical formalization, argument reconstruction/evaluation and modelling in the social sciences. He has published in journals such as the *British Journal for the Philosophy of Science*, *Comparative Political Studies*, *Dialectica*, *Erkenntnis*, *Field Methods*, the *Journal of Philosophical Logic*, *Sociological Methods & Research*, and *Synthese*. He has developed the method of CNA and is a co-author of the corresponding cna package for the R environment.

Alrik Thiem is a post-doctoral researcher at the Department of Philosophy of the University of Geneva. The main part of his work addresses topics in the field of empirical social research methods, primarily configurational ones such as Coincidence Analysis, Event Structure Analysis, and Qualitative Comparative Analysis. He has published in numerous journals, including *Comparative Political Studies*, the *European Political Science Review*, the *Evaluation Review*, *Field Methods*, the *International Journal of Social Research Methodology*, the *Journal of Mathematical Sociology*, *Quality & Quantity*, the *Social Science Computer Review*, and *Sociological Methods & Research*. He is a co-author of both the QCA package as well as the cna package for the R environment, and has taught nationally and internationally on QCA.

5 Prerequisite Knowledge

Formally, the course requires no prior knowledge of configurational methods, but it will be intensive for absolute beginners. Users with an intermediate to advanced knowledge of QCA as taught in standard textbooks (Ragin, 2008; Rihoux and Ragin, 2009; Schneider and Wagemann, 2012) will learn much they did not know before about the method. Participants at all levels of knowledge will benefit from the instructors' current research, a significant part of which will be discussed during the course. Some basic knowledge of R, or at least programming more generally, would be helpful but it is not essential.

6 Date and Venue

2-6 November, 2015; University of Geneva, Switzerland. The exact venue at the University of Geneva will be communicated in due course.

7 Fees

No course fees will be charged, but participants are expected to cover all costs related to their attendance (travel, accommodation, living expenses) themselves.

8 Registration

To register for the workshop, please send an e-mail to alrik.thiem@unige.ch. Please also indicate your home institution, your position, and briefly describe your current knowledge about configurational methods, and whether you have any experience using the R software. Participants who are enrolled at the University of Geneva are asked to additionally register in the usual manner via chamilo.unige.ch.

9 Language of Instruction

The language of instruction is English.

10 ECTS Points

Participants who are enrolled at the University of Geneva can receive ECTS points according to the requirements of their study programs (*plan d'études*). Please indicate your individual requirements when registering for the course. Participants who are not enrolled at the University of Geneva can obtain 4 ECTS points if they submit a short research paper (2000-3000 words) within four weeks after the end of the course. It is the responsibility of the participants to enquire at their home institution whether ECTS points earned at this workshop will be accepted. To participants who do not want to earn credits, a certificate of attendance will be issued directly at the end of the workshop. To participants who would like to earn credits, this certificate will be issued after successful completion of all course requirements.

References

Cronqvist, Lasse. 2011. *Tosmana: Tool for Small-N Analysis, Version 1.3.2.0 [Computer Programme]*. Trier: University of Trier.

Krogslund, Chris, Donghyun Danny Choi and Mathias Poertner. 2015. "Fuzzy Sets on Shaky Ground: Parameter Sensitivity and Confirmation Bias in fsQCA." *Political Analysis* 23(1):21–41.

Lucas, Samuel R. and Alisa Szatrowski. 2014. "Qualitative Comparative Analysis in Critical Perspective." *Sociological Methodology* 44(1):1–79.

Ragin, Charles C. 2008. *Redesigning Social Inquiry: Fuzzy Sets and Beyond*. Chicago: University of Chicago Press.

Ragin, Charles C. and Sean Davey. 2014. *fs/QCA: Fuzzy-Set/Qualitative Comparative Analysis, Version 2.5 [Computer Programme]*. Irvine: Department of Sociology, University of California.

Rihoux, Benoît and Charles C. Ragin. 2009. *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*. London: SAGE.

Schneider, Carsten Q. and Claudius Wagemann. 2012. *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis (QCA)*. Cambridge: Cambridge University Press.