

3rd International QCA Expert Workshop  
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# THEORY TESTING AND SMALL-N DESIGNS

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Bayesian and Boolean inference

# THEORY-TESTING STRATEGIES

## Process Tracing

## QCA

van Evera, Collier

Humphreys/ Jacobs

Fairfield/ Charman

Ragin

**Causation model**

$X \rightarrow p \rightarrow q \rightarrow Y$

$X \cdot p \cdot q \rightarrow Y$

**Question**

Is my case an instance of my Hp?

Is my case a *true* instance of my Hp?

Can my Hp make better sense of all the evidence from my case?

Can my conditions explain cases' differences in outcome?

**Proof**

Special 'symptoms' confirm my expectations that my Hp is more credible than rivals when observed

Conditions 'make a difference' across positive and negative subpopulations

**Tests**

Doubly decisive, Hoop, Smoking gun, Straws in the wind

Van Evera's, as sign and direction of the difference in Bayesian likelihoods - of observing evidence in a true and a false instance

Odds ratio of Hp Bayesian posterior probability against rival

N-consistency, S-consistency, Quine-McCluskey minimizations

**Problems**

*When used as a stand-alone strategy:* Hp ad hoc; parameters by discretion; + Causation = presence alone; Equifinals as rivals; Selection on the dependent

Unobserved outliers  
← credible scope condition

QCA with 2 instances

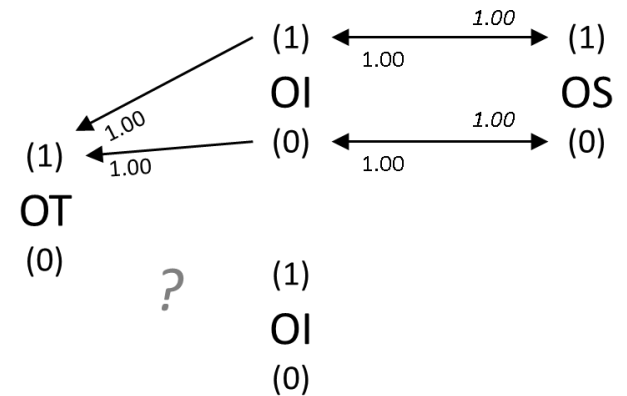
# APPLICATION

MKT	COOP	ALL	cases in T	OT	cases in I	OI	cases in S	OS
1	1	1			H-MW	1	H-MW, H-PW	1
1	1	0	H-MW, H-PW	1	H-PW	1		
1	0	1						
1	0	0						
0	1	1						
0	1	0						
0	0	1	P-MW, P-PW	1				
0	0	0			P-MW, P-PW	0	P-MW, P-PW	0

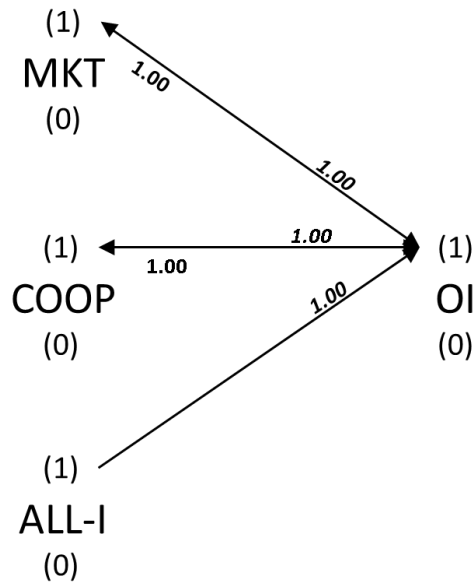
**[HP.0a]**  $OT(1) \leftarrow OI(1) \leftarrow OS(1)$

