

Applying qualitative comparative analysis (QCA) in poverty research

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School for Policy Studies
University of Bristol

I. What is QCA

- 1.1 Boolean algebra
- 1.2 Boolean minimisation
- 1.3 Necessary vs. sufficient conditions (I)
- 1.4 Veen diagram

II. Crisp-set QCA

- 2.1 The truth table
- 2.2 Types of configurations
- 2.3 Resolve contradictory configurations

III. Fuzzy-set QCA

- 3.1 Calibration of fuzzy-set
- 3.2 Logical AND & OR
- 3.3 Necessary vs. sufficient conditions (II)

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I. What is QCA



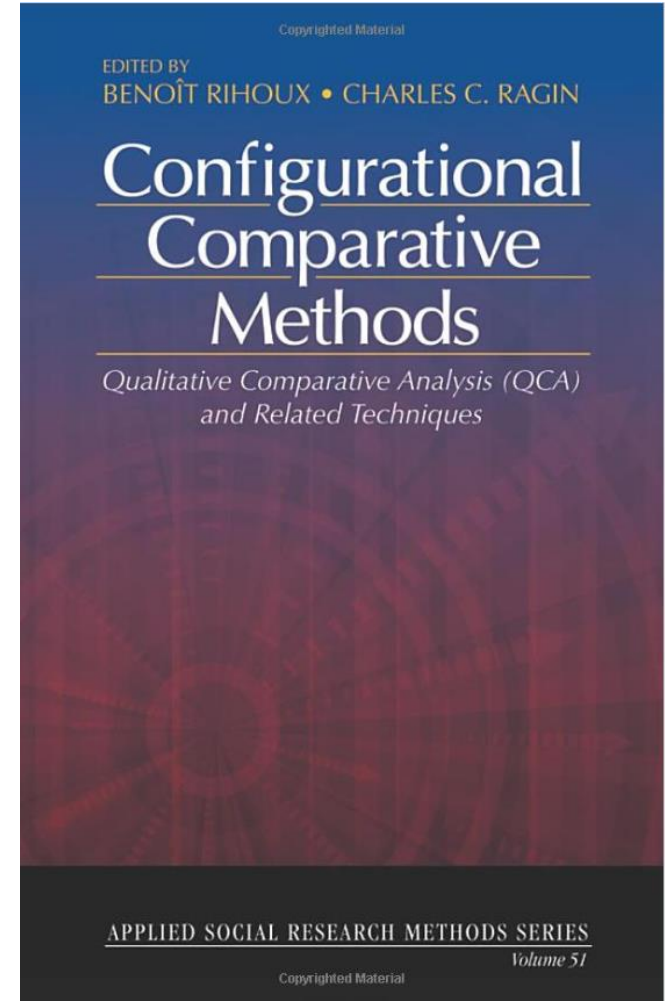
Charles C. Ragin

Chancellor's Professor of Sociology
at the University of California, Irvine

Some Key QCA Works:

The Comparative Method (1987)
Fuzzy-Set Social Science (2000)
Redesigning Social Inquiry: Fuzzy
Sets and Beyond (2008)

“...to *identify patterns* of multiple conjectural causation and *simplify complex data structures* in a logical and holistic manner” (Rihoux & de Meur, 2012, p.33)



I. What is QCA

small number
of cases

	Variable-orientated	Case-orientated	
	quantitative	qualitative	
causal competition	variables independent & evaluated against each	effect of one factor depending on presence/absence of others	causal combination
causal homogeneity	all variables work the same way in all cases	multiple paths leading to same outcome	equifinality

“using the basic principles of *Boolean algebra*, QCA can identify, simplify and compare the *combinations* of conditions leading to a particular outcome” (Krook, 2010)

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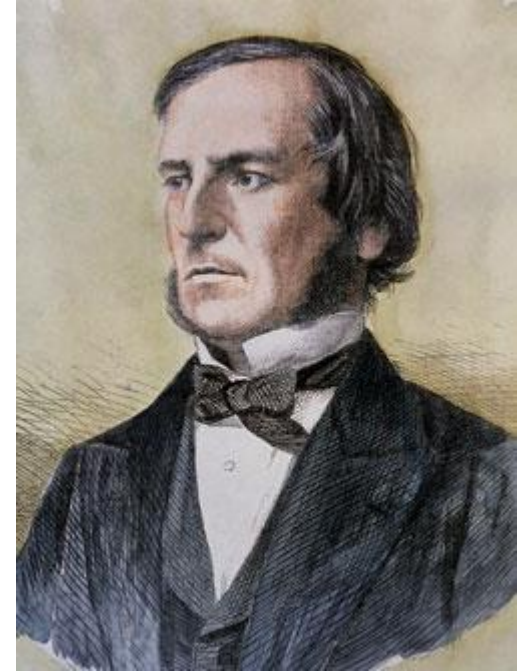
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1.1 Boolean algebra

Boolean algebra conventions

UPPERCASE	condition [A] is present/high/large
lowercase	condition [b] is absent/low/small
*	logical AND: [C*d] the presence of condition [C] AND the absence of condition [d]
+	logical OR: [c + D] the absence of condition [c] OR the presence of condition [D]



George Boole
19th Century British
mathematician and logician

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1.2 Boolean minimisation

“if two Boolean expressions differ in *only one* causal condition yet produce the same outcome, then the causal condition that *distinguishes* the two expressions can be considered *irrelevant* and can be *removed*” (Ragin, 1987, p.93)

* = logical AND
+ = logical OR

UPPERCASE = PRESENCE
lowercase = absence

$$R * B * I + R * B * i \rightarrow O$$



$$R * B \rightarrow O$$

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1.3 Necessary vs. sufficient conditions (I)

A *necessary* condition is a condition that must be present for the outcome to occur, but its presence does not guarantee that occurrence.

A *sufficient* condition is a condition that is sufficient for an outcome, if the outcome always occurs when the condition (or combination of conditions) is present.

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1.4 Veen diagram: visualisation of Boolean minimisation

conditions	possibilities	
R	RIGHT (1)	not-right (0)
B	BELOW (1)	not-below (0)
I	INSIDE (1)	not-inside (0)



$$R * B \rightarrow O$$

all possible combinations (2 X 2 X 2 = 8)				
caseid	R	B	I	O
1	0	0	0	
2	1	0	0	
3	0	0	1	
4	1	0	1	
5	0	1	1	
6	0	1	0	
7	1	1	1	
8	1	1	0	

1.4 Veen diagram: visualisation of Boolean minimisation

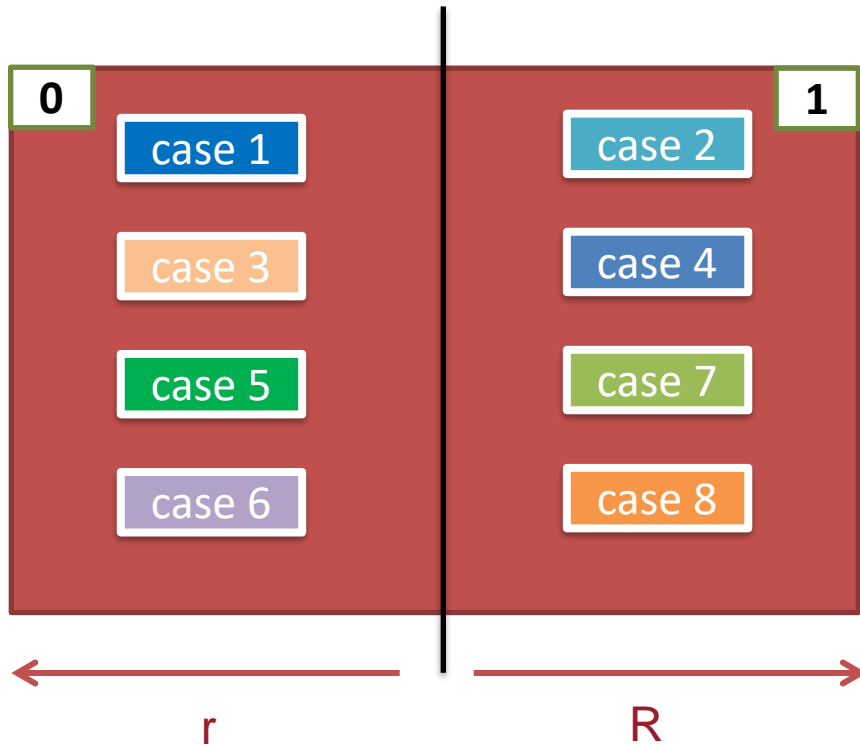
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3	0	0	1	0
4	1	0	1	0
5	0	1	1	0
6	0	1	0	0
7	1	1	1	1
8	1	1	0	1

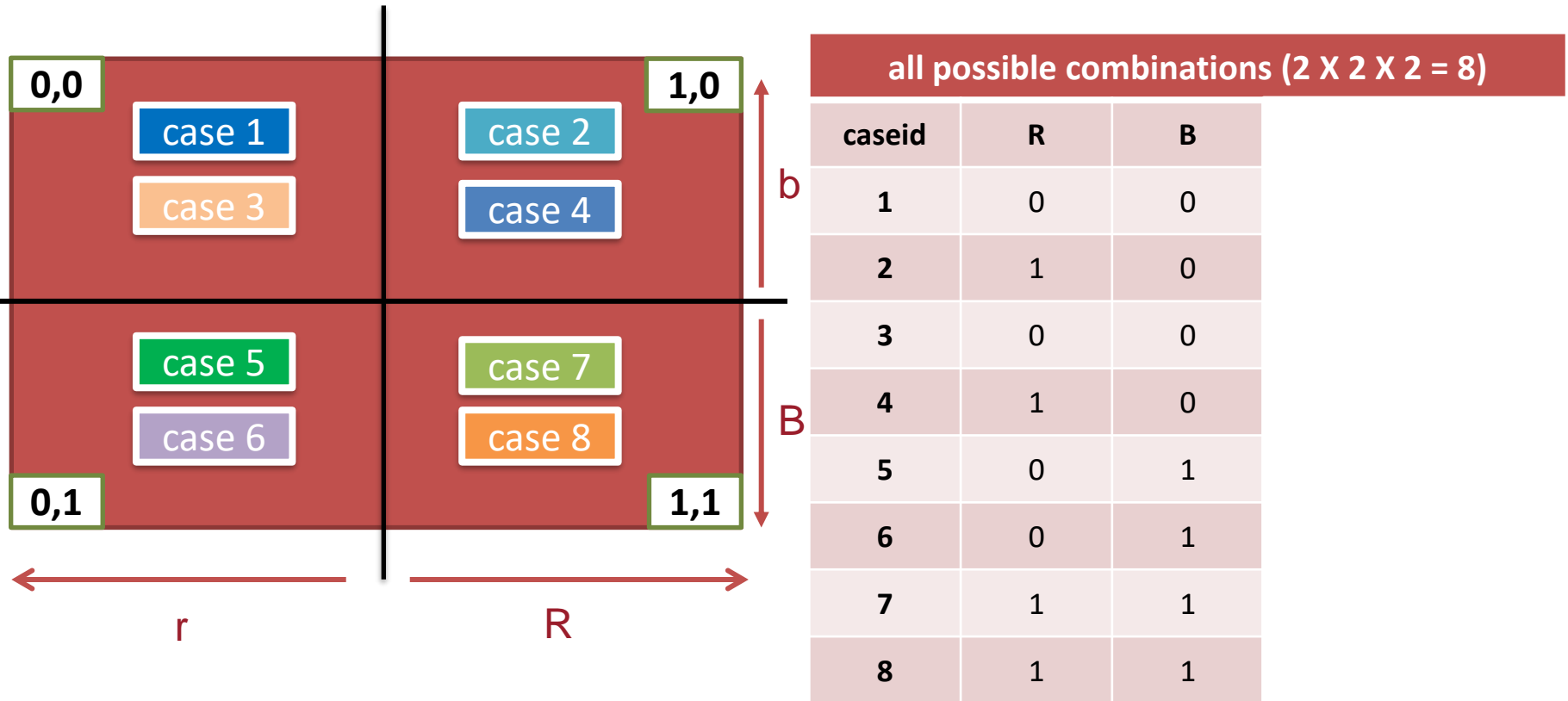
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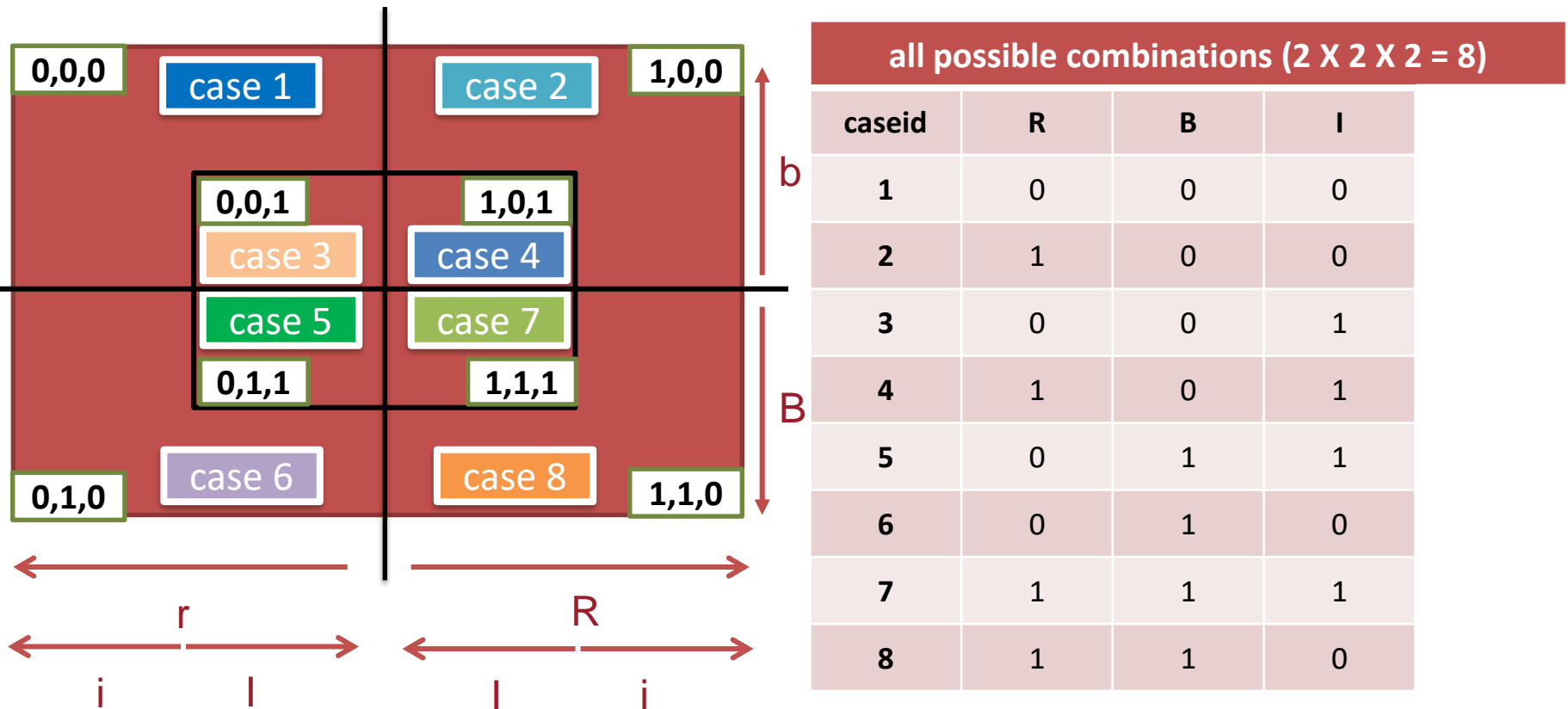
all possible combinations ($2 \times 2 \times 2 = 8$)

