

PDW Academy of Management, Anaheim, August 6, 2016

ROTTERDAM SCHOOL OF MANAGEMENT
ERASMUS UNIVERSITY

NECESSARY CONDITION ANALYSIS (NCA)

A NOVEL VIEW ON CAUSALITY AND
ON EMPIRICAL DATA ANALYSIS

JAN DUL

The business school that thinks
and lives in the future



RSM
ERASMUS
UNIVERSITY

CORE PAPER AND USEFUL LINKS




Core paper:

Dul, J. (2016) Necessary Condition Analysis (NCA): Logic and methodology of “necessary but not sufficient” causality.
Organizational Research Methods 19(1), 10-52. (free access)

Useful links:



- [NCA website](#): (which includes the following links, and more)
- [NCA publications](#)
- [NCA calculator](#)
- [NCA-R software](#)
- [Subscription for NCA Newsletter](#)
- [FAQ about NCA](#)
- See also the links in the slides

RSM
ERASMUS
UNIVERSITY




WHY THIS PDW?


1. Novel method
2. New theoretical insights
3. Practical relevance
4. Publication opportunities



MY GOALS OF TODAY



1. To make you familiar with the NCA logic and approach
2. To discuss the method (and to learn from you)
3. To consider applying NCA in your research






AGENDA


1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field
2. How to identify/test necessary conditions (data analysis)
 - With regression/QCA?
 - With NCA
 - Comparison OLS-NCA
 - Example
3. How to publish with NCA? (papers)



TRILOGY OF LOGICS AND METHODS



- Regression:
Additive logic: **single** determinants are **sufficient but not necessary** for producing the outcome
- QCA:
Configurational binary logic: combinations of single determinants (**configurations**) are **sufficient but not necessary** for producing the outcome (“equifinality”)
- NCA:
Necessity logic: **single** determinants are **necessary but not sufficient** to allow the outcome.





NECESSARY CONDITIONS IN EVERY-DAY LIFE

- A high GMAT test score is **necessary but not sufficient** for admission to a PhD program
- HIV is **necessary but not sufficient** for AIDS
- Croutons are **necessary but not sufficient** for a Caesar salad
- Etc.



NECESSARY CONDITIONS IN PRACTICE

Examples:


- Senior management commitment is **necessary but not sufficient** for successful organizational change
- User participation is **necessary but not sufficient** for successful ICT implementation


In general:

- “must have” (versus “nice to have”).
- a “gotta have”
- “we cannot without it”

e.g., project management **MoSCoW**-method classification of factors:

- **MUST HAVE** - necessary
- **SHOULD HAVE**- important but not necessary
- **COULD HAVE**- desirable but not necessary
- **WOULD LIKE TO HAVE**- nice to have but not necessary:







PRACTICAL RELEVANCE

- If the necessary condition is not in place, there is guaranteed failure
- This absence of a necessary condition cannot be compensated by other conditions/determinants
- The presence of the necessary condition does not guarantee success, but may increase the likelihood of success


*The necessary condition works in isolation,
independently of the context*




NECESSARY CONDITIONS IN ACADEMIA

- X is necessary for Y
- X is needed for Y.
- X is critical for Y.
- X is crucial for Y.
- X is essential for Y.
- X is indispensable for Y.
- X is a prerequisite for Y.
- X is a requirement for Y.
- X is *condicio sine qua non* for Y
- X is a pre-condition for Y.
- X allows Y.
- There must be X to have Y.
- Y requires X.
- Without X there cannot be Y

Dul, J., Hak, T., Goertz, G. & Voss, C. (2010). Necessary condition hypotheses in operations management. *International Journal of Operations & Production Management* 30 (11), 1170-1190







NECESSARY CONDITIONS IN ACADEMIA

Examples from *Academy of Management Journal*


- “Emotion recognition may be a **necessary but insufficient** ability involved in the performance of transformational leadership behavior.” (Rubin, Munz, & Bommer, 2005)
- Social relationships are **necessary but not sufficient** for promoting high-performing cross-BU collaboration.” (Martin & Eisenhardt, 2010)
- “Organizational commitment may be a **necessary but insufficient condition** for low absenteeism” (Hausknecht et al. 2008)




NECESSARY CONDITIONS IN ACADEMIA

Examples from *Journal of Management*:

- Treadway et al. (2013, p.1536): “the ability of an entrepreneur to demonstrate previous performance is a **necessary, but not sufficient**, condition for success.”
- Hill and Birkenshaw (2014, p. 1907) “... a fertile relational context provides a **necessary, but not sufficient**, foundation for corporate venture unit survival.”
- Huselid and Becker (2011, p. 423) “higher quality HR management systems will become a **necessary, but not sufficient**, form of organizational infrastructure to provide a long term source of competitive advantage”.







NECESSARY CONDITIONS IN ACADEMIA

Goertz' first law:
“for any research area one can find important
necessary condition hypotheses.”


Goertz, G., & Starr, H. (2002). *Necessary conditions: theory, methodology, and applications*. Rowman & Littlefield.




DAVID HUME: PHILOSOPHY OF CAUSATION


David Hume's philosophy of causation (Hume, 1777):

“...we may define a cause to be an object, followed
by another, and where all the objects, similar to the
first, are followed by objects, similar to the second.
Or in other words, where, **if the first had not been,
the second never had existed.**”



Hume, D. (1777). *An enquiry concerning human understanding*. London.







NECESSARY (BUT NOT SUFFICIENT) CONDITION

Present (1)		●
Y (outcome)		
Absent (0)	●	●
	Absent (0)	Present (1)
	X (condition)	

From the perspective of the outcome/output Y:
 Y is only possible if X is present (necessity formulation, X allows success of Y)


From the perspective of condition/input X:
 If X is absent Y will be absent (sufficiency formulation, X produces failure of Y)

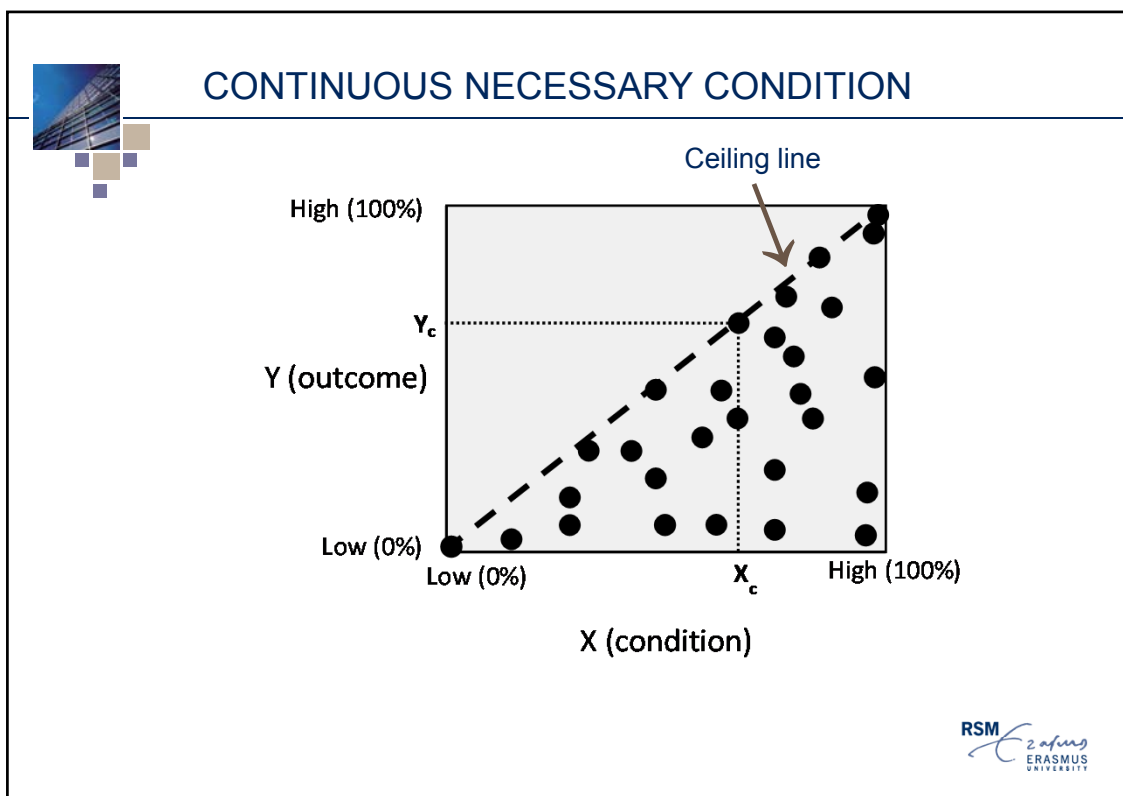
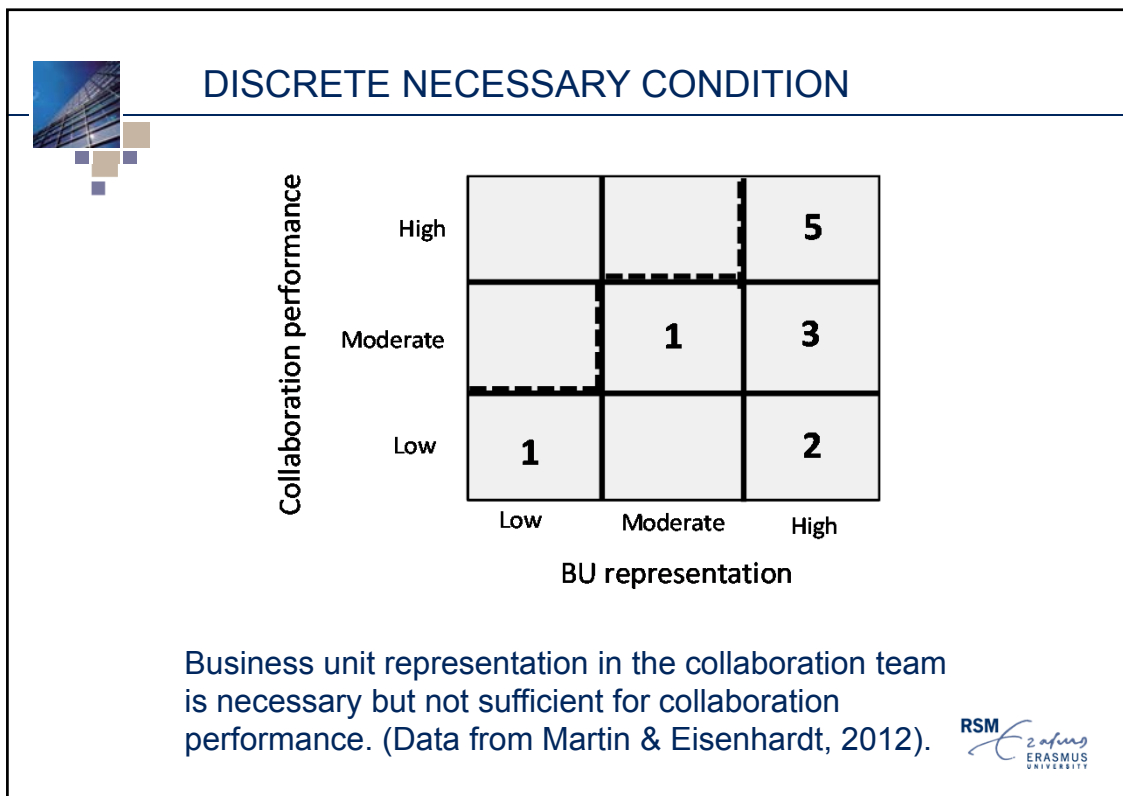




DICHOTOMOUS NECESSARY CONDITION

Success	1	34
Admission		
Failure	98	209
	<620	≥ 620
	Quantitative GRE score	

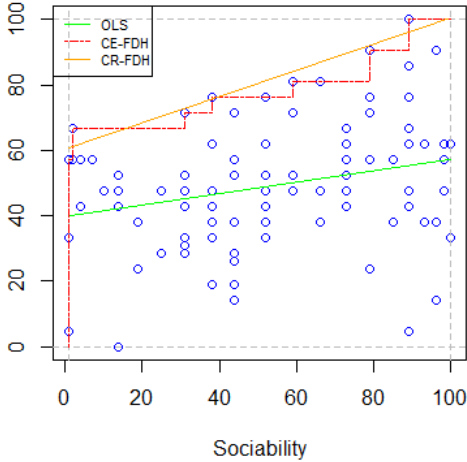
Number of students applying for admission to the Berkeley
 Sociology Graduate Program in 2009 (Data from: Vaisey, 2009)









EXAMPLE



The scatter plot displays the relationship between Sociability (x-axis, 0-100) and Sales Performance (y-axis, 0-100). Three regression models are shown: OLS (green solid line), CE-FDH (red dashed line), and CR-FDH (yellow solid line). The OLS line shows a weak positive correlation. The CE-FDH line is a step function that increases in discrete steps as sociability increases. The CR-FDH line is a smooth curve that increases more steeply than the OLS line, reaching a sales performance of 100 at a sociability level of approximately 90.


Sociability is necessary but not sufficient for sales performance.
Hogan Personality Inventory (HPI) (Hogan, & Hogan, 2007).




RECENT QUOTE IN A META-ANALYTIC PAPER

“While our meta-analysis contributes to the understanding of the relative importance of different antecedents, what is less clear is **whether certain antecedents are necessary and/or sufficient for the development of psychological safety.** Or, for that matter, whether psychological safety is necessary and/or sufficient for the development of behavioral and attitudinal work outcomes. Moreover, in what ways might different antecedent conditions substitute or neutralize the effectiveness of other conditions? Here, we suggest future theoretical development exploring issues of necessity and sufficiency and **encourage researchers to explore alternative nonparametric methodologies** – such as qualitative comparative analysis (Ragin, 2000) or **Necessary Condition Analysis (Dul, 2016)** – which are better suited to address issues these issues than standard regression approaches.”



Frazier, M.F. , Fainshmidt, S. & Klinger, .L. (2016) Psychological Safety: A meta-analytic review and extension. *Personnel Psychology* (in press).
Dul, J. (2016) Necessary Condition Analysis (NCA): Logic and methodology of “necessary but not sufficient” causality. *Organizational Research Methods* 19(1), 10-52.






DISCUSSION EXAMPLES IN YOUR FIELD?

