



A Short Introduction To Qualitative Comparative Analysis

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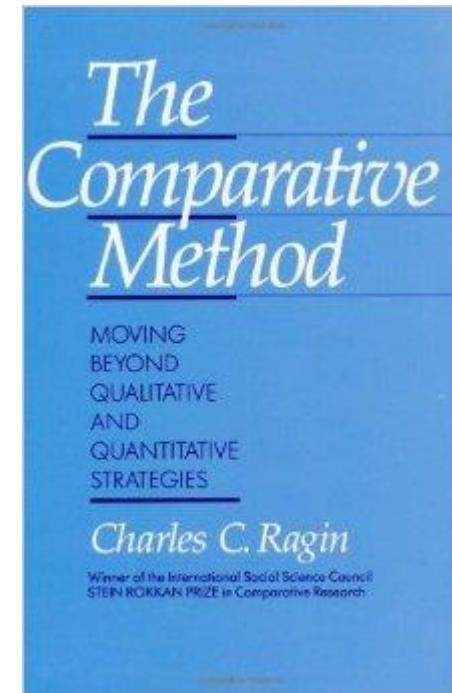
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Overview

- ∞ Background of QCA
- ∞ QCA as an approach
- ∞ QCA as a technique
- ∞ Concluding remarks
- ∞ Some references

Background of QCA

- ∞ Introduced by Charles Ragin in 1987
- ∞ Aim: move beyond endless qualitative vs. quantitative discussion in the social sciences methods literature



Background of QCA

<i>Quantitative</i>	<i>Qualitative</i>
Linear causality	Holistic causality
Variable-based	Case-based
Large-N	Small-N
Pattern recognition	High level of detail
Objectifying	Interpretive



Qualitative Comparative Analysis



Background of QCA

∞ Since 1987...