caseid	R
1	0
2	1
3	0
4	1
5	0
6	0
7	1
8	1

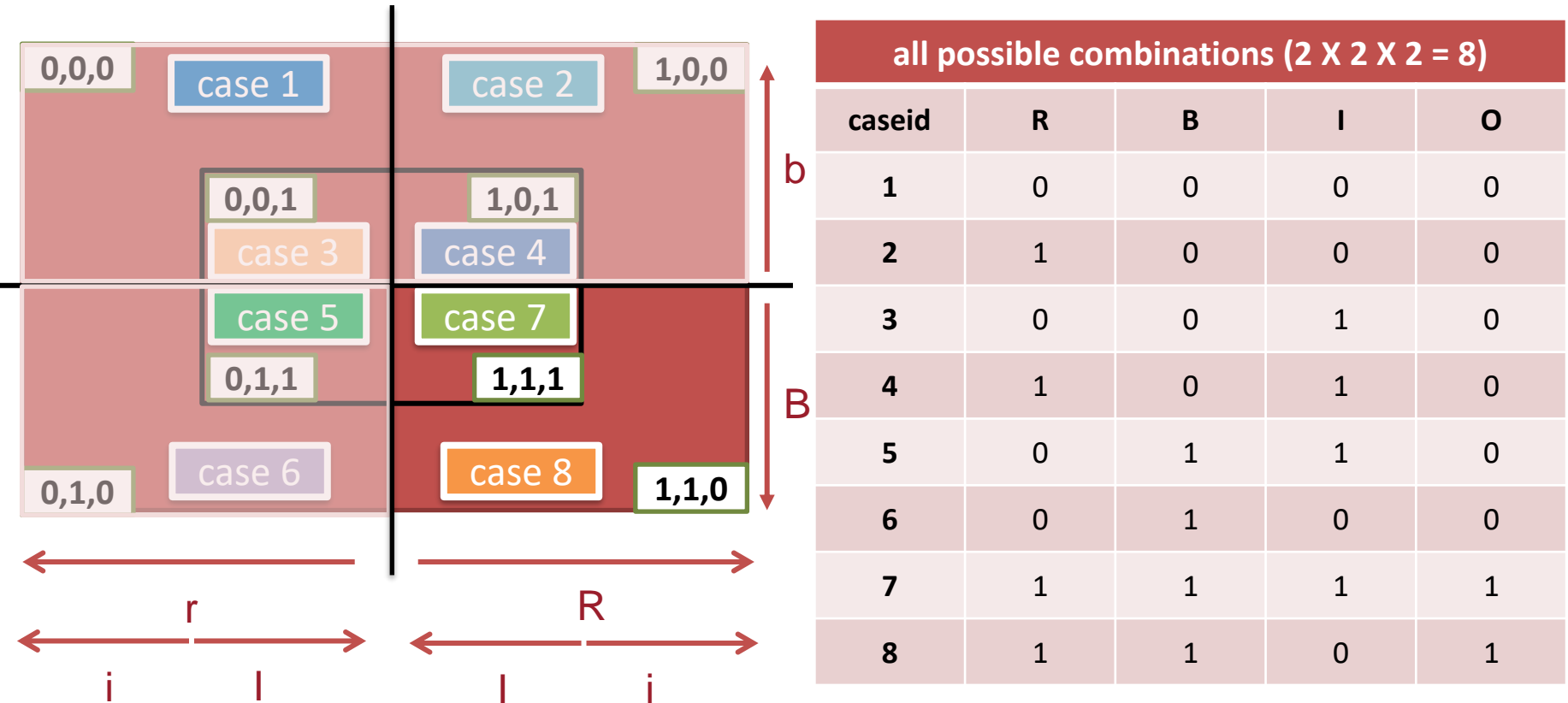
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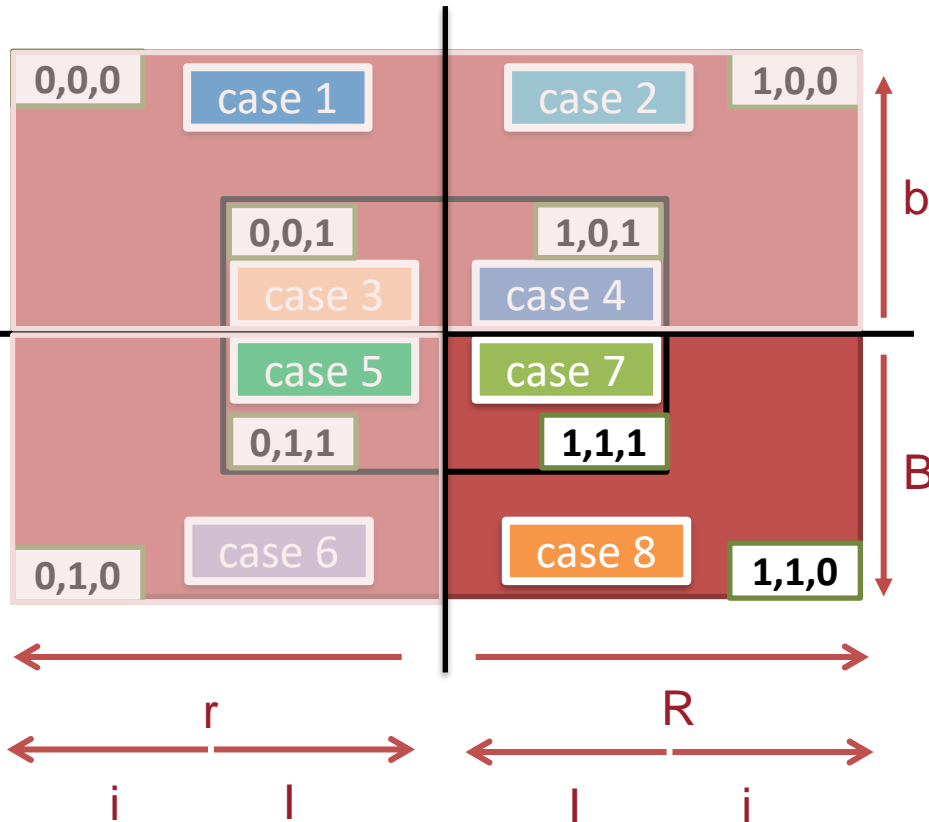
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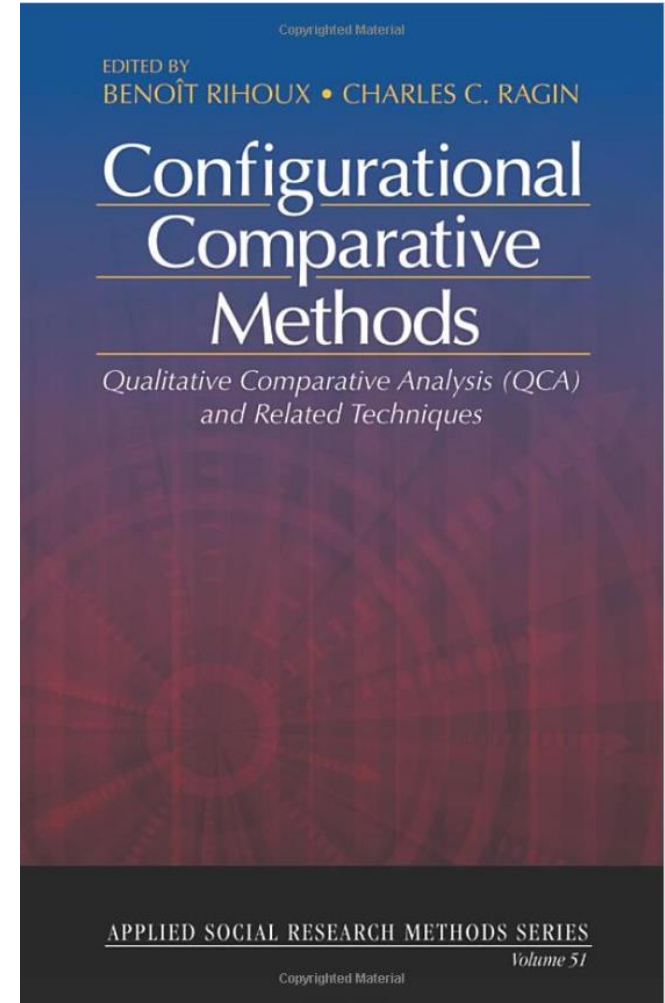
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II. Crisp-set QCA

Why is it that some democratic systems in Europe survived during the inter-war period, while others collapsed?



Why is it that some democratic systems in Europe survived during the inter-war period, while others collapsed?

GNPCAP

**Gross National Product/Capita
(ca. 1930)**

URBANIZA

**Urbanisation (% population in
towns with 20,000 + inhabitants)**

LITERACY

% Literacy

INDLAB

% Industrial Labour Force

CASE	GNPCAP	URBANIZA	LITERACY	INDLAB	SURVIVAL
AUS: Austria	720	33.4	98	33.4	0.05
BEL: Belgium	1098	60.5	94.4	48.9	0.95
CZE: Czechoslovakia	568	69.0	95.9	37.4	0.89
EST: Estonia	468	28.5	95	14.0	0.12
FIN: Finland	590	22.0	99.1	22.0	0.77
FRA: France	983	21.2	96.2	34.8	0.95
GER: Germany	795	56.5	98.0	40.4	0.05
GRE: Greece	390	31.1	59.2	28.1	0.06
HUN: Hungary	424	36.3	85.0	21.6	0.42
IRE: Ireland	662	25.0	95.0	14.5	0.92
ITA: Italy	517	31.4	72.1	29.6	0.05
NET: Netherlands	1008	78.8	99.9	39.3	0.95
POL: Poland	350	37.0	76.9	11.2	0.12
POR: Portugal	320	15.3	38.0	23.1	0.05
ROM: Romania	331	21.9	61.8	12.2	0.21
SPA: Spain	367	43.0	55.6	25.2	0.06
SWE: Sweden	897	34.0	99.9	32.3	0.95
UK: United Kingdom	1038	74.0	99.9	49.9	0.95

CASE	GNPCAP: 600	URBANIZA: 50	LITERACY: 75	INDLAB: 30	SURVIVAL: 0.5
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AUS: Austria	1	0	1	1	0
BEL: Belgium	1	1	1	1	1
CZE: Czechoslovakia	0	1	1	1	1
EST: Estonia	0	0	1	0	0
FIN: Finland	0	0	1	0	1
FRA: France	1	0	1	1	1
GER: Germany	1	1	1	1	0
GRE: Greece	0	0	0	0	0
HUN: Hungary	0	0	1	0	0
IRE: Ireland	1	0	1	0	1
ITA: Italy	0	0	0	0	0
NET: Netherlands	1	1	1	1	1
POL: Poland	0	0	1	0	0
POR: Portugal	0	0	0	0	0
ROM: Romania	0	0	0	0	0
SPA: Spain	0	0	0	0	0
SWE: Sweden	1	0	1	1	1
UK: United Kingdom	1	1	1	1	1

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FIN: Finland	0	0	1	0	1
FRA: France	1	0	1	1	1
GER: German	1	1	1	1	0
GRE: Greece	0	0	0	0	0
HUN: Hungary	0	0	1	0	0
IRE: Ireland	1	0	1	0	1
ITA: Italy	0	0	0	0	0
NET: Netherlands	1	1	1	1	1
POL: Poland	0	0	1	0	0
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SWE: Sweden; FRA: France; AUS: Austria	1	0	1	1
FIN: Finland; HUN: Hungary; POL: Poland; EST: Estonia	0	0	1	0
BEL: Belgium; NET: Netherlands; UK: United Kingdom; GER: Germany	1	1	1	1
CZE: Czechoslovakia	0	1	1	1
ITA: Italy; ROM: Romania; POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0
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SWE: Sweden; FRA: France; AUS: Austria	1	0	1	1	C
FIN: Finland; HUN: Hungary; POL: Poland; EST: Estonia	0	0	1	0	C
BEL: Belgium; NET: Netherlands; UK: United Kingdom; GER: Germany	1	1	1	1	C
CZE: Czechoslovakia	0	1	1	1	1
ITA: Italy; ROM: Romania; POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0	0
IRE: Ireland	1	0	1	0	1

1
configuration

**presence of
an outcome**

0
configuration

**absence of
an outcome**

C
configuration

**both presence and absence
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2.3 Resolve contradictory configurations

- A. Add one or more conditions
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- C. Adjust the threshold of dichotomisation
- D. Re-examine the outcome
- E. Re-examine the cases involved
- F. Re-code all contradictory configurations as [0] outcome
- G. Re-code all contradictory configurations as [1] outcome if it fits the majority of cases

Several iterations may be needed to obtain a contradiction-free truth table!