- What are examples of potential necessary conditions in your field (could “important factors” be necessary?)
- What would be the theoretical and practical relevance of the (potential) necessary condition?



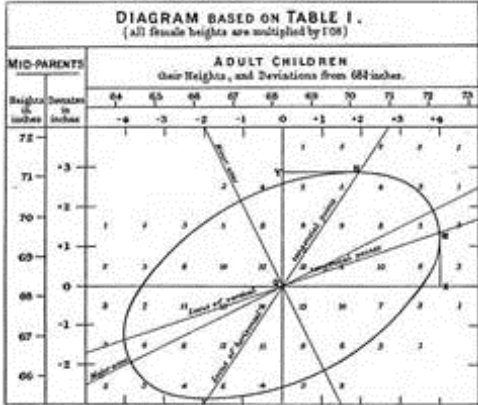
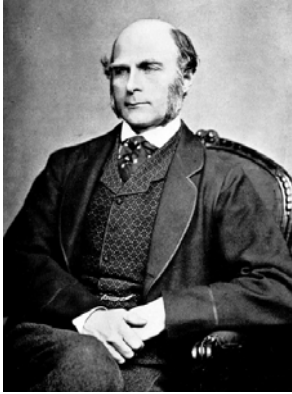
AGENDA

1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field
2. How to identify/test necessary conditions (data analysis)
 - With regression/QCA?
 - With NCA
 - Comparison OLS-NCA
 - Example
3. How to publish with NCA? (papers)




REGRESSION/SUFFICIENCY IS THE NORM

- Francis Galton (1886)
- Founder of correlation and regression



Francis Galton (1886) [Anthropological Miscellanea: "Regression towards mediocrity in hereditary stature."](#) *The Journal of the Anthropological Institute of Great Britain and Ireland*, 15: 246–263





TRADITIONAL DATA ANALYSIS APPROACH

- Formulation of necessary condition:** A theoretical necessary but not sufficient statement is introduced in the Introduction, Theory, or Hypotheses section.

Example:
“organizational commitment may be a *necessary but not sufficient* condition for low absenteeism”.

Hausknecht, J.P., Hiller, N.J., & Vance, R.J. (2008). Work-Unit Absenteeism: Effects of Satisfaction, Commitment, Labor Market Conditions, and Time. *Academy of Management Journal*, 51(6), 1223-1245.







TRADITIONAL DATA ANALYSIS APPROACH

2. Re-formulation as association: This statement is reformulated as a traditional hypothesis with an unspecified "positive association" (or similar) between cause and outcome (i.e., without specifying that the cause is considered as necessary but not sufficient).

Example:
"when organizational commitment is low, higher levels of absenteeism *may occur*."

Hausknecht, J.P., Hiller, N.J., & Vance, R.J. (2008). Work-Unit Absenteeism: Effects of Satisfaction, Commitment, Labor Market Conditions, and Time. *Academy of Management Journal*, 51(6), 1223-1245.




TRADITIONAL DATA ANALYSIS APPROACH


3. Traditional association analysis: The obtained observational data are analyzed using traditional variants of the general linear model (e.g., correlation or regression).

Example: **Results of Models Predicting Rate of Change in Unit-Level Absenteeism^a**

Intercept	2.08***
Unemployment rate ^b	-0.04*
Work-unit size ^b	0.00
Work-unit type ^c	-0.18
Time	0.12***
Organizational commitment ^b	-0.31***
Commitment × time	0.03

Hausknecht, J.P., Hiller, N.J., & Vance, R.J. (2008). Work-Unit Absenteeism: Effects of Satisfaction, Commitment, Labor Market Conditions, and Time. *Academy of Management Journal*, 51(6), 1223-1245.







TRADITIONAL DATA ANALYSIS APPROACH

4. **Interpretation as necessary condition:** if the hypothesis was confirmed (e.g., a positive association found between cause and effect), the results were interpreted as a confirmation of the necessary but not sufficient statement.

Example:
“[...] findings [...] show that high organizational commitment is *necessary* to avoid high levels of absenteeism”

Hausknecht, J.P., Hiller, N.J., & Vance, R.J. (2008). Work-Unit Absenteeism: Effects of Satisfaction, Commitment, Labor Market Conditions, and Time. *Academy of Management Journal*, 51(6), 1223-1245.





EXAMPLE

Intelligence is necessary but not sufficient for creativity

“The basic idea behind the threshold hypothesis is that high creativity **requires** high or at least above-average intelligence. At this, above-average intelligence is thought to form a **necessary but not a sufficient condition** for high creativity (Guilford, 1967)”.

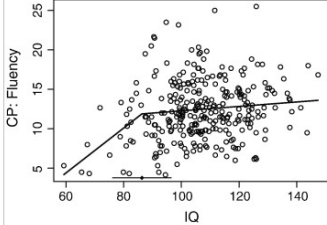
Jauk, E., Benedek, M., Dunst, B., & Neubauer, A.C. (2013) The relationship between intelligence and creativity: New support for the threshold hypothesis by means of empirical breakpoint detection. *Intelligence*. 41(4): 212–221



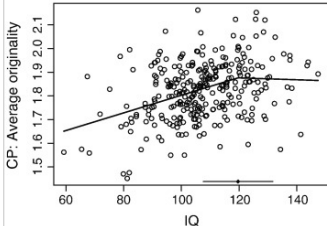


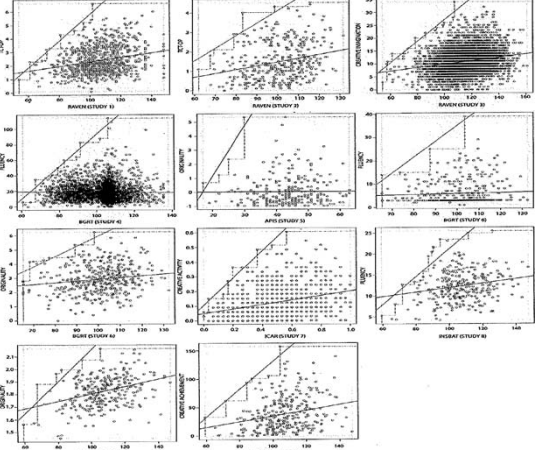
EXAMPLE

a




c





Jauk, E., Benedek, M., Dunst, B., & Neubauer, A.C. (2013) The relationship between intelligence and creativity: New support for the threshold hypothesis by means of empirical breakpoint detection. *Intelligence*. 41(4): 212–221

Karwowski, M., Dul, J., Gralewski, J., Jauk, E., Jankowska, D. M., Gajda, A., ... & Benedek, M. (2016). Is creativity without intelligence possible? A Necessary Condition Analysis. *Intelligence*, 57, 105-117.



CAN WE DRAW CEILING LINES WITH ADAPTED REGRESSION?

Received suggestions (list prepared by Roelof Kuik):

Near:


- Monotone Boundary Estimation
- Regression with one-sided errors
- Support curve estimation

Middle:

- Novelty detection
- One-class classification
- Crash modification factors

Far:

- Density estimation
- Consideration sets
- Two-stage selection/regression models
- Spline regression analysis
- Funnel plot
- Cliff effect
- Formal concept analysis
- Bag plots
- Hyperbox



CAN WE USE QCA ?

Yes:

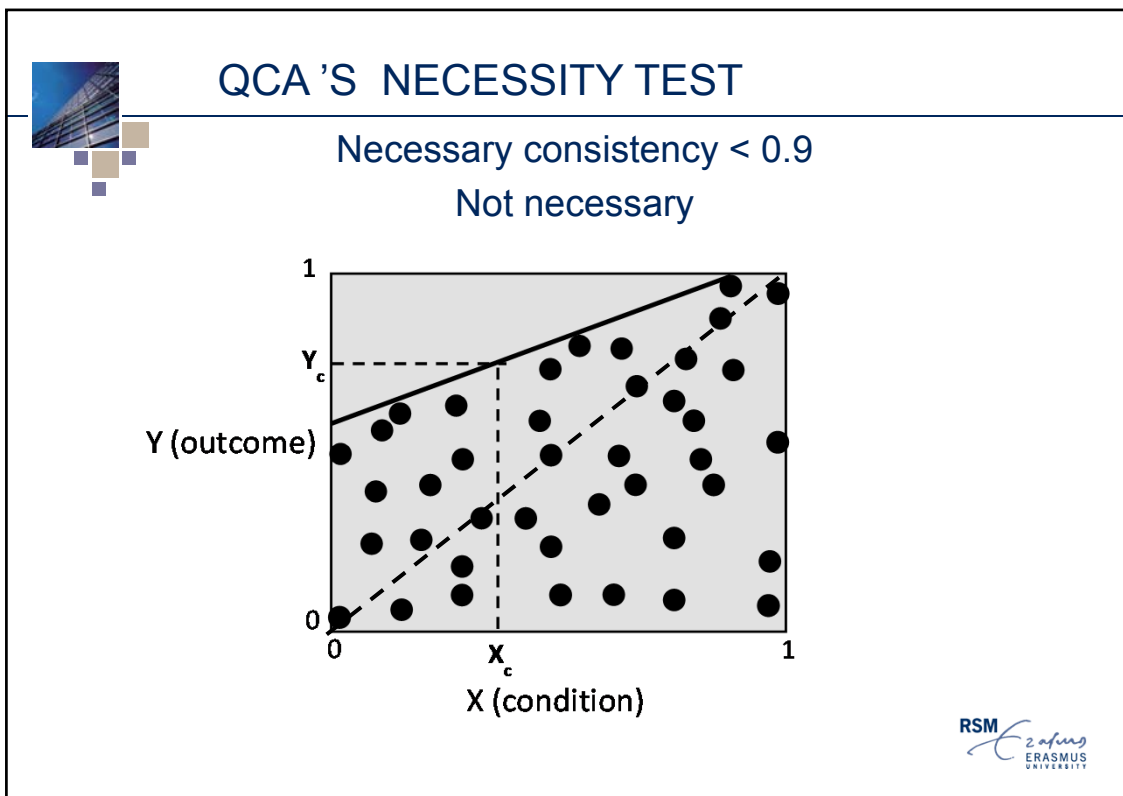

- Only for dichotomous (binary) necessity statements (X is necessary for Y): *QCA's necessity test*


No:

- For continuous necessity statements (level X is necessary for level Y)

Dul, J. (2016). Identifying single necessary conditions with NCA and fsQCA. *Journal of Business Research*, 69(4):1516-1523.

Vis, B. & Dul, J. (2016) Analyzing relationships of necessity not just *in kind* but also *in degree*: RSM
Complementing fsQCA with NCA. *Sociological Methods and Research* (in press).





CAN WE USE QCA ?

Yes:



- Only for dichotomous (binary) necessity statements (X is necessary for Y): *QCA's necessity analysis*

No:

- For continuous necessity statements (level X is necessary for level Y)


Note: an INUS condition is not a necessary condition!

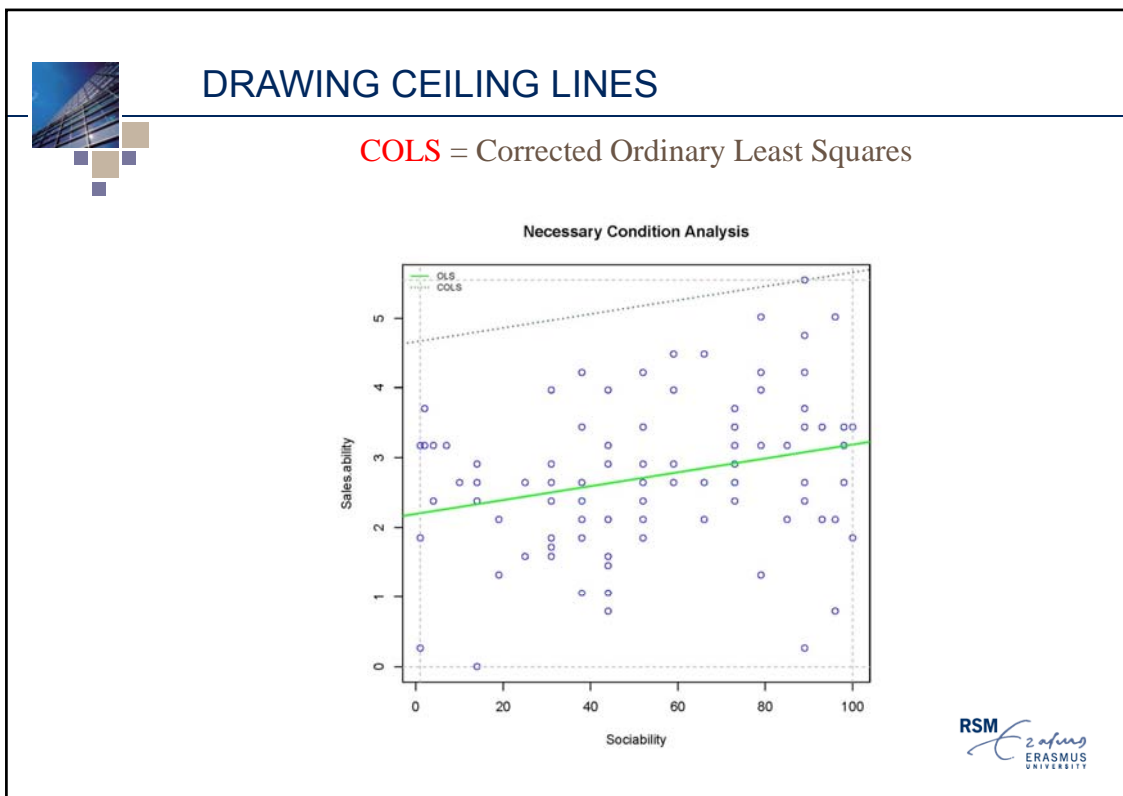
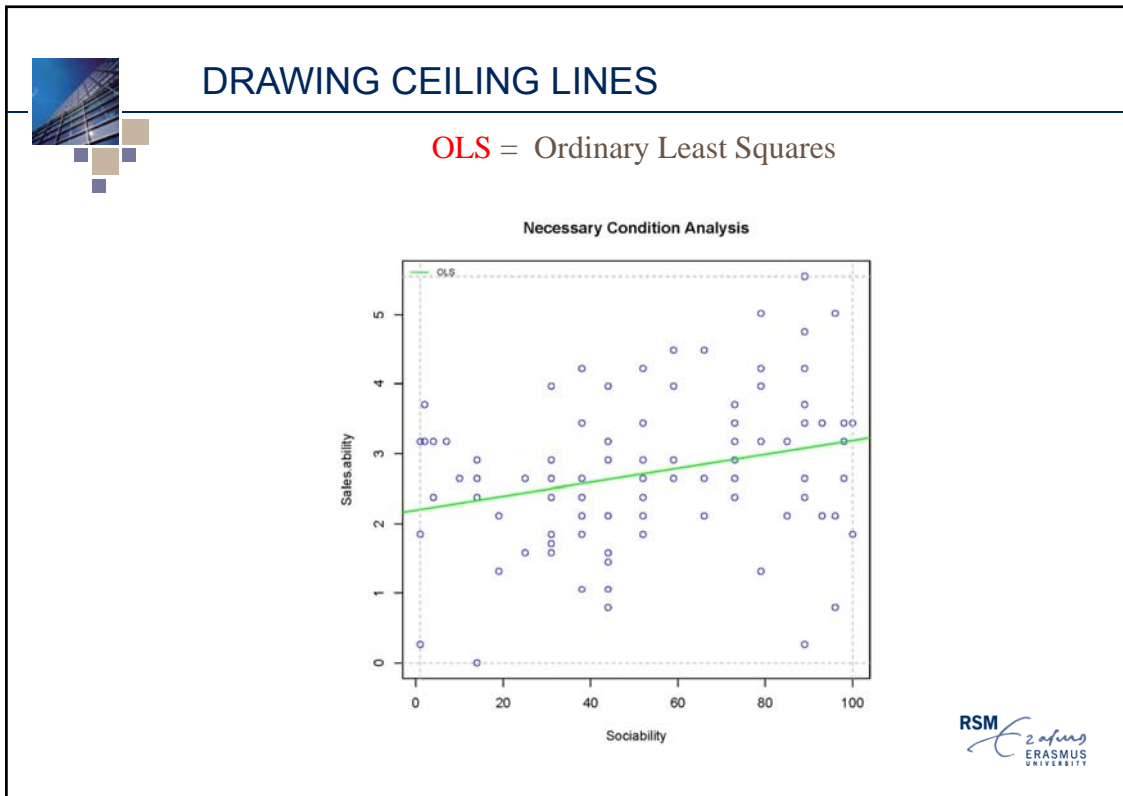
Dul, J. (2016). Identifying single necessary conditions with NCA and fsQCA. *Journal of Business Research*, 69(4):1516-1523.
Vis, B. & Dul, J. (2016) Analyzing relationships of necessity not just *in kind* but also *in degree*: RSM
Complementing fsQCA with NCA. *Sociological Methods and Research* (in press).

