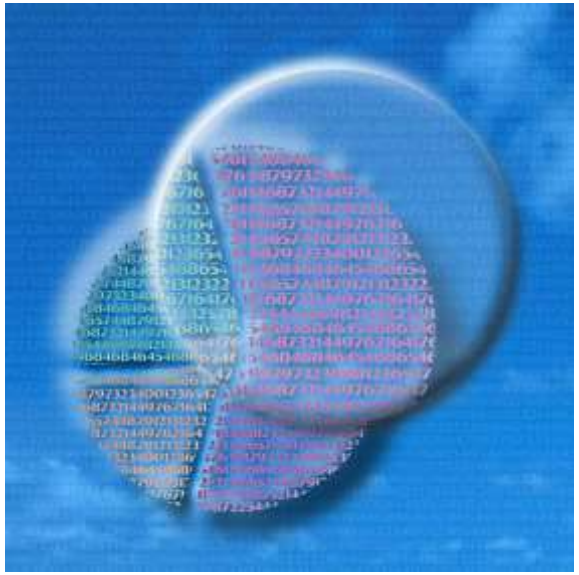


The Ethics and Practice of Quantification

Andrea Saltelli
Open Evidence Research, Open University of Catalonia

Lesson to the Università Politecnica
delle Marche, Ancona, June 14, 2021

Where to find this talk: www.andreasaltelli.eu

Sociology and ethics of quantification

Espeland, W.N., Stevens, M.L., 2008. A sociology of quantification. Eur. J. Sociol. 49, 401–436. https://doi.org/10.1017/S0003975609000150

Mennicken, A., Espeland, W.N., 2019. What's New with Numbers? Sociological Approaches to the Study of Quantification. Annu. Rev. Sociol. 45, 223–245. https://doi.org/10.1146/annurev-soc-073117-041343

… our world is structured by numbers, visible and invisible, where truth is conveyed and reality constructed

Numbers are seductive, performative, confer to their masters' epistemic power and legitimacy

Governing the modern state, or even contesting it, without numbers is impossible

Numbers are the prevalent means to express value in our societies … Access & production of numbers reflect and reinforce power imbalances

IIPP UCL Institute for Innovation and Public Purpose

WORKING PAPER
WP 2021/05

Why ethics of quantification is needed now

Andrea Saltelli
Open Evidence Research, Universitat Oberta de Catalunya, Barcelona, Spain

Antonio Andreoni
UCL Institute for Innovation and Public Purpose; South African Research Chair in Industrial Development, University of Johannesburg, South Africa

Wolfgang Drechsler
Tallinn University of Technology, Estonia;
UCL Institute for Innovation and Public Purpose;
Davis Center at Harvard University, United States

Jayati Ghosh
University of Massachusetts Amherst, United States;
UCL Institute for Innovation and Public Purpose

Rainer Kattel
UCL Institute for Innovation and Public Purpose

Ingrid H. Kvangraven
Department of Politics, University of York

Ismael Rafols
Centre for Science and Technology Studies, Leiden University, the Netherlands

Erik S. Reinert
Tallinn University of Technology, Estonia;
UCL Institute for Innovation and Public Purpose

Andy Stirling
Science Policy Research Unit, University of Sussex

Ting Xu
School of Law at the University of Essex

IIPP UCL Institute for Innovation and Public Purpose

WORKING PAPER
WP 2021/05

UCL

Blurring lines:

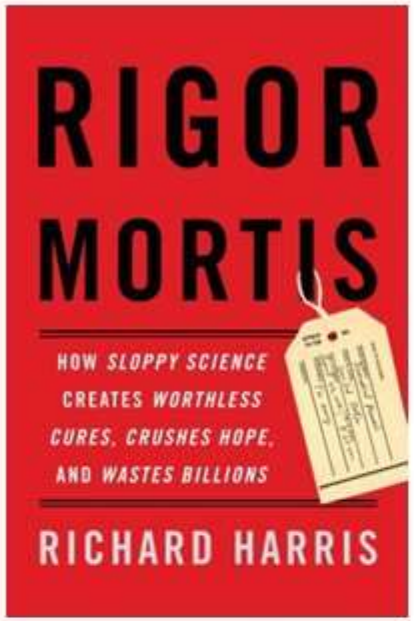
"what qualities are specific to rankings, or indicators, or models, or algorithms?"

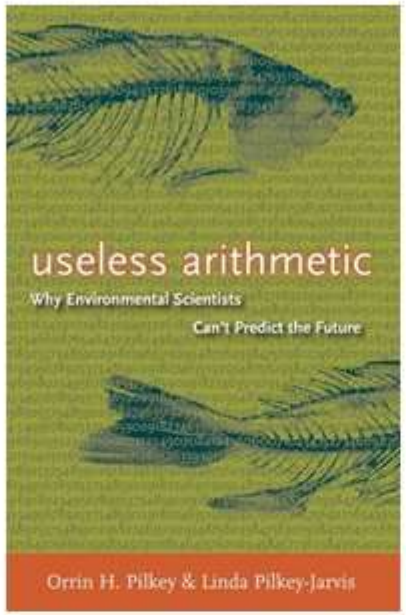
Elizabeth Popp Berman

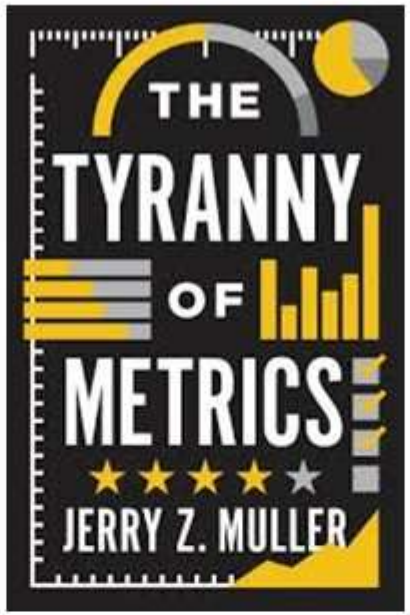
E. Popp Berman and D. Hirschman, The Sociology of Quantification: Where Are We Now?, Contemp. Sociol., vol. in press, 2017.

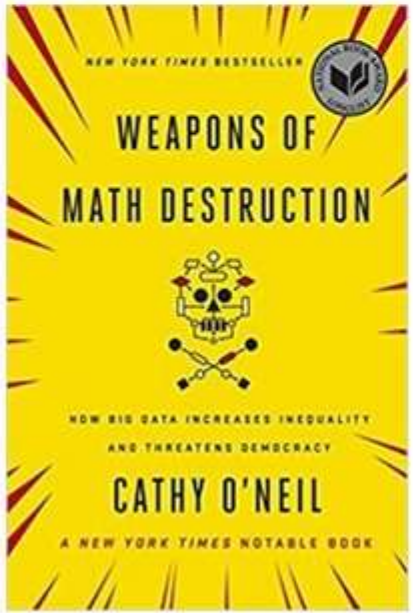
And an explosion of works, from within and without, from many disciplines

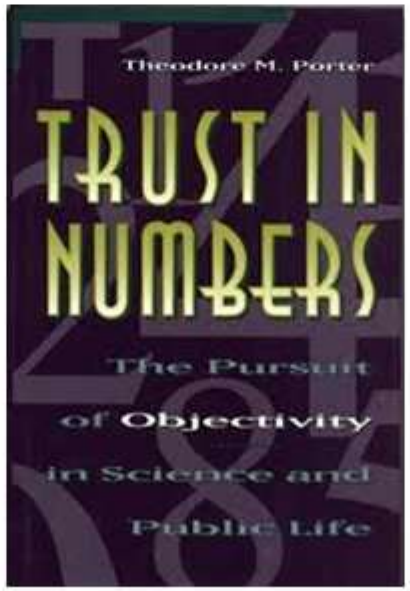
Algorithms, models, metrics, statistics…



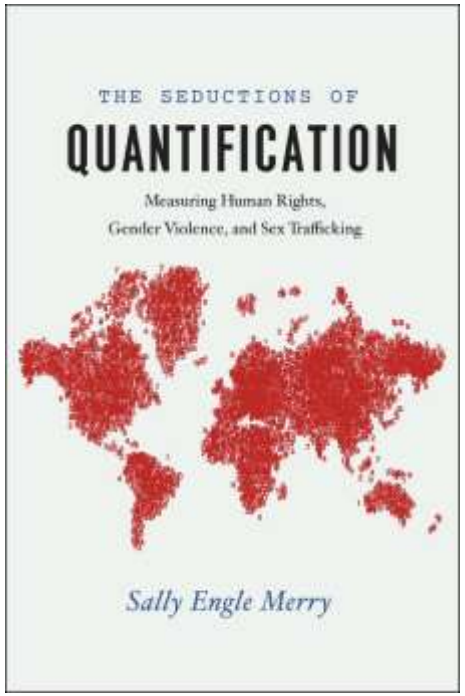


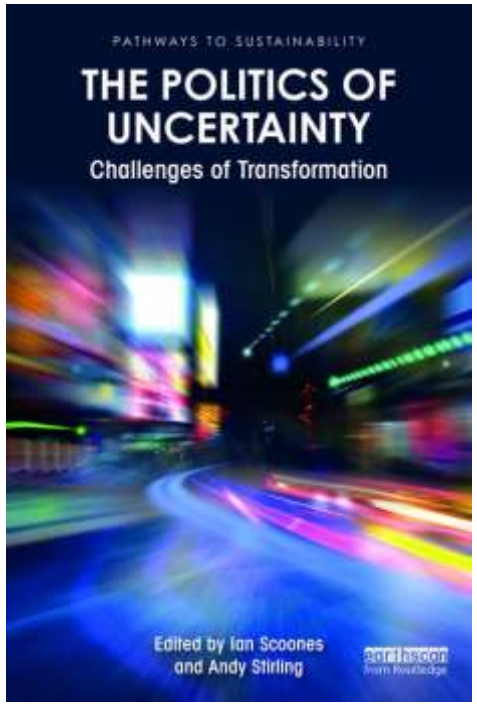


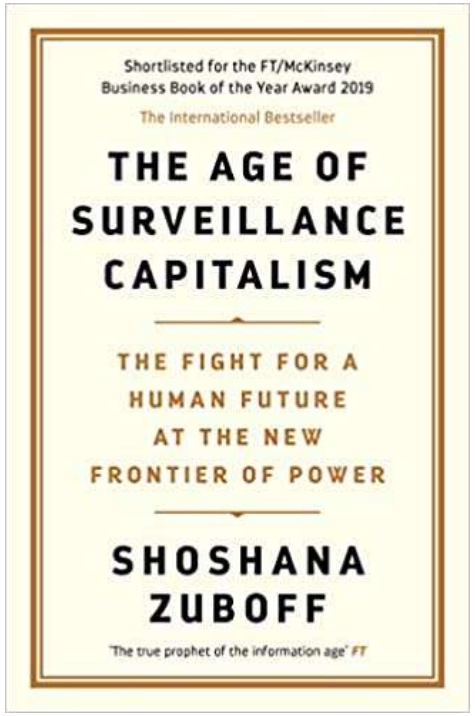


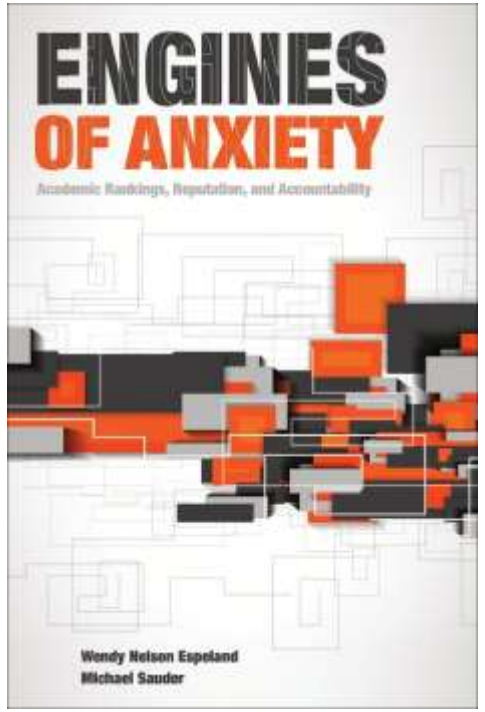


Algorithms, models, metrics, statistics…







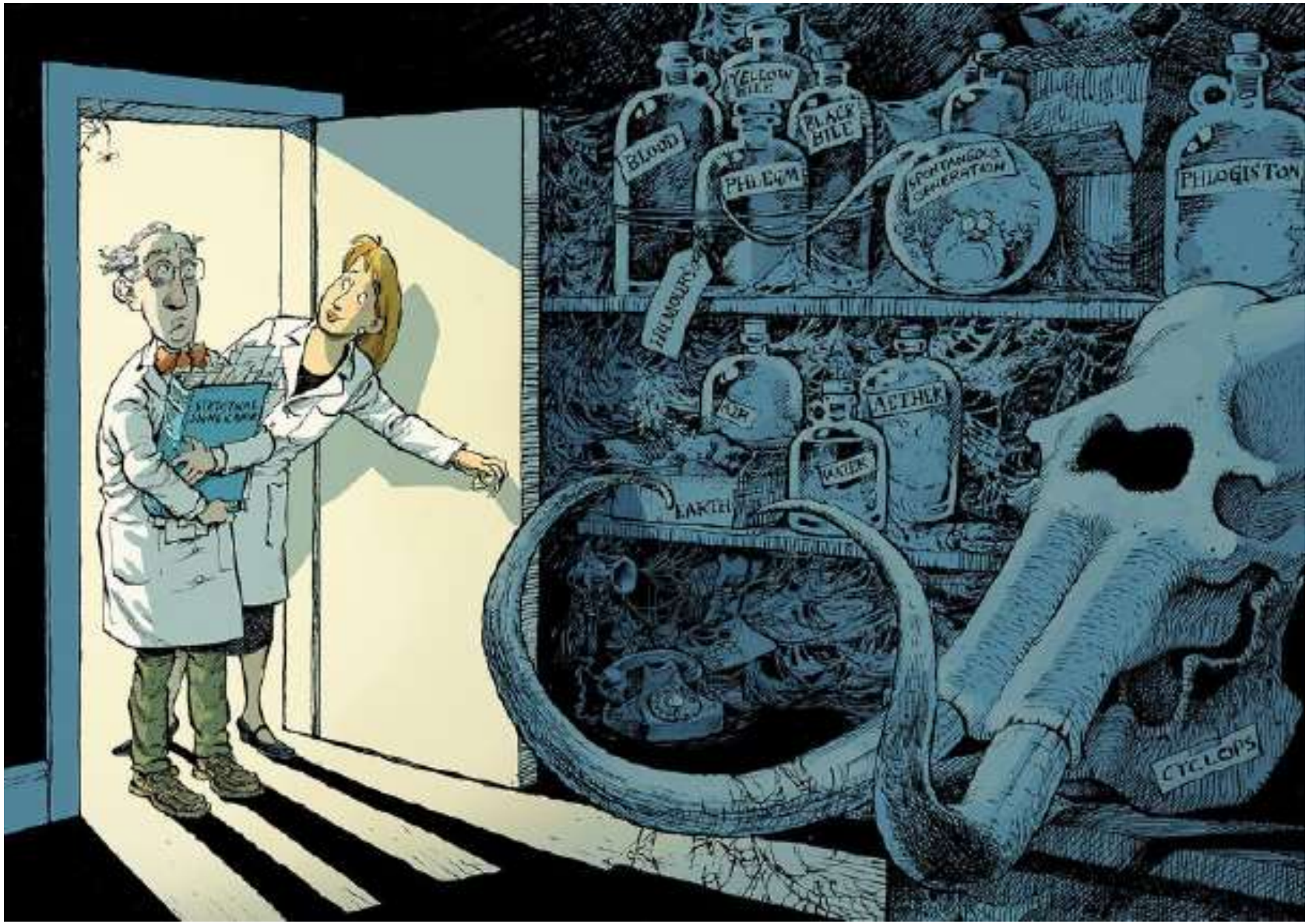


Numbers and their ‘reactivity’
(Espeland and Sauder, 2016)

Incumbent numbers affect what society will measure in the future (Merry 2016)

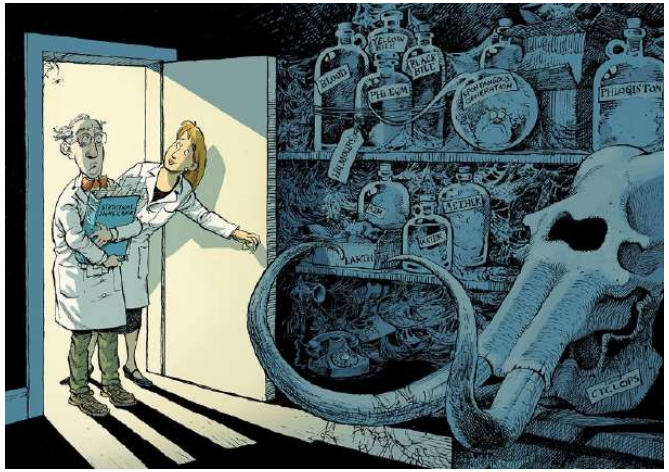
Numbers “create the environment that justifies their assumptions”
(O’Neil, 2016)

Statistical and mathematical modelling



Throw away the concept of statistical significance?

nature
International journal of science



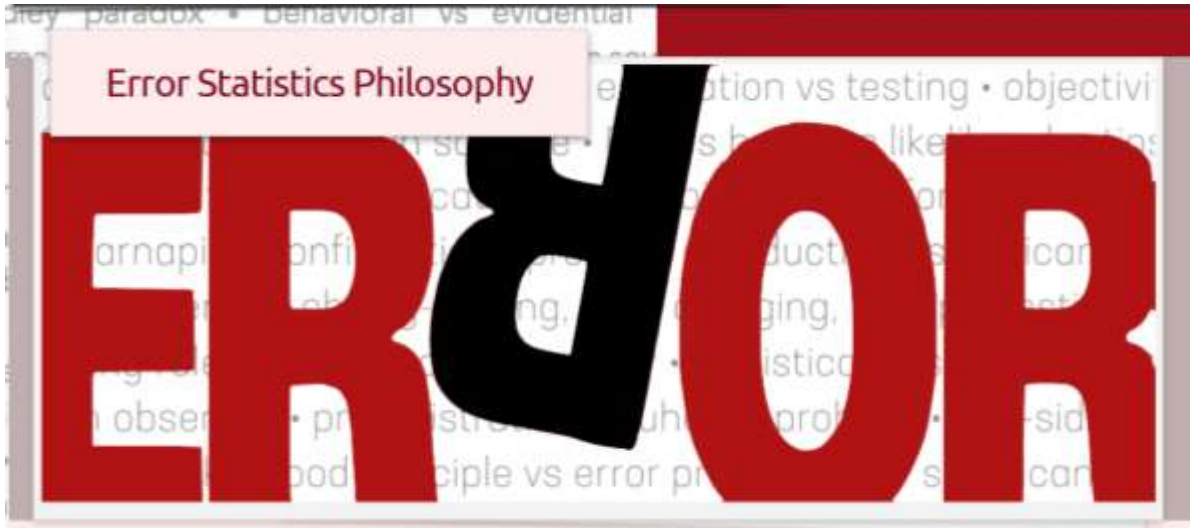
COMMENT · 20 MARCH 2019

Scientists rise up against statistical significance

Valentin Amrhein, Sander Greenland, Blake McShane and more than 800 signatories call for an end to hyped claims and the dismissal of possibly crucial effects.