2.2 Types of configurations

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CZE: Czechoslovakia	0	1	1	1	1
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IRE: Ireland	1	0	1	0	1

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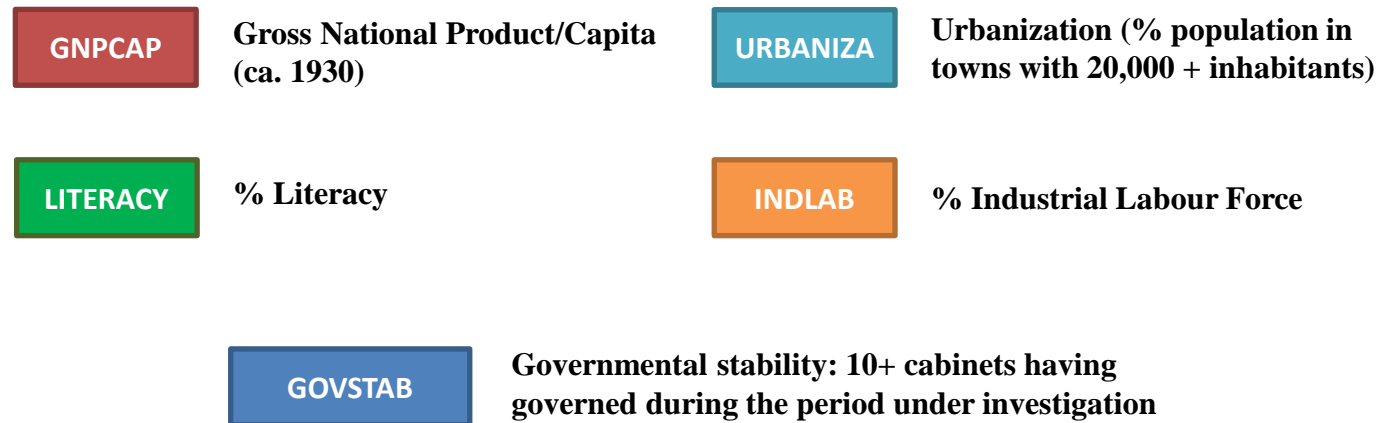
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FIN: Finland	0	0	1	0	1	1
FRA: France	1	0	1	1	1	1
GER: Germany	1	1	1	1	0	0
GRE: Greece	0	0	0	0	0	0
HUN: Hungary	0	0	1	0	0	0
IRE: Ireland	1	0	1	0	1	1
ITA: Italy	0	0	0	0	1	0
NET: Netherlands	1	1	1	1	1	1
POL: Poland	0	0	1	0	0	0
POR: Portugal	0	0	0	0	0	0
ROM: Romania	0	0	0	0	1	0
SPA: Spain	0	0	0	0	0	0
SWE: Sweden	1	0	1	1	1	1
UK: United Kingdom	1	1	1	1	1	1

CASE	GNPC AP	URBA NIZA	LITER ACY	INDL AB	TYPE
SWE: Sweden; FRA: France; AUS: Austria	1	0	1	1	C
FIN: Finland; HUN: Hungary; POL: Poland; EST: Estonia	0	0	1	0	C
BEL: Belgium; NET: Netherlands; UK: United Kingdom; GER: Germany	1	1	1	1	C
CZE: Czechoslovakia	0	1	1	1	1
ITA: Italy; ROM: Romania; POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0	0
IRE: Ireland	1	0	1	0	1

CASE	GNPC AP	URBA NIZA	LITER ACY	INDLA B	GOVS TAB	TYPE
AUS: Austria	1	0	1	1	0	0
BEL: Belgium; NET: Netherlands; UK: United Kingdom	1	1	1	1	1	1
CZE: Czechoslovakia	0	1	1	1	1	1
EST: Estonia; FIN: Finland	0	0	1	0	1	C
SWE: Sweden; FRA: France;	1	0	1	1	1	1
GER: Germany	1	1	1	1	0	0
POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0	0	0
HUN: Hungary; POL: Poland	0	0	1	0	0	0
IRE: Ireland	1	0	1	0	1	1
ITA: Italy; ROM: Romania	0	0	0	0	1	0

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BEL: Belgium	1	1	1	1	1	1
CZE: Czechoslovakia	1	1	1	1	1	1
EST: Estonia	0	0	1	0	1	0
FIN: Finland	1	0	1	0	1	1
FRA: France	1	0	1	1	1	1
GER: Germany	1	1	1	1	0	0
GRE: Greece	0	0	0	0	0	0
HUN: Hungary	0	0	1	0	0	0
IRE: Ireland	1	0	1	0	1	1
ITA: Italy	0	0	0	0	1	0
NET: Netherlands	1	1	1	1	1	1
POL: Poland	0	0	1	0	0	0
POR: Portugal	0	0	0	0	0	0
ROM: Romania	0	0	0	0	1	0
SPA: Spain	0	0	0	0	0	0
SWE: Sweden	1	0	1	1	1	1
UK: United Kingdom	1	1	1	1	1	1

CASE	GNPC AP	URBA NIZA	LITER ACY	INDL AB	GOVS TAB	TYPE
AUS: Austria	1	0	1	1	0	0
BEL: Belgium; NET: Netherlands; UK: United Kingdom	1	1	1	1	1	1
CZE: Czechoslovakia	0	1	1	1	1	1
EST: Estonia; FIN: Finland	0	0	1	0	1	C
SWE: Sweden; FRA: France;	1	0	1	1	1	1
GER: Germany	1	1	1	1	0	0
POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0	0	0
HUN: Hungary; POL: Poland	0	0	1	0	0	0
IRE: Ireland	1	0	1	0	1	1
ITA: Italy; ROM: Romania	0	0	0	0	1	0

CASE	GNPC AP	URBA NIZA	LITER ACY	INDL AB	GOVS TAB	TYPE
AUS: Austria	1	0	1	1	0	0
BEL: Belgium; CZE: Czechoslovakia NET: Netherlands; UK: United Kingdom	1	1	1	1	1	1
EST: Estonia	0	0	1	0	1	0
SWE: Sweden; FRA: France;	1	0	1	1	1	1
GER: Germany	1	1	1	1	0	0
POR: Portugal; SPA: Spain; GRE: Greece	0	0	0	0	0	0
HUN: Hungary; POL: Poland	0	0	1	0	0	0
IRE: Ireland; FIN: Finland	1	0	1	0	1	1
ITA: Italy; ROM: Romania	0	0	0	0	1	0

1
configuration

presence of
an outcome

0
configuration

absence of
an outcome

C
configuration

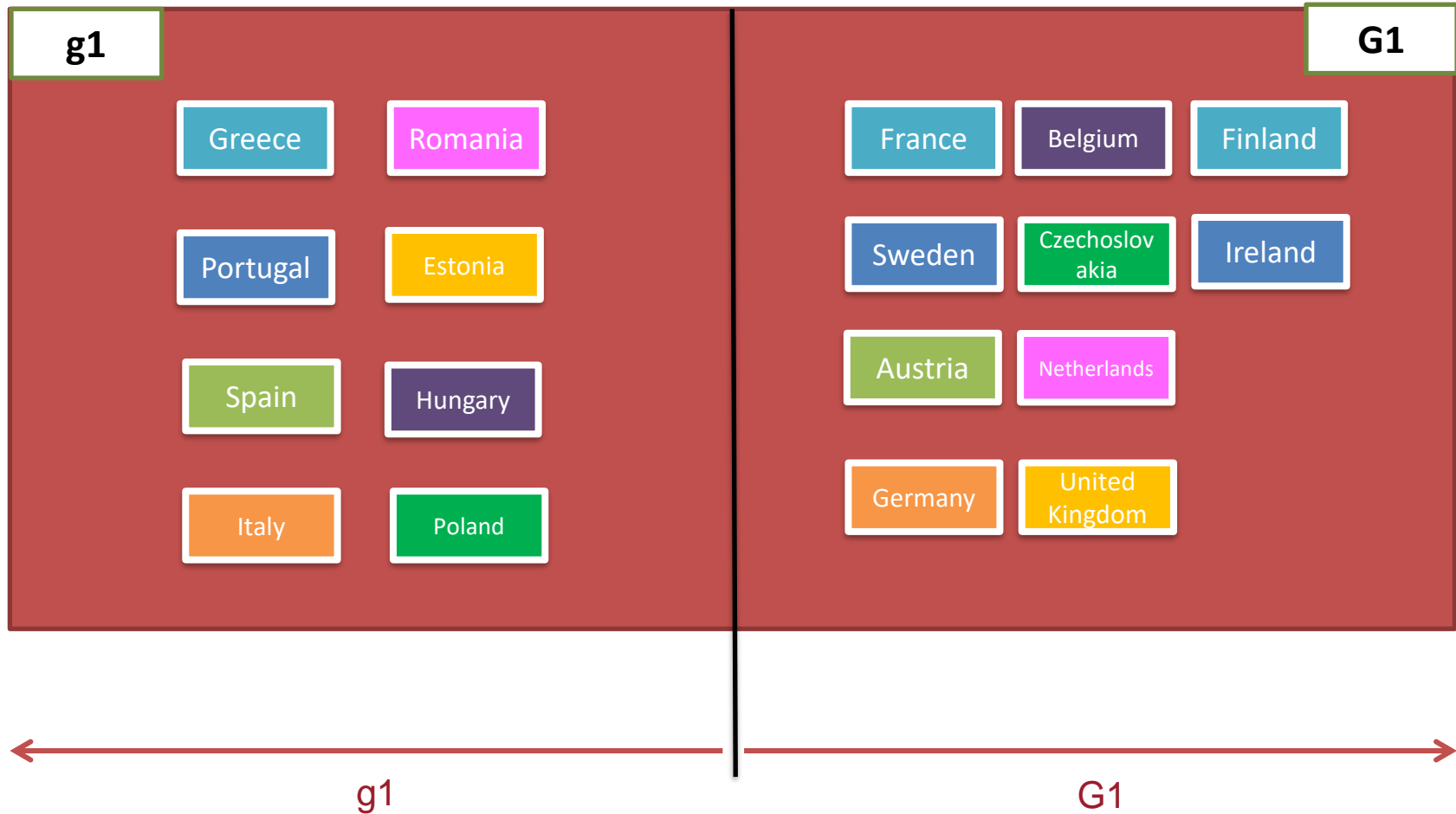
both presence and absence
of an outcome

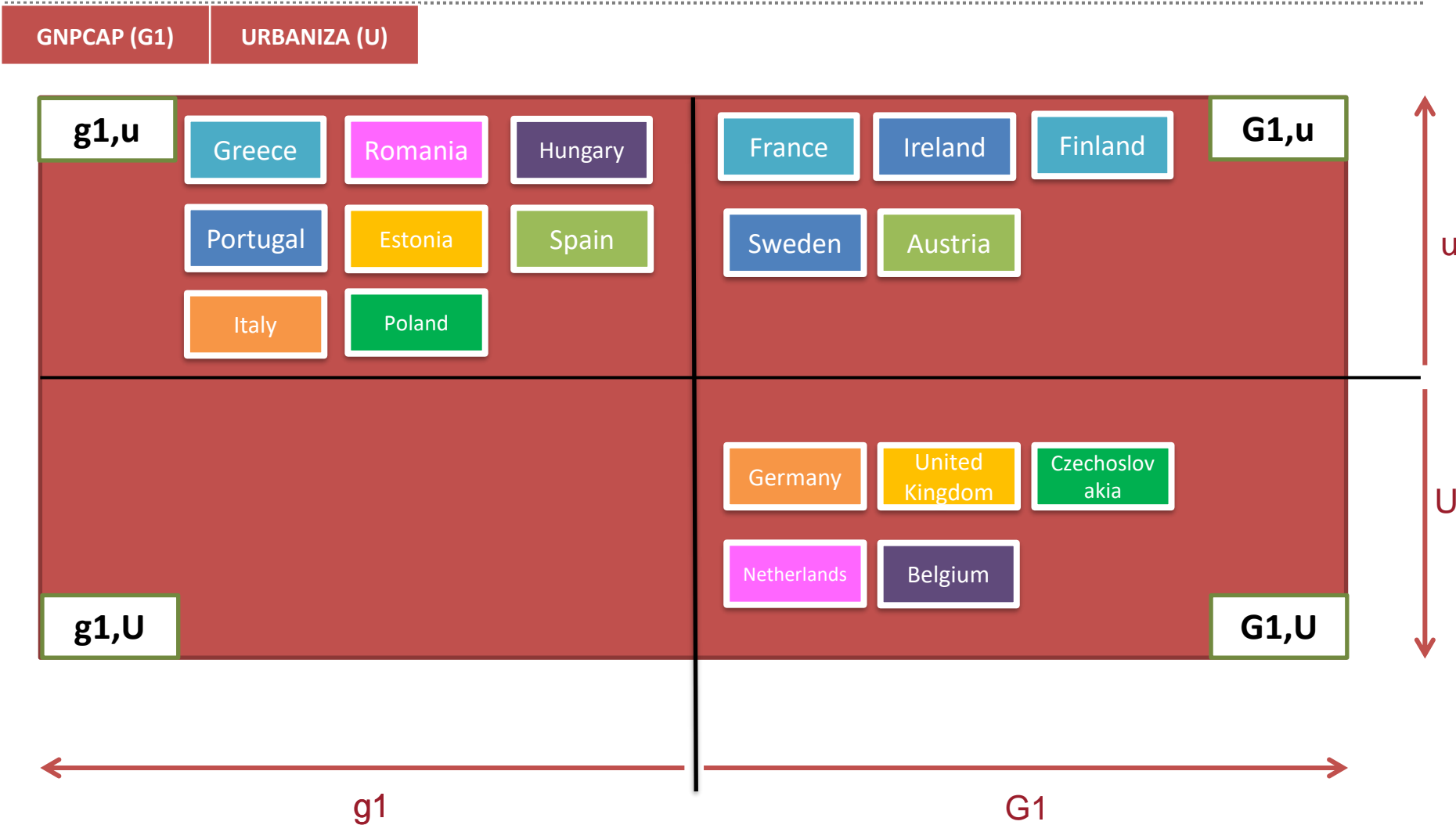
2.3 Resolve contradictory configurations