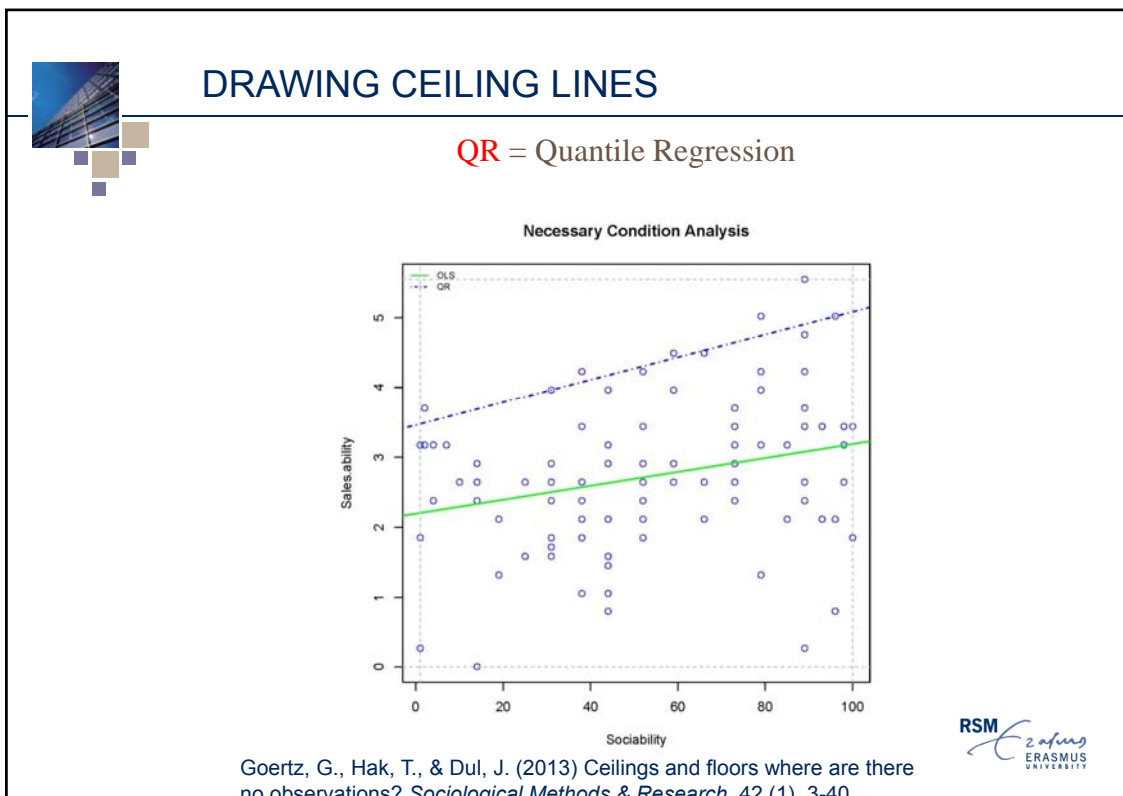
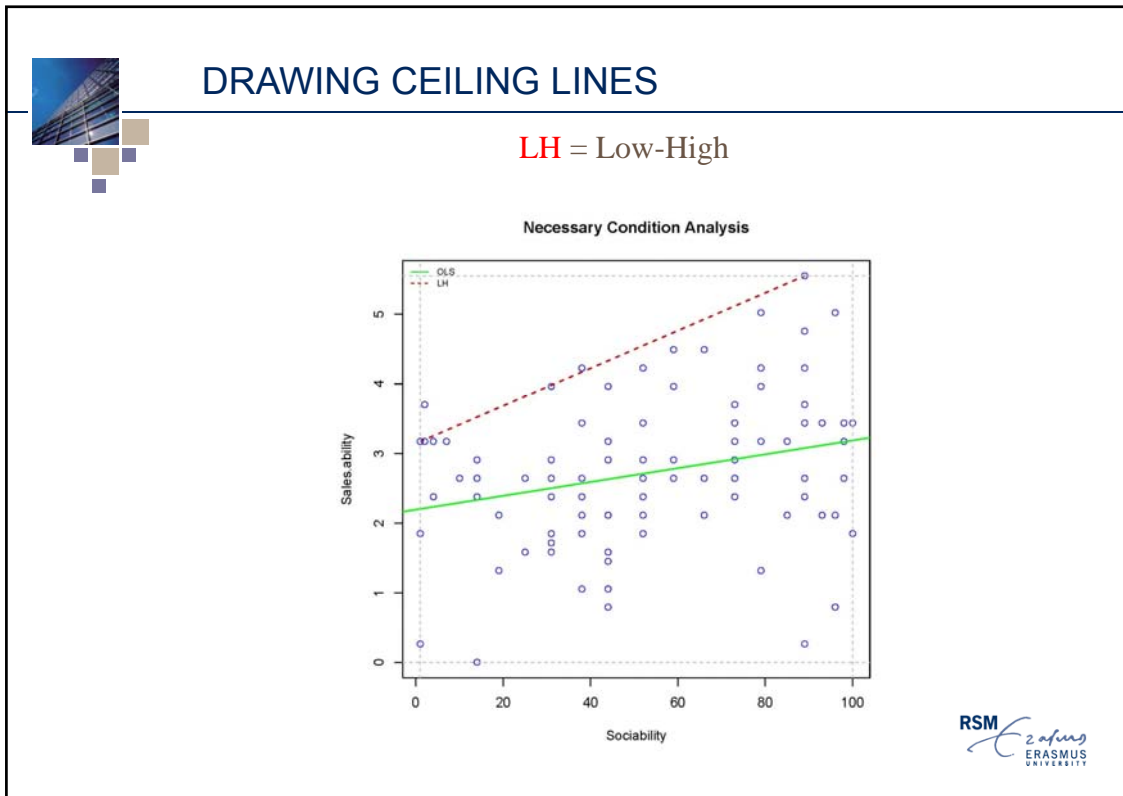


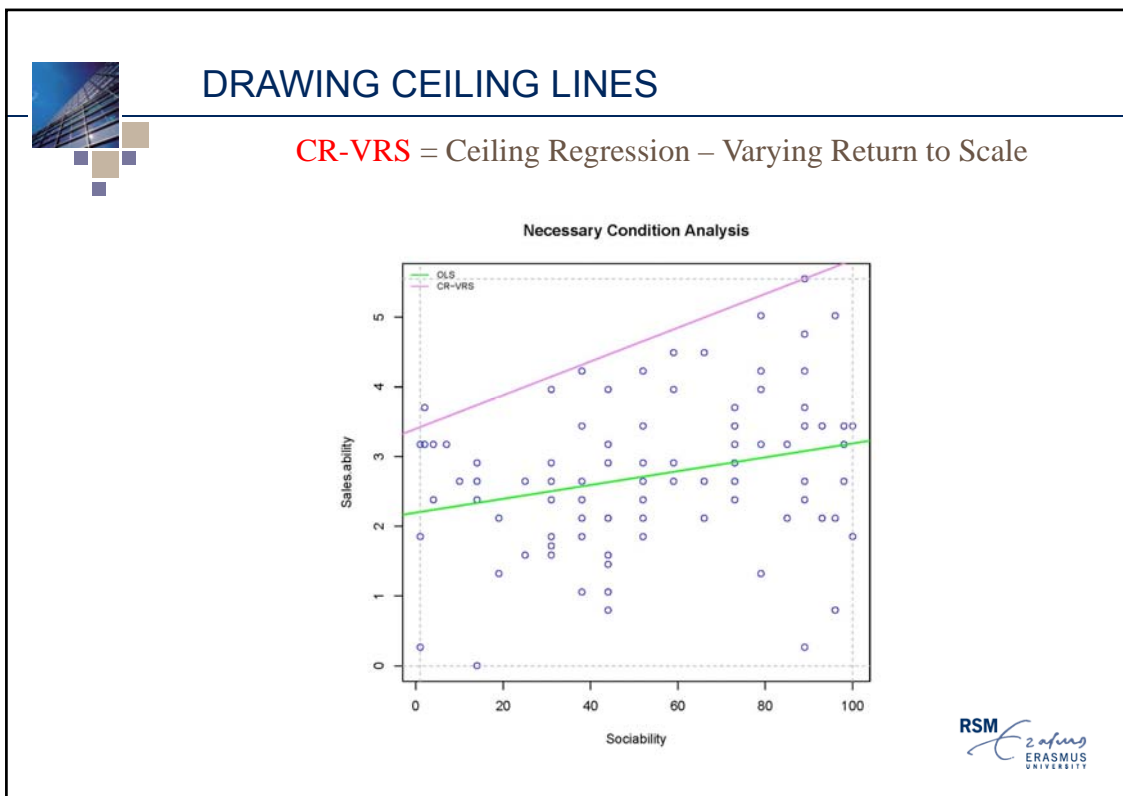
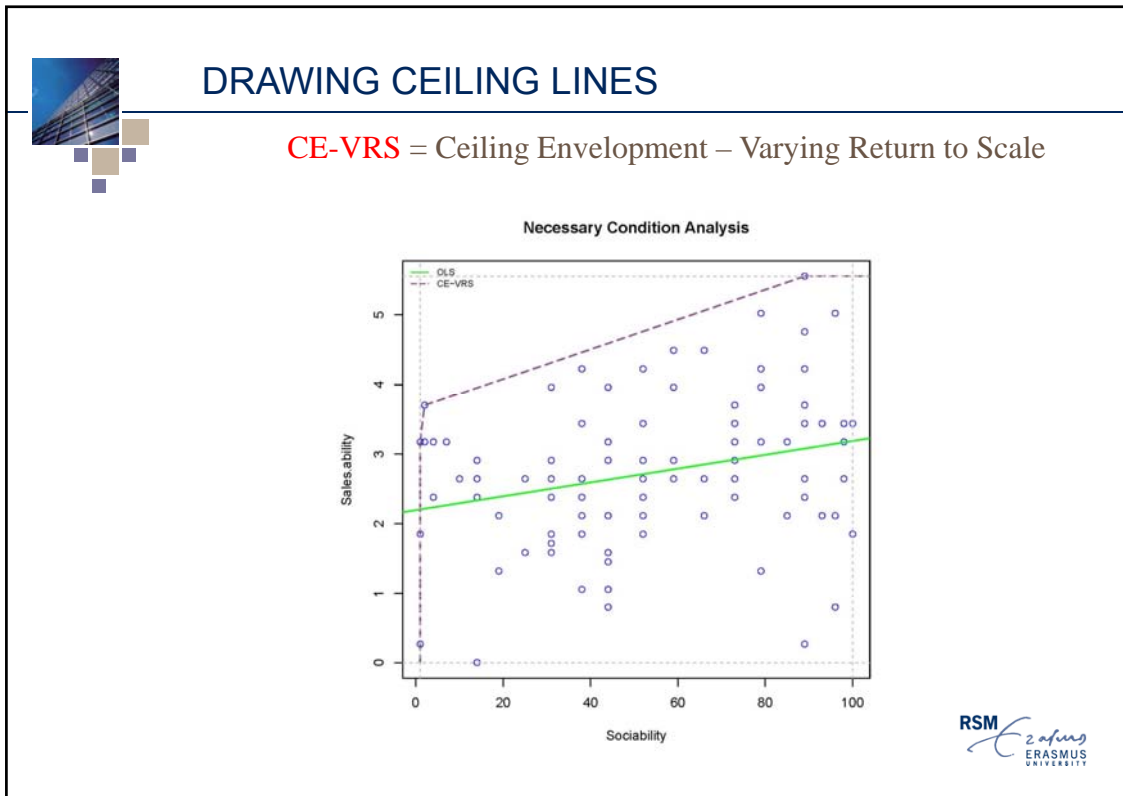
AGENDA