Valentin Amrhein ✉, Sander Greenland & Blake McShane

See the discussion on the blog of Andrew Gelman https://statmodeling.stat.columbia.edu/



Cargo-cult statistics and scientific crisis

Written by Philip B. Stark and Andrea Saltelli on 05 July 2018. Posted in Science

Statistics in the wake of the reproducibility crisis

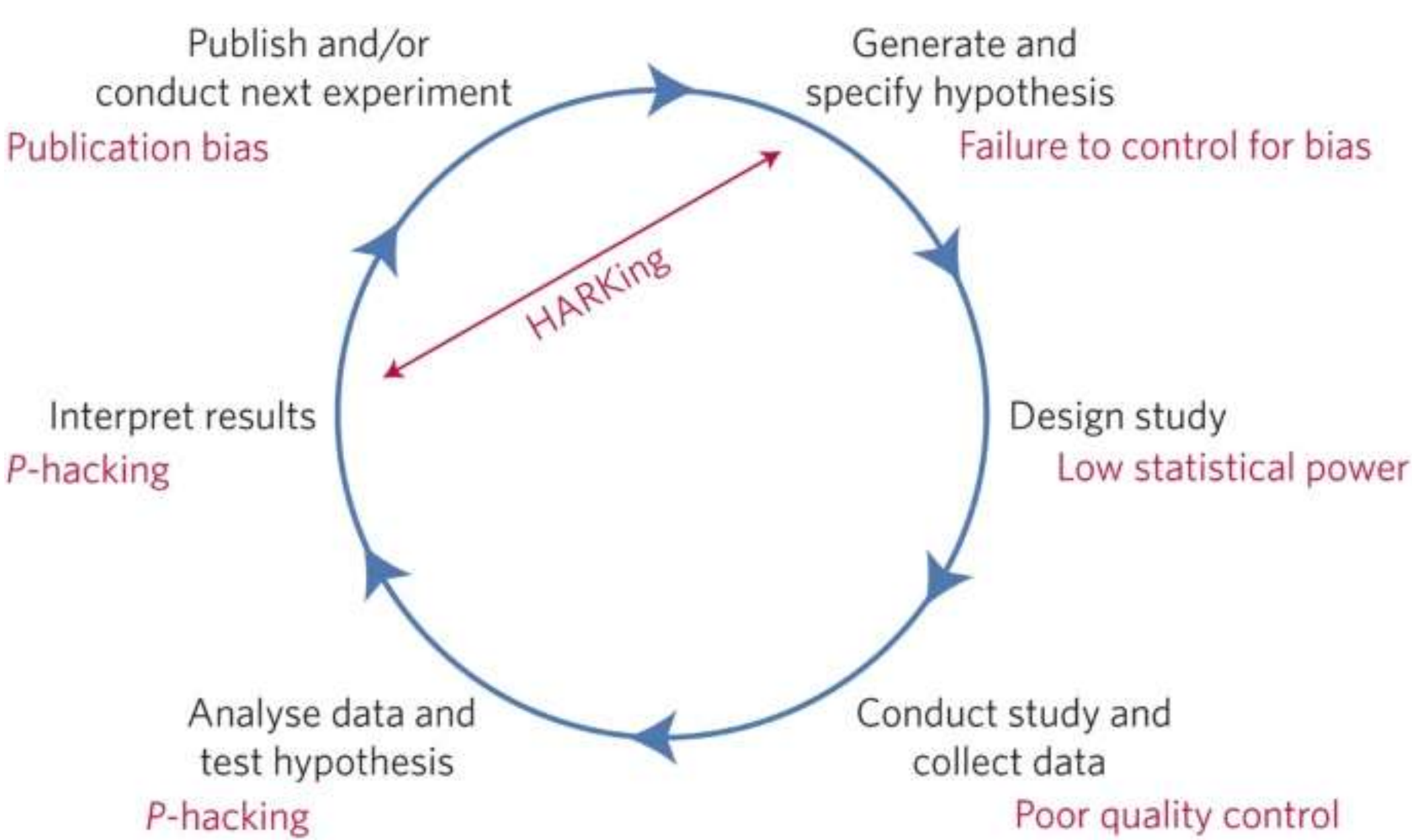
Statistical wars?

nature human behaviour

Open Access | Published: 10 January 2017

A manifesto for reproducible science

Marcus R. Munafò ✉, Brian A. Nosek, Dorothy V. M. Bishop, Katherine S. Button, Christopher D. Chambers, Nathalie Percie du Sert, Uri Simonsohn, Eric-Jan Wagenmakers, Jennifer J. Ware & John P. A. Ioannidis


Publish and/or
conduct next experiment
Publication bias
Generate and
specify hypothesis
Failure to control for bias
HARKing
Interpret results
P-hacking
Design study
Low statistical power
Analyse data and
test hypothesis
P-hacking
Conduct study and
collect data
Poor quality control

P-hacking (fishing for favourable p-values) and **HARKing** (formulating the research **H**ypothesis **A**fter the **R**esults are **K**nown);
Desire to achieve a sought for – or simply publishable – result leads to fiddling with the data points, the modelling assumptions, or the research hypotheses themselves

Leamer, E. E. Tantalus on the Road to Asymptopia. J. Econ. Perspect. 24, 31–46 (2010).

Kerr, N. L. HARKing: Hypothesizing After the Results are Known. Personal. Soc. Psychol. Rev. 2, 196–217 (1998).

A. Gelman and E. Loken, "The garden of forking paths: Why multiple comparisons can be a problem, even when there is no 'fishing expedition' or 'p-hacking' and the research hypothesis was posited ahead of time," 2013.

The P-test saga

Downloaded from http://rsos.royalsocietypublishing.org/ on January 13, 2017

ROYAL SOCIETY OPEN SCIENCE

rsos.royalsocietypublishing.org

Review

Cite this article: Colquhoun D. 2014 An investigation of the false discovery rate and the misinterpretation of *p*-values. *R. Soc. open sci.* **1**: 140216.
http://dx.doi.org/10.1098/rsos.140216

An investigation of the false discovery rate and the misinterpretation of *p*-values

David Colquhoun

Department of Neuroscience, Physiology and Pharmacology, University College London, Gower Street, London WC1 6BT, UK

P values by way of an example

- Two groups, one with a placebo, one with the treatment
- Random allocation to groups
- The difference *d* between the means of the two groups is tested (is it different from zero?)
- *p=0.05* implies that if there were no effect the probability of observing a value equal to *d* or higher would be *5%*

“At first sight, it might be thought that this procedure would guarantee that you would make a fool of yourself only once in every 20 times that you do a test”

Colquhoun D. 2014 An investigation of the false discovery rate and the misinterpretation of p-values. R. Soc. Open sci. 1: 140216. http://dx.doi.org/10.1098/rsos.140216

“The classical p-value does exactly what it says. But it is a statement about what would happen if there were no true effect… sometimes there really is an effect. In order to do the calculation, **we need to know a few more things**”

Colquhoun D. 2014 An investigation of the false discovery rate and the misinterpretation of p-values. R. Soc. Open sci. 1: 140216. http://dx.doi.org/10.1098/rsos.140216

A classic exercise in screening

You test positive for AIDS (one test only). Time for despair?

Only one 1 in 100,000 has AIDS in your population

The test has a 5% false positive rate

Already one can say: in a population of say 100,000 one will have AIDS and 5,000 (5% of 100,000) will test positive

➔ Don't despair (yet)

Another exercise in screening (Colquhoun 2014)

You test positive for mild cognitive impairment (MCI) (one test only). Time to retire?

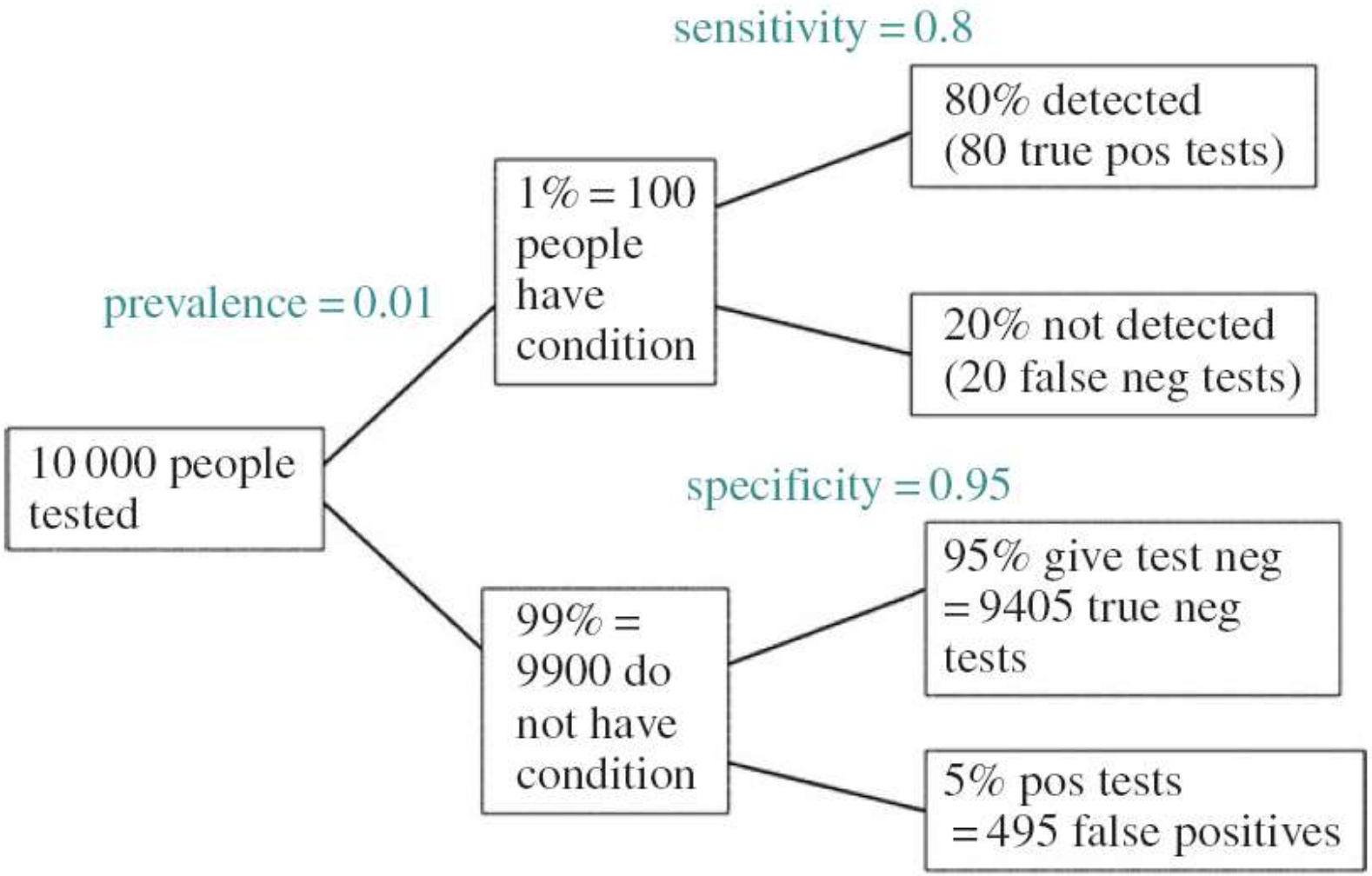
MCI prevalence in the population 1%, i.e. in a sample of 10,000 then 100 have MCI and 9,900 don't

The test has a 5% false positive rate; of the 9,900 who don't have MCI 495 test (false) positive and the remaining 9,405 (true) negative

The test does not pick all the 100 MCI but only 80; there will be 20 false negative. So we see 80+ 495=575 positive of which only 80 (a 14%) are true and the remaining 495 (a 86%) false

➔ It does not make sense to screen the population for MCI!

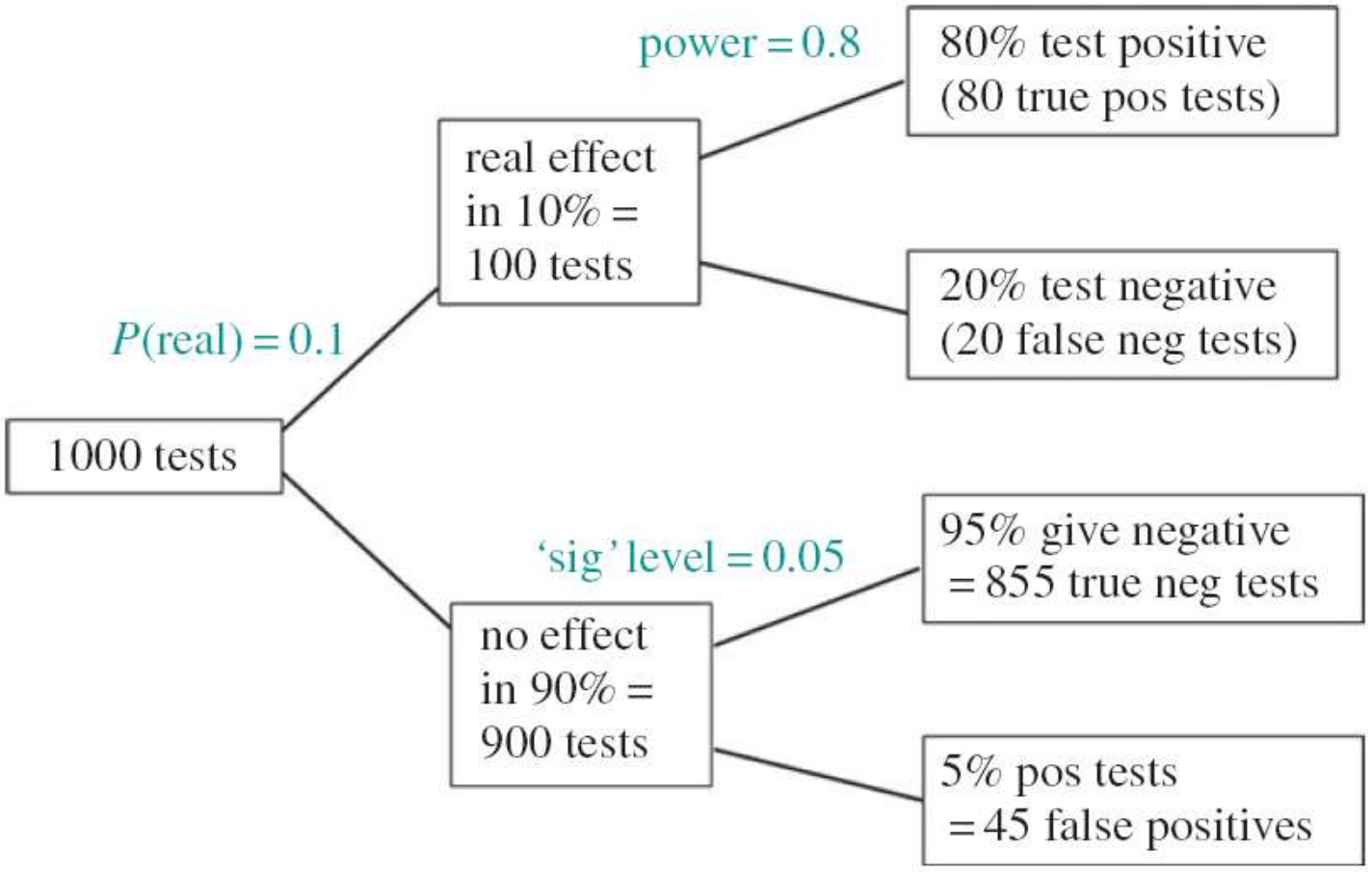
The number 86% = 495/(495+ 80) is our false discovery rate



Colquhoun D. 2014 An investigation of the false discovery rate and the misinterpretation of p-values. R. Soc. Open sci. 1: 140216. http://dx.doi.org/10.1098/rsos.140216

The same concept of false discovery rate applies to the problem of significance test

We now consider tests instead of individuals



Colquhoun D. 2014 An investigation of the false discovery rate and the misinterpretation of p-values. R. Soc. Open sci. 1: 140216. http://dx.doi.org/10.1098/rsos.140216.