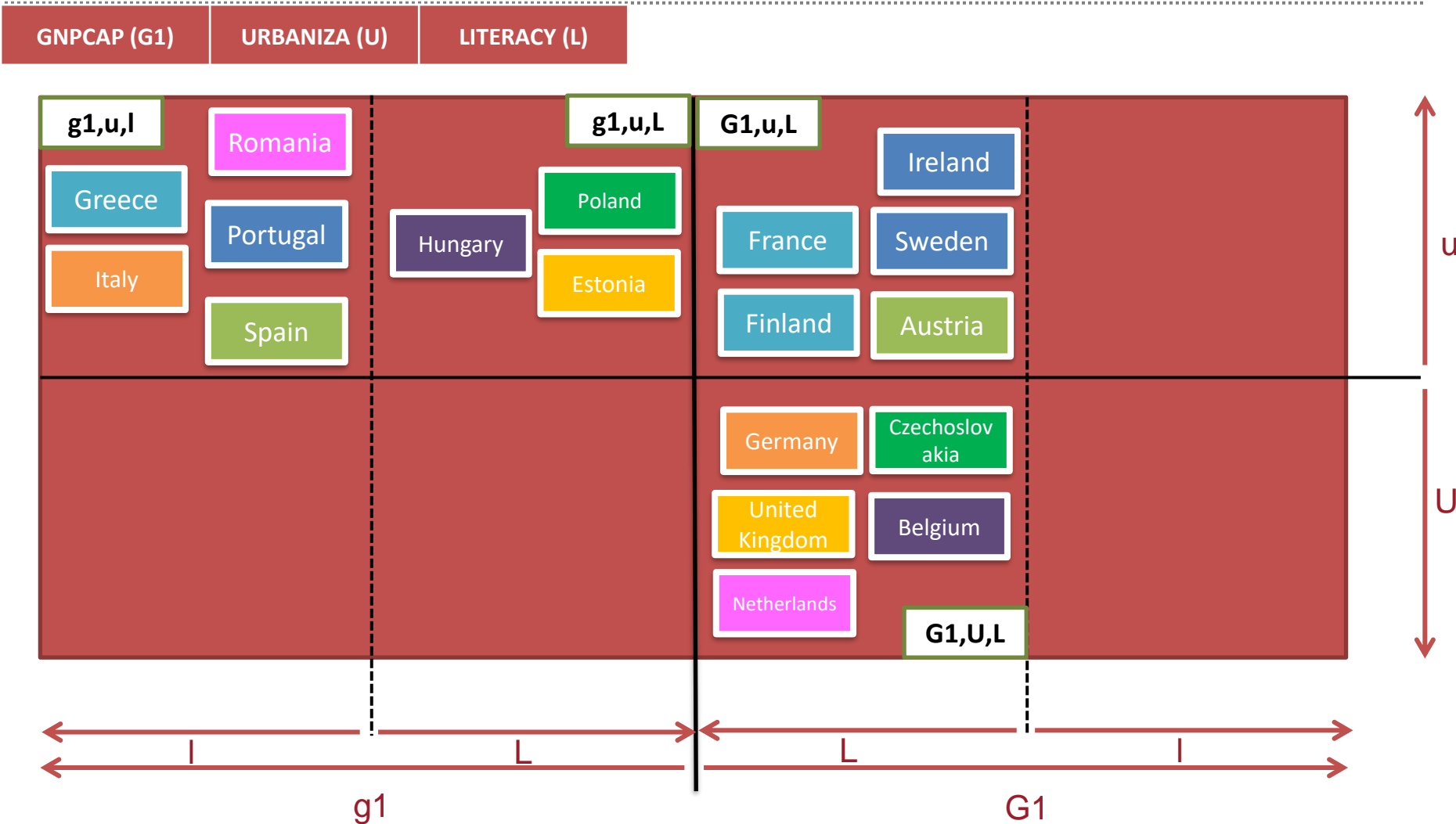
- A. Add one or more conditions
- B. Remove one or more conditions
- C. Adjust the threshold of dichotomisation
- D. Re-examine the outcome
- E. Re-examine the cases involved
- F. Re-code all contradictory configurations as [0] outcome
- G. Re-code all contradictory configurations as [1] outcome if it fits the majority of cases

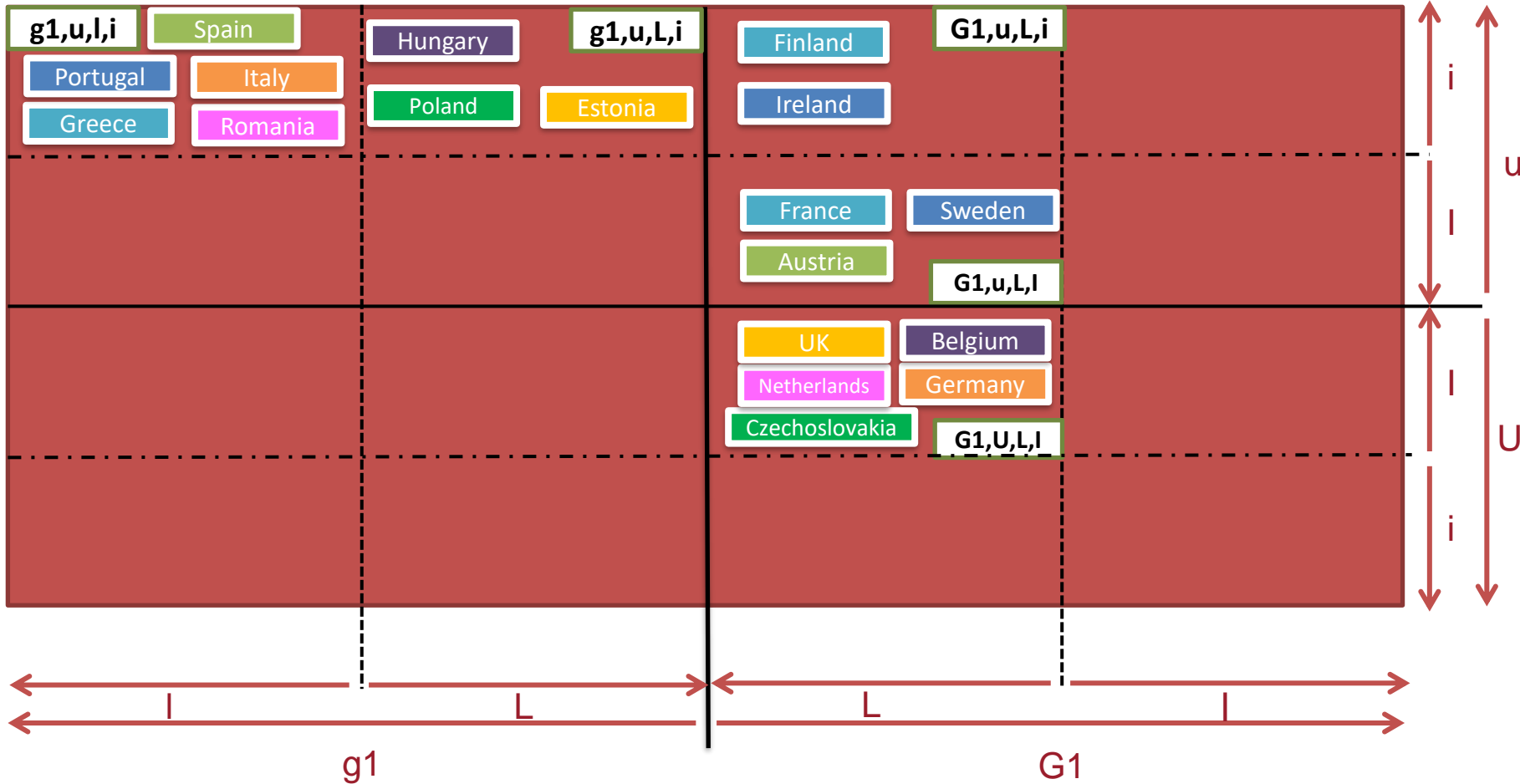
Several iterations may be needed to obtain a contradiction-free truth table!

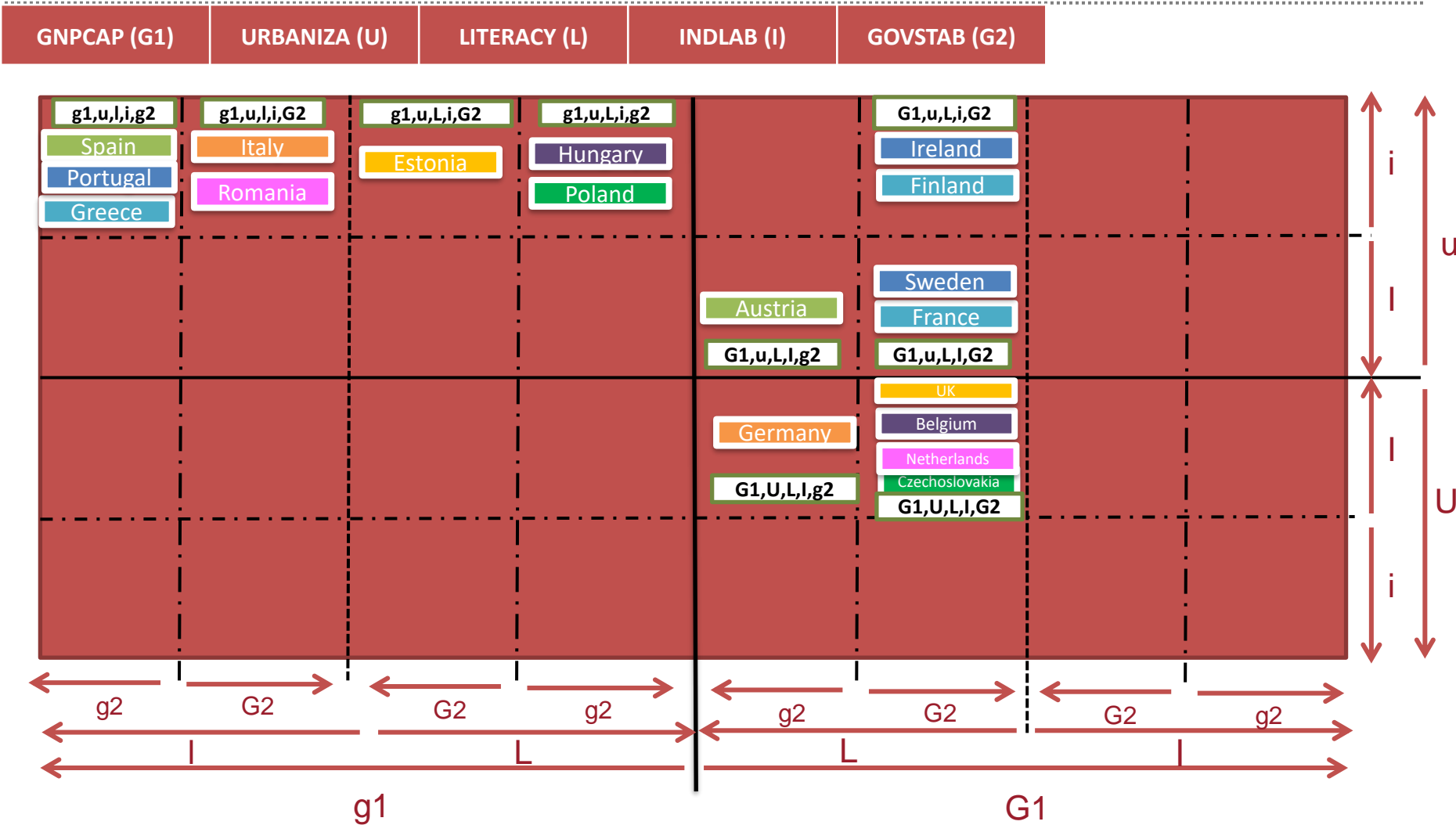
GNPCAP (G1)











GNPCAP (G1)

URBANIZA (U)

LITERACY (L)

INDLAB (I)

GOVSTAB (G2)

SURVIVED [1]

G1,u,L,i,G2

Ireland

Finland

Sweden

France

G1,u,L,I,G2

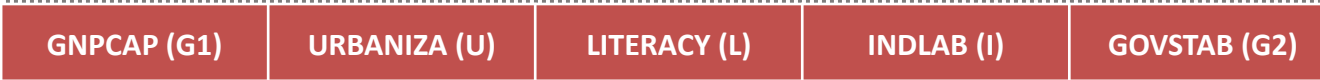
UK

Belgium

Netherlands

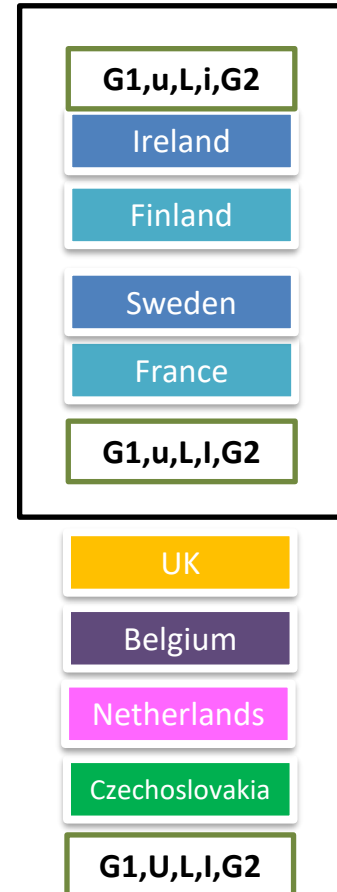
Czechoslovakia

G1,U,L,I,G2



GNPCAP * urbaniza * LITERACY *
GOVSTAB
→ SURVIVAL

SURVIVED [1]