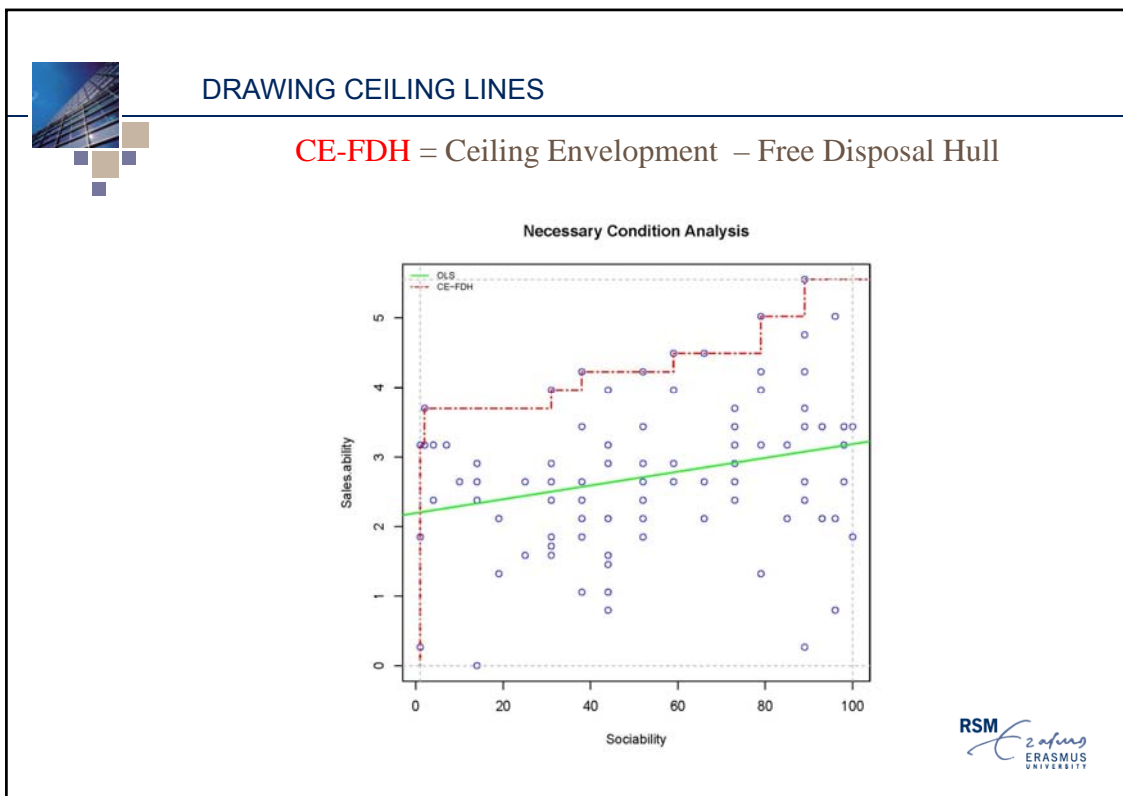
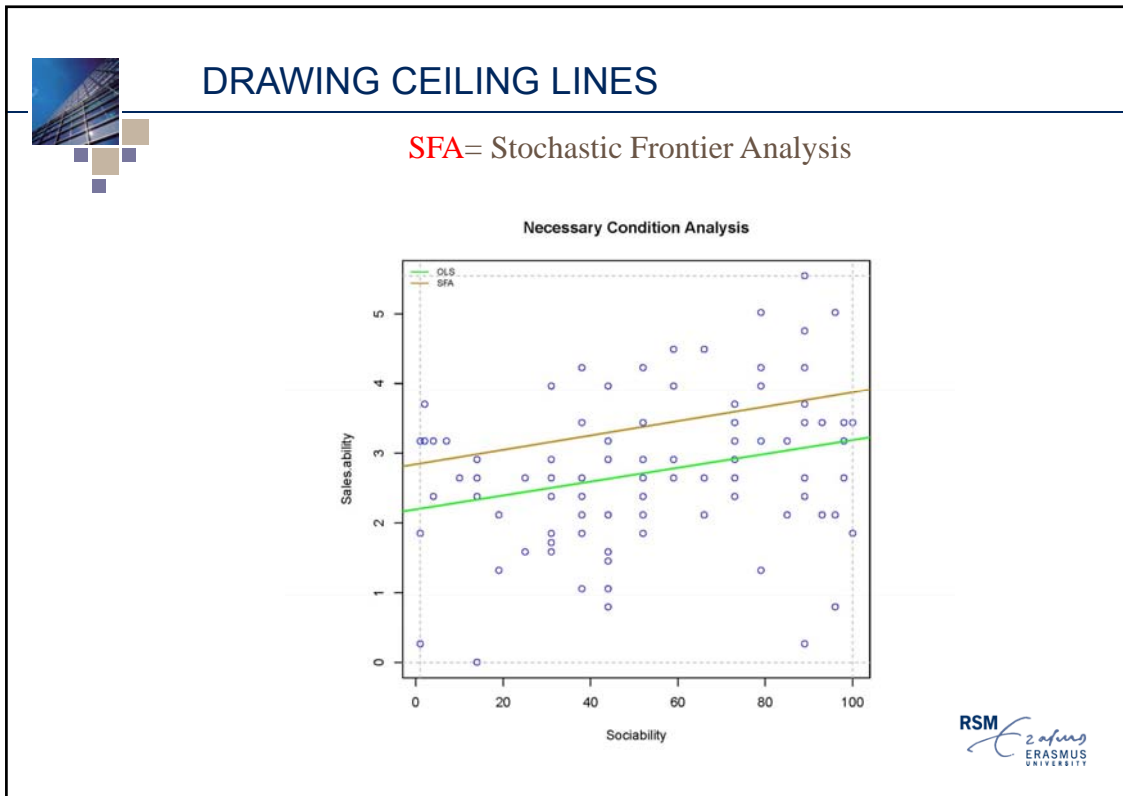
1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field
2. How to identify/test necessary conditions (data analysis)
 - With regression/QCA?
 - **With NCA**
 - Comparison OLS-NCA
 - Example
3. How to publish with NCA? (papers)

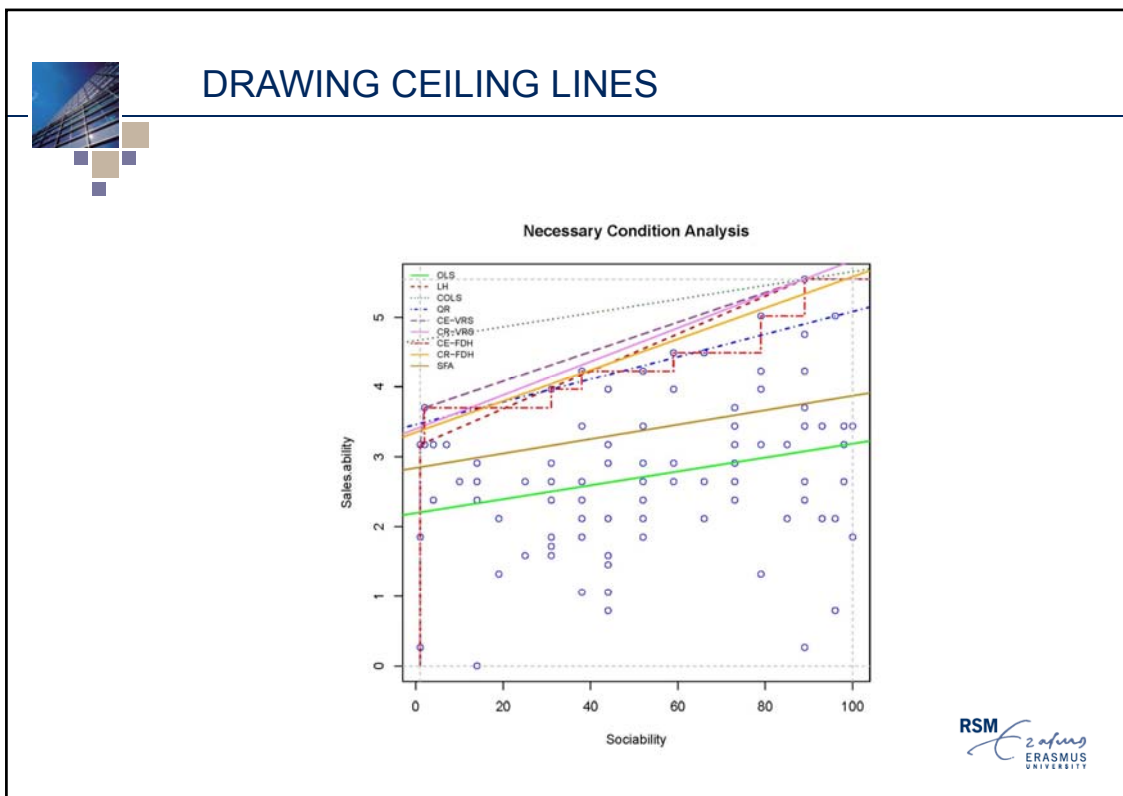
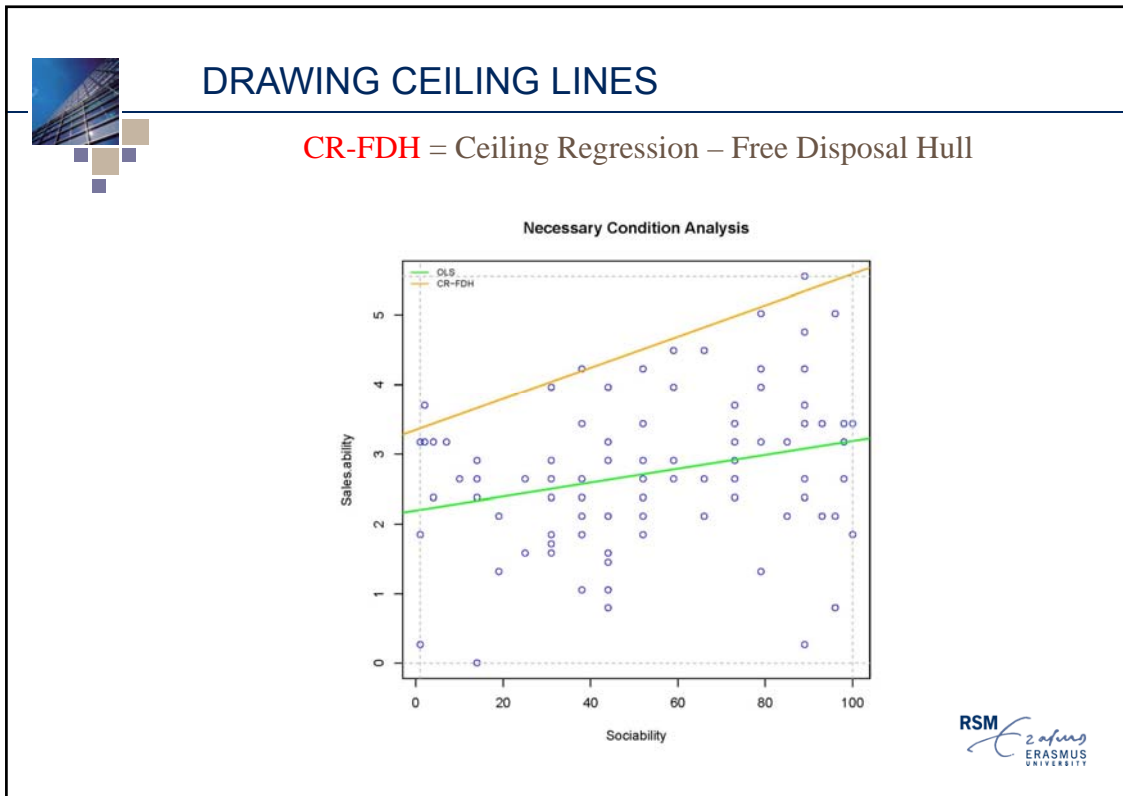