➔ We see 125 (80+ 45) hypotheses as true 45 of which are not; the false discovery rate is 45/125 = 36%

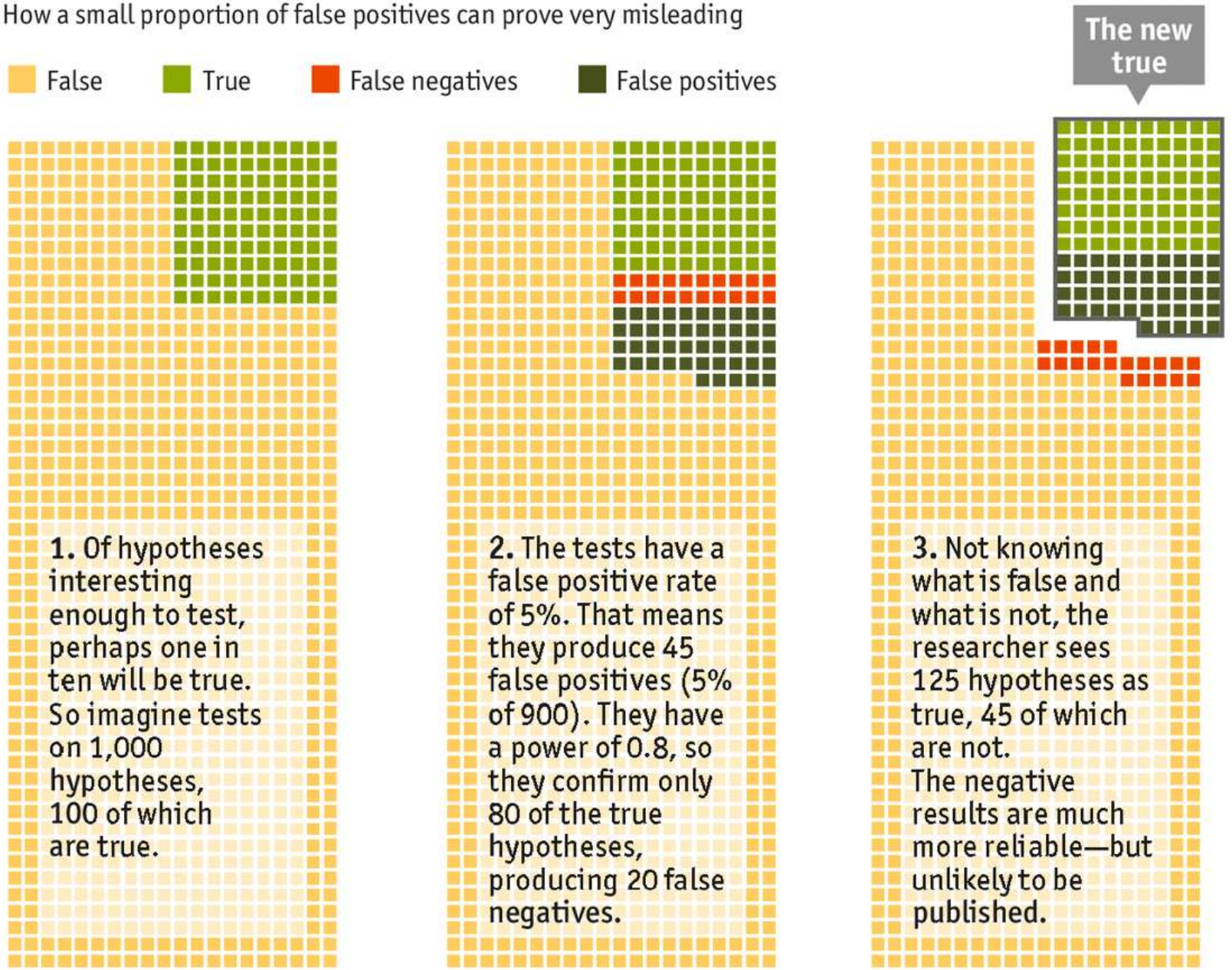
Significance p=0.05 ➔ false discovery rate of 36%

We now know that p=0.05 did not correspond to a chance in twenty of being wrong but in one in three

How many numbers did we need to know to reach this conclusion?

Unlikely results

How a small proportion of false positives can prove very misleading



Source: *The Economist*

The false discovery rate is the black area divided by the (green + black) one

“20% of the faculty teaching statistics in psychology, 39% of the professors and lecturers, and 66% of the students” don’t understand what the P-test is about

Gigerenzer, G., 2018, Statistical Rituals: The Replication Delusion and How We Got There, Advances in Methods and Practices in Psychological Science, 1-21

nature
International journal of science

CORRESPONDENCE · 16 JANUARY 2018

Fixing statistics is more than a technical issue

Andrea Saltelli & Philip Stark

https://www.nature.com/articles/d41586-018-00647-9

nature
International journal of science

CORRESPONDENCE · 16 JANUARY 2018

Integrity must underpin quality of statistics

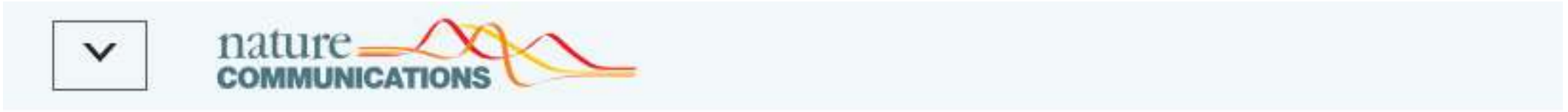
Jerome Ravetz

https://www.nature.com/articles/d41586-018-00648-8

The great paradox of science is that passionate practitioners must carefully produce dispassionate facts (J. Ravetz *Scientific Knowledge and its Social Problems* Oxford Univ. Press; 1971). Meticulous technical and normative judgement, as well as morals and morale, are necessary to navigate the forking paths of the statistical garden (Saltelli and Stark, 2018)

All users of statistical techniques, as well as those in other mathematical fields such as modelling and algorithms, need an effective societal commitment to the maintenance of quality and integrity in their work. If imposed alone, technical or administrative solutions will only breed manipulation and evasion (Ravetz, 2018)

Is mathematical modelling affected?



Comment | Open Access | Published: 27 August 2019

A short comment on statistical versus mathematical modelling

Andrea Saltelli

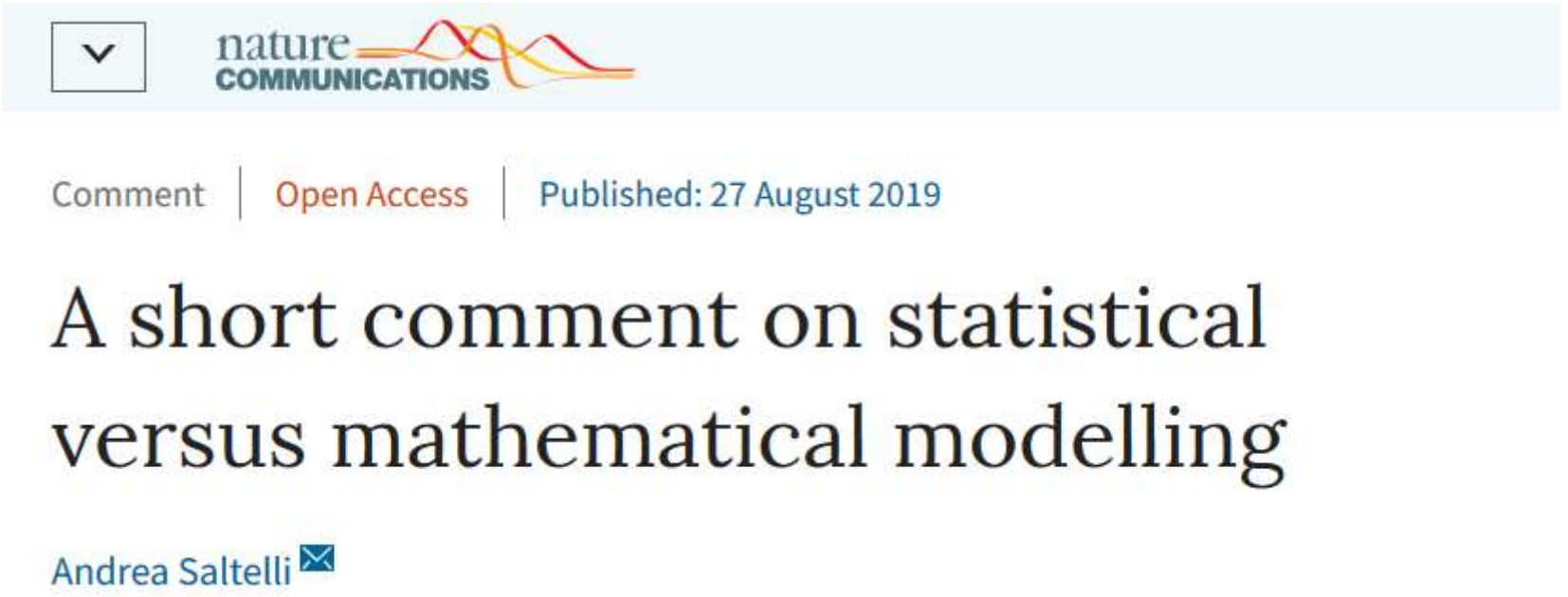
Unlike statistics, modelling is not a discipline …

… mathematical modelling cannot do this:

Wasserstein, R.L. and Lazar, N.A., 2016. 'The ASA's statement on p-values: context, process, and purpose', The American Statistician, Volume 70, 2016 - Issue 2, Pages 129-133.

- Models–including algorithms, should be made inherently interpretable.

- For key models used in policy, peer review should be extended to include auditing by an extended community involving a plurality of disciplines and interested actors ➔ model pedigrees



COMMENT · 24 JUNE 2020

Five ways to ensure that models serve society: a manifesto

Pandemic politics highlight how predictions need to be transparent and humble to invite insight, not blame.

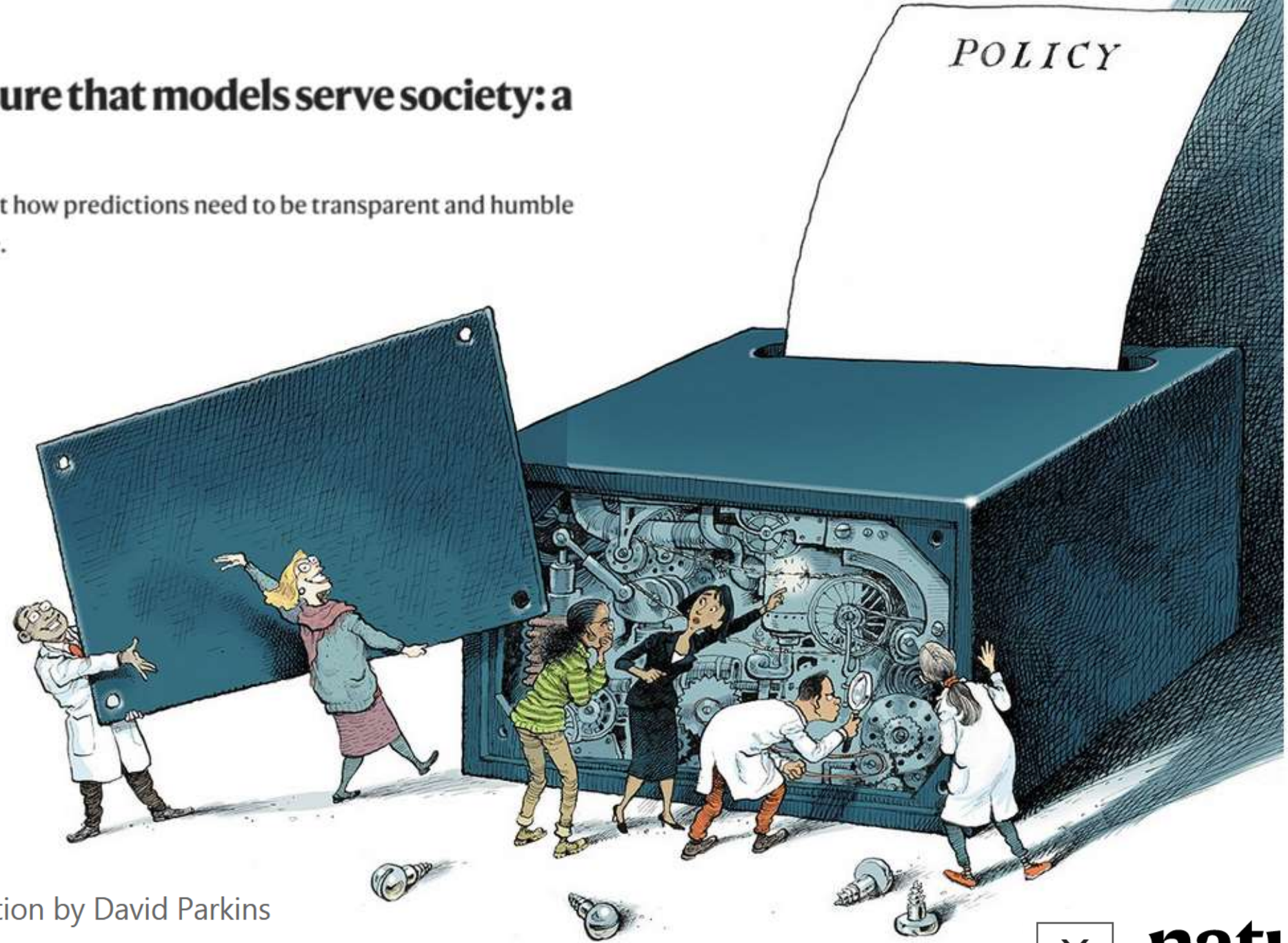


Illustration by David Parkins

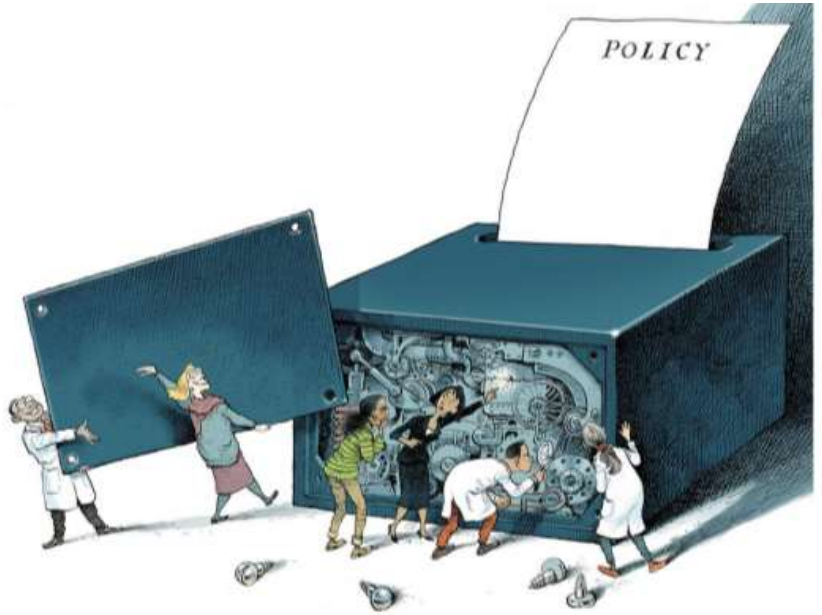
nature

nature

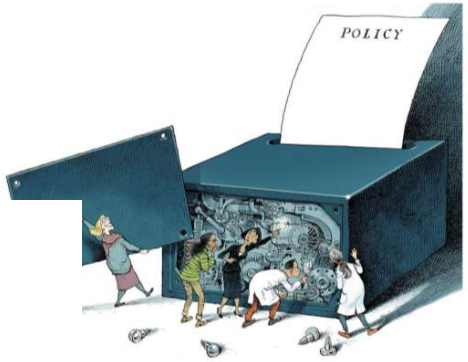
Andrea Saltelli ✉, Gabriele Bammer, Isabelle Bruno, Erica Charters, Monica Di Fiore, Emmanuel Didier, Wendy Nelson Espeland, John Kay, Samuele Lo Piano, Deborah Mayo, Roger Pielke Jr, Tommaso Portaluri, Theodore M. Porter, Arnald Puy, Ismael Rafols, Jerome R. Ravetz, Erik Reinert, Daniel Sarewitz, Philip B. Stark, Andrew Stirling, Jeroen van der Sluijs & Paolo Vineis

3 modellers
2 experts models and society
3 statisticians
2 *statactivistes*
2 economists
1 epidemiologist

2 sociologists of quantification
3 STS scholars
1 philosopher
1 historian
1 political scientists
1 expert RRI - Open Science



Power



The New York Times

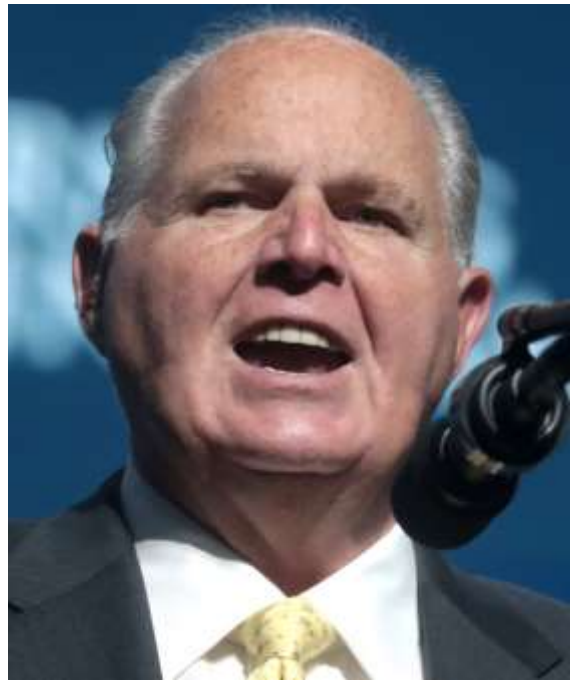
Behind the Virus Report That Jarred the U.S. and the U.K. to Action

It wasn't so much the numbers themselves, frightening though they were, as who reported them: Imperial College London.

Landler, Mark, and Stephen Castle. 2020. Behind the Virus Report That Jarred the U.S. and the U.K. to Action - The New York Times.