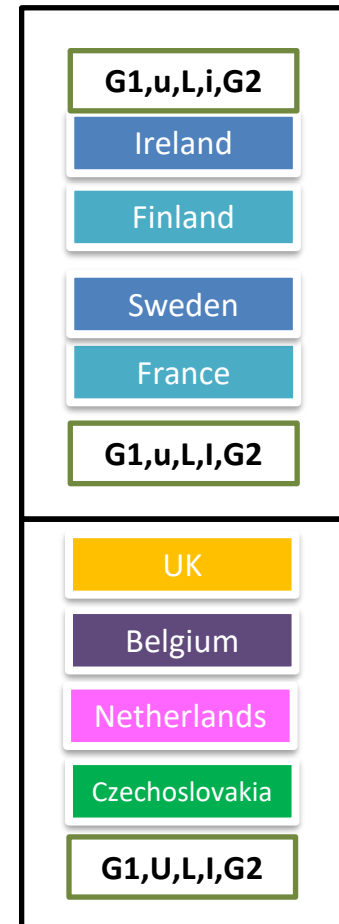




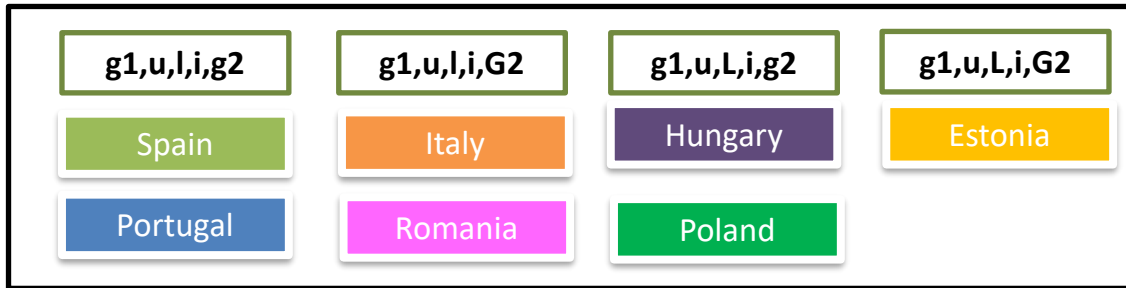
GNPCAP * urbaniza * LITERACY *
GOVSTAB
→ SURVIVAL

SURVIVED [1]

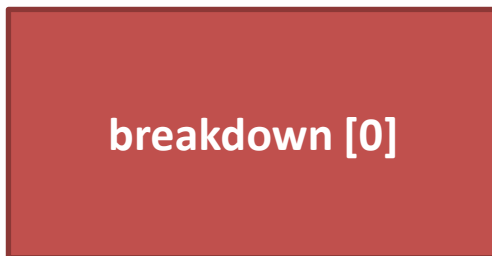
GNPCAP * URBANIZA * LITERACY *
INDLAB * GOVSTAB
→ SURVIVAL

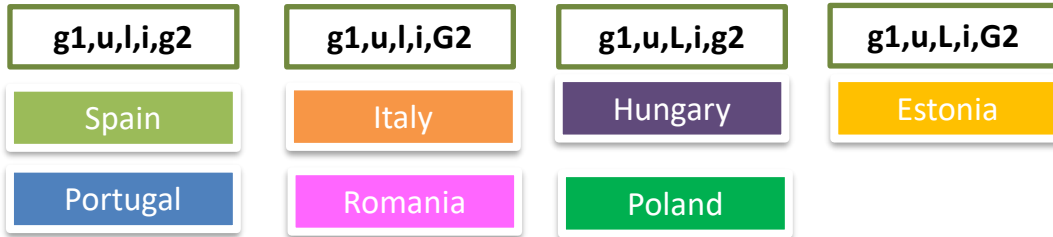


**Do not expect to find
perfect causal
symmetry!**



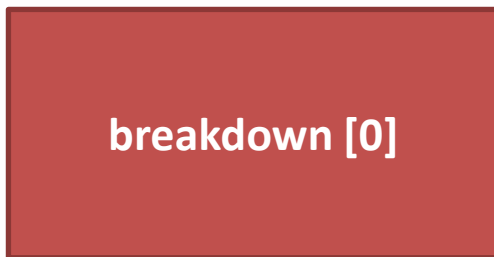
gnpcap * urbaniza * indlab
→ survival





gnpcap * urbaniza * indlab
→ survival

GNPCAP * LITERACY *
INDLAB * govstab
→ survival



I. What is QCA

- 1.1 Boolean algebra
- 1.2 Boolean minimisation
- 1.3 Necessary vs. sufficient conditions (I)
- 1.4 Veen diagram

II. Crisp-set QCA

- 2.1 The truth table
- 2.2 Types of configurations
- 2.3 Resolve contradictory configurations

III. Fuzzy-set QCA

- 3.1 Calibration of fuzzy-set
 - 3.2 Logical AND & OR
 - 3.3 Necessary vs. sufficient conditions (II)
-

III. Fuzzy-set QCA

**What if we have continuous variables and do
NOT want to dichotomise?**

CASE	GNPCAP	URBANIZA	LITERACY	INDLAB	GOVSTAB	SURVIVAL
AUS: Austria	720	33.4	98	33.4	10	0.05
BEL: Belgium	1098	60.5	94.4	48.9	4	0.95
CZE: Czechoslovakia	568	69.0	95.9	37.4	6	0.89
EST: Estonia	468	28.5	95	14.0	6	0.12
FIN: Finland	590	22.0	99.1	22.0	9	0.77
FRA: France	983	21.2	96.2	34.8	5	0.95
GER: Germany	795	56.5	98.0	40.4	11	0.05
GRE: Greece	390	31.1	59.2	28.1	10	0.06
HUN: Hungary	424	36.3	85.0	21.6	13	0.42
IRE: Ireland	662	25.0	95.0	14.5	5	0.92
ITA: Italy	517	31.4	72.1	29.6	9	0.05
NET: Netherlands	1008	78.8	99.9	39.3	2	0.95
POL: Poland	350	37.0	76.9	11.2	21	0.12
POR: Portugal	320	15.3	38.0	23.1	19	0.05
ROM: Romania	331	21.9	61.8	12.2	7	0.21
SPA: Spain	367	43.0	55.6	25.2	12	0.06
SWE: Sweden	897	34.0	99.9	32.3	6	0.95
UK: United Kingdom	1038	74.0	99.9	49.9	4	0.95

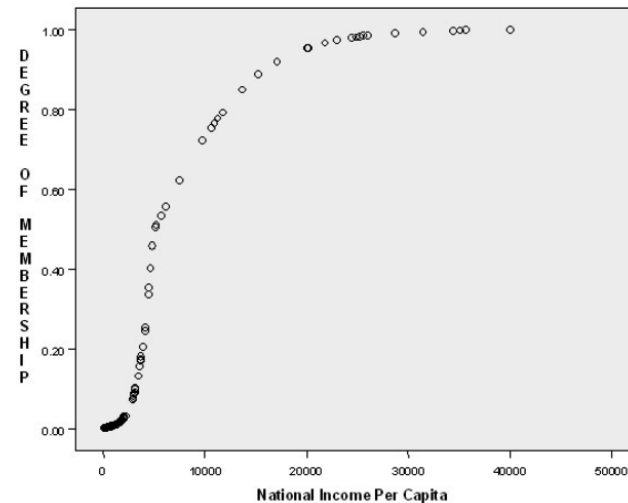
III. Fuzzy-set QCA

Country	Crisp set	Continuous fuzzy set
A	0	0.27
B	1	0.95
C	1	0.77
D	0	0.41
E	0	0.19
F	1	0.55

0 = non-membership
1 = full-membership

Partial membership in a condition allowed!

Plot of Degree of Membership in the Set of Rich Countries



I. What is QCA

1.1 Boolean algebra

1.2 Boolean minimisation

1.3 Necessary vs. sufficient conditions (I)

1.4 Veen diagram

II. Crisp-set QCA

2.1 The truth table

2.2 Types of configurations

2.3 Resolve contradictory configurations

III. Fuzzy-set QCA

3.1 Calibration of fuzzy-set

3.2 Logical AND & OR

3.3 Necessary vs. sufficient conditions (II)

Examples of fuzzy-set calibration

Crisp set	3-value fuzzy set	4-value fuzzy set	6-value fuzzy set	Continuous fuzzy set
<p>1 = fully in 0 = fully out</p>	<p>1 = fully in 0.5 = neither fully in nor fully out 0 = fully out</p>	<p>1 = fully in 0.67 = more in than out 0.33 = more out than in 0 = fully out</p>	<p>1 = fully in 0.9 = mostly but not fully in 0.6 = more or less in 0.4 = more or less out 0.1 = mostly but not fully out 0 = fully out</p>	<p>1 = fully in $0.5 < x < 1$ = more in than out 0.5 = neither in nor out $0 < x < .05$ = fully out</p>

Equal intervals are not necessary

Value of 0.5 = max. ambiguity regarding whether a case is in or out a condition

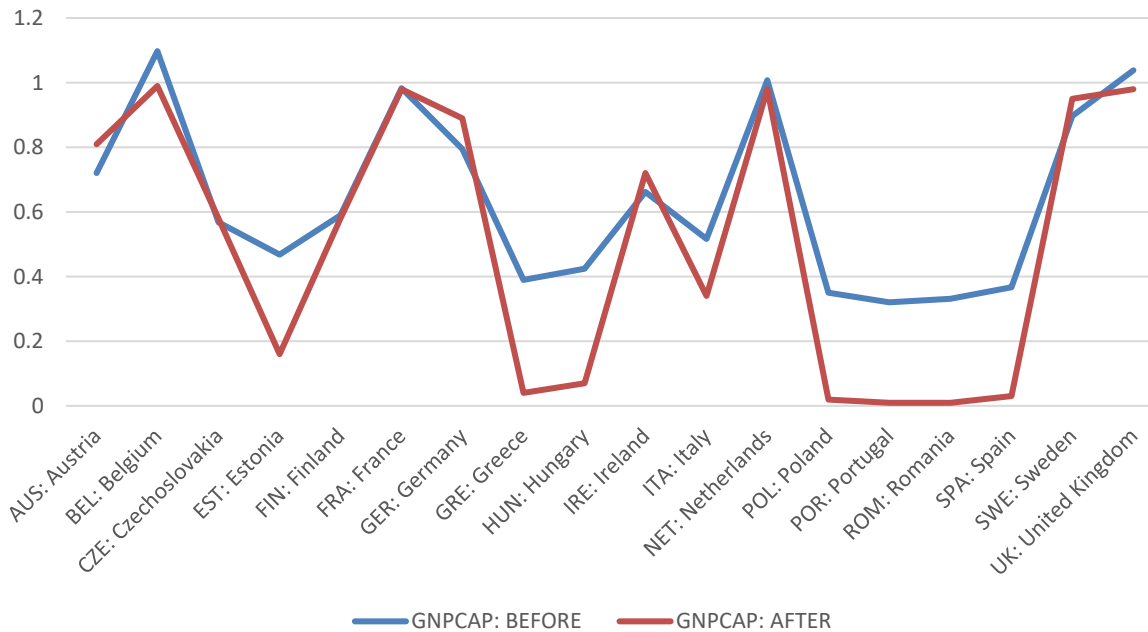
CASE	GNPCAP: 550	URBANIZA: 50	LITERACY: 75	INDLAB: 30	GOVSTAB: 10	SURVIVAL
AUS: Austria	720	33.4	98	33.4	10	0.05
BEL: Belgium	1098	60.5	94.4	48.9	4	0.95
CZE: Czechoslovakia	568	69.0	95.9	37.4	6	0.89
EST: Estonia	468	28.5	95	14.0	6	0.12
FIN: Finland	590	22.0	99.1	22.0	9	0.77
FRA: France	983	21.2	96.2	34.8	5	0.95
GER: Germany	795	56.5	98.0	40.4	11	0.05
GRE: Greece	390	31.1	59.2	28.1	10	0.06
HUN: Hungary	424	36.3	85.0	21.6	13	0.42
IRE: Ireland	662	25.0	95.0	14.5	5	0.92
ITA: Italy	517	31.4	72.1	29.6	9	0.05
NET: Netherlands	1008	78.8	99.9	39.3	2	0.95
POL: Poland	350	37.0	76.9	11.2	21	0.12
POR: Portugal	320	15.3	38.0	23.1	19	0.05
ROM: Romania	331	21.9	61.8	12.2	7	0.21
SPA: Spain	367	43.0	55.6	25.2	12	0.06
SWE: Sweden	897	34.0	99.9	32.3	6	0.95
UK: United Kingdom	1038	74.0	99.9	49.9	4	0.95

CASE	GNPCAP: 550	URBANIZA: 50	LITERACY: 75	INDLAB: 30	GOVSTAB: 10	SURVIVAL
AUS: Austria	0.81	0.12	0.99	0.73	0.43	0.05
BEL: Belgium	0.99	0.89	0.98	1.00	0.98	0.95
CZE: Czechoslovakia	0.58	0.98	0.98	0.90	0.91	0.89
EST: Estonia	0.16	0.07	0.98	0.01	0.91	0.12
FIN: Finland	0.58	0.03	0.99	0.08	0.58	0.77
FRA: France	0.98	0.03	0.99	0.81	0.95	0.95
GER: Germany	0.89	0.79	0.99	0.96	0.31	0.05
GRE: Greece	0.04	0.09	0.13	0.36	0.43	0.06
HUN: Hungary	0.07	0.16	0.88	0.07	0.13	0.42
IRE: Ireland	0.72	0.05	0.98	0.01	0.95	0.92
ITA: Italy	0.34	0.10	0.41	0.47	0.58	0.05
NET: Netherlands	0.98	1.00	0.99	0.94	0.99	0.95
POL: Poland	0.02	0.17	0.59	0.00	0.00	0.12
POR: Portugal	0.01	0.02	0.01	0.11	0.01	0.05
ROM: Romania	0.01	0.03	0.17	0.00	0.84	0.21
SPA: Spain	0.03	0.30	0.09	0.21	0.20	0.06
SWE: Sweden	0.95	0.13	0.99	0.67	0.91	0.95
UK: United Kingdom	0.98	0.99	0.99	1.00	0.98	0.95