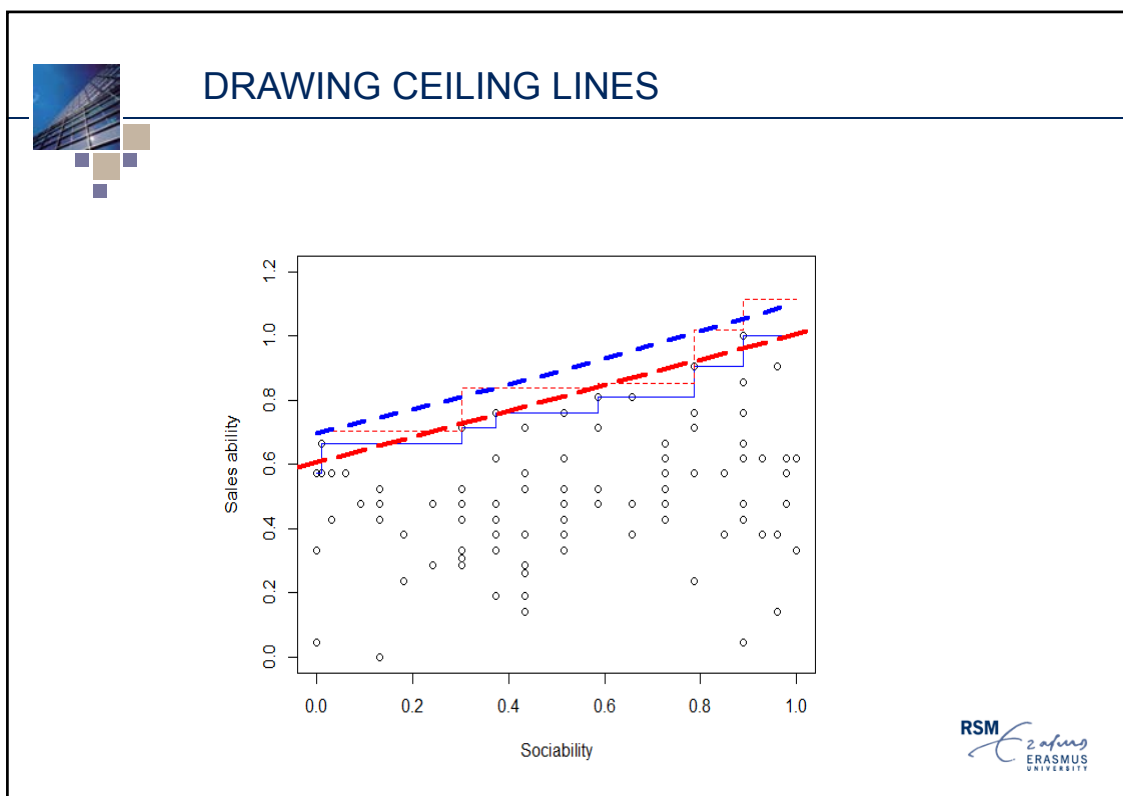
COMPARISON OF CEILING TECHNIQUES

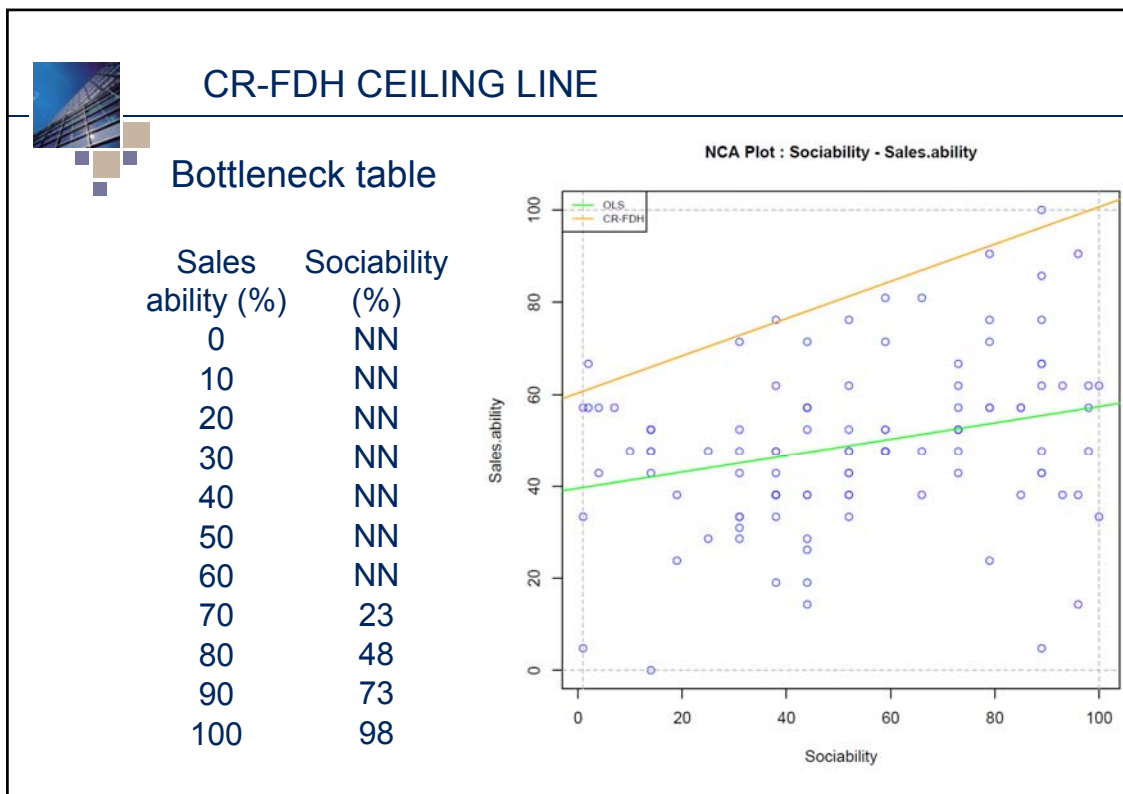
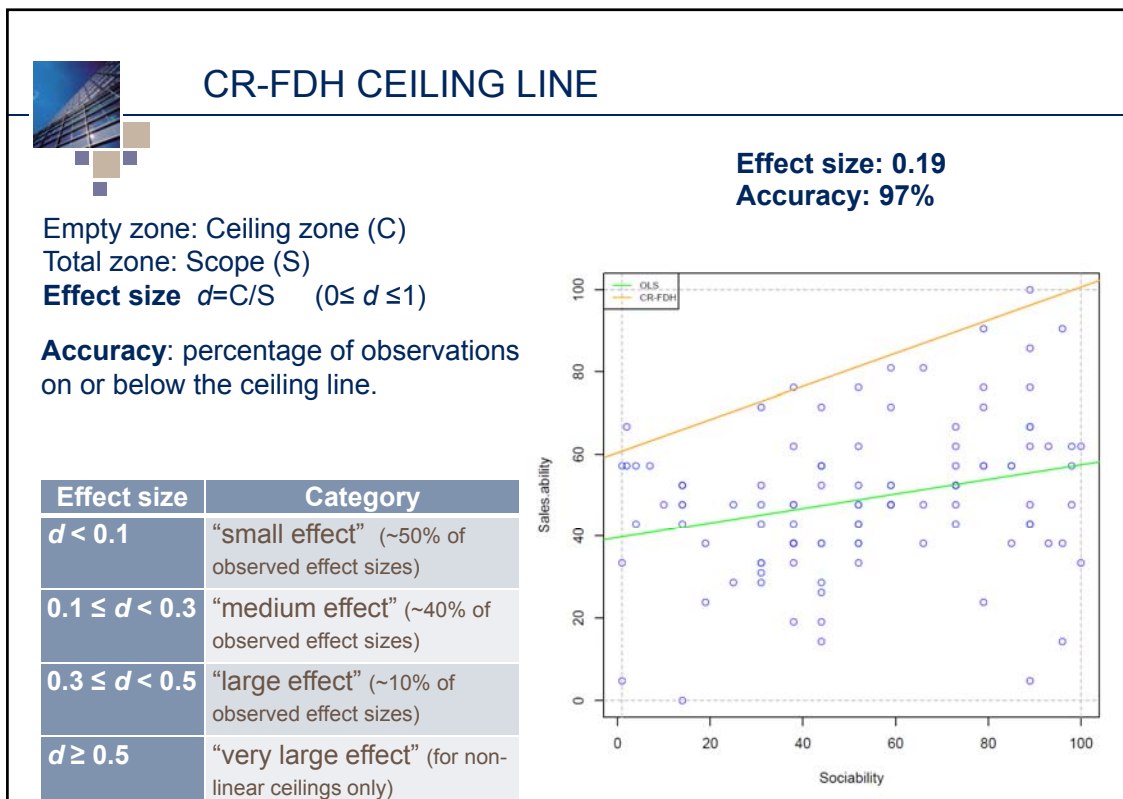
	Ceiling line technique ¹	Observations that are used	Pre-defined ceiling function	Allows points above ceiling	Drawing procedure
Discrete data →	CE-VRS	Upper left	No ²	No	Optimization
	CE-FDH	Upper left	No	No	Optimization
Continuous data →	CR-VRS	Upper left	Yes	Yes	Optimization+Statistical
	CR-FDH	Upper left	Yes	Yes	Optimization+Statistical
	COLS	All	Yes	No	Statistical
	QR	All	Yes	Yes	Statistical
	SFA	All	Yes	Yes	Statistical
	LH	Lowest left and highest right	Yes	Yes	Mathematical

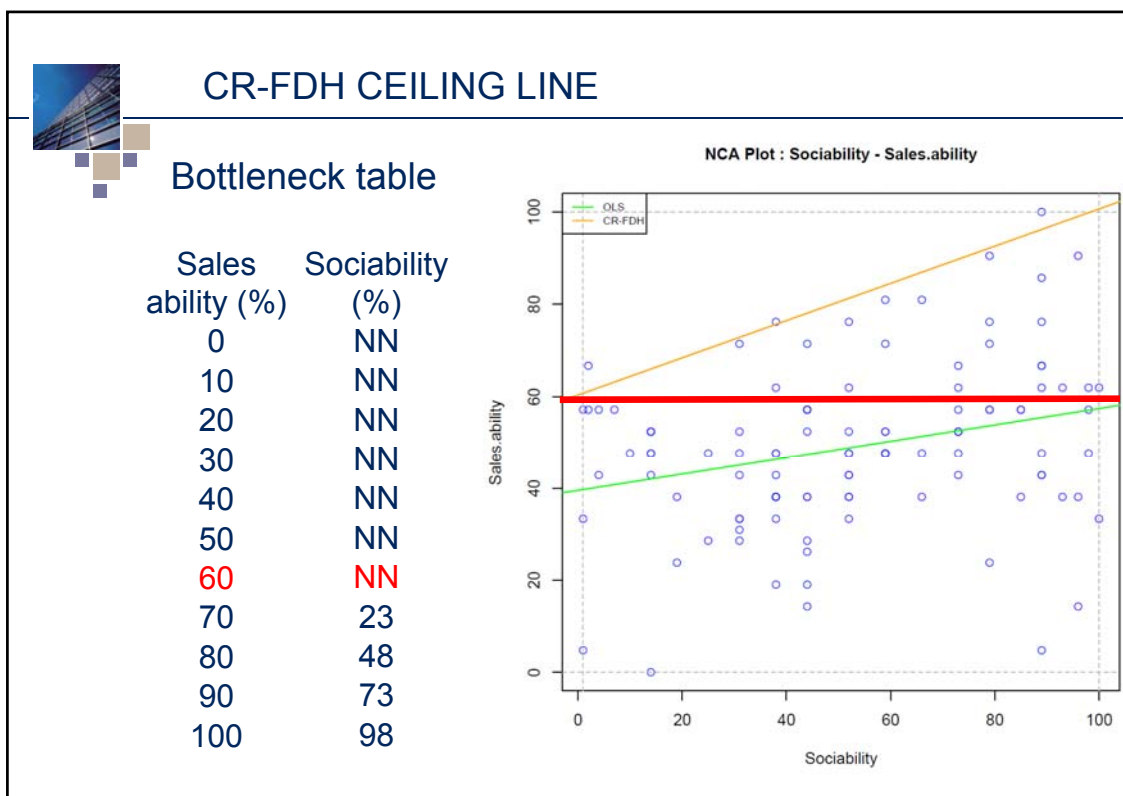
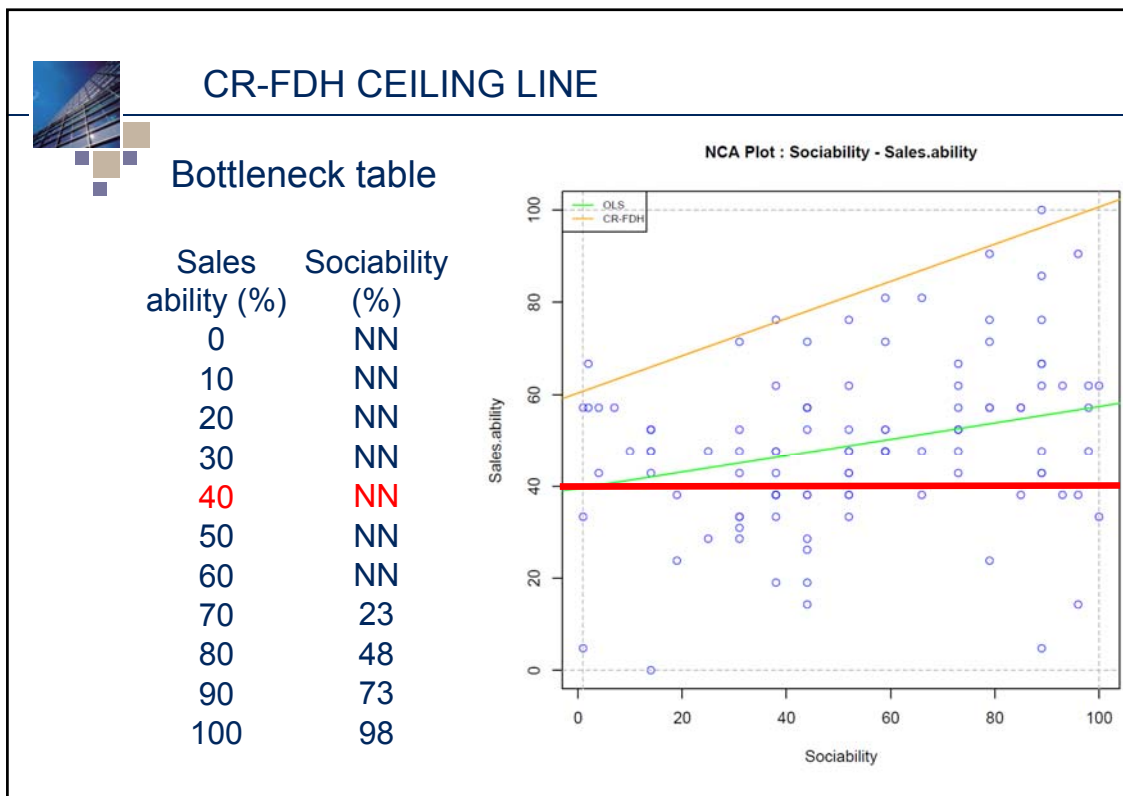
¹ CE-VRS = Ceiling Envelopment – Varying Return to Scale;
 CE-FDH = Ceiling Envelopment – Free Disposal Hull;
 CR-VRS = Ceiling Regression – Varying Return to Scale;
 CR-FDH = Ceiling Regression – Free Disposal Hull;