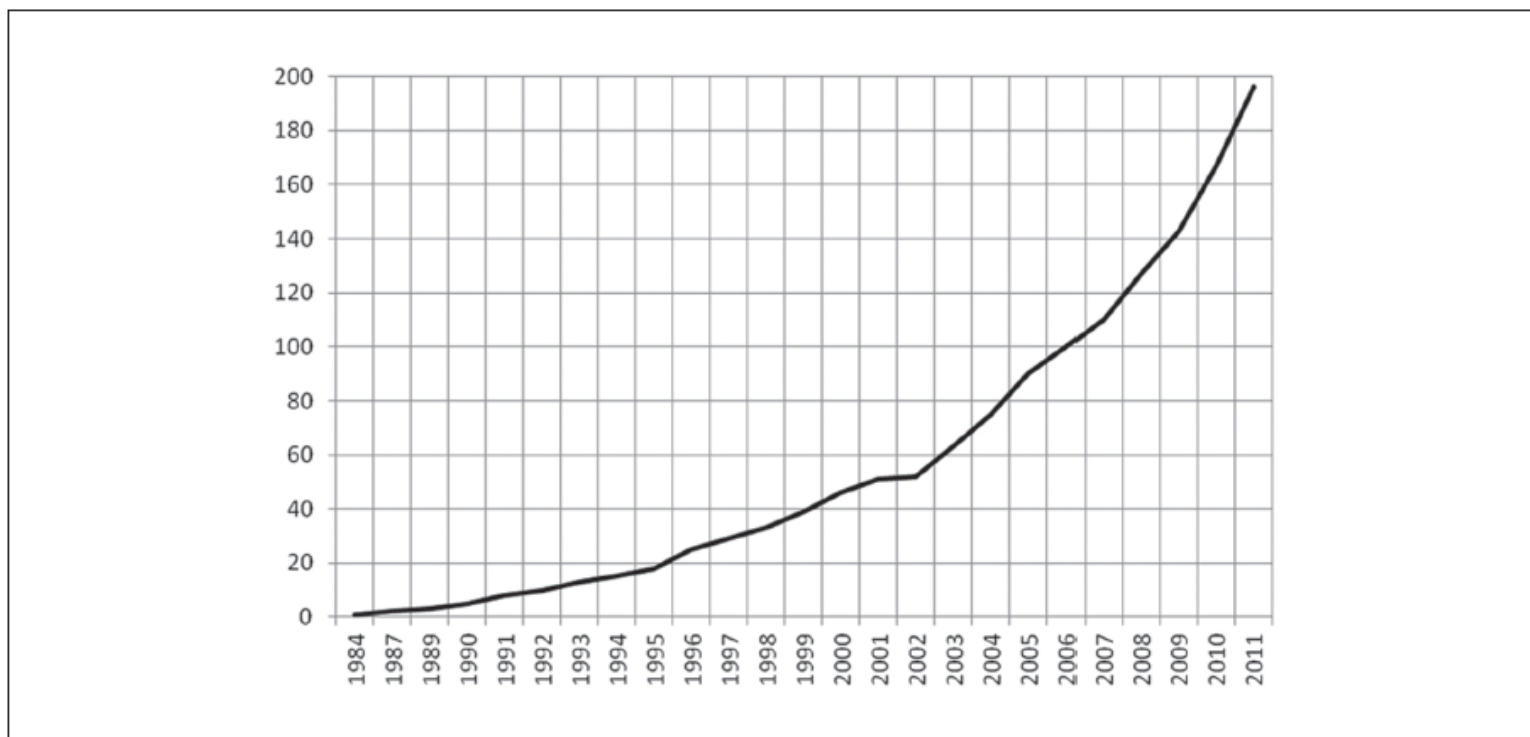


Figure 9. Cumulative number of journals having published QCA applications.²⁴

Background of QCA

∞ Since 1987...

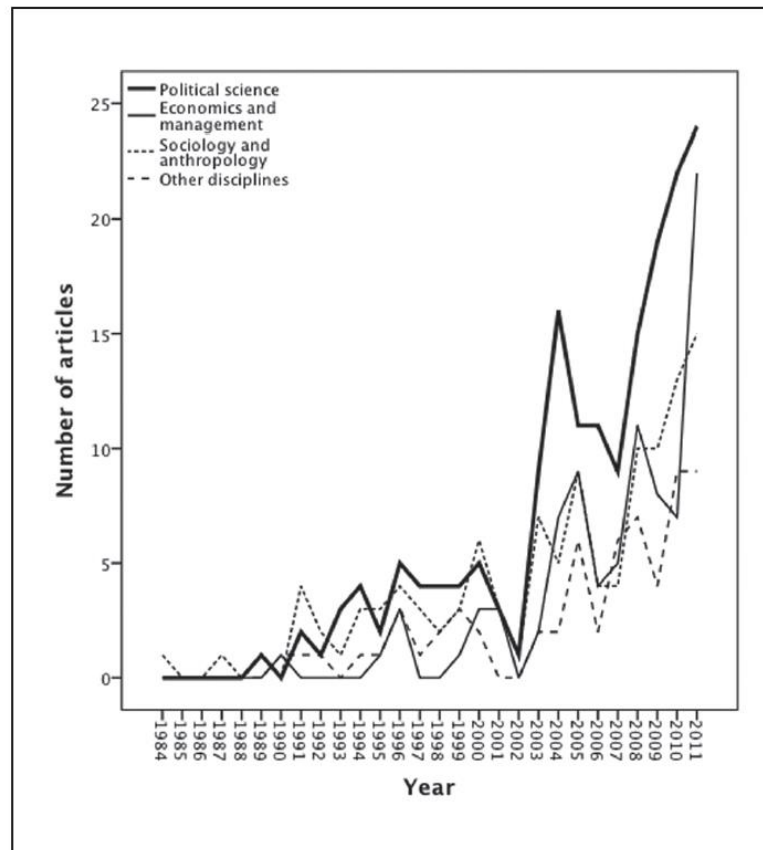
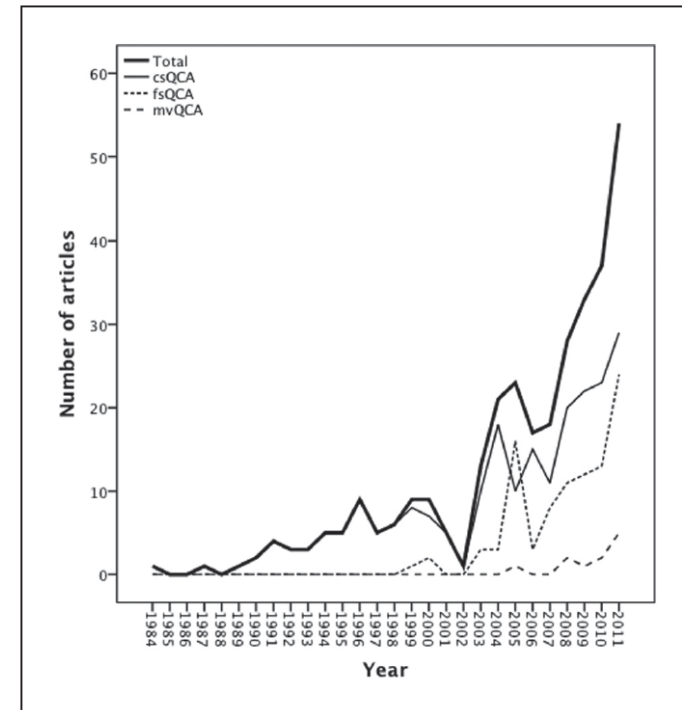