Calibration: before vs. after

Redesigning Social Inquiry

GNPCAP

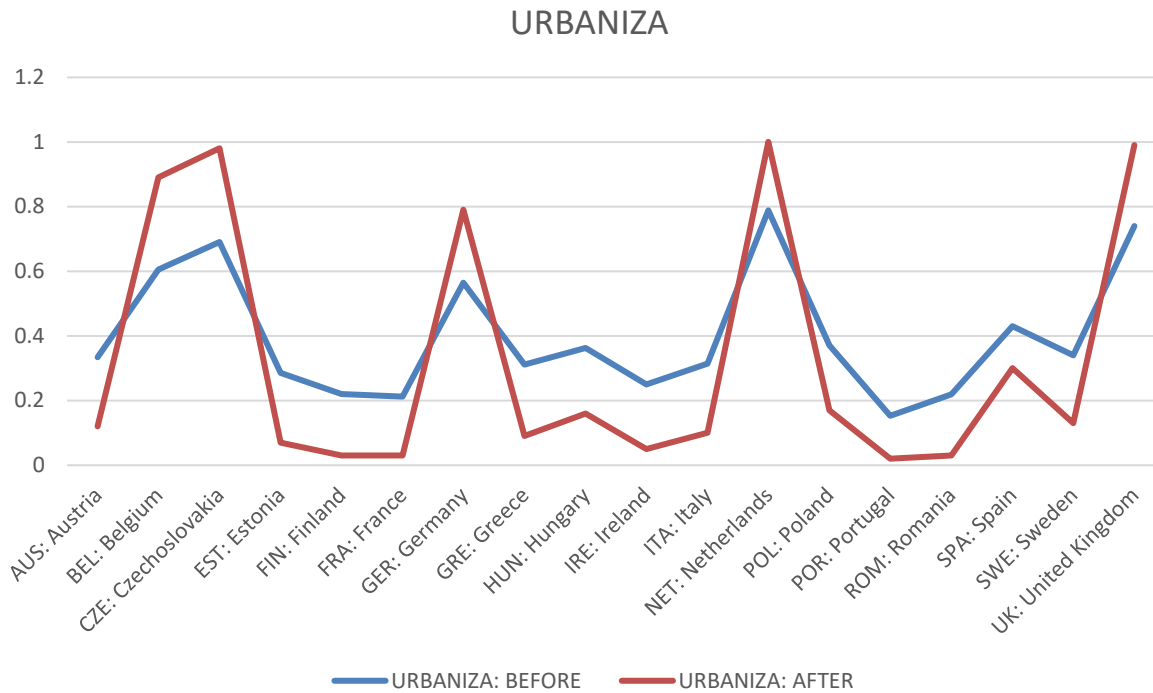


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Calibration: before vs. after

Redesigning Social Inquiry

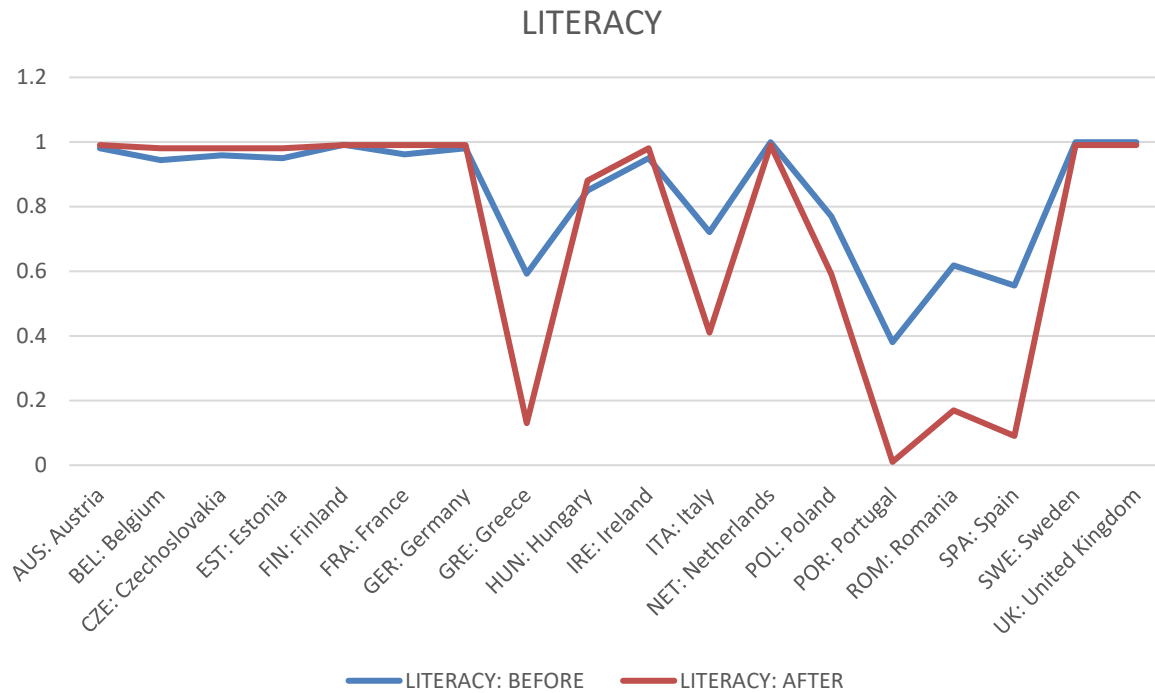


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Calibration: before vs. after

Redesigning Social Inquiry



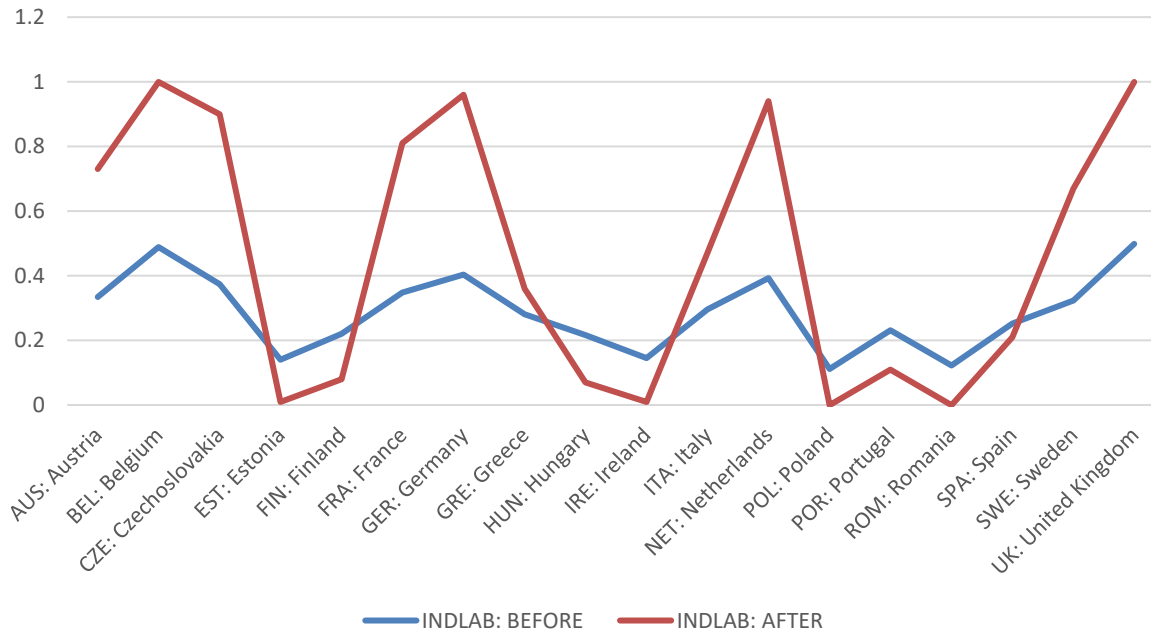
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Calibration: before vs. after

Redesigning Social Inquiry

INDLAB



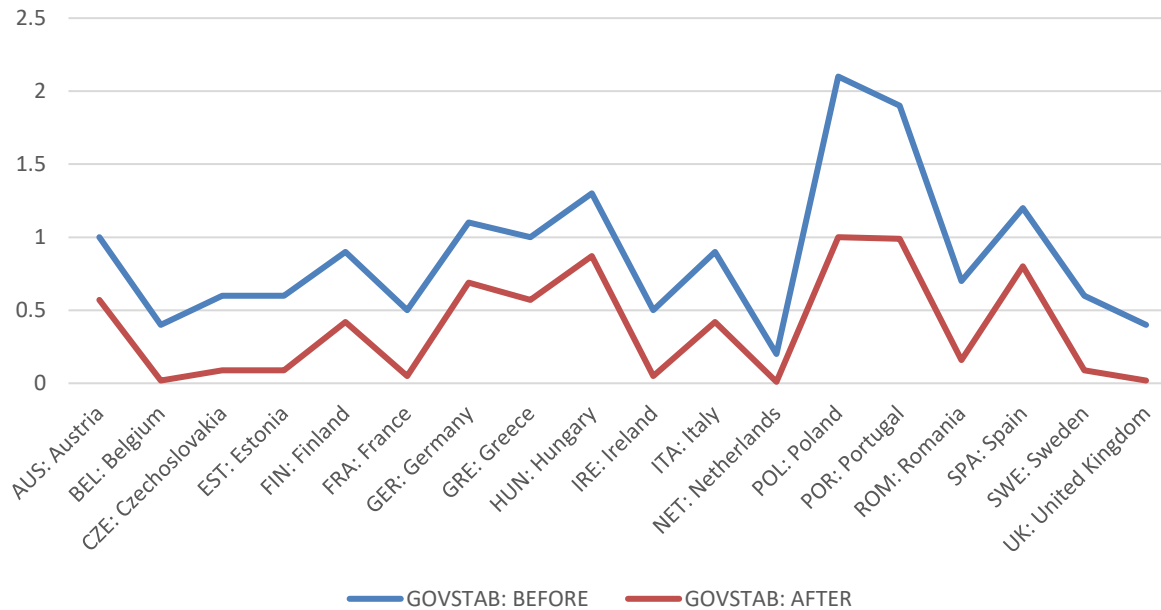
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Calibration: before vs. after

Redesigning Social Inquiry

GOVSTAB

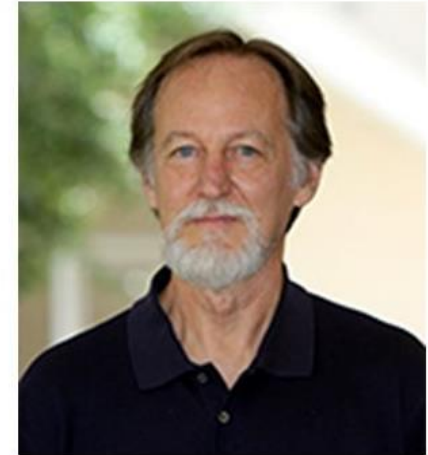


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3.1 Calibration of fuzzy-set

“The specific translation of ordinal ranks to fuzzy membership scores depends on the *fit* between the content of the ordinal categories and the researcher’s conceptualisation of the fuzzy set...researchers must calibrate membership scores using *substantive and theoretical knowledge and should NOT be mechanical*” (Rihoux & de Meur, 2012, p.92)



I. What is QCA

1.1 Boolean algebra

1.2 Boolean minimisation

1.3 Necessary vs. sufficient conditions (I)

1.4 Veen diagram

II. Crisp-set QCA

2.1 The truth table

2.2 Types of configurations

2.3 Resolve contradictory configurations

III. Fuzzy-set QCA

3.1 Calibration of fuzzy-set

3.2 Logical AND & OR

3.3 Necessary vs. sufficient conditions (II)

3.2 Logical AND & OR

no longer as simple as

* = logical AND

+ = logical OR

With fuzzy sets, *logical AND* is accomplished by taking the *minimum* membership score of each case in the sets of conditions that are combined.

With fuzzy sets, *logical OR* is accomplished by taking the *maximum* membership score of each case in the sets of conditions that are combined.

CASE	DEVELOPMENT (D)	URBANISATION (U)	LITERACY (L)	logical AND (min)	Logical OR (max)
AUS: Austria	0.81	0.12	0.99	?	?
BEL: Belgium	0.99	0.89	0.98	?	?
CZE: Czechoslovakia	0.58	0.98	0.98	?	?
EST: Estonia	0.16	0.07	0.98	?	?
FIN: Finland	0.58	0.03	0.99	?	?
FRA: France	0.98	0.03	0.99	?	?
GER: Germany	0.89	0.79	0.99	?	?
GRE: Greece	0.04	0.09	0.13	?	?
HUN: Hungary	0.07	0.16	0.88	?	?
IRE: Ireland	0.72	0.05	0.98	?	?
ITA: Italy	0.34	0.10	0.41	?	?
NET: Netherlands	0.98	1.00	0.99	?	?
POL: Poland	0.02	0.17	0.59	?	?
POR: Portugal	0.01	0.02	0.01	?	?
ROM: Romania	0.01	0.03	0.17	?	?
SPA: Spain	0.03	0.30	0.09	?	?
SWE: Sweden	0.95	0.13	0.99	?	?
UK: United Kingdom	0.98	0.99	0.99	?	?