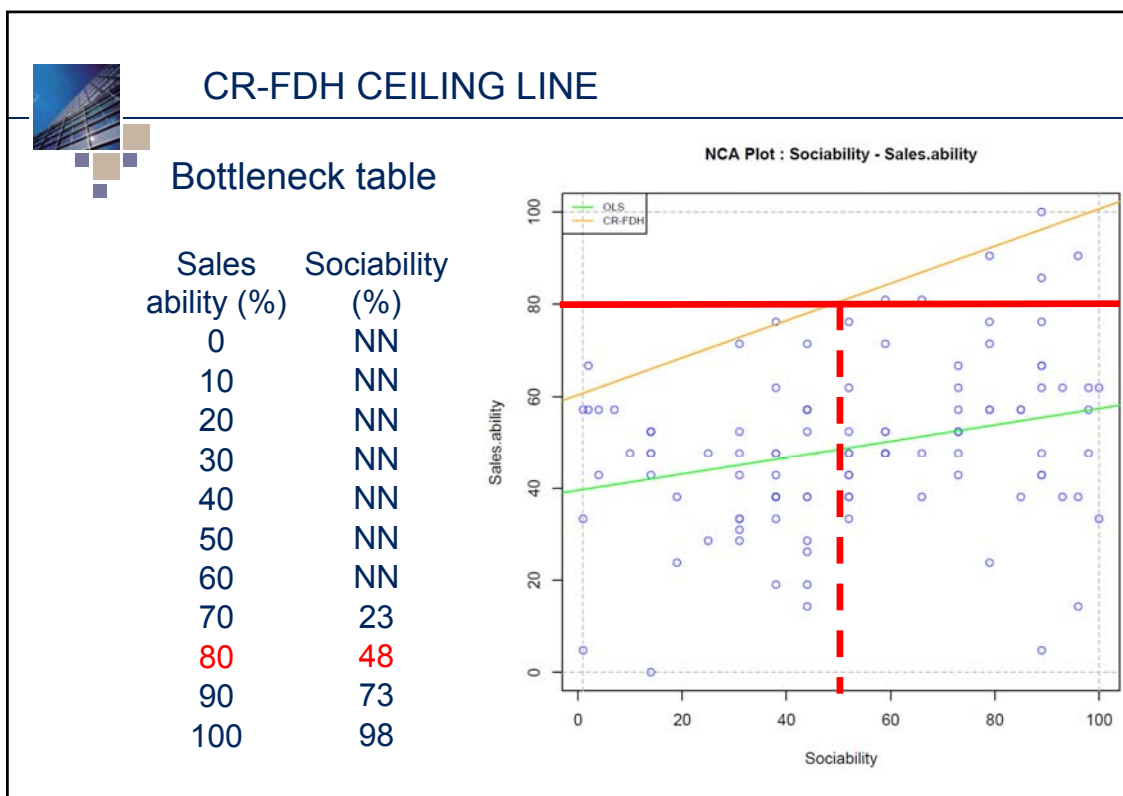
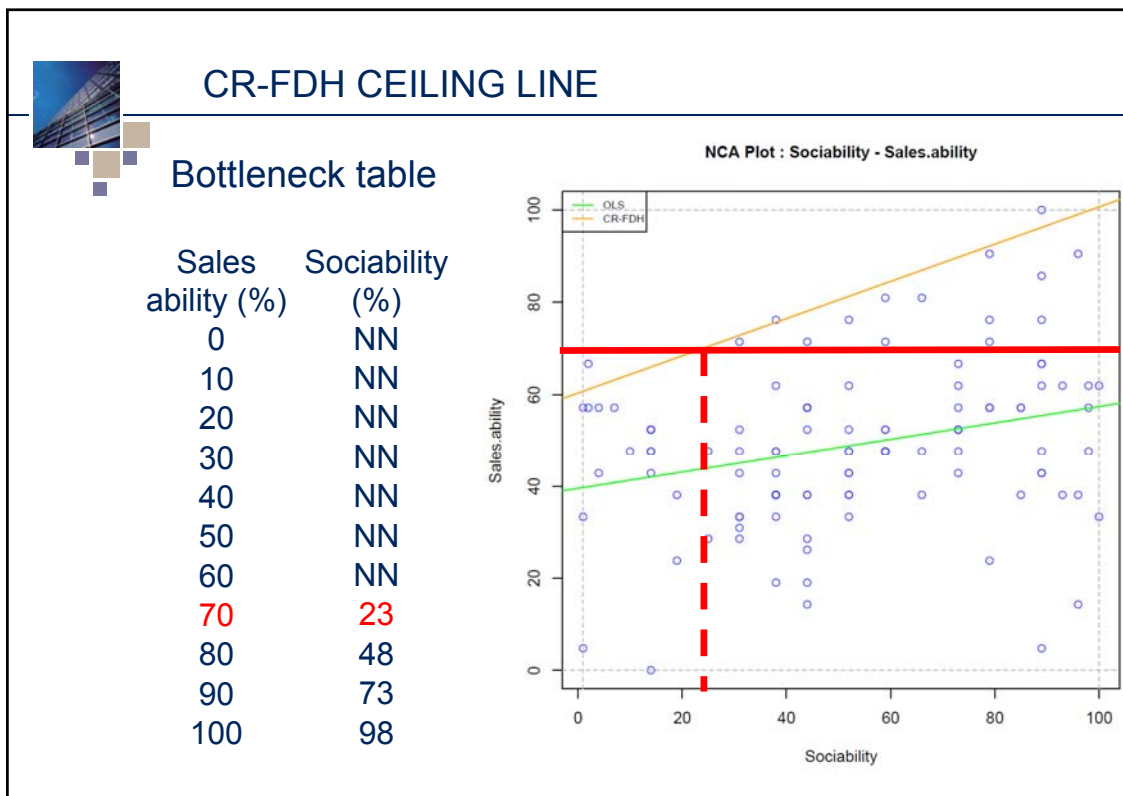
² Convexity required

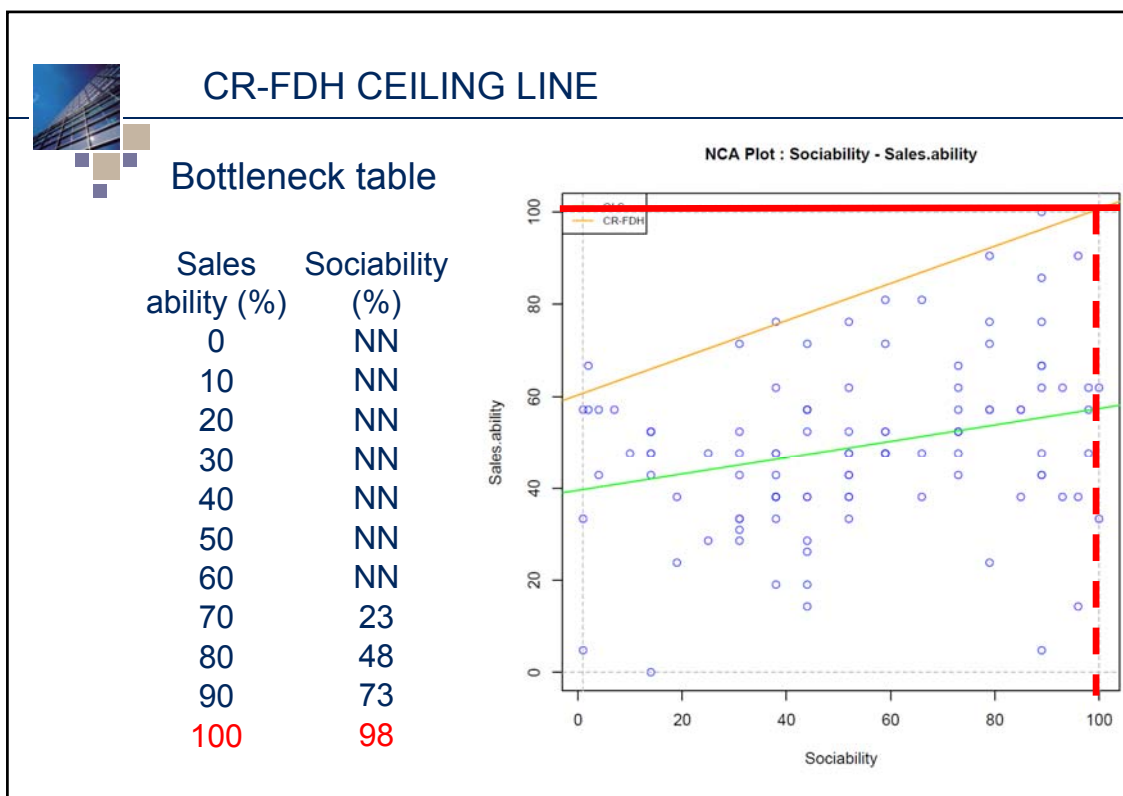
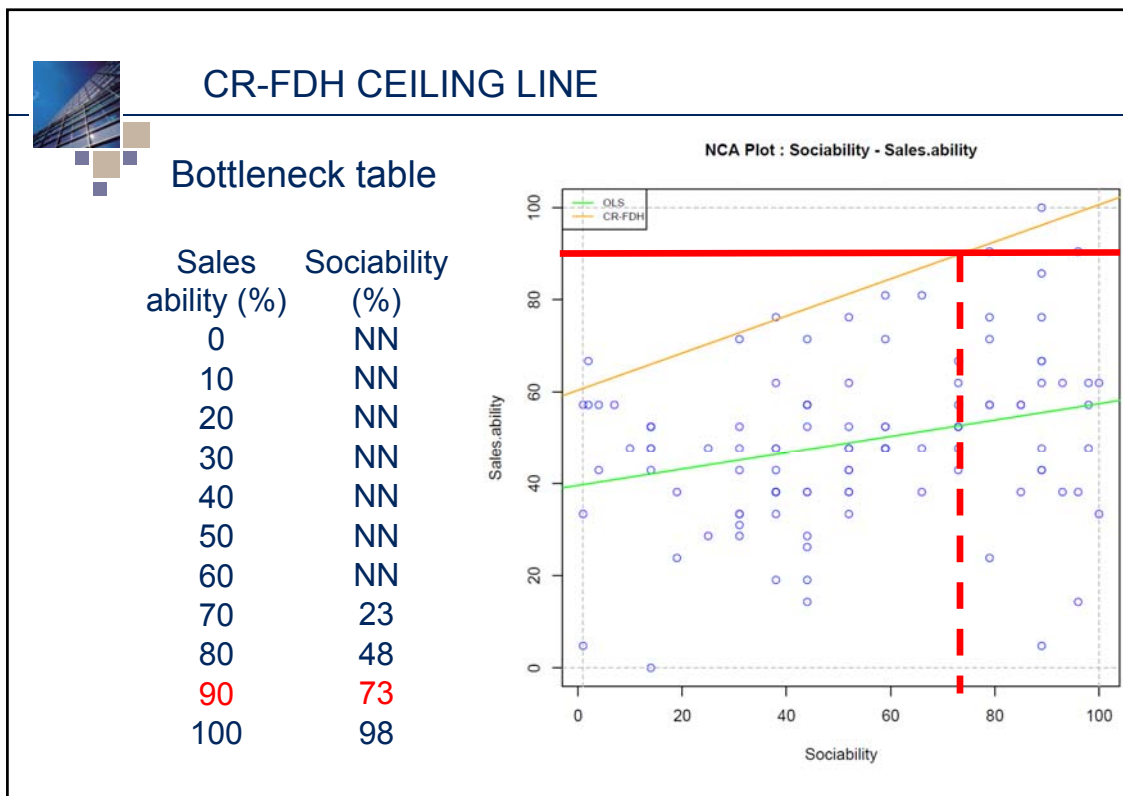
COLS = Corrected Ordinary Least Squares;
 QR = Quantile Regression;
 SFA= Stochastic Frontier Analysis.
 LH = Low-High;

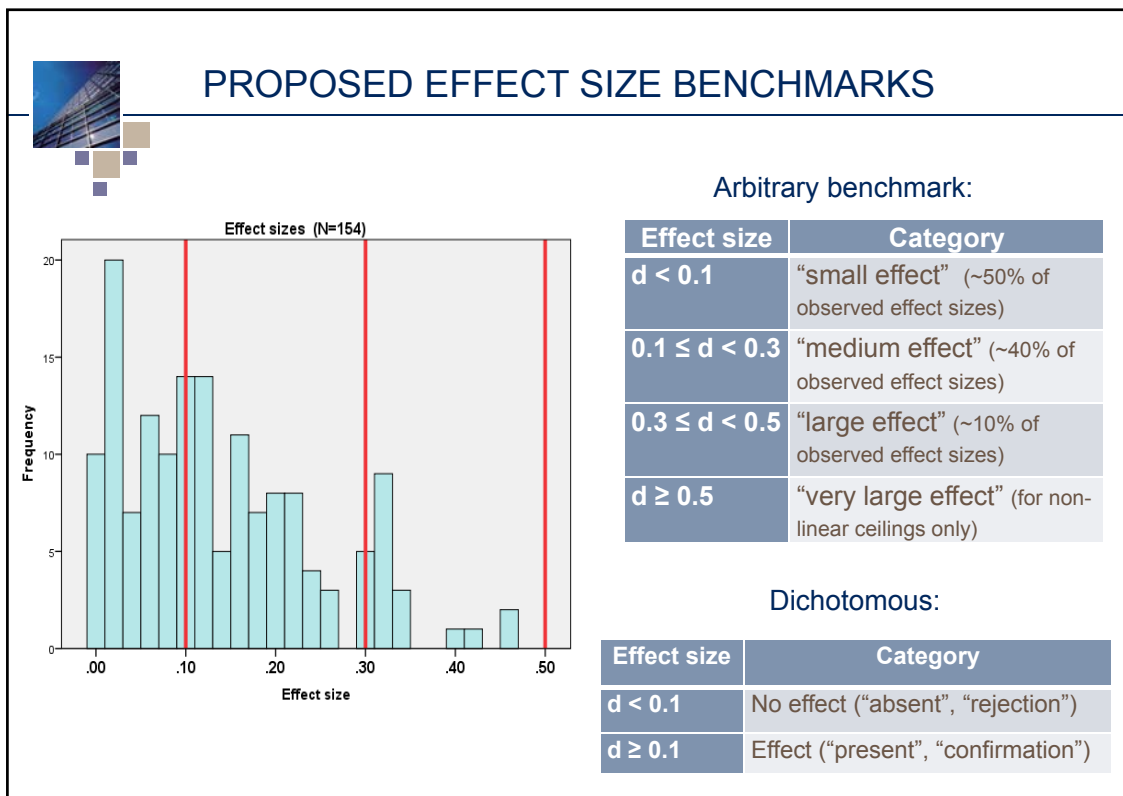














- ## AGENDA
1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field

 2. How to identify/test necessary conditions (data analysis)
 - With regression?
 - With NCA
 - Comparison OLS-NCA
 - Example

 3. How to publish with NCA? (papers)





NCA VERSUS OLS

NCA

- Searches for empty space
- Draws a ceiling line (maximum Y for given X)
- $Y \leq f_{ceiling}(X)$


OLS


- Searches for full space
- Draws a central line (average Y for given X)
- $Y = f_{central}(X) + e$

ASSUMPTIONS/LIMITATIONS OLS AND NCA



	OLS	NCA
Causal logic	X is sufficient but not necessary for Y	X is necessary but not sufficient for Y
Sampling	Probability sample (representative)	Same
Measurement	No measurement error	Same
Model specification: Functional form	Correct functional form of the X-Y relation	Same
Model specification: inclusion of variables	Include all relevant variables (complex model with control variables to avoid omitted variable bias)	Include variable(s) of interest (parsimonious model without risk of omitted variable bias)





AGENDA

1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field
2. How to identify/test necessary conditions (data analysis)
 - With regression/QCA?
 - With NCA
 - Comparison OLS-NCA
 - **Example**
3. How to publish with NCA? (papers)




EXAMPLE: SELECTION OF SALES PEOPLE

Personality traits:

- **Ambition**: the degree to which a person seems leader like, status seeking, and achievement-oriented
- **Sociability**: the degree to which a person needs and/or enjoys social interaction
- **Interpersonal sensitivity**: the degree to which a person has social sensitivity, tact, and perceptiveness
- **Learning approach**: the degree to which a person enjoys academic activities and values education as an end in itself

Sales performance:

- **Sales ability**: the degree to which a person has effective demonstration, promotion, and selling of products and services.