Figure 2. Number of articles by discipline, 1984–2011.⁶

Background of QCA

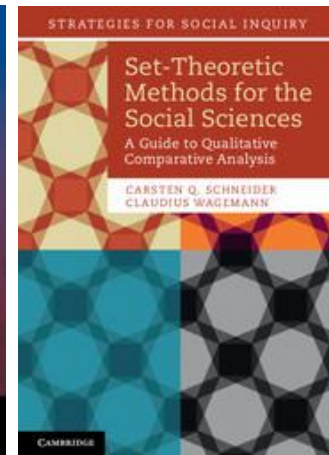
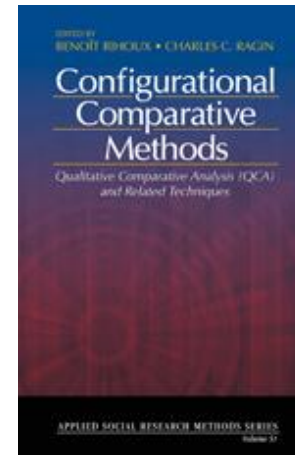
- ∞ Three *main* types of QCA:
 - ∞ Crisp-set QCA (Ragin 1987)
 - ∞ Fuzzy-set QCA (Ragin 2000; 2008)
 - ∞ Multi-value QCA (Cronqvist)



Background of QCA

- ∞ Several textbooks have been published, i.a.:
 - ∞ Rihoux & Ragin (eds.) (2009)
 - ∞ Schneider & Wagemann (2012)

- ∞ QCA has its own website:
 - ∞ <http://www.compasss.org>
 - ∞ QCA software freely available