Conflicts, when questions of urgency, stakes, values and uncertainty collide

"Wild-Ass Covid numbers … The minute I hear anybody start talking about models and modeling, I blanch"

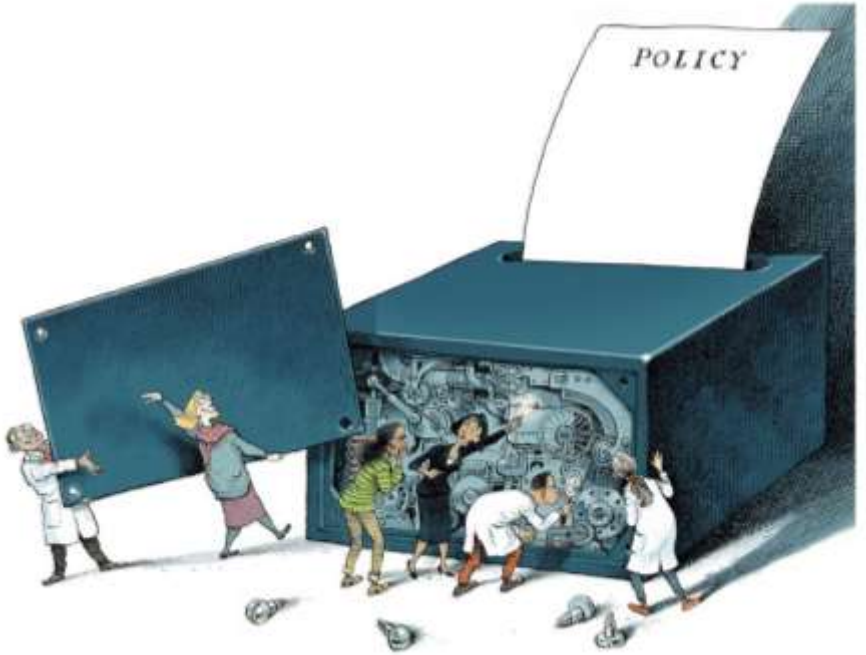


Rush Limbaugh

Rhodes, Tim, and Kari Lancaster. 2020. "Mathematical Models as Public Troubles in COVID-19 Infection Control: Following the Numbers." Health Sociology Review 1-18. doi: 10.1080/14461242.2020.1764376

Mind the assumptions

Assess uncertainty and sensitivity



Mind the hubris

Complexity can be the enemy of relevance

Mind the framing

Match purpose and context

Mind the consequences

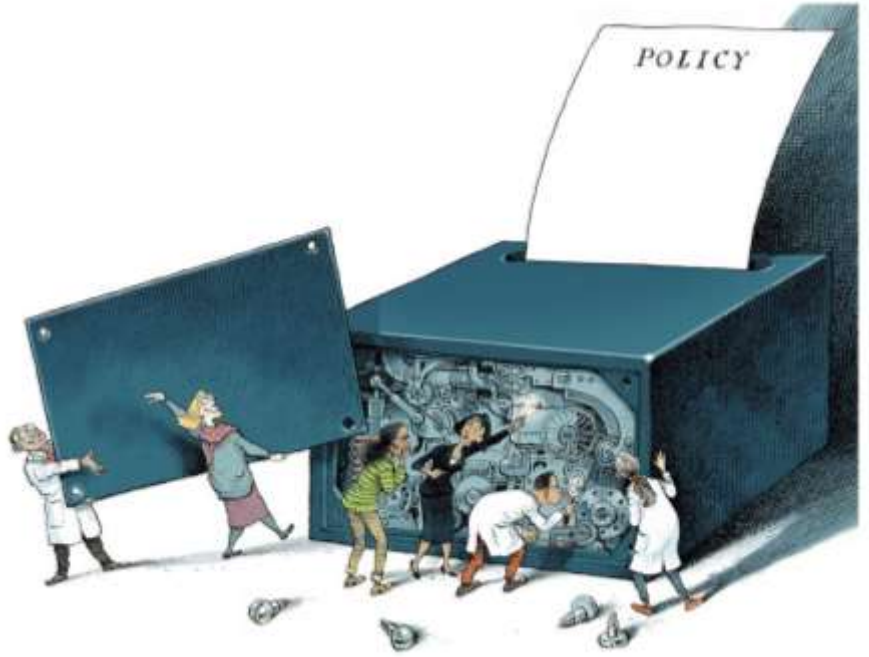
Quantification can backfire

Mind the unknowns

Acknowledge ignorance

Mind the assumptions

Assess uncertainty and sensitivity



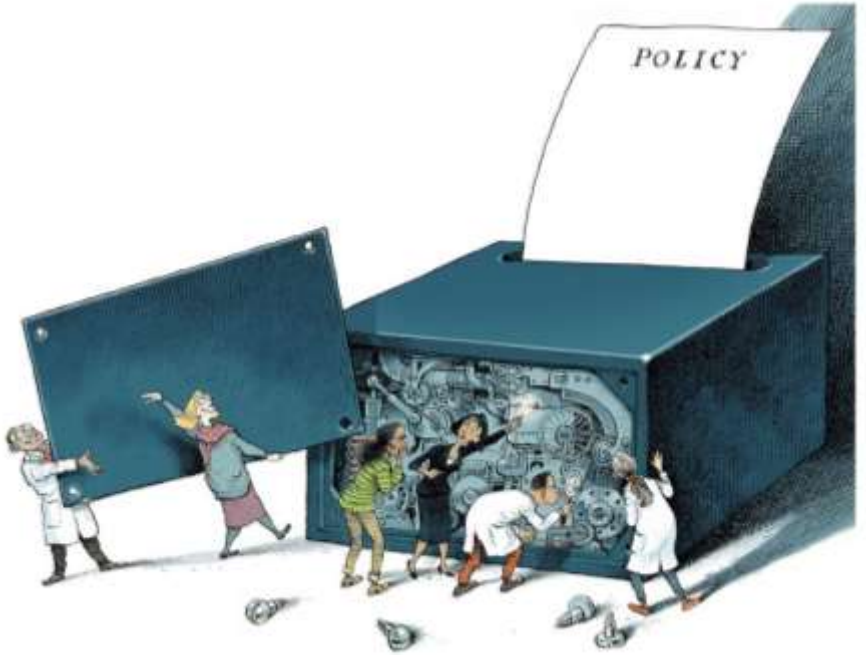
…global uncertainty and sensitivity analyses are often not done. Anyone turning to a model for insight should demand them …

SUPPLEMENTARY INFORMATION

1. Additional information and references >260 references

Mind the assumptions

Assess uncertainty and sensitivity

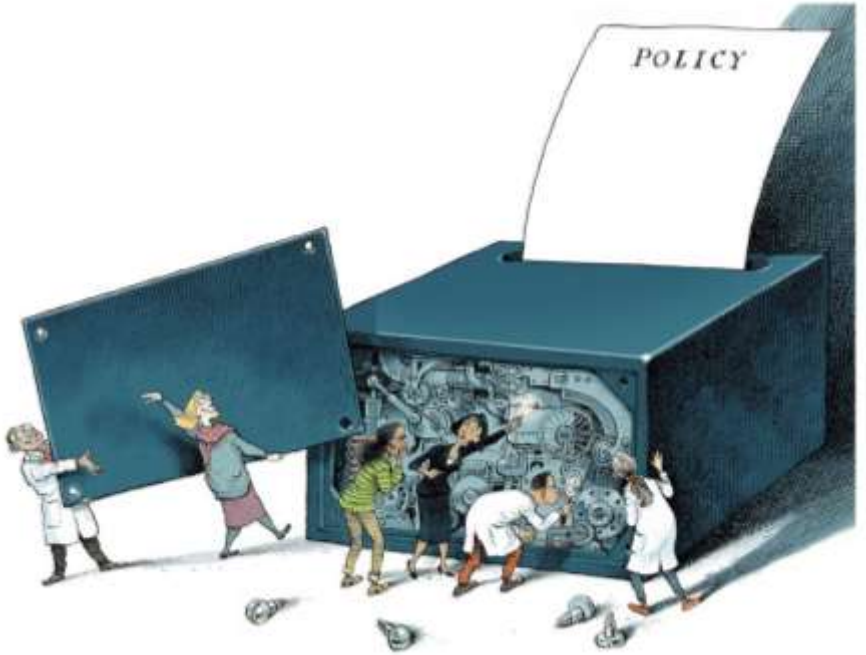


… assumptions that are reasonable in one situation can become nonsensical in another…

… models require input values for which there is no reliable information.

Mind the assumptions

Assess uncertainty and sensitivity

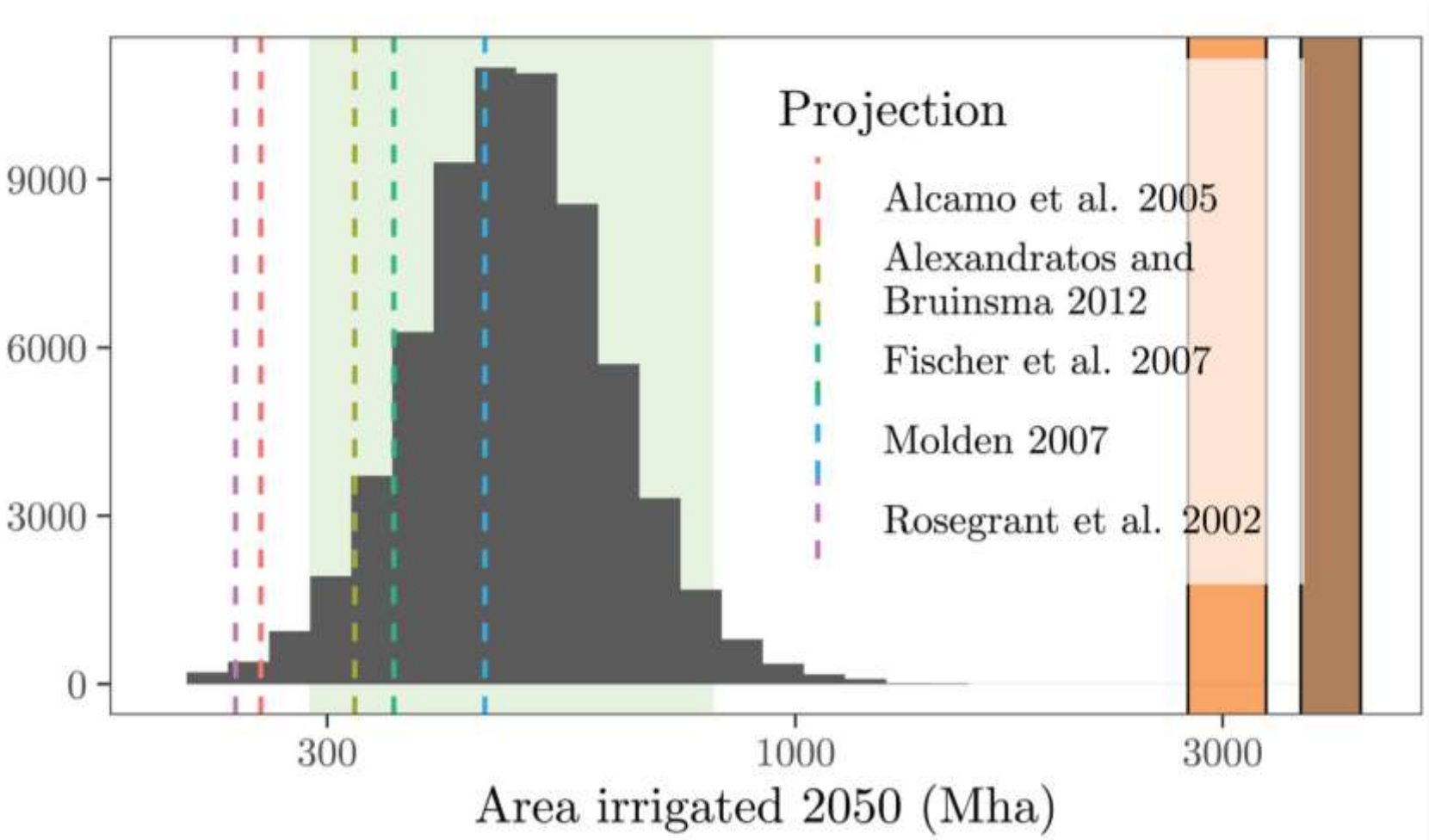


… global uncertainty and sensitivity analyses can lead to interesting discoveries

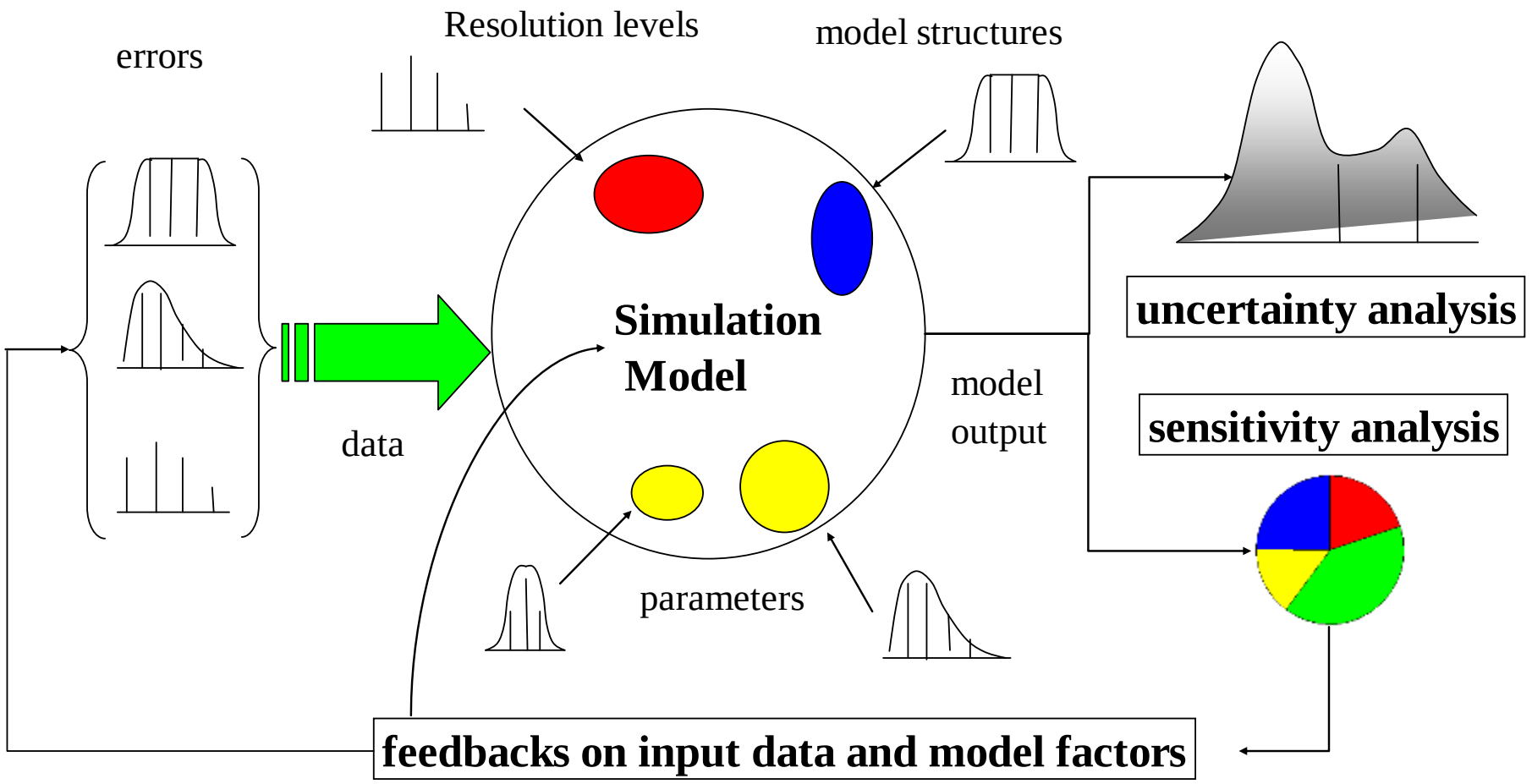
Geophysical Research Letters

Current Models Underestimate Future Irrigated Areas

A. Puy ✉, S. Lo Piano, A. Saltelli First published: 17 April 2020 https://doi.org/10.1029/2020GL087360 |



An engineer's vision of UA, SA

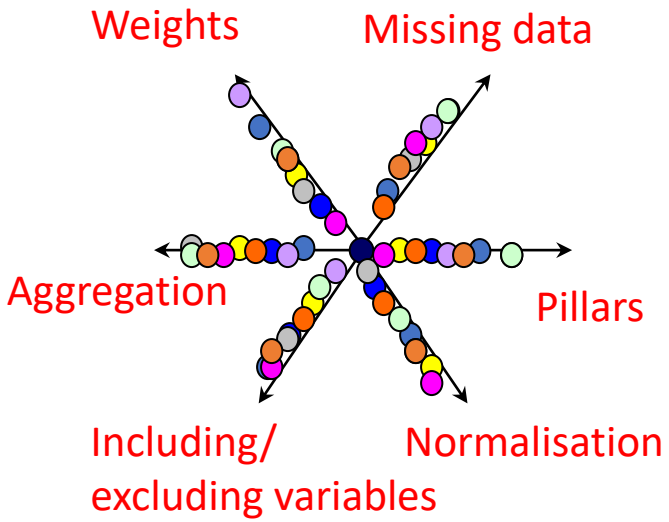


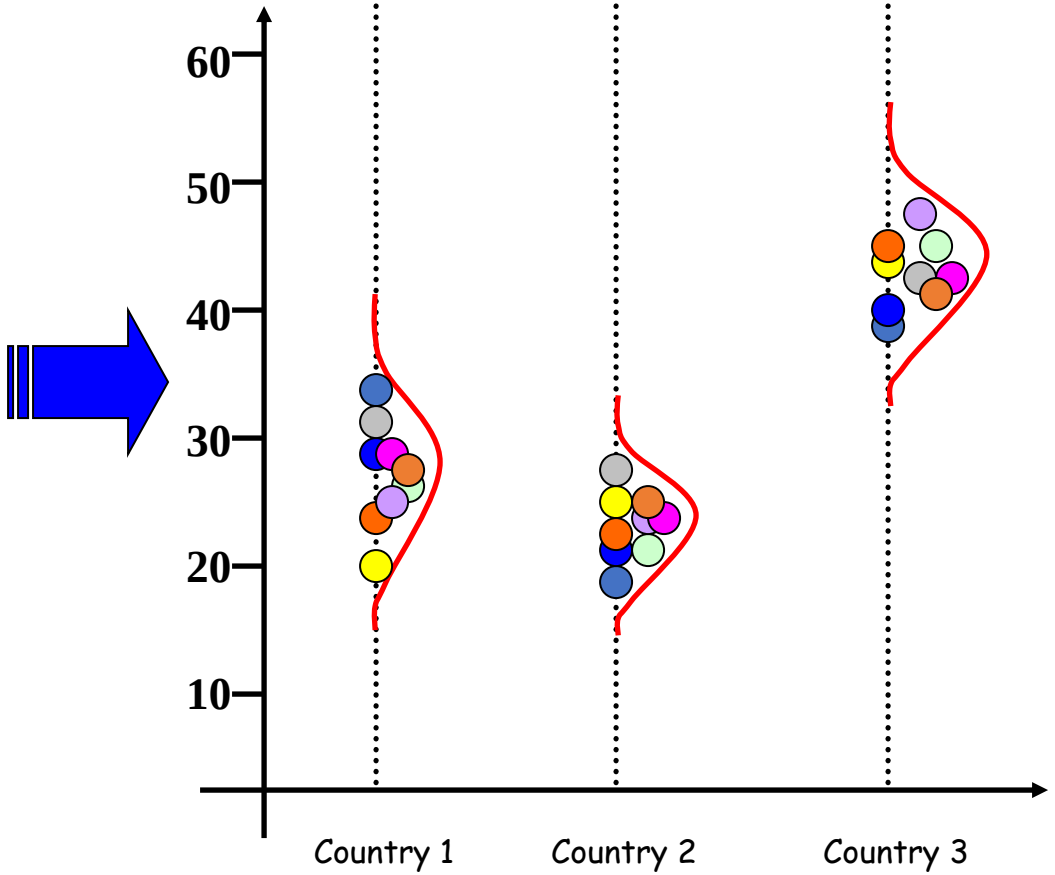
One can sample more than just factors:

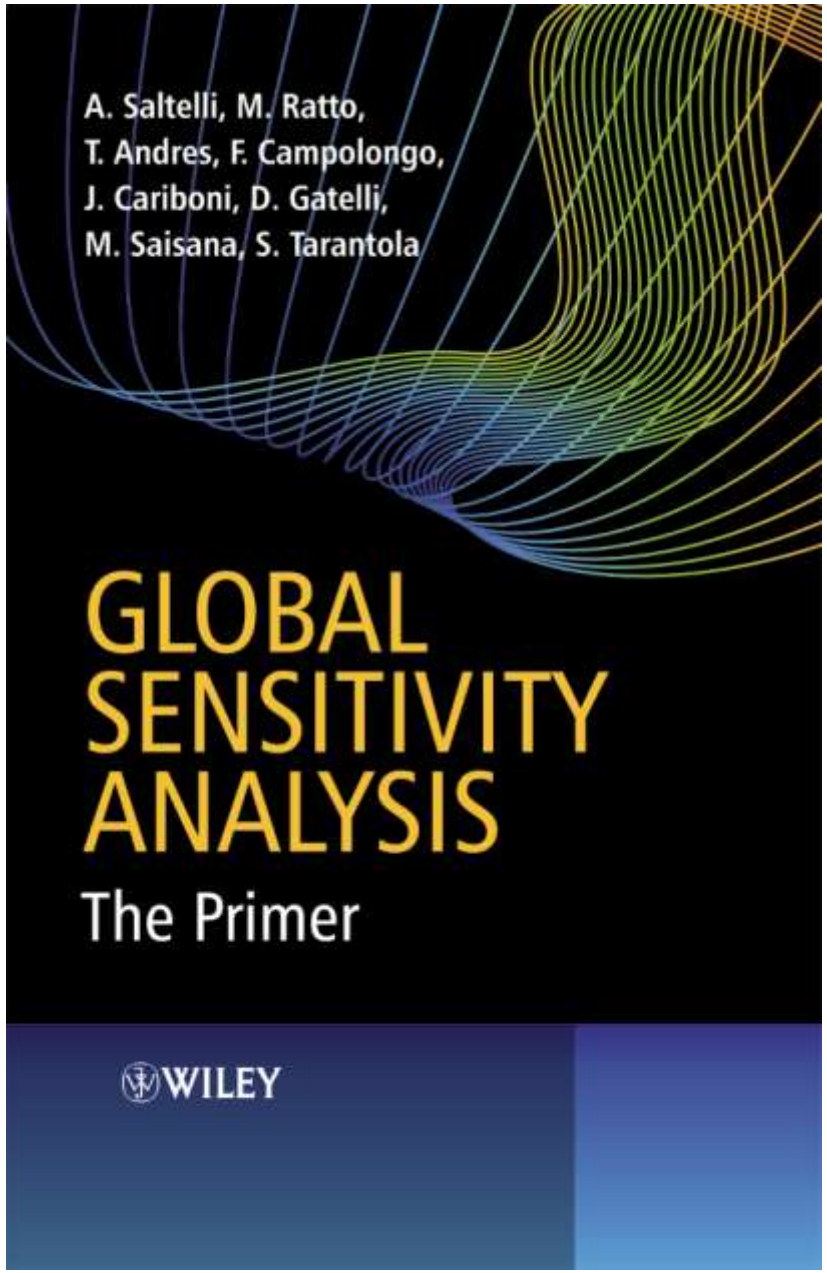
- modelling assumptions,
- alternative data sets,
- resolution levels,
- scenarios …

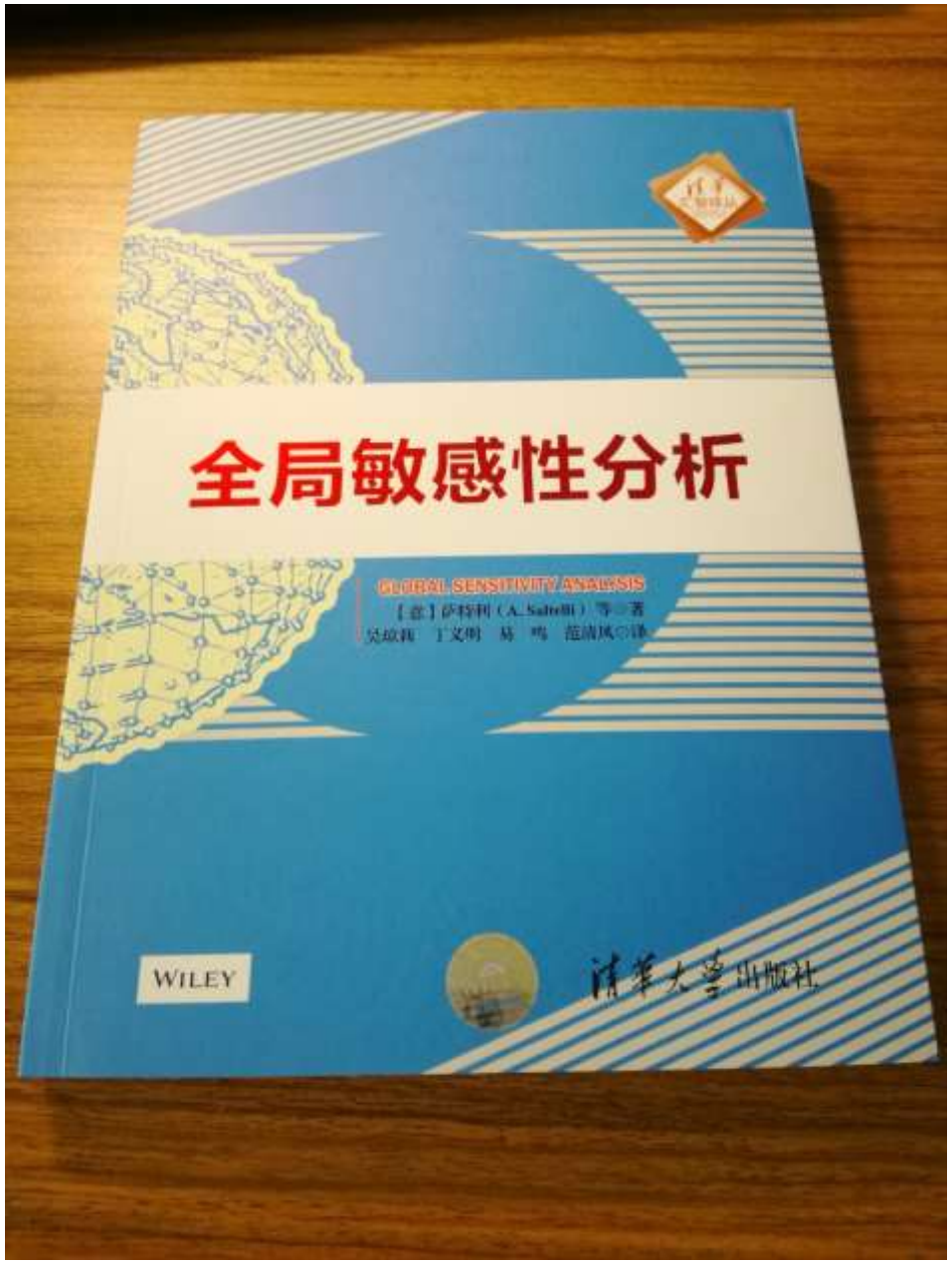
Assumption	Alternatives
Number of indicators	▪ all six indicators included or one-at-time excluded (6 options)
Weighting method	▪ original set of weights, ▪ factor analysis, ▪ equal weighting, ▪ data envelopment analysis
Aggregation rule	▪ additive, ▪ multiplicative, ▪ Borda multi-criterion

Space of alternatives






A. Saltelli, M. Ratto,
T. Andres, F. Campolongo,
J. Cariboni, D. Gatelli,
M. Saisana, S. Tarantola
GLOBAL
SENSITIVITY
ANALYSIS
The Primer
WILEY


全局敏感性分析
GLOBAL SENSITIVITY ANALYSIS
WILEY

For John Kay modelling may need as input information which we don't have (The case of WEBTAG; knowing car passengers number decades into futures)

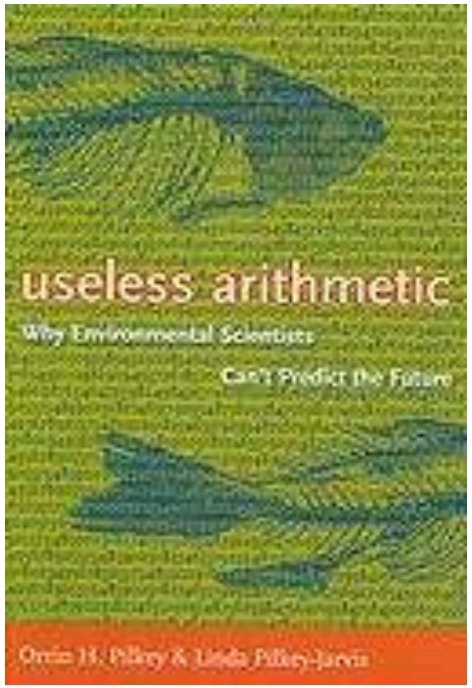
John Kay

J. A. Kay, "Knowing when we don't know," 2012, https://www.ifs.org.uk/docs/john_kay_feb2012.pdf

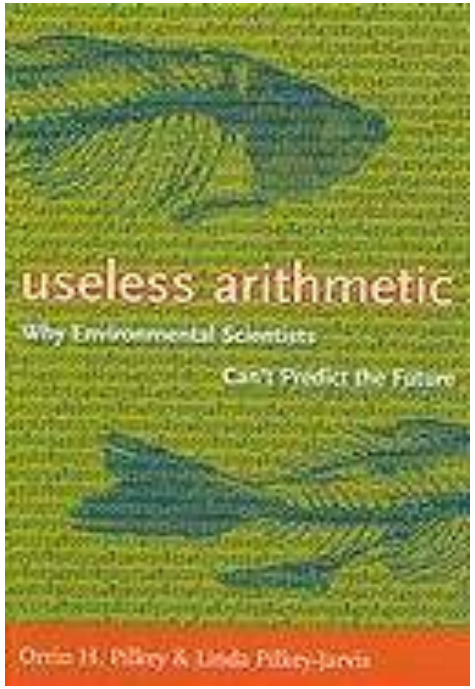
WebTAG: Annual Percentage Change in Car Occupancy (% pa) up to 2036

Journey Purpose	Weekday					Weekend	All Week
	7am-10am	10am-4pm	4pm-7pm	7pm-7am	Weekday Average		
Work	-0.48	-0.4	-0.62	-0.5	-0.44	-0.48	-0.45
Non - Work (commuting and other)	-0.67	-0.65	-0.53	-0.47	-0.59	-0.52	-0.56

Orrin H. Pilkey



Useless Arithmetic: Why Environmental Scientists Can't Predict the Future
by Orrin H. Pilkey and Linda Pilkey-Jarvis

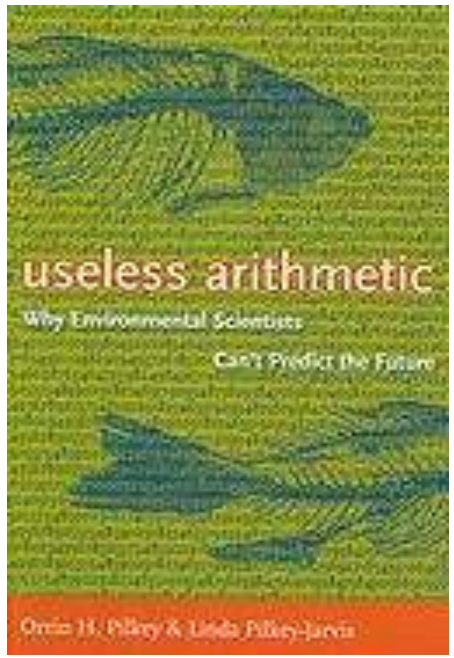


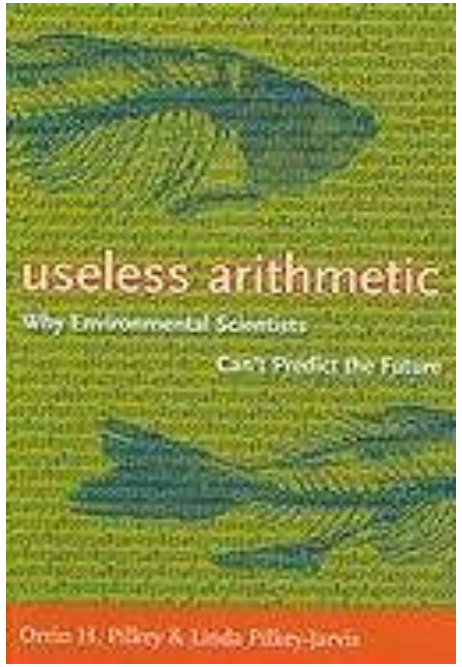
<<It is important, however, to recognize that the sensitivity of the parameter in the equation is what is being determined, not the sensitivity of the parameter in nature.

[…] If the model is wrong or if it is a poor representation of reality, determining the sensitivity of an individual parameter in the model is a meaningless pursuit.>>

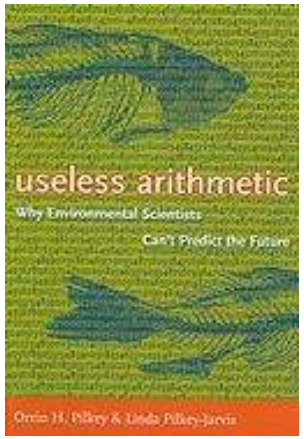
One of the examples discussed concerns the Yucca Mountain repository for radioactive waste. TSPA model (for total system performance assessment) for safety analysis.

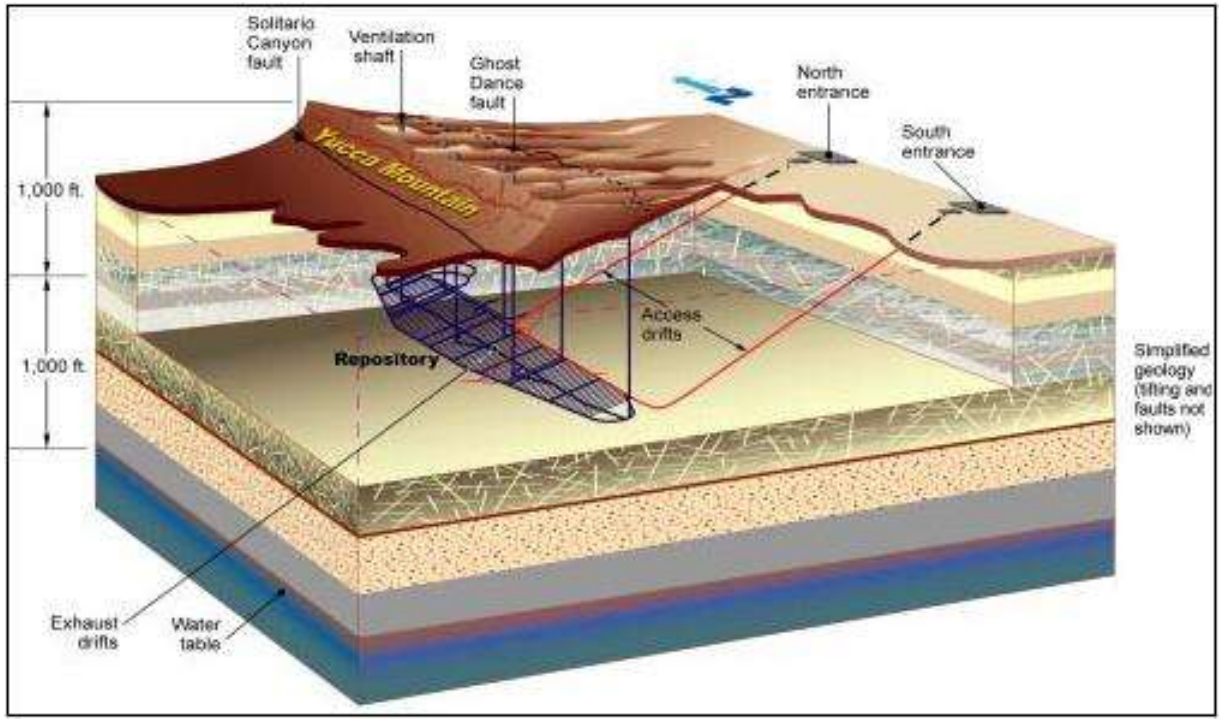
TSPA is Composed of 286 sub-models.





TSPA (like any other model) relies on assumptions → one is the low permeability of the geological formation → long time for the water to percolate from surface to disposal.