CAUSAL THEORY: $X \rightarrow Y$ (\rightarrow MEANS "CAUSES")


```
graph LR; A[Ambition] --> SA[Sales ability]; S[Sociability] --> SA; IS[Interpersonal sensitivity] --> SA; LA[Learning approach] --> SA;
```

OLS:


- Sufficient cause
- X produces Y
- X is sufficient but not necessary for Y

NCA:


- Necessary cause
- X allows Y
- X is necessary but not sufficient for Y




THEORY TESTING



- **Data:**
 - Hogan Personality Inventory
 - Hogan, R., & Hogan, J. (2007). Hogan Personality Inventory manual (3rd ed.). Tulsa, OK: Hogan Assessment
- **Sample:**
 - 108 Sales representatives
 - Large USA food manufacturer
 - 81.7% male
 - Average age 36.7 (SD = 10.7).
- **Measurement (scores 0-100%):**
 - Independent variables (conditions: 4 personal traits):
 - Sales persons completed the HPI
 - Dependent variables (outcome=Sales ability):
 - Supervisor rating of employee's performance.
 - Seven items (alpha = 0.83).







DESCRIPTIVE STATISTICS

Means, standard deviations, and correlations^a

	M	S.D.	Y	X ₁	X ₂	X ₃
Y. Sales Ability	49.0	18.1				
X₁. Ambition	57.7	27.0	0.24*			
X₂. Sociability	53.1	28.5	0.28**	0.35***		
X₃. Interpersonal sensitivity	54.0	33.5	0.06	0.19†	0.03	
X₄. Learning approach	49.5	29.8	-0.08	0.23*	0.23*	-0.02

†p<0.10, * p<0.05, **p<0.01, ***p<0.001
^aN = 108





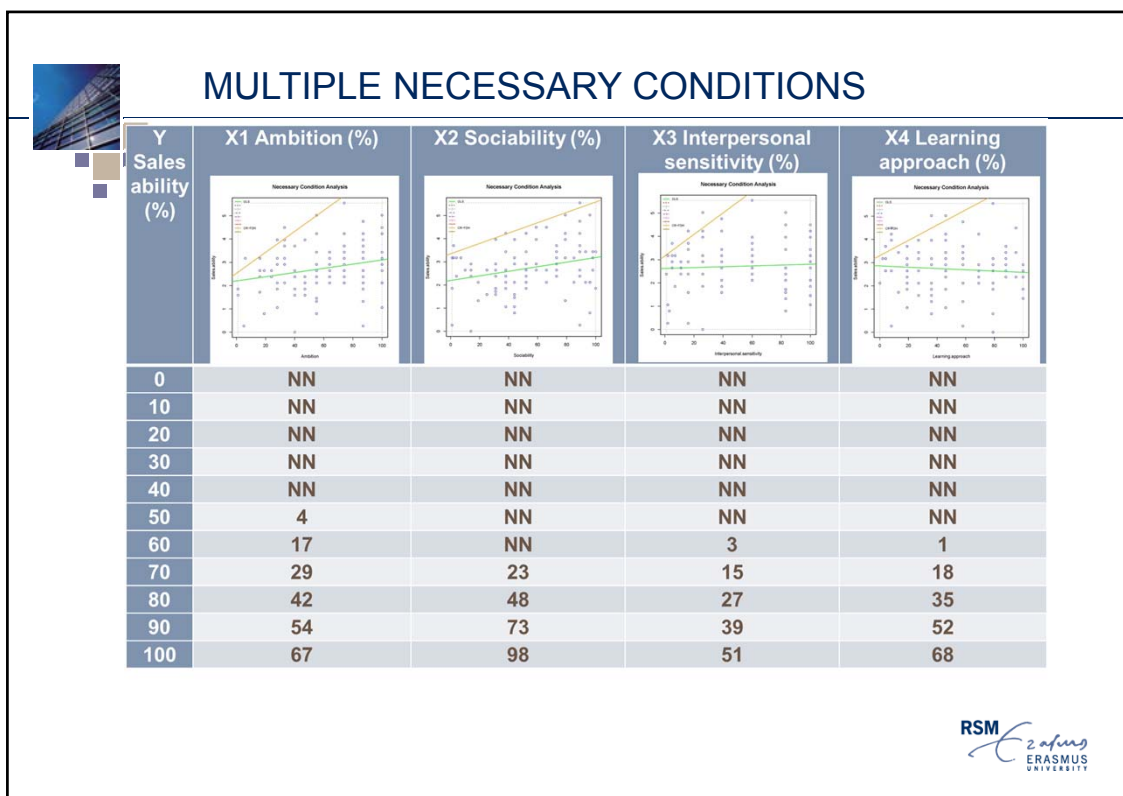
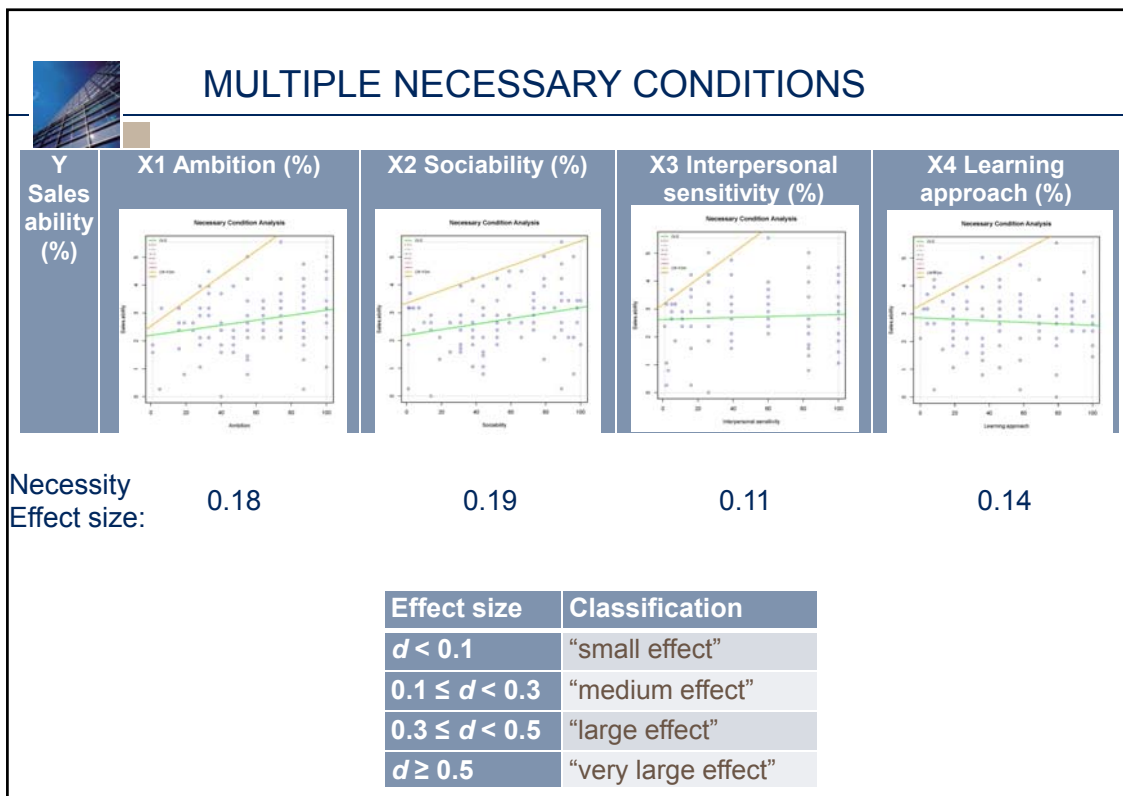
MULTIPLE REGRESSION (OLS)

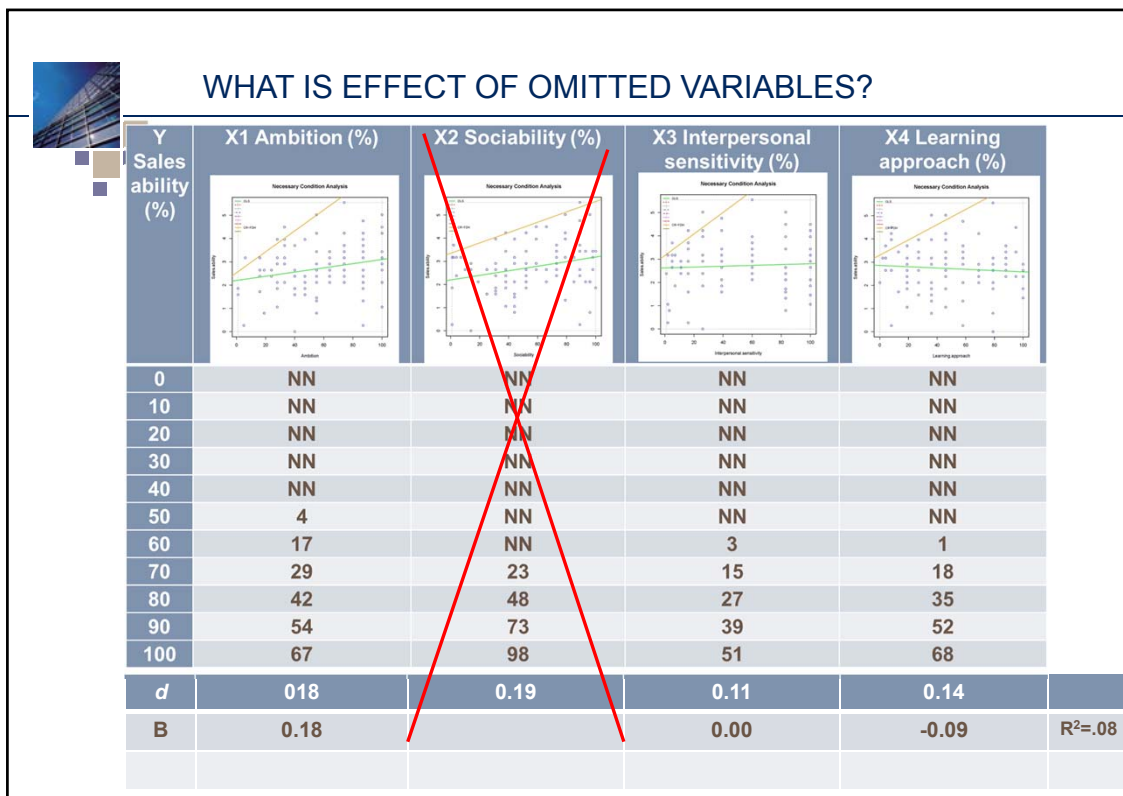
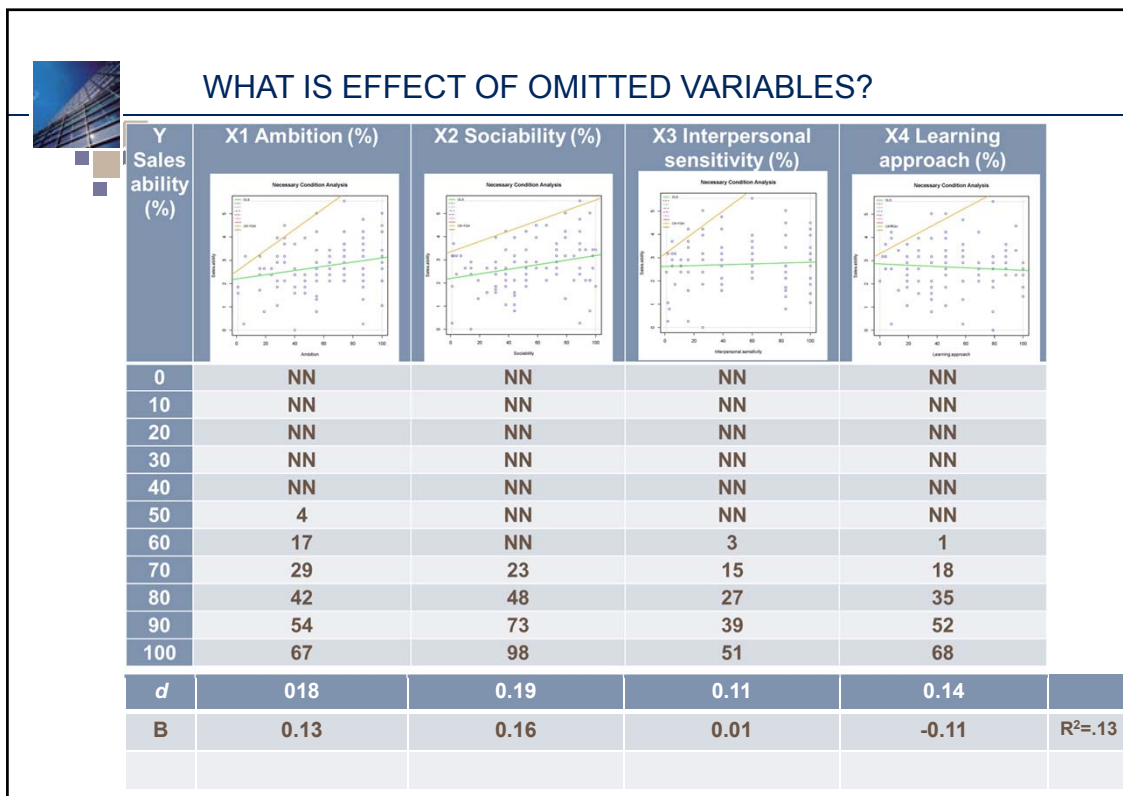
Regression analyses predicting Sales ability ^{a,b}


	B	SE	t	p
Intercept	38.1	5.19	7.34	0.000***
X₁. Ambition	0.13	0.07	1.91	0.059†
X₂. Sociability	0.16	0.06**	2.57	0.011*
X₃. Interpersonal sensitivity	0.01	0.05	0.15	0.883
X₄. Learning approach	-0.11	0.06	-0.94	0.055†
R²	0.13			
Adjusted R²	0.10			
Model F	4.01			
Model p	0.005			

†p<0.10, * p<0.05, **p<0.01, ***p<0.001
^aN = 108
^bUnstandardized regression coefficients











NECESSARY CONDITION DATA ANALYSIS

NOT:

- Regression line
- Regression coefficient (β)

BUT:

- Ceiling line
- Empty zone (effect size (d))




RESULTS OLS AND NCA


OLS:

- Ambition and Sociability have positive average effects on sales performance
- Interpersonal sensitivity has no average effect on sales performance
- Learning approach has a negative average effect on sales performance

NCA:



- “In kind” (qualitative) result:
All personality traits are necessary for sales performance (even though the OLS average trend shows no or negative effect) (necessity effect size >0.1)
- “In degree” (quantitative) result:
A certain level of personality trait is necessary for a certain level of sales performance (ceiling line).