QCA as an approach

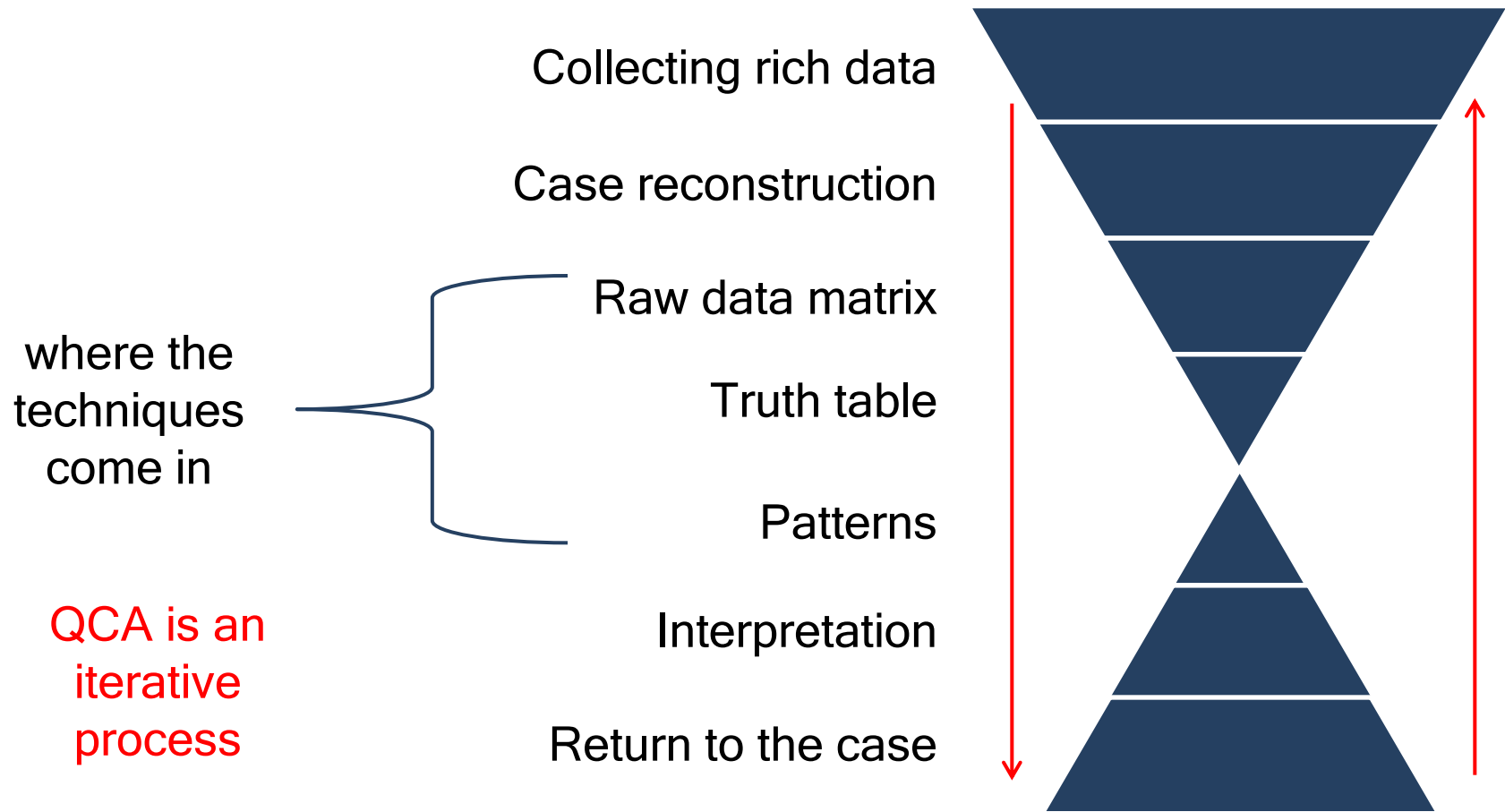
- ∞ QCA is a *case-based, qualitative, comparative* research approach
- ∞ That contains several techniques

- ∞ Complex causality
 - ∞ Asymmetric
 - ∞ Configurational
 - ∞ Equifinal
- ∞ Set-theory
 - ∞ Necessity and sufficiency



QCA as an approach

- ∞ QCA is a *case-based, qualitative, comparative* research approach



QCA as an approach

- ∞ Complex causality

- ∞ *Asymmetric*

If in one case $x \rightarrow y$ than it is not assumed that $\sim x \rightarrow \sim y$ in another case

- ∞ Compare this with variable-oriented approaches that search for correlations



QCA as an approach

- ∞ Complex causality
 - ∞ *Configurational*



Combinations of aspects (of cases) produce an outcome

- ∞ Note: aspects of cases are called ‘conditions’ in QCA
- ∞ Condition ≠ variable

Whereas variables are “adversaries in the struggle to explain variation in dependent variables (...) [conditions are] potential collaborators in the production of outcomes”

QCA as an approach

- ∞ Complex causality
 - ∞ *Equifinal*
 1. Different conditions can produce the same outcome
 2. The same condition can produce different outcomes
- ∞ The effect of a condition is contingent upon the other conditions (i.e. configurational)

QCA as an approach

- ∞ Set-theory
 - ∞ *Necessity / necessary conditions*

“The condition has to be present for the outcome to occur”

QCA as an approach

- ∞ Set-theory
 - ∞ *Sufficiency / sufficient conditions*

“The condition can produce the outcome by itself”