CASE	DEVELOPMENT (D)	URBANISATION (U)	LITERACY (L)	logical AND (min) $D * U * L$	Logical OR (max) $D + U + L$
AUS: Austria	0.81	0.12	0.99	0.12	0.99
BEL: Belgium	0.99	0.89	0.98	0.89	0.98
CZE: Czechoslovakia	0.58	0.98	0.98	0.58	0.98
EST: Estonia	0.16	0.07	0.98	0.07	0.98
FIN: Finland	0.58	0.03	0.99	0.03	0.99
FRA: France	0.98	0.03	0.99	0.03	0.99
GER: Germany	0.89	0.79	0.99	0.79	0.99
GRE: Greece	0.04	0.09	0.13	0.04	0.13
HUN: Hungary	0.07	0.16	0.88	0.07	0.88
IRE: Ireland	0.72	0.05	0.98	0.05	0.98
ITA: Italy	0.34	0.10	0.41	0.10	0.41
NET: Netherlands	0.98	1.00	0.99	0.98	0.99
POL: Poland	0.02	0.17	0.59	0.02	0.59
POR: Portugal	0.01	0.02	0.01	0.01	0.02
ROM: Romania	0.01	0.03	0.17	0.01	0.17
SPA: Spain	0.03	0.30	0.09	0.03	0.30
SWE: Sweden	0.95	0.13	0.99	0.13	0.99
UK: United Kingdom	0.98	0.99	0.99	0.98	0.99

I. What is QCA

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III. Fuzzy-set QCA

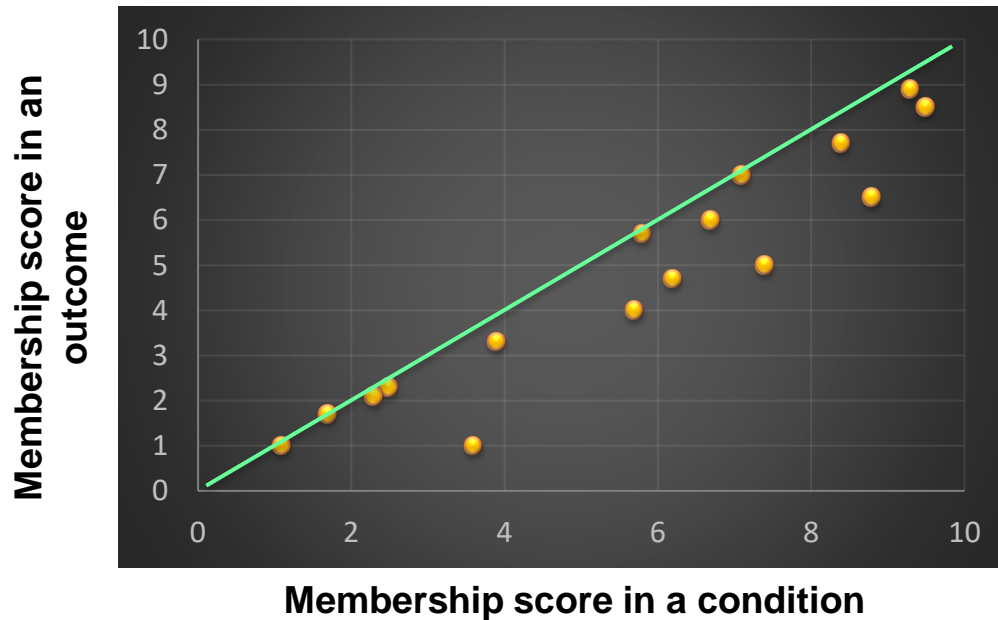
3.1 Calibration of fuzzy-set

3.2 Logical AND & OR

3.3 Necessary vs. sufficient conditions (II)

3.2 Necessary vs. sufficient conditions (II)

$$\text{Consistency } (Y_i \leq X_i) = \frac{\sum(\min(X_i, Y_i))}{\sum(Y_i)}$$



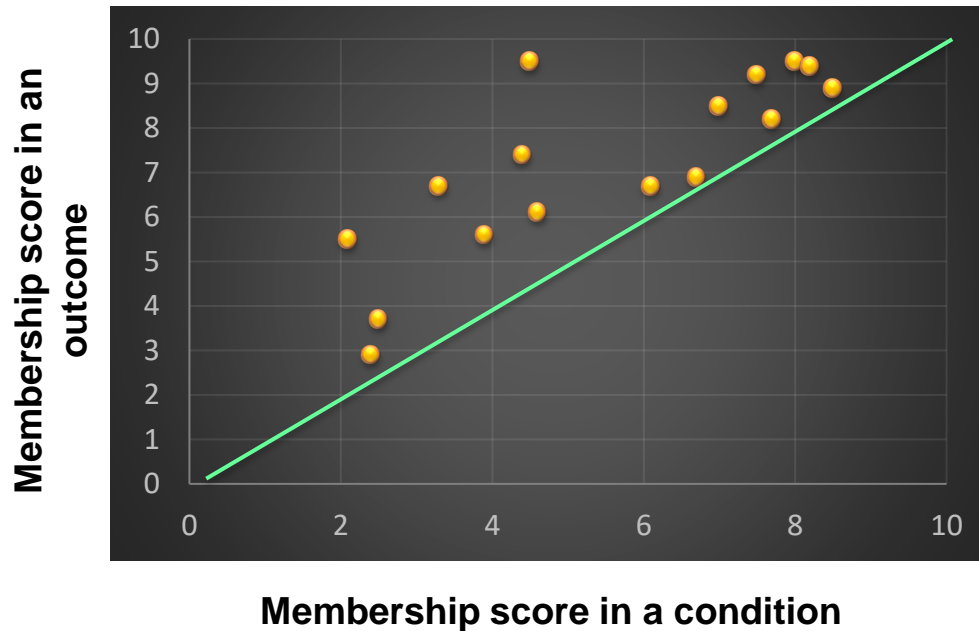
A *necessary condition* is a condition that must be present for the outcome to occur, but its presence does not guarantee that occurrence.

The set of cases within the outcome is a subset of cases within the causal conditions.

3.2 Necessary vs. sufficient conditions (II)

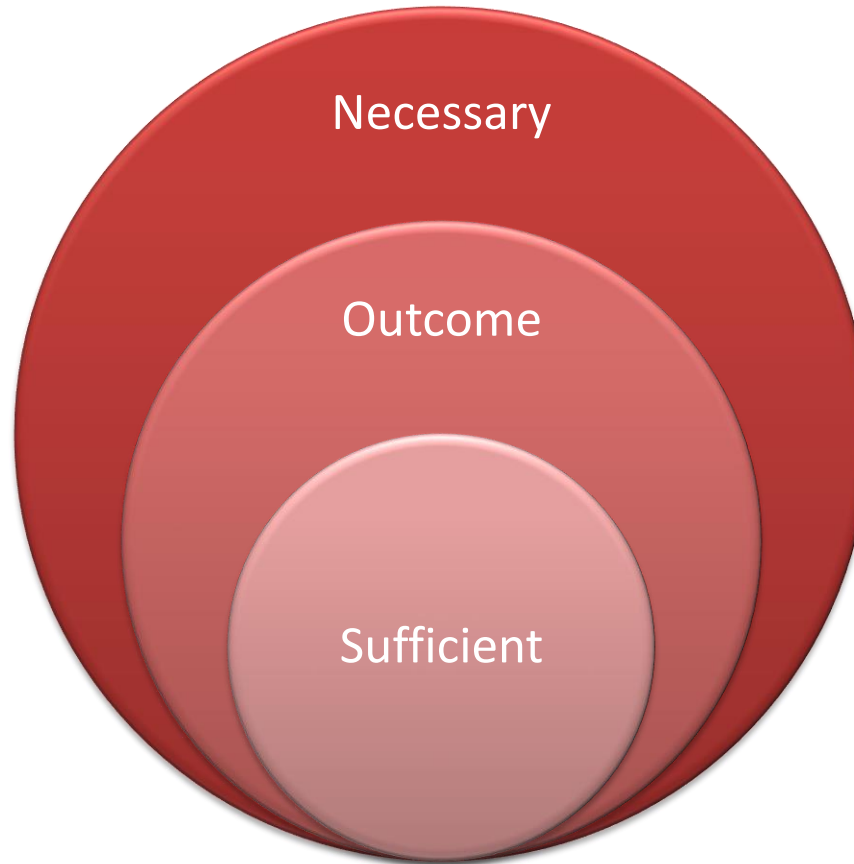
$$\text{Consistency } (X_i \leq Y_i) = \frac{\sum(\min(X_i, Y_i))}{\sum(X_i)}$$

A *sufficient condition* is a condition that is sufficient for an outcome, if the outcome always occurs when the condition (or combination of conditions) is present.



The set of cases in a condition is also a subset of cases in the outcome.

3.2 Necessary vs. sufficient conditions (II)

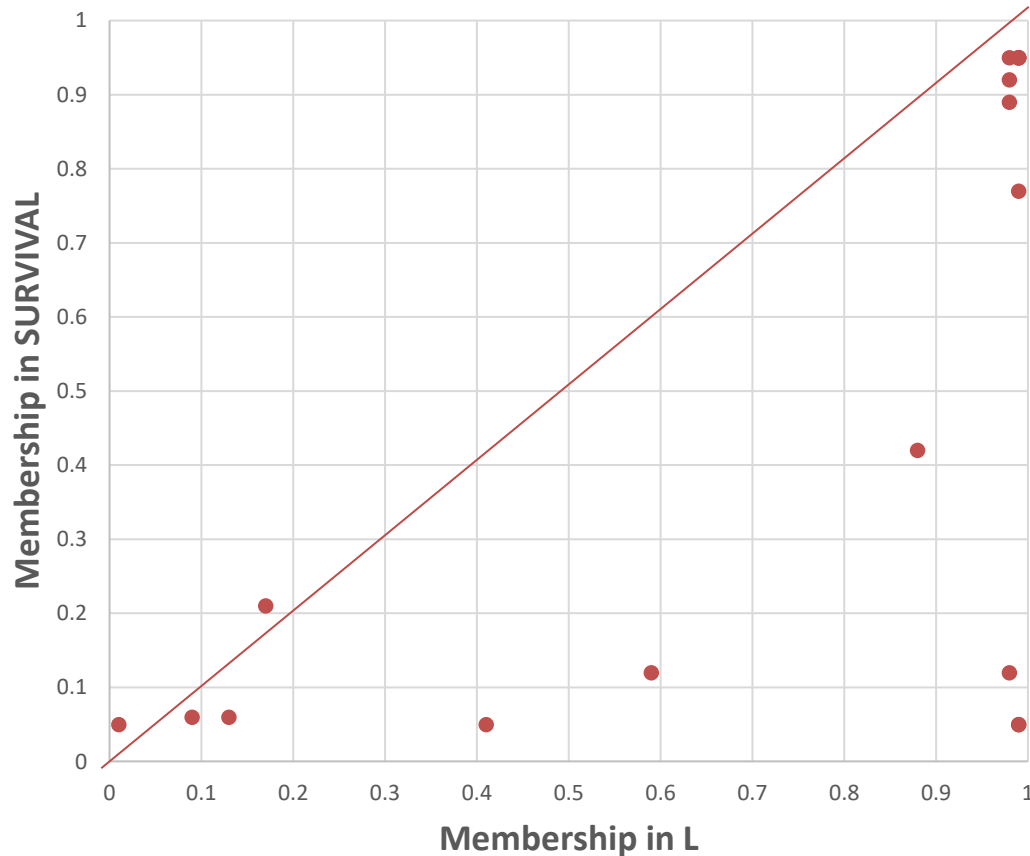


CASE	DEVELOPMENT (D)	URBANISATION (U)	LITERATE (L)	logical AND (min) $D * U * L$	Logical OR (max) $D + U + L$
AUS: Austria	0.81	0.12	0.99	0.12	0.99
BEL: Belgium	0.99	0.89	0.98	0.89	0.98
CZE: Czechoslovakia	0.58	0.98	0.98	0.58	0.98
EST: Estonia	0.16	0.07	0.98	0.07	0.98
FIN: Finland	0.58	0.03	0.99	0.03	0.99
FRA: France	0.98	0.03	0.99	0.03	0.99
GER: Germany	0.89	0.79	0.99	0.79	0.99
GRE: Greece	0.04	0.09	0.13	0.04	0.13
HUN: Hungary	0.07	0.16	0.88	0.07	0.88
IRE: Ireland	0.72	0.05	0.98	0.05	0.98
ITA: Italy	0.34	0.10	0.41	0.10	0.41
NET: Netherlands	0.98	1.00	0.99	0.98	0.99
POL: Poland	0.02	0.17	0.59	0.02	0.59
POR: Portugal	0.01	0.02	0.01	0.01	0.02
ROM: Romania	0.01	0.03	0.17	0.01	0.17
SPA: Spain	0.03	0.30	0.09	0.03	0.30
SWE: Sweden	0.95	0.13	0.99	0.13	0.99
UK: United Kingdom	0.98	0.99	0.99	0.98	0.99