AGENDA

1. Necessary conditions (logic):
 - In every-day life
 - In practice
 - In academia
 - In your field
2. How to identify/test necessary conditions (data analysis)
 - With regression?
 - With NCA
 - Comparison OLS-NCA
 - Example
3. How to publish with NCA? (papers)




NCA IS NOW PUBLISHED IN ACADEMIC PAPERS


METHODOLOGICAL PAPERS

- Dul, J. (2016) Necessary Condition Analysis (NCA): Logic and methodology of “necessary but not sufficient” causality. *Organizational Research Methods* 19(1), 10-52.
- Dul, J. (2016). Identifying single necessary conditions with NCA and fsQCA. *Journal of Business Research*, 69(4):1516-1523.
- Dul, J., Hak, T., Goertz, G., & Voss, C. (2010). Necessary condition hypotheses in operations management. *International Journal of Operations & Production Management*, 30, 1170–1190
- Goertz, G., Hak, T., & Dul, J. (2013) Ceilings and floors where are there no observations? *Sociological Methods & Research*, 42 (1), 3-40.
- Hak, T., Jaspers, F., & Dul, J. (2013). The analysis of temporally ordered configurations: Challenges and solutions. In P. Fiss, B. Cambre, & A. Marx (Eds), *Configurational theory and methods in organizational research*. Vol. 38: 107–127. Bingley: Emerald.
- Vis, B. & Dul, J. (2016) Analyzing relationships of necessity not just *in kind* but also *in degree*: Complementing fsQCA with NCA. *Sociological Methods and Research* (in press).

SUBSTANTIVE PAPERS

- Karwowski, M., Dul, J., Gralewski, J., Jauk, E., Jankowska, D.M., Gajda, A., Chruszczewski, M.H., Benedek, M. (2016). Is creativity without intelligence possible? A Necessary Condition Analysis. *Intelligence* (in press).
- Van der Valk, Sumo, R., Dul, J. & Schroeder, R. When contracts and trust are necessary for innovation in buyer-supplier relationships? A Necessary Condition Analysis. *Journal of Purchasing and Supply Management* (in press)







CONFERENCE/WORKING PAPERS

METHODOLOGICAL PAPERS

- Dul, J. & LeBreton, J. A new methodology for analysing necessary but not sufficient conditions: Comparing NCA with OLS (Euram conference).
- Dul, J., & Ragin, C. Integrating necessary conditions in sufficient configurations (working paper).
- Van der Laan, E., Dul, J. & Kuik, R. Estimating ceiling lines and effect sizes in Necessary Conditions Analysis (working paper).

SUBSTANTIVE PAPERS


- Albuquerque de Sousa, J.A., Beck, T., Van Bergeijk, P.A.G, & Van Dijk, M.A. Success and failure of nascent stock markets (working paper).
- De Vries, J. (2016). Behavioral Operations in Logistics. PhD thesis, Erasmus Research Institute of Management (ERIM). Chapter 6: Which Drivers Should Transport Your Cargo? Empirical Evidence from Long-haul Transport. <http://repub.eur.nl/pub/79705/>.
- Lasrado, L., Vatrappu, R., & Andersen, K.N. (2016). A methodological demonstration of set-theoretical approach to social media maturity models using Necessary Condition Analysis. [Proceedings of the Pacific Asia Conference on Information Systems \(PACIS\)](#).
- Servajean-Hilst, R., Guedon, T., & Sarkis, G-E. (2016). Best and worst practice for governing vertical innovation cooperations, A Necessary Condition Analysis (EURAM conference)
- Van der Laan, G., & Dul, J. (2016). Corporate social performance: A necessary condition analysis (EURAM conference).
- Van Rhee, H., & Dul, J. The limiting-factor model: AMO-factors as individually necessary and jointly sufficient for behaviour (working paper).
- Westerhuis, G., Dul, J., De Jong, A., & Hak, T. (2012). Success in bank mergers. An application of Necessary Condition Analysis (NCA) in business history [Abstract]. [Book of Abstracts](#), p.31. 16th Annual conference of the European Business History Association congress, Paris, Aug-1 Sep 2012.




EDITORS' OPINIONS

Positive:

- “From my perspective, it is the most interesting paper I have handled at this journal, insofar as it really represents a new way to think about data analyses”
- “I just added the paper to the required reading list for my doctoral-level seminar on research methods”
- “This is a fine paper, employing a novel methodology”
- “I believe the paper holds the potential to be widely cited and to change how organizational researchers approach testing for cause and effect relationships”
- “Candidly, this paper is the most interesting paper that has crossed my desk since taking over”
- “NCA has potential for theory development”







EDITORS' OPINIONS

Neutral:

- “Interesting”


Negative:

- “Endogeneity problem”
- “It seems that your paper does not contribute to theory development in the traditional sense, and while it can offer an empirical contribution by introducing a new method to examine an interesting question, the fact that NCA is so new and requires validation and perhaps even endorsement by top journals, limits your contribution rather than enhances it”.



WHAT USERS SAY: SIMPLE AND STRAIGHTFORWARD

- “Intuitively easy to understand”
- “Simple technique that requires no ‘preparation’, data transformation/manipulation/ correction. A perfect plug-and-play method that can give output in under 10 minutes”
- “Shifts the focus to the most important drivers of an outcome --> from nice-to-have to need-to-have”
- “Easy to implement”
- “Easy to understand/logical”
- “Fast ‘visual analysis’ of the scatter plots that can give you insights immediately”
- “It allows you to test a theory using a small set of observations”
- “Userfriendliness: easy to learn: all analyses can be done within 15 minutes; visualization of outcomes is easy”
- “Very intuitive method”
- “Done in under 15 minutes”






WHAT USERS SAY: NEW THEORETICAL INSIGHTS

- "It's a new thinking compared with common sufficiency thinking and regression technique and it can bring us exciting insights from the theoretical causality relationship"
- "It's a new way of thinking and therefore it may lead to many interesting insights, just reanalyzing old dataset"
- "Analysis provides insights that cannot be obtained with another method"
- "Provides a radically different perspective on existing data"
- "Opportunity to make truly novel/strong theoretical contributions"
- "Could have potential break through insights in the way we view causality an also reverse causality"
- "Ability to test theoretical assumptions that are currently often overlooked or taken for granted in a rigorous was"
- "Possibility to combine the method with other methodologies in order to deepen our theoretical understanding of a certain phenomenon"
- "It allows you to test another kind of causality (i.e. necessity) that cannot be accurately examined or described in any other way"
- "This method can advance our understanding by providing a new perspective on causal relationship"
- "New perspectives on relationships"
- "Different approach to analysis for a completely different, yet very relevant question"





WHAT USERS SAY: COMPLEMENTS OTHER METHODS

- Novel method that can be complemented with QCA or regression (correlational) techniques"
- "Although it is not explained as such, I do believe that is has great exploratory value that is congruent with recent emphasis on big data"
- "Great addition to other types of data analyses"
- Can be a complement to regressions – less assumptions required to find results (multicolinearity, endogeneity, heteroscedasticity ...)"
- Potential to find relationships and connections that traditional OLS and QCA analyses are unable t
- "Helps in testing the necessity statements that cannot be tested by other methods"
- "Option to use it as a complementary analysis or main analysis of the paper"
- "Get on the NCA wave; doors will open when successful"
- "Little assumptions (compared to traditional methods)"
- Practical relevance:
- "If there is a necessary condition its implications to practice are clear-cut and strong"
- "Insights are very relevant for practice"
- "Practically relevant!"
- "Very relevant for practice"
-



WHAT USERS SAY: PRACTICAL RELEVANCE

- "If there is a necessary condition its implications to practice are clear-cut and strong"
- "Insights are very relevant for practice"
- "Practically relevant!"
- "Very relevant for practice"




HOW TO PUBLISH RESULTS OF AN NCA ANALYSIS


Low risk/nice added value

- Additional analysis in a traditional regression paper

Higher risk/high potential:



- NCA based paper (logic and data analysis)






HOW TO WRITE A SUBSTANTIVE NCA PAPER?


- Introduction:
 - Review the pertinent literature on the topic
 - Briefly describe necessity logic and NCA methodology (“important” factors could be necessary; contrast with sufficiency and additive logic)
 - Suggest the necessity logic for the topic
 - Be explicit about applying a novel logic and methodology as a theoretical and practical contribution
- Theory/hypotheses:
 - Develop the necessity theory/hypotheses based on existing theory, empirical findings and logical reasoning.
 - Provide support for necessity logic by citing phrases that refer to it (use words like necessary, need, must, required, essential, etc.)
 - Formulate the hypothesis as “X is necessary for Y”
 - Explain why the theory can be parsimonious (no “control” variables, no “complete” predictive model).



HOW TO WRITE A SUBSTANTIVE NCA PAPER?



- Methods:
 - Just like other methods: explain research design, sample and measurement
 - Give details about the NCA methodology and how it is used in the present work (see examples in other papers)
- Results:
 - Provide scatter plots
 - Report necessity effect size(s)
 - Evaluate the substantial significance of the effect size (if desired used general benchmarks)
 - For multiple necessary conditions: report also the bottleneck table and evaluate combinations of conditions that are necessary for given levels of outcome





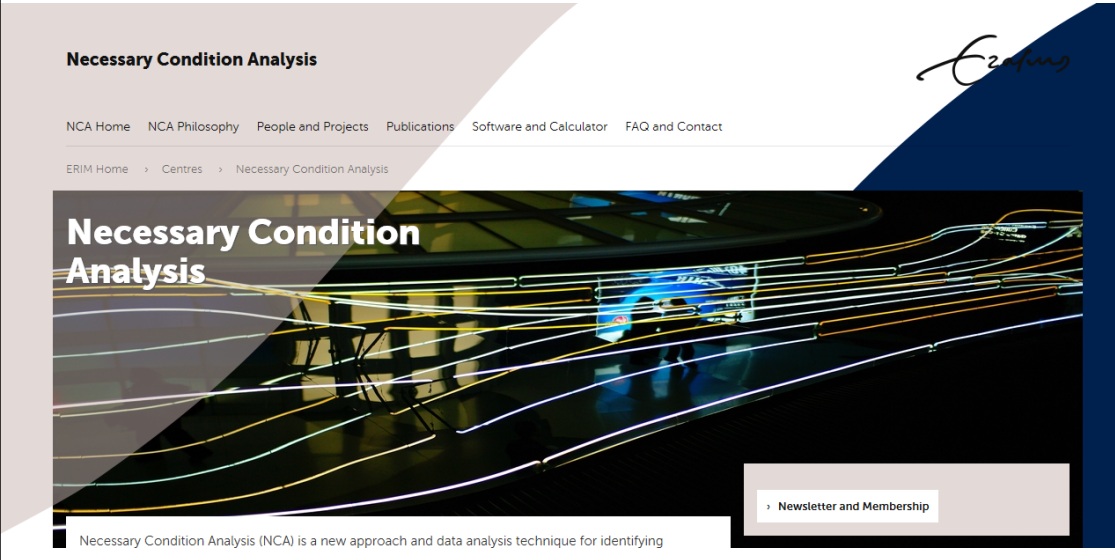
HOW TO WRITE A SUBSTANTIVE NCA PAPER?

- Discussion:
 - **Consequences for theory: necessary logic complements** sufficiency logic. If the necessary cause is not present at the right level, it produces failure and prevents that sufficient causes increase the outcome
 - **Consequences for practice:** If the necessary condition is not in place the outcome will not occur and focusing on other factors is a waste of time.
 - Discuss **cases around the ceiling line** ("best practices", measurement error, outliers)
 - Mention **limitations of NCA approach:**
 - Just like other methods:
 - sensitive for sampling error (probability sample and replications needed)
 - sensitive for measurement error (especially for observations around the ceiling line; not for observation below the ceiling; valid and reliable measurement needed)
 - sensitive for outliers (especially above the ceiling line; outlier analysis needed)
 - limited possibility for causal inference for observational studies (theory needed for support; (quasi)experimental designs needed)



MORE INFORMATION: WWW.ERIM.NL/NCA

- [The NCA calculator is here](#)



The screenshot shows the homepage of the Necessary Condition Analysis (NCA) website. The main heading is "Necessary Condition Analysis". Below it is a navigation menu with links: "NCA Home", "NCA Philosophy", "People and Projects", "Publications", "Software and Calculator", and "FAQ and Contact". A breadcrumb trail reads "ERIM Home > Centres > Necessary Condition Analysis". The main content area features a large image of a modern building at night with light trails, overlaid with the text "Necessary Condition Analysis". At the bottom, there is a "Newsletter and Membership" button and a short introductory text: "Necessary Condition Analysis (NCA) is a new approach and data analysis technique for identifying".