QCA as an approach

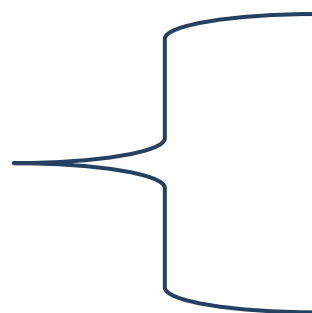
- ∞ Set-theory: necessity vs. sufficiency
 - ∞ Often, there are no purely sufficient conditions for outcomes to occur, because social phenomena are complex
 - ∞ INUS: “**I**nsufficient but **N**on-redundant parts of a condition which is itself **U**nnecessary but **S**ufficient for the occurrence of the effect” (Mackie, 1988)
 - ∞ INUS is what makes QCA interesting, because INUS is the logical expression of complex causality

QCA as a technique

- ∞ This presentation: crisp-set QCA

where the techniques come in

QCA is an iterative process



Collecting rich data

Case reconstruction

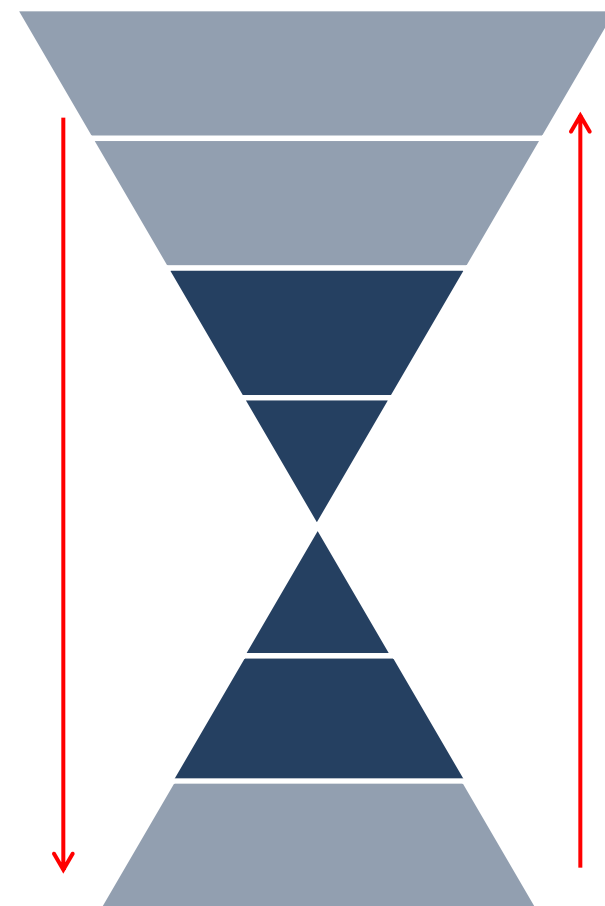
Raw data matrix

Truth table

Patterns

Interpretation

Return to the case



QCA as a technique

- ∞ Set-theory
 - ∞ A condition is a set
 - ∞ Sets combine in configurations (INUS) to produce outcomes

Logical AND (*): intersection of sets

Logical OR (+): union of sets

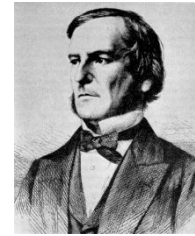
Logical NOT (\sim): negation of sets

- ∞ Cases have memberships in sets



QCA as a technique

- ∞ Cases have memberships in sets
 - ∞ Crisp-set QCA (csQCA)
 - ∞ Boolean algebra



George Boole

- 0.0** = when the condition is absent in the case = the case has full non-membership (i.e. is fully out) in the set
- 0.5** = ambiguity = 'cross-over point'
- 1.0** = when the condition is present in the case = the case has full membership (i.e. is fully in) in the set

QCA as a technique

- ∞ Cases have memberships in sets
 - ∞ Fuzzy-set QCA (fsQCA)
 - ∞ Fuzzy-set algebra

CRISP VERSUS FUZZY SETS

Some examples of fuzzy-set scales

Crisp set = binary (not necessarily nominal)

Fuzzy-set = ordinal, interval or ratio

Crisp set	Three-value fuzzy set	Four-value fuzzy set	Six-value fuzzy set	"Continuous" fuzzy set
1 = fully in	1 = fully in	1 = fully in	1 = fully in	1 = fully in
		.75 = more in than out	.9 = mostly but not fully in .7 = more or less in	Degree of membership is more "in" than "out": $.5 < x_i < 1$
	.5 = neither fully in nor fully out	.25 = more out than in	.3 = more or less out .1 = mostly but not fully out	.5 = cross-over: neither in nor out Degree of membership is more "out" than "in": $0 < x_i < .5$
0 = fully out	0 = fully out	0 = fully out	0 = fully out	0 = fully out