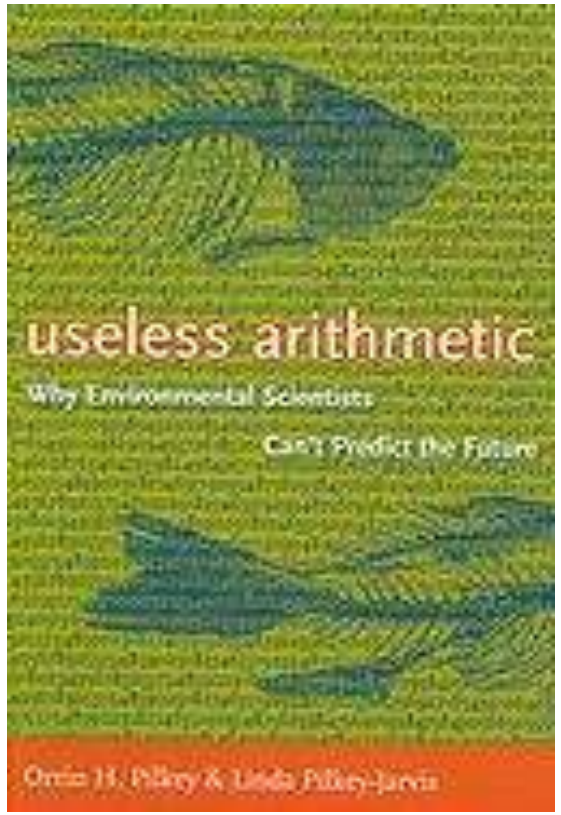
The confidence of the stakeholders in TSPA was not helped when evidence was produced which could lead to an upward revision of 4 orders of magnitude of this parameter

(the ^{36}Cl story)

Type III error in sensitivity: Examples:

In the case of TSPA (Yucca mountain) a range of 0.02 to 1 millimetre per year was used for percolation of flux rate.

→… SA useless if it is instead ~ 3,000 millimetres per year.



"Scientific mathematical modelling should involve constant efforts to falsify the model"

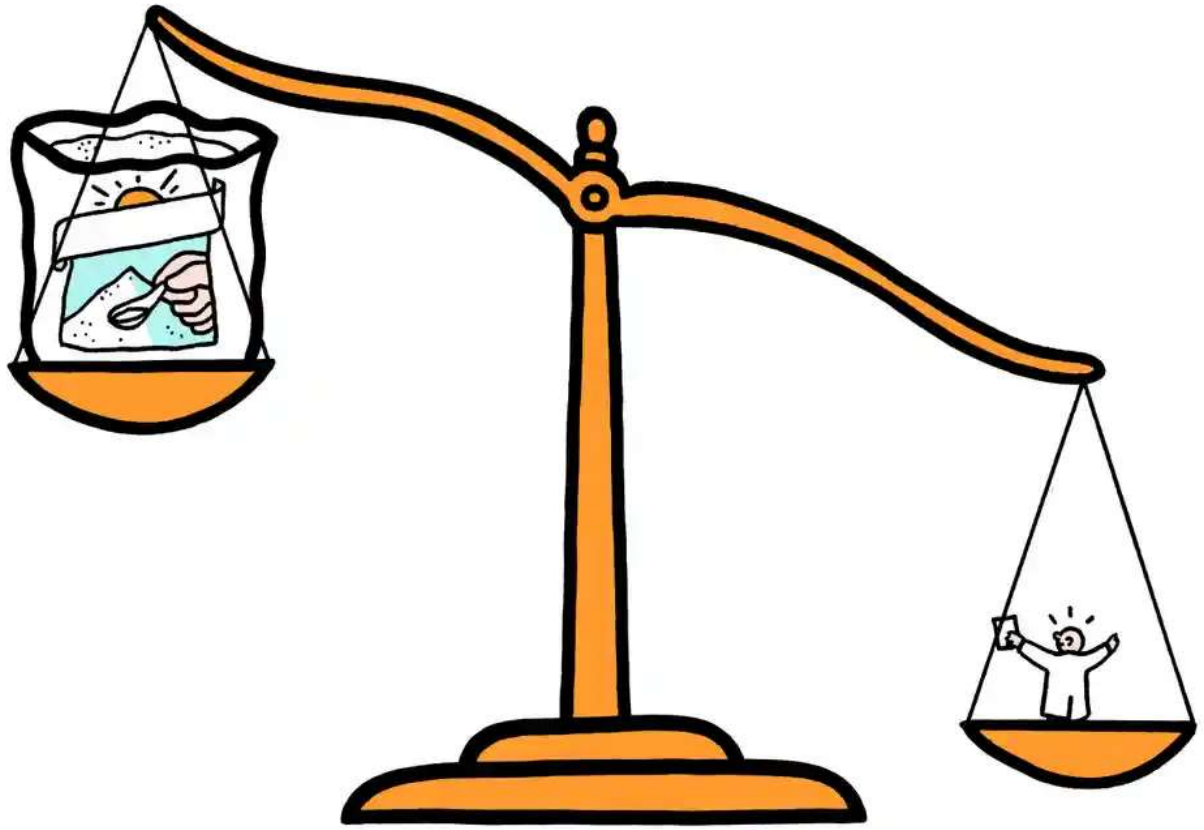
Global quantitative uncertainty and sensitivity analysis are the way to tackle the assumption issue

Search The Guardian For 200 years International edition

The long story of the Seven Countries study (1958 – 1964) led by Ancel Keys

Seven Countries study has become canonical, with the fat hypothesis enshrined in official advice

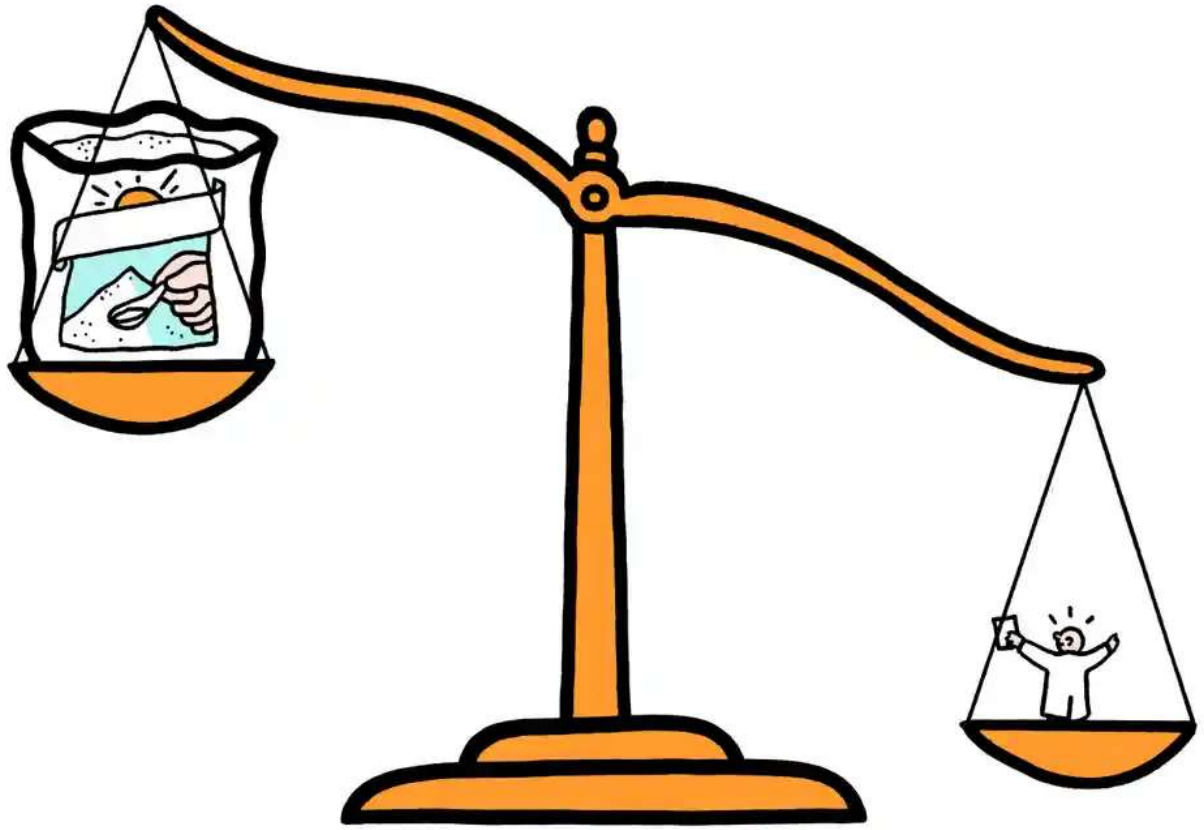
https://www.theguardian.com/society/2016/apr/07/the-sugar-conspiracy-robert-lustig-john-yudkin



Search The Guardian For 200 years International edition

"Alessandro Menotti, went back to the data, and found that the food that correlated most closely with deaths from heart disease was not saturated fat, but sugar"

https://www.theguardian.com/society/2016/apr/07/the-sugar-conspiracy-robert-lustig-john-yudkin



Search The Guardian For 200 years International edition

Keys included seven nations in Europe but left out France and West Germany – he knew that the French and Germans had low rates of heart disease, despite living on a diet rich in saturated fats

https://www.theguardian.com/society/2016/apr/07/the-sugar-conspiracy-robert-lustig-john-yudkin

Search The Guardian International edition
For 200 years

In spite of repeated ‘disproves’ of the association CHD–cholesterol the medical establishment is reluctant to abandon cholesterol for sugar

“our findings suggest the industry sponsored a research program in the 1960s and 1970s that successfully cast doubt about the hazards of sucrose while promoting fat as the dietary culprit in CHD [coronary hearth disease]”

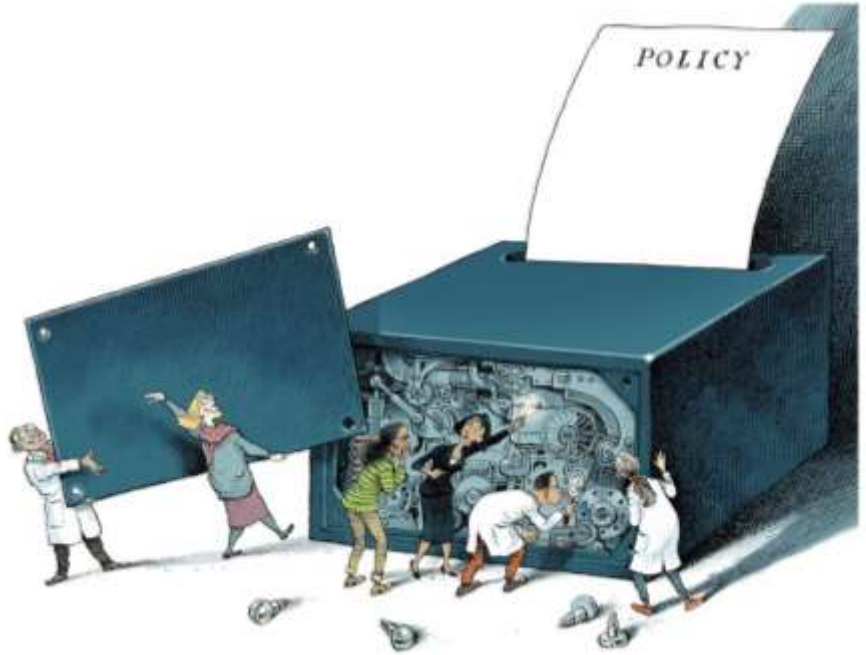
http://archinte.jamanetwork.com/article.aspx?articleid=2548255

Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance



Mind the framing

Match purpose and context

Mind the consequences

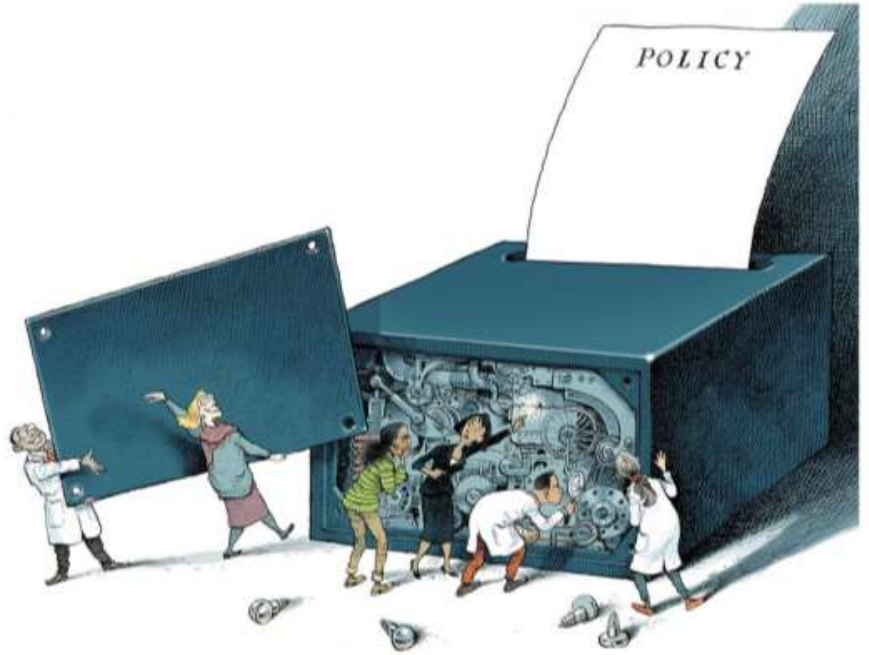
Quantification can backfire

Mind the unknowns

Acknowledge ignorance

Mind the hubris

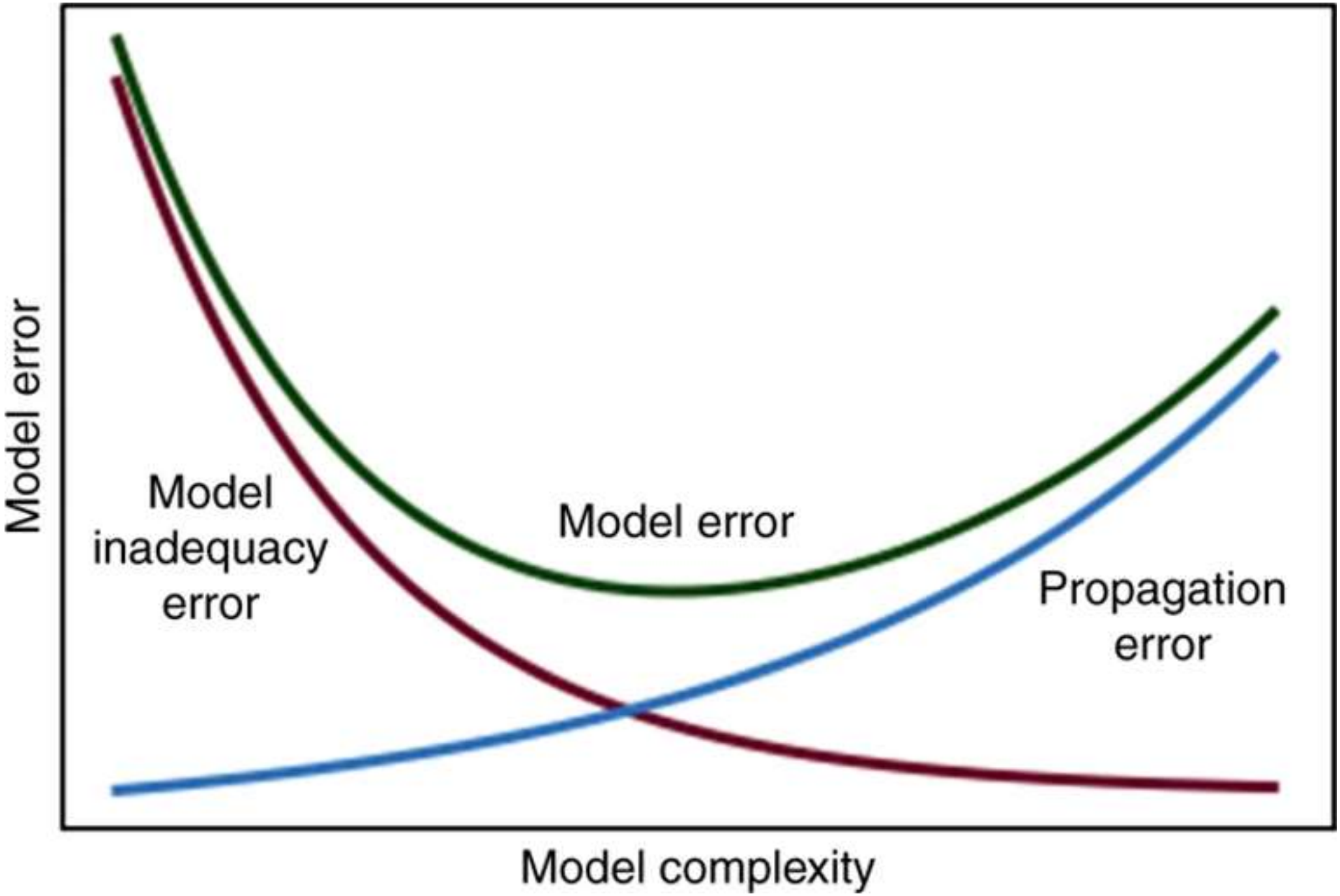
Complexity can be the enemy of relevance



… many are seduced by the idea of adding complexity in an attempt to capture reality more accurately, but…