**[HP.0b]**  $OT(0) \rightarrow OI(0) \rightarrow OS(0)$

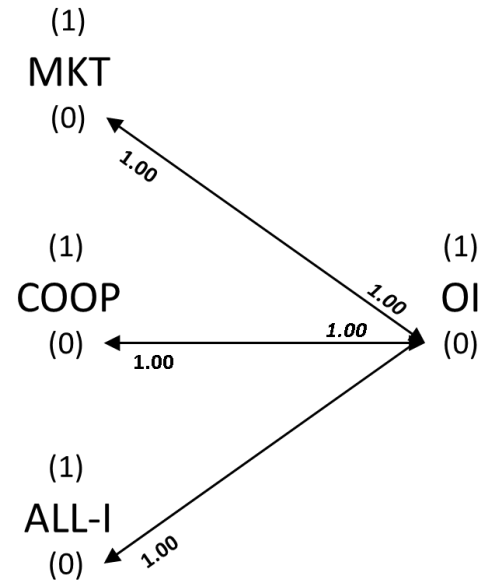
		N-consistency	S-consistency
<i>Consequent:</i> <b>OI<sub>1</sub></b>			
<i>Antecedent:</i> OT <sub>1</sub>		1.000000	0.500000
OT <sub>0</sub>		0.000000	-1.#IND00
<i>Consequent:</i> <b>OI<sub>0</sub></b>			
<i>Antecedent:</i> OT <sub>1</sub>		1.000000	0.500000
OT <sub>0</sub>		0.000000	-1.#IND00
<i>Consequent:</i> <b>OS<sub>1</sub></b>			
<i>Antecedent</i> OI <sub>1</sub>		1.000000	1.000000
OI <sub>0</sub>		0.000000	0.000000
<i>Consequent:</i> <b>OS<sub>0</sub></b>			
<i>Antecedent</i> OI <sub>1</sub>		0.000000	0.000000
OI <sub>0</sub>		1.000000	1.000000



Factors:	Outcome: $OI_1$		Outcome: $OI_0$	
	<i>N-cons</i>	<i>S-cons</i>	<i>N-cons</i>	<i>S-cons</i>
$MKT_1$	1.000000	1.000000	0.000000	0.000000
$MKT_0$	0.000000	0.000000	1.000000	1.000000
$COOP_1$	1.000000	1.000000	0.000000	0.000000
$COOP_0$	0.000000	0.000000	1.000000	1.000000
$ALL-I_1$	0.500000	1.000000	0.000000	0.000000
$ALL-I_0$	0.500000	0.333333	1.000000	0.666667

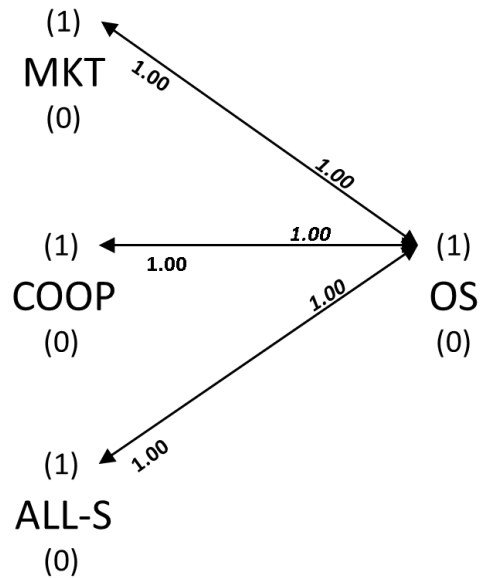


$$COOP_1 \bullet MKT_1 \leftrightarrow OI_1$$

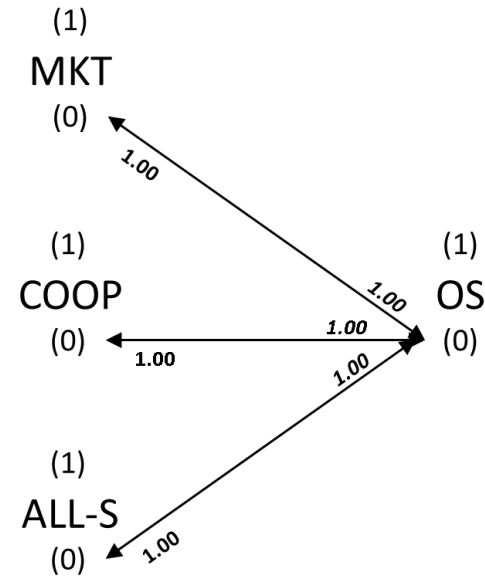


$$ALL-I_0 \bullet COOP_0 \bullet MKT_0 \leftrightarrow OI_1$$

<i>Factors:</i>	<b>Outcome: <math>OS_1</math></b>		<b>Outcome: <math>OS_0</math></b>	
	<i>N-cons</i>	<i>S-cons</i>	<i>N-cons</i>	<i>S-cons</i>
MKT <sub>1</sub>	1.000000	1.000000	0.000000	0.000000
MKT <sub>0</sub>	0.000000	0.000000	1.000000	1.000000
COOP <sub>1</sub>	1.000000	1.000000	0.000000	0.000000
COOP <sub>0</sub>	0.000000	0.000000	1.000000	1.000000
ALL-S <sub>1</sub>	1.000000	1.000000	0.000000	0.000000
ALL-S <sub>0</sub>	0.000000	0.000000	1.000000	1.000000



$$COOP_1 \bullet MKT_1 \bullet ALL-S_1 \leftrightarrow OS_1$$



$$ALL-S_0 \bullet COOP_0 \bullet MKT_0 \leftrightarrow OS_0$$