QCA as a technique

- ∞ Cases have memberships in sets
 - ∞ Multi-value QCA (mvQCA)
 - ∞ Discord in the literature about whether mvQCA is set-theoretic or not, because values are discrete (see Vink & Van Vliet, 2013)

- ∞ For example:

Values are 1, 2 and 3

Geographical location (Europe, America, Asia)

Family status (married, single, widowed)

Profession (academic, banker, dentist)

QCA as a technique

- ∞ Example
 - ∞ See article: Verweij, S., Klijn E.H., Edelenbos, J. & Van Buuren, M.W. (2013). What makes governance networks work? A fuzzy set qualitative comparative analysis of 14 Dutch spatial planning projects. *Public Administration*, 91(4), 1035-1055.
 - ∞ Example adapted from fsQCA to csQCA

QCA as a technique

- ∞ Example: raw data matrix

3 conditions

2^k logically possible configurations = $2^3 = 8$

14 cases

“Calibration” = scoring cases on the conditions
= iterative dialogue between theory and data

C	I	M	Case	Outcome Y
1	0	0	WIER	0
1	1	1	ZUID	1
1	1	1	NOORD	1
1	1	0	LENT	1
0	1	0	WAAL	1
0	0	0	DIEF	1
1	1	1	IJSS	1
1	0	1	PERK	1
1	1	1	SIJT	1
1	1	0	SCHL	0
1	0	1	DELFT	1
1	1	1	WEST	1
0	1	0	GOUW	0
0	1	1	BROEK	1



QCA as a technique

- ∞ Example: truth table
 1. Order cases over the logically possible configurations
 2. Assign the outcome to each configuration

Each row is a statement of sufficiency; if $Y = 1$ that statement is 'true'

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF



QCA as a technique

- ∞ Example: truth table
 1. Order cases over the logically possible configurations
 2. Assign the outcome to each configuration

Complex causality

Configurational

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF



QCA as a technique

- ∞ Example: truth table
 1. Order cases over the logically possible configurations
 2. Assign the outcome to each configuration

Limited diversity
(logical remainders)

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF

Limited Diversity



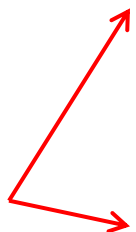
QCA as a technique

- ∞ Example: truth table
 1. Order cases over the logically possible configurations
 2. Assign the outcome to each configuration

Logical contradictions

Logical Contradictions

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF



QCA as a technique

- ∞ Example: limited diversity
 - ∞ Measured by *coverage*
 - ∞ Problematic: less generalized patterns
 - ∞ Solutions include: add cases, lift conditions, counterfactual analysis, recalibration [the iterative, qualitative nature of QCA]

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF

Limited Diversity

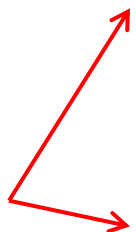


QCA as a technique

- ∞ Example: logical contradictions
 - ∞ Measured by *consistency*
 - ∞ Problematic: less generalized and consistent patterns
 - ∞ Solutions include: exclude cases, lift configuration, add conditions, recalibration [the iterative, qualitative nature of QCA]

Logical Contradictions

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF



QCA as a technique

- ∞ Example: truth table minimization
 - ∞ After solving the contradictions: minimization
 - ∞ This example: minimization for the presence of Y
 - ∞ Rewrite rows: $C*I*M + C*\sim I*M + \sim C*I*M + \sim C*\sim I*\sim M \rightarrow Y$

Minimization =
pairwise compare
cases that agree on
the outcome and
differ in but one
condition

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF



QCA as a technique

∞ Example: truth table minimization

∞ Rewrite rows: $\underline{C*I*M} + \underline{C*\sim I*M} + \underline{\sim C*I*M} + \underline{\sim C*\sim I*\sim M} \rightarrow Y$

$\underline{C*M} + \underline{I*M} + \underline{\sim C*\sim I*\sim M} \rightarrow Y$

Minimization = pairwise compare cases that agree on the outcome and differ in but one condition