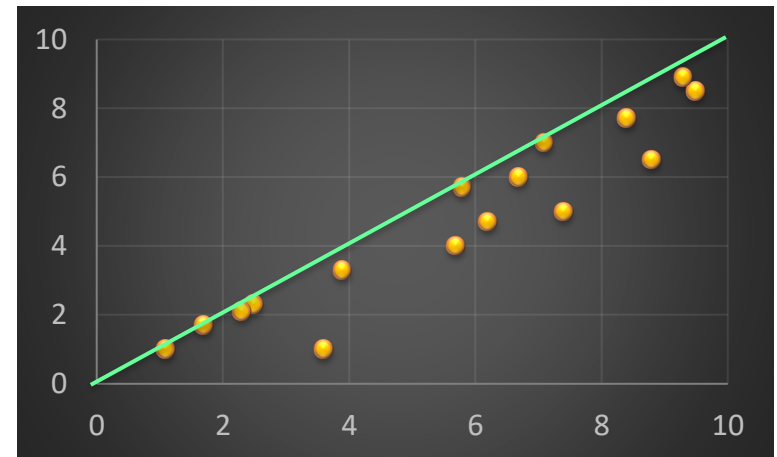
CASE	D	U	L	D * U * L	~ D	~ U	~ L	~ D * ~ U * ~ L	Survival	Breakdown
AUS: Austria	0.81	0.12	0.99	0.12	0.19	0.88	0.01	0.01	0.05	0.95
BEL: Belgium	0.99	0.89	0.98	0.89	0.01	0.11	0.02	0.01	0.95	0.05
CZE: Czechoslovakia	0.58	0.98	0.98	0.58	0.42	0.02	0.02	0.02	0.89	0.11
EST: Estonia	0.16	0.07	0.98	0.07	0.84	0.93	0.02	0.02	0.12	0.88
FIN: Finland	0.58	0.03	0.99	0.03	0.42	0.97	0.01	0.01	0.77	0.23
FRA: France	0.98	0.03	0.99	0.03	0.02	0.97	0.01	0.01	0.95	0.05
GER: Germany	0.89	0.79	0.99	0.79	0.11	0.21	0.01	0.01	0.05	0.95
GRE: Greece	0.04	0.09	0.13	0.04	0.96	0.91	0.87	0.87	0.06	0.94
HUN: Hungary	0.07	0.16	0.88	0.07	0.93	0.84	0.12	0.12	0.42	0.58
IRE: Ireland	0.72	0.05	0.98	0.05	0.28	0.95	0.02	0.02	0.92	0.08
ITA: Italy	0.34	0.10	0.41	0.10	0.66	0.90	0.59	0.59	0.05	0.95
NET: Netherlands	0.98	1.00	0.99	0.98	0.02	0.00	0.01	0.00	0.95	0.05
POL: Poland	0.02	0.17	0.59	0.02	0.98	0.83	0.41	0.41	0.12	0.88
POR: Portugal	0.01	0.02	0.01	0.01	0.99	0.98	0.99	0.98	0.05	0.95
ROM: Romania	0.01	0.03	0.17	0.01	0.99	0.97	0.83	0.83	0.21	0.79
SPA: Spain	0.03	0.30	0.09	0.03	0.97	0.70	0.91	0.70	0.06	0.94
SWE: Sweden	0.95	0.13	0.99	0.13	0.05	0.87	0.01	0.01	0.95	0.05
UK: United Kingdom	0.98	0.99	0.99	0.98	0.02	0.01	0.01	0.01	0.95	0.05

CASE	D	U	L	D * U * L	~ D	~ U	~ L	~ D * ~ U * ~ L	Survival	Breakdown
AUS: Austria	0.81	0.12	0.99	0.12	0.19	0.88	0.01	0.01	0.05	0.95
BEL: Belgium	0.99	0.89	0.98	0.89	0.01	0.11	0.02	0.01	0.95	0.05
CZE: Czechoslovakia	0.58	0.98	0.98	0.58	0.42	0.02	0.02	0.02	0.89	0.11
EST: Estonia	0.16	0.07	0.98	0.07	0.84	0.93	0.02	0.02	0.12	0.88
FIN: Finland	0.58	0.03	0.99	0.03	0.42	0.97	0.01	0.01	0.77	0.23
FRA: France	0.98	0.03	0.99	0.03	0.02	0.97	0.01	0.01	0.95	0.05
GER: Germany	0.89	0.79	0.99	0.79	0.11	0.21	0.01	0.01	0.05	0.95
GRE: Greece	0.04	0.09	0.13	0.04	0.96	0.91	0.87	0.87	0.06	0.94
HUN: Hungary	0.07	0.16	0.88	0.07	0.93	0.84	0.12	0.12	0.42	0.58
IRE: Ireland	0.72	0.05	0.98	0.05	0.28	0.95	0.02	0.02	0.92	0.08
ITA: Italy	0.34	0.10	0.41	0.10	0.66	0.90	0.59	0.59	0.05	0.95
NET: Netherlands	0.98	1.00	0.99	0.98	0.02	0.00	0.01	0.00	0.95	0.05
POL: Poland	0.02	0.17	0.59	0.02	0.98	0.83	0.41	0.41	0.12	0.88
POR: Portugal	0.01	0.02	0.01	0.01	0.99	0.98	0.99	0.98	0.05	0.95
ROM: Romania	0.01	0.03	0.17	0.01	0.99	0.97	0.83	0.83	0.21	0.79
SPA: Spain	0.03	0.30	0.09	0.03	0.97	0.70	0.91	0.70	0.06	0.94
SWE: Sweden	0.95	0.13	0.99	0.13	0.05	0.87	0.01	0.01	0.95	0.05
UK: United Kingdom	0.98	0.99	0.99	0.98	0.02	0.01	0.01	0.01	0.95	0.05

Necessary condition

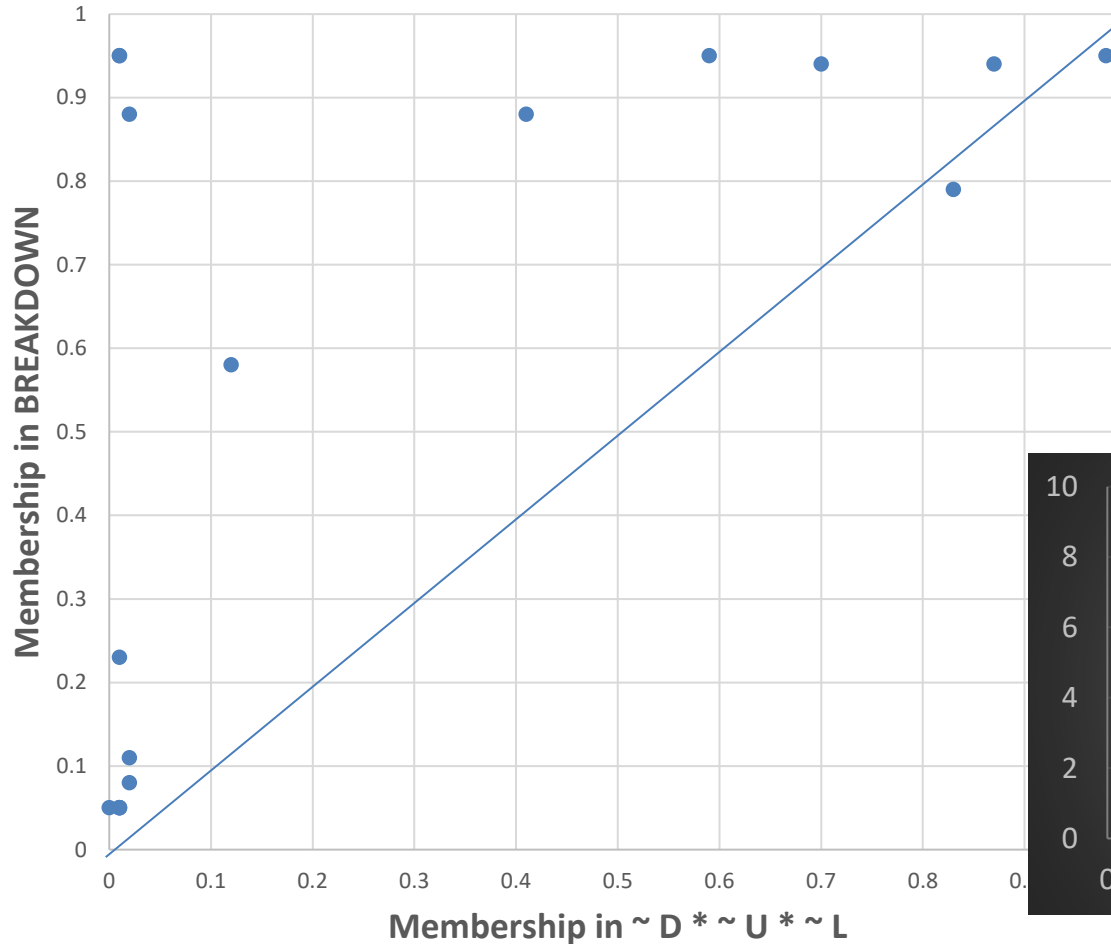


A *necessary condition* is a condition that must be present for the outcome to occur, but its presence does not guarantee that occurrence.

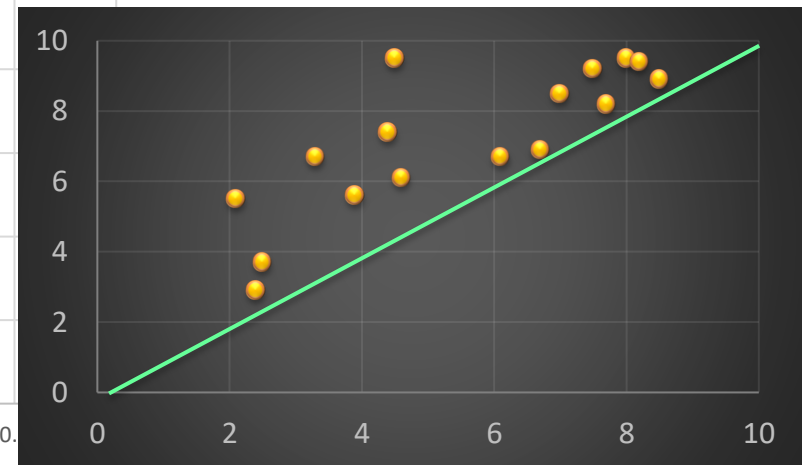


CASE	D	U	L	D * U * L	~ D	~ U	~ L	~ D * ~ U * ~ L	Survival	Breakdown
AUS: Austria	0.81	0.12	0.99	0.12	0.19	0.88	0.01	0.01	0.05	0.95
BEL: Belgium	0.99	0.89	0.98	0.89	0.01	0.11	0.02	0.01	0.95	0.05
CZE: Czechoslovakia	0.58	0.98	0.98	0.58	0.42	0.02	0.02	0.02	0.89	0.11
EST: Estonia	0.16	0.07	0.98	0.07	0.84	0.93	0.02	0.02	0.12	0.88
FIN: Finland	0.58	0.03	0.99	0.03	0.42	0.97	0.01	0.01	0.77	0.23
FRA: France	0.98	0.03	0.99	0.03	0.02	0.97	0.01	0.01	0.95	0.05
GER: Germany	0.89	0.79	0.99	0.79	0.11	0.21	0.01	0.01	0.05	0.95
GRE: Greece	0.04	0.09	0.13	0.04	0.96	0.91	0.87	0.87	0.06	0.94
HUN: Hungary	0.07	0.16	0.88	0.07	0.93	0.84	0.12	0.12	0.42	0.58
IRE: Ireland	0.72	0.05	0.98	0.05	0.28	0.95	0.02	0.02	0.92	0.08
ITA: Italy	0.34	0.10	0.41	0.10	0.66	0.90	0.59	0.59	0.05	0.95
NET: Netherlands	0.98	1.00	0.99	0.98	0.02	0.00	0.01	0.00	0.95	0.05
POL: Poland	0.02	0.17	0.59	0.02	0.98	0.83	0.41	0.41	0.12	0.88
POR: Portugal	0.01	0.02	0.01	0.01	0.99	0.98	0.99	0.98	0.05	0.95
ROM: Romania	0.01	0.03	0.17	0.01	0.99	0.97	0.83	0.83	0.21	0.79
SPA: Spain	0.03	0.30	0.09	0.03	0.97	0.70	0.91	0.70	0.06	0.94
SWE: Sweden	0.95	0.13	0.99	0.13	0.05	0.87	0.01	0.01	0.95	0.05
UK: United Kingdom	0.98	0.99	0.99	0.98	0.02	0.01	0.01	0.01	0.95	0.05

Sufficient conditions



A *sufficient condition* is a condition that is sufficient for an outcome, if the outcome always occurs when the condition (or combination of conditions) is present.



Software packages



<http://www.socsci.uci.edu/~cragin/fsQCA/software.shtml>



TOSMANA

<https://www.tosmana.net/>



<https://www.r-project.org/>

Further reading

- Cooper, B., & Glaesser, J. (2016). Qualitative Comparative Analysis, Necessary Conditions, and Limited Diversity: Some Problematic Consequences of Schneider and Wagemann's Enhanced Standard Analysis. *Field Methods*, 28(3), 300–315. <https://doi.org/10.1177/1525822X15598974>
- Cress, D. M., & Snow, D. A. (2000). The Outcomes of Homeless Mobilization: The Influence of Organization, Disruption, Political Mediation, and Framing. *American Journal of Sociology*, 105(4), 1063–1104. <https://doi.org/10.1086/210399>
- Gran, B. (2003). Charitable choice policy and abused children: the benefits and harms of going beyond the public-private dichotomy. *International Journal of Sociology and Social Policy*, 23(11), 80–125. <https://doi.org/10.1108/01443330310790363>
- Handbook, T. S. (2013). *The SAGE Handbook of Case-Based Methods* - David Byrne.
- Harriss-White, B., Olsen, W., Vera-Sanso, P., & Suresh, V. (2013). Multiple shocks and slum household economies in South India. *Economy and Society*, 42(3), 398–429. <https://doi.org/10.1080/03085147.2013.772760>
- Haynes, P. (2014). Combining the Strengths of Qualitative Comparative Analysis with Cluster Analysis for Comparative Public Policy Research: With Reference to the Policy of Economic Convergence in the Euro Currency Area. *International Journal of Public Administration*, 37(9), 581–590. <https://doi.org/10.1080/01900692.2014.880849>
- Kent, R. (2018). Cases as Configurations: Using Combinatorial and Fuzzy Logic to Analyse Marketing Data. *International Journal of Market Research*, 47(2), 205–228. <https://doi.org/10.1177/147078530504700202>
- Kogut, B., Macduffie, J. P., & Ragin, C. (2004). Credit Using Fuzzy Sets. *European Management Review*, 1, 114–131. <https://doi.org/10.1057/palgrave.emr.1500020>
- Krook, M. L. (2010). Women's Representation in Parliament: A Qualitative Comparative Analysis. *Political Studies*, 58(5), 886–908. <https://doi.org/10.1111/j.1467-9248.2010.00833.x>
- Ragin, C. C. (2017). *Crisp-Set Qualitative Comparative Analysis (csQCA)*.
- Ragin, C. C. (2008). What is Qualitative Comparative Analysis (QCA)? ESRC Research Methods Festival, 1–19. [https://doi.org/10.1016/0921-5093\(89\)90627-8](https://doi.org/10.1016/0921-5093(89)90627-8)
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Any questions?



Thank you!