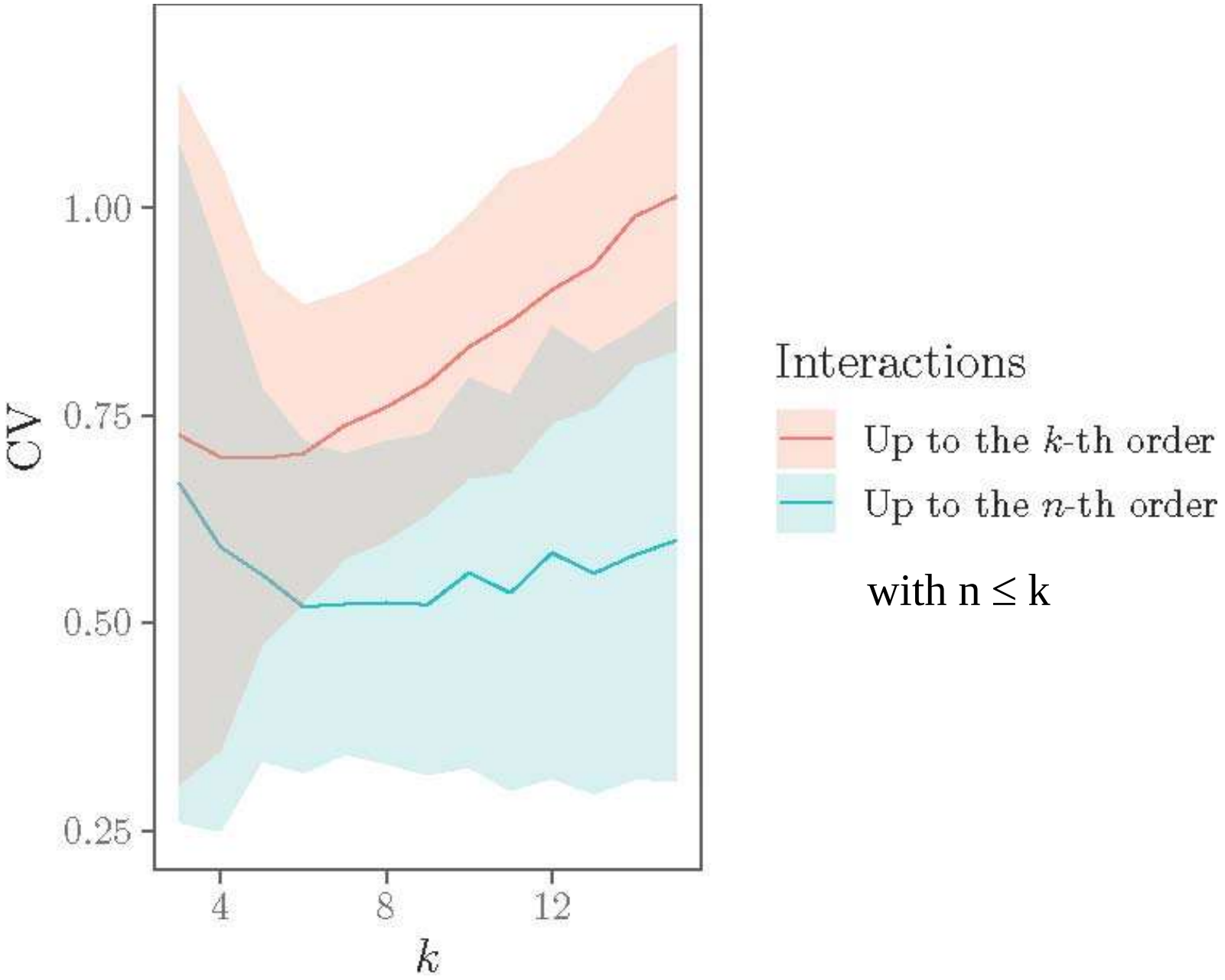
SUPPLEMENTARY INFORMATION

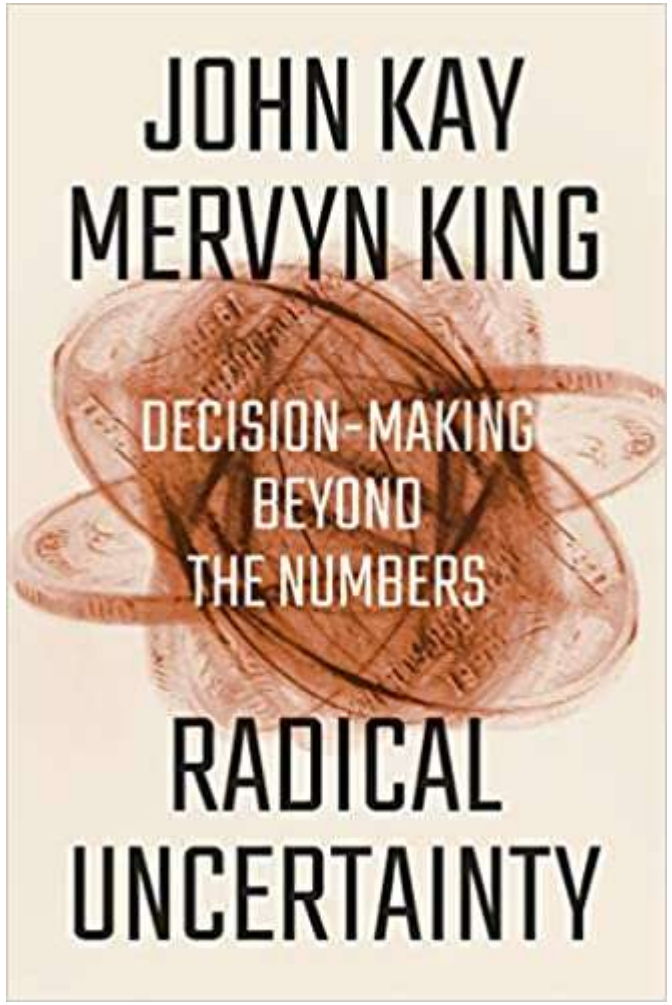
1. Additional information and references >260 references


Model error
Model inadequacy error
Model error
Propagation error
Model complexity

O'Neil conjecture, uncertainty cascade … CV=STD/mean

From A. Puy et al., "O'Neil conjecture tested", **paper in progress**





At times the simpler model gets it right because it makes the right assumptions

Predicting world fatalities from AIDS

WHO model did not consider that an HIV-positive sex worker who sleeps with 10 different people is more likely to spread the disease than someone who sleeps with the same person ten times

Kay, J. A. & King, M. A. *Radical uncertainty : decision-making beyond the numbers*. (W. W. Norton & Company, 2020).

Mind the assumptions

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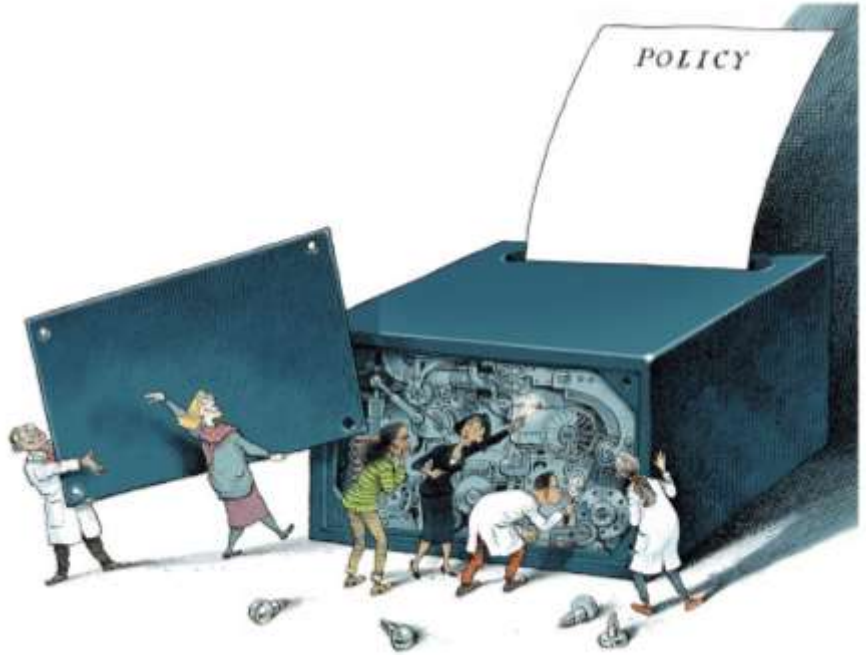
Complexity can be the enemy of relevance



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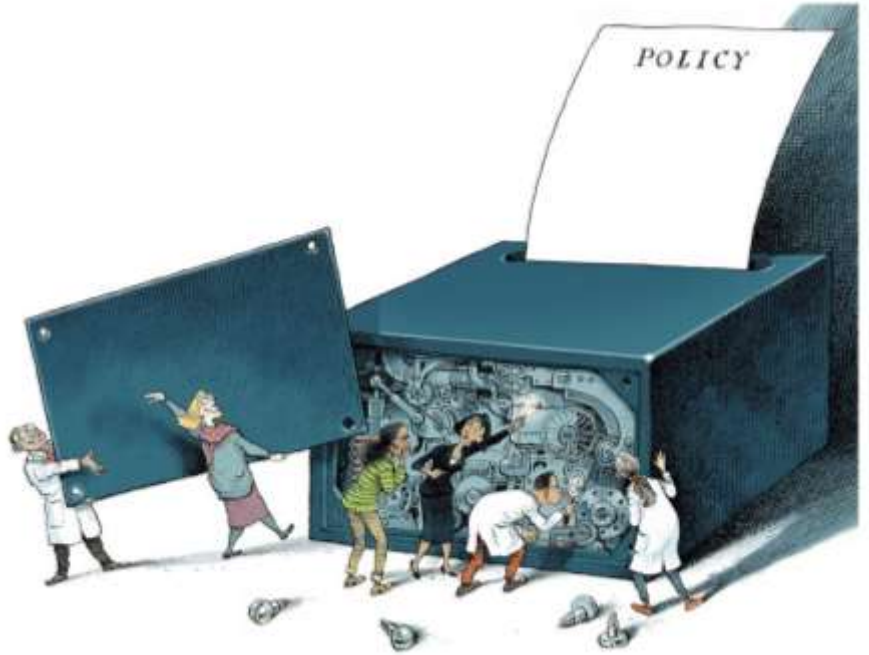


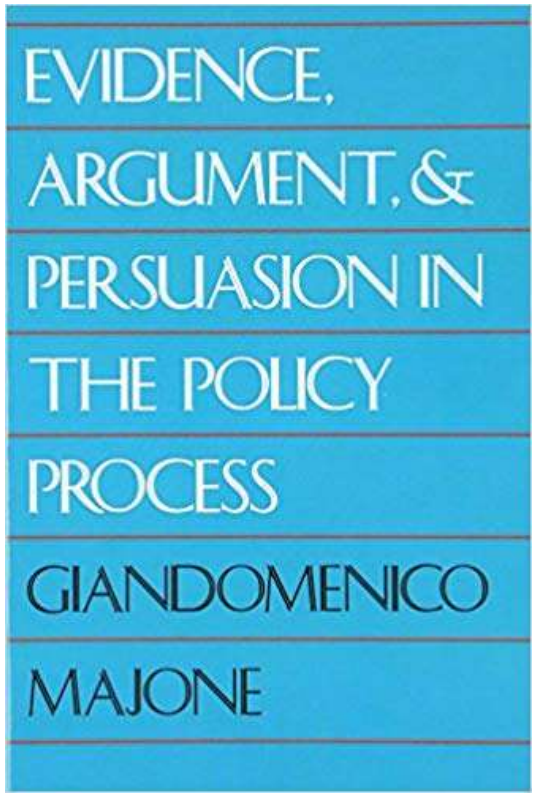
… models will reflect the interests, disciplinary orientations and biases of the developers…

SUPPLEMENTARY INFORMATION

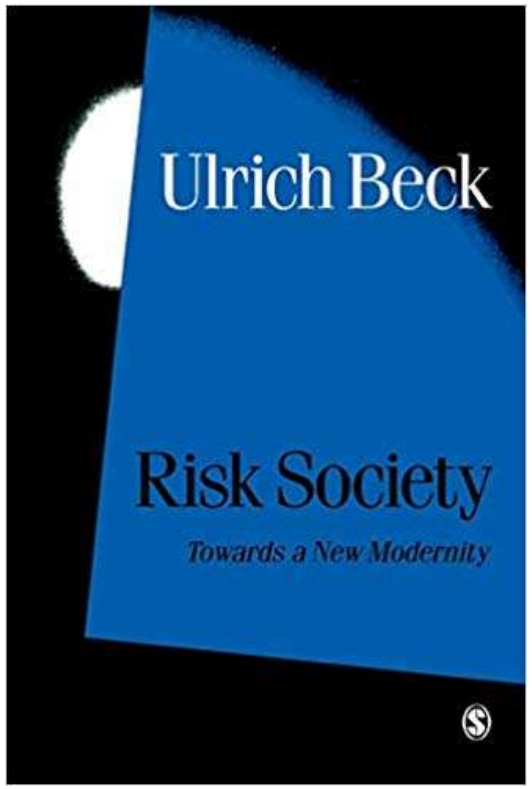
1. Additional information and references >260 references

From Ulrich Beck to Giandomenico Majone: the technique is never neutral

Ulrich Beck
(1944 –2015)



1989



1992 (1986)

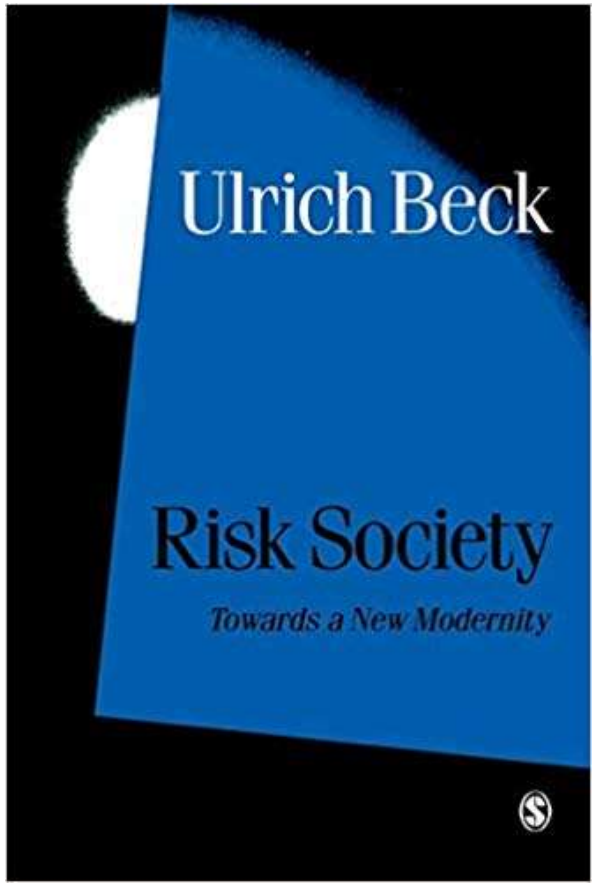
ELSEVIER

Environmental Science & Policy
Volume 106, April 2020, Pages 87-98

The technique is never neutral. How methodological choices condition the generation of narratives for sustainability

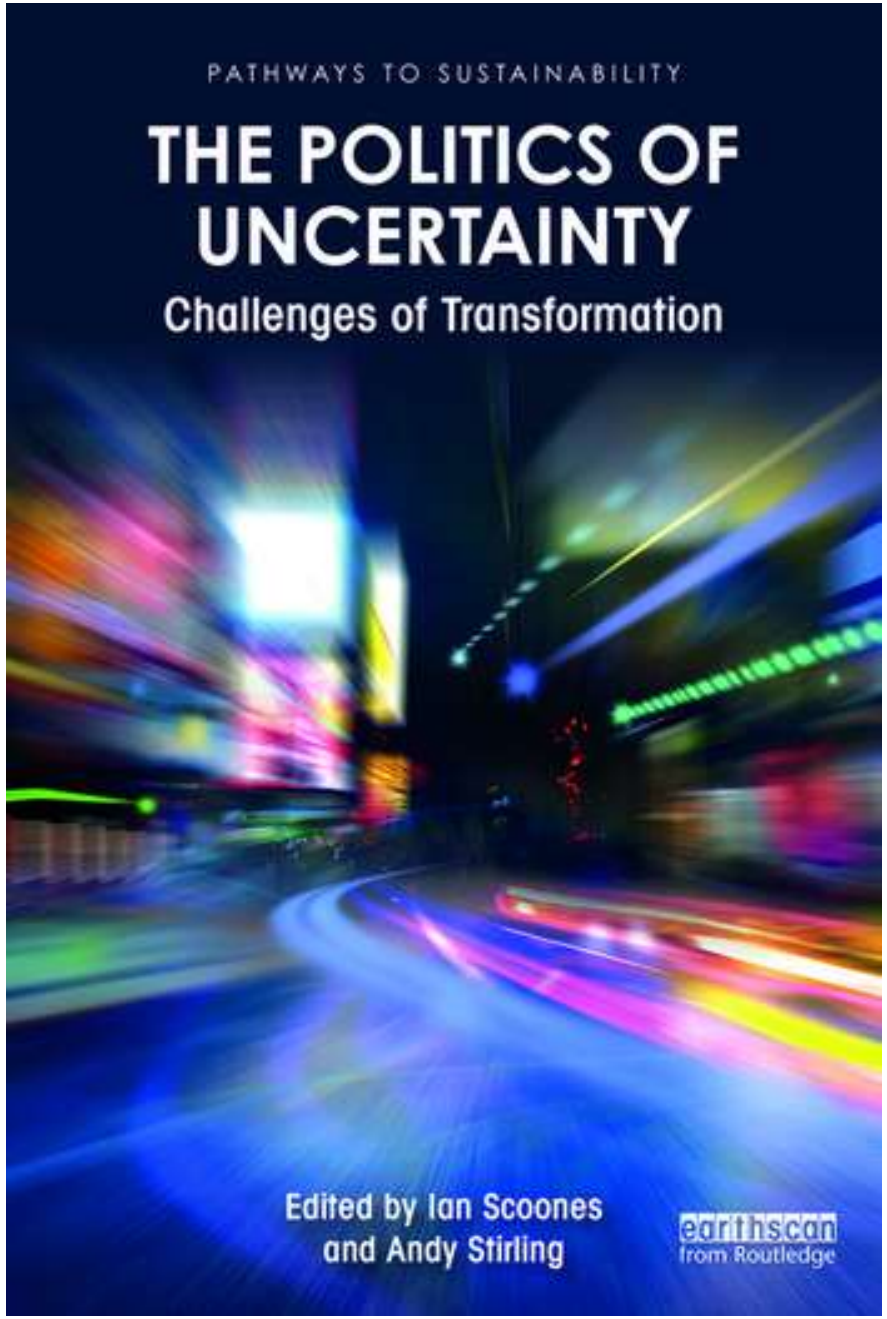
Andrea Saltelli [a, b], Lorenzo Benini [c], Silvio Funtowicz [a], Mario Giampietro [d, e], Matthias Kaiser [a], Erik Reinert [a, f], Jeroen P. van der Sluijs [a, g, h]

“It is not uncommon for political programs to be decided in advance simply by the choice of what expert representatives are included in the circle of advisers.”



1992 (1986)

Ulrich Beck
(1944 –2015)



3

SHARING RISKS OR PROLIFERATING UNCERTAINTIES?