C	I	M	Outcome Y	Cases
1	1	1	1	ZUID, NOORD, IJSS, SIJT, WEST
1	1	0	C	LENT, SCHEL
1	0	1	1	PERK, DELFT
1	0	0	0	WIER
0	1	1	1	BROEK
0	1	0	C	WAAL, GOUW
0	0	1		---
0	0	0	1	DIEF

QCA as a technique

- ∞ Example: interpretation of the results
 - ∞ Minimized solution: $\underline{C^*M} + \underline{I^*M} + \underline{\sim C^* \sim I^* \sim M} \rightarrow Y$
 - ∞ Complex causality
 - Sufficient conditions: none
 - Necessary conditions: none
 - Sufficient configurations: three
 - Necessary configurations: none
 - All conditions are INUS



QCA as a technique

- ∞ Example: interpretation of the results
 - ∞ Minimized solution: $\underline{C^*M} + \underline{I^*M} + \underline{\sim C^* \sim I^* \sim M} \rightarrow Y$
 - ∞ Strength of the findings
 - Consistency is high, because there are no contradictory cases represented by the solution formula
 - Coverage is perfectly acceptable, because the solution formula covers 9 out of 14 cases

Concluding remarks

<i>Quantitative</i>	<i>QCA</i>	<i>Qualitative</i>
Linear causality	Complex causality	Holistic causality
Variable-based	Case-based and comparative	Case-based
Large-N	Medium-N	Small-N
Pattern recognition	Between generality and complexity	High level of detail
Objectifying	Both - systematic and transparent comparison	Interpretive

Some references

∞ Textbooks on QCA:

- ∞ Rihoux, B. & Ragin, C.C. (Eds.) (2009). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques*. London: Sage.
- ∞ Schneider, C.Q. & Wagemann, C. (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge: Cambridge University Press.
 - ∞ See for a review of the book: Verweij, S. (2013). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. *International Journal of Social Research Methodology*, 16(2), 165-166.

∞ Seminal works:

- ∞ Ragin, C.C. (1987). *The comparative method: Moving beyond qualitative and quantitative strategies*. Los Angeles: University of California Press.
- ∞ Ragin, C.C. (2000). *Fuzzy-set social science*. Chicago: University of Chicago Press.
- ∞ Ragin, C.C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. Chicago: University of Chicago Press.



Some references

∞ Complexity, evaluation and QCA:

- ∞ Befani, B., Ledermann, S. & Sager, F. (2007). Realistic evaluation and QCA: Conceptual parallels and an empirical application. *Evaluation*, 13(2), 171-192.
- ∞ Byrne, D.S. (2005). Complexity, configurations and cases. *Theory, Culture & Society*, 22(5), 95-111.
- ∞ Byrne, D.S. (2009). Complex realist and configurational approaches to cases: A radical synthesis. In: D.S. Byrne and C.C. Ragin (Eds.), *The Sage Handbook of Case-Based Methods* (pp. 131-141). London: Sage.
- ∞ Byrne, D.S. (2013). Evaluating complex social interventions in a complex world. *Evaluation*, 19(3), 217-228.
- ∞ Gerrits, L.M. & Verweij, S. (2013). Critical realism as a meta-framework for understanding the relationships between complexity and qualitative comparative analysis. *Journal of Critical Realism*, 12(2), 166-182.
- ∞ Verweij, S. & Gerrits, L.M. (2012). Assessing the applicability of qualitative comparative analysis for the evaluation of complex projects. In: L.M. Gerrits & P.K. Marks (Eds.), *Compact 1: Public Administration in Complexity* (pp. 93-117). Litchfield Park: Emergent Publications.
- ∞ Verweij, S. & Gerrits, L.M. (2013). Understanding and researching complexity with qualitative comparative analysis: Evaluating transportation infrastructure projects. *Evaluation*, 19(1), 40-55.
- ∞ Verweij, S. & Gerrits, L.M. (OnlineFirst 2014). How satisfaction is achieved in the implementation phase of large transportation infrastructure projects: A qualitative comparative analysis into the A2 tunnel project. *Public Works Management & Policy*, doi: 10.1177/1087724X13518743.



Thank you!

- ∞ See www.stefanverweij.eu for other presentations and references about QCA
- ∞ Contact: verweij@fsw.eur.nl