Insurance, disaster and development

Leigh Johnson

Model-based parametric insurance led to dramatic consequences for developing countries during draughts

Open access: https://www.taylorfrancis.com/books/politics-uncertainty-ian-scoones-andy-stirling/e/10.4324/9781003023845

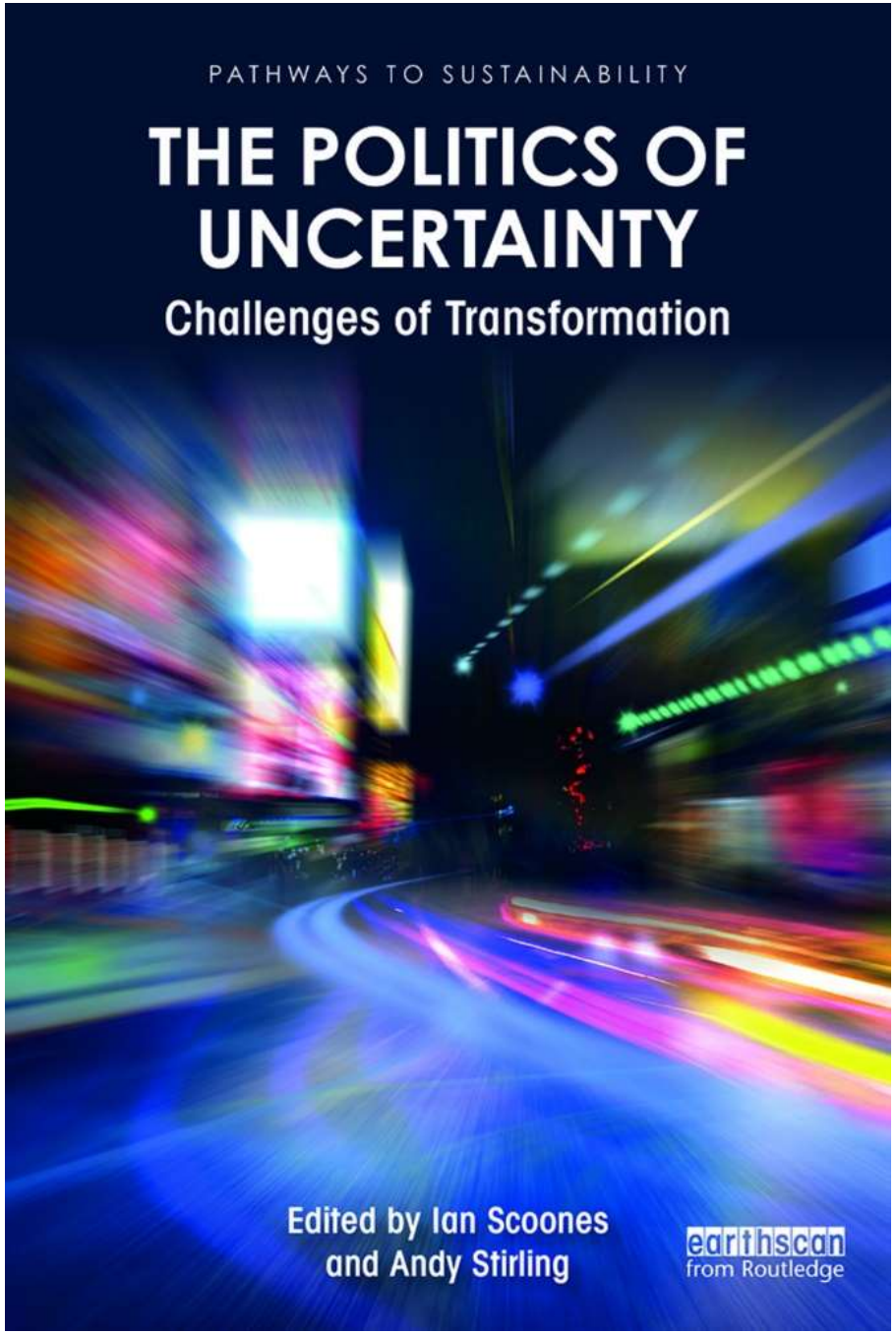
A recent critique of reductionism

4

THE UNRAVELLING OF TECHNOCRATIC ORTHODOXY?

Contemporary knowledge politics in technology regulation

Patrick van Zwanenberg



Frames as hypocognition & Socially constructed ignorance

Sense-making is possible only through processes of exclusion. Storytelling is possible only because of the mass of detail that we leave out. Knowledge is possible only through the systematic 'social construction of ignorance'

Steve Rayner Jerry Ravetz

Ravetz, J., R., 1987, Usable Knowledge, Usable Ignorance, Incomplete Science with Policy Implications, Knowledge: Creation, Diffusion, Utilization, 9(1), 87-116.
Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.

Rayner's (2012) strategies to deal with "uncomfortable knowledge".

1. Denial: "There isn't a problem"

2. Dismissal: "It's a minor problem"

Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.

Rayner's (2012) strategies to deal with "uncomfortable knowledge".

3. Diversion: "Yes I am working on it" (In fact I am working on something that is only apparently related to the problem)

Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.

Rayner's (2012) strategies to deal with "uncomfortable knowledge".

4. Displacement: "Yes and the model we have developed tells us that real progress is being achieved" (The focus in now the model not the problem).

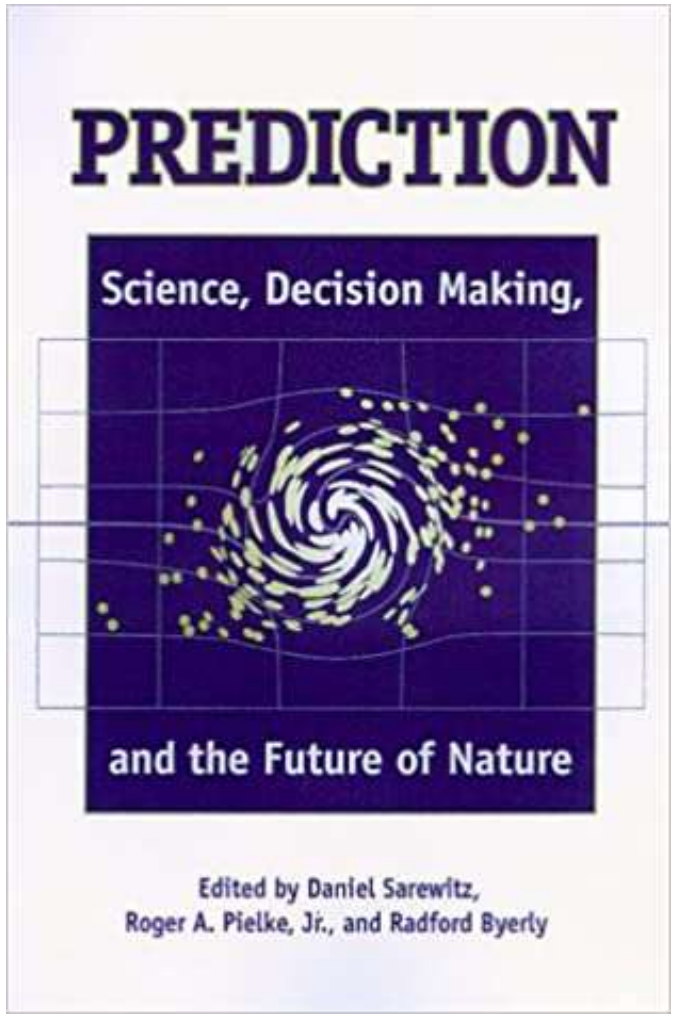
Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.

Example of displacement: Chesapeake Bay Program (CBP) modelling work

The model results – rather than the actual measurements, become the substance of use

"Bay models are used to track nutrient loads to ensure the cap is not exceeded"

Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.



Model GENESIS for beach erosion

US Army Corps of Engineers ®

Manipulated to support coastal-engineering projects

It neglected the role of extreme event

Sarewitz, D., Pielke, R. A. & Byerly, R. *Prediction: Science, Decision Making, and the Future of Nature* (Island Press, 2000).

Transactions of the Institute of British Geographers
Royal Geographical Society with IBG
Advancing geography and geographical learning

Doing flood risk science differently: an experiment in radical scientific method

S N Lane*, N Odoni*, C Landström**, S J Whatmore**, N Ward† and S Bradley‡

Involve stakeholders, accommodate multiple views and promote transparency, replication and analysis of sensitivity and uncertainty

Lane, S. N., Odoni, N., Landström, C., Whatmore, S. J., Ward, N. and Bradley, S., 2011. "Doing flood risk science differently: an experiment in radical scientific method." Transactions of the Institute of British Geographers, 36: 15-36.

[…] knowledge regarding flooding was co-produced … experts, both certified (academic natural and social scientists) and noncertified (local people affected by flooding)

➔ deep and distributed understanding of flood hydrology across all experts, certified and uncertified

Years of modeling stream flow and cost/benefit ratios for flood protection structures had failed to consider an alternative intervention—upstream storage of flood waters—until local stakeholders were brought into the modeling process.

Upstream storage was neglected in the models because of the "use of a pit-filling algorithm that made sure that all water flows downhill"!

Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance

Mind the framing

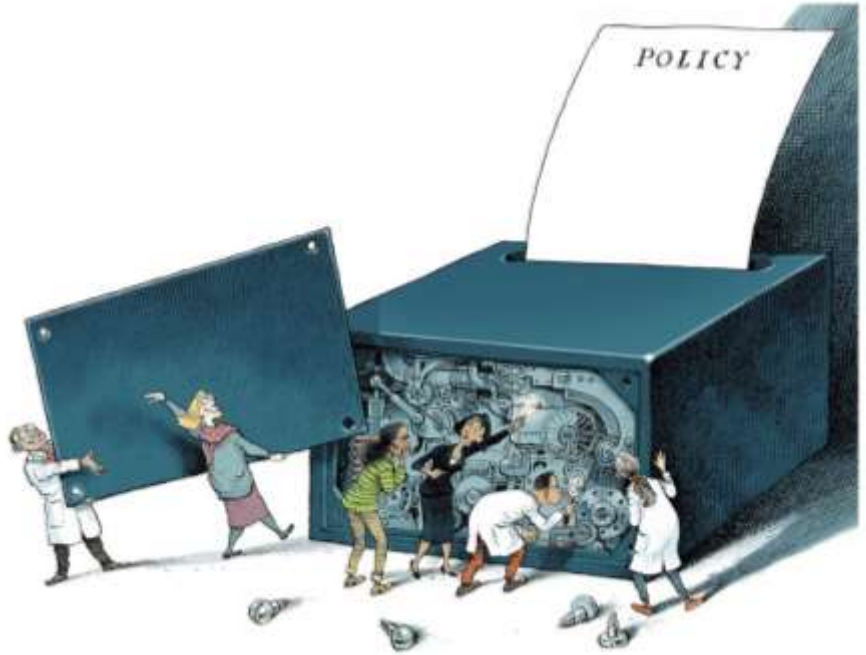
Match purpose and context

Mind the consequences

Quantification can backfire

Mind the unknowns

Acknowledge ignorance



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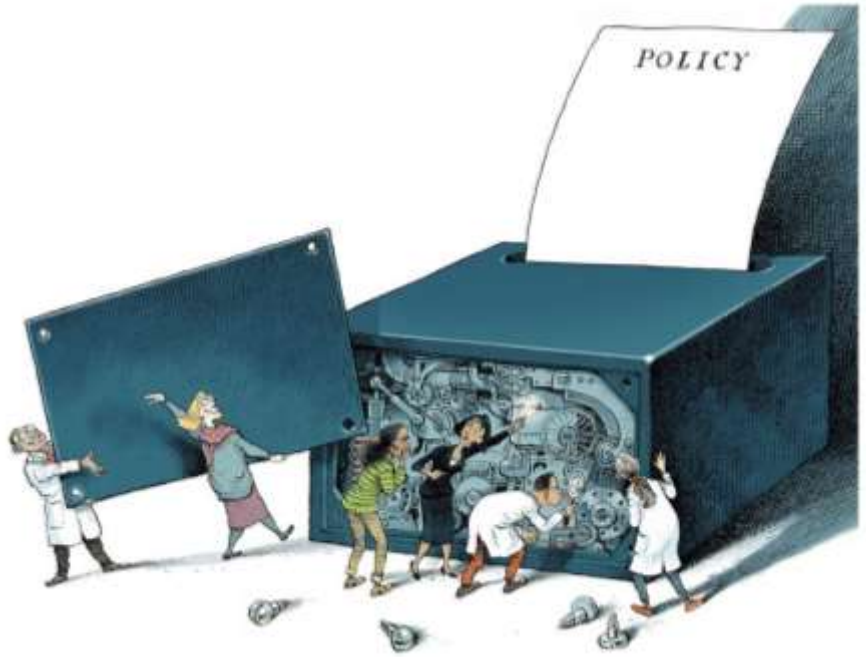


From the risk of financial products to the management of costal zones to the models for disaster insurance bad modelling may lead to wrong decisions

SUPPLEMENTARY INFORMATION

1. Additional information and references >260 references

THE NEW YORKER

"Carmen Reinhart and Kenneth Rogoff [...] famous (now infamous) research that conservative politicians around the world had seized upon to justify pennypinching Policies ..."

John Cassidy, April 2013 issue

"… rising levels of government debt are associated with much weaker rates of economic growth, indeed negative ones"

It was instead a coding error uncovered by three researchers at the university of Michigan.

"In Britain and Europe, great damage has been done as a result"

THE NEW YORKER

“The fact that software is commercial is no guarantee that it does what it's supposed to do” (Philip B. Stark)

http://www.stat.berkeley.edu/~stark/Preprints/auditingPosition09.htm#excel

Philip B. Stark

Perils of placing faith in a thin theory

By Wolfgang Münchau

April 21, 2013

FT
FINANCIAL TIMES

Reinhart and Rogoff told policy makers what they wanted to hear

The Rogoff-Reinhart data scandal reminds us economists aren't gods

Heidi Moore

Search The Guardian International edition

For 200 years

Caeteris are never paribus

Ceteris paribus or caeteris paribus is a Latin phrase meaning "all other things being equal" or "other things held constant" or "all else unchanged“ (Wikipedia)

The case of DSGE, dynamic stochastic general equilibrium models

Rational expectations of agents
Efficient market hypothesis

Philip Mirowski

Philip Mirowski, 2013, Never let a serious crisis go wasted, Verso Books.

The US senate and Queen Elisabeth perplexed…

Philip Mirowski, 2013, Never let a serious crisis go wasted, Verso Books.

An ethical problem in the use of models in economics?

Dangers of mathematization of economics

Wolfgang Drechsler

Erik S. Reinert

Paul Romer

Philip Mirowski

W. Drechsler, “On the possibility of quantitative-mathematical social science, chiefly economics,” *J. Econ. Stud.*, vol. 27, no. 4/5, pp. 246–259, 2000.

E. S. Reinert, “Full circle: economics from scholasticism through innovation and back into mathematical scholasticism,” *J. Econ. Stud.*, vol. 27, no. 4/5, pp. 364–376, Aug. 2000.

P. Romer, “Mathiness in the Theory of Economic Growth,” *Am. Econ. Rev.*, vol. 105, no. 5, pp. 89–93, May 2015.

Mirowski, Philip. 2013. Never Let a Serious Crisis Go to Waste: How Neoliberalism Survived the Financial Meltdown. Verso.

Paul Romer's Mathiness = use of mathematics to veil normative stances

"The style that I am calling mathiness lets academic politics masquerade as science"

P. M. Romer, "Mathiness in the Theory of Economic Growth," Am. Econ. Rev., vol. 105, no. 5, pp. 89–93, May 2015.

The Trouble With Macroeconomics

PAUL ROMER
Stern School of Business
New York University

Wednesday 14th September, 2016

"striking parallels between the characteristics of string-theorists in particle physics and postreal Macroeconomists"

Outspoken World Bank chief economist Paul Romer exits

Emails reveal clashes over issues ranging from grammar to methodology

© EPA

Shawn Donnan in Washington JANUARY 25 2018

FT FINANCIAL TIMES

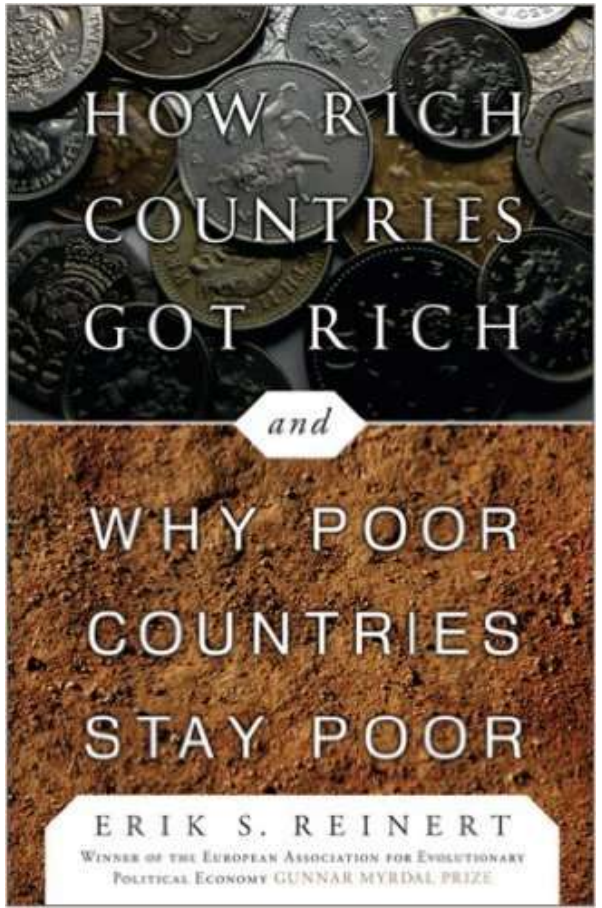
Methodological & normative conflicts, including over the methodology used in the World Bank's "Doing Business" rankings – Romer accused the bank staff of manipulating the data for political reasons (Chile, Michelle Bachelet)

https://www.ft.com/content/be72f8e2-0144-11e8-9650-9c0ad2d7c5b5
https://www.reuters.com/article/us-worldbank-economist-romer-idUSKBN1FD38Y

Economics has reverted to scholasticism

… forgetting an important continental tradition

… implications for developments



DSGE hearing in the US senate

‘*an event in 2010 that was literally unprecedented in the history of economic thought in America*’, p. 275

DSGE hearing in the US senate, with sworn testimony of economists such as **Sidney Winter, Scott Page, Robert Solow, David Colander and V.V. Chari**, to understand how 'theorists tools' had come to be used as policy instruments and why these instruments were all but useless in anticipating the economic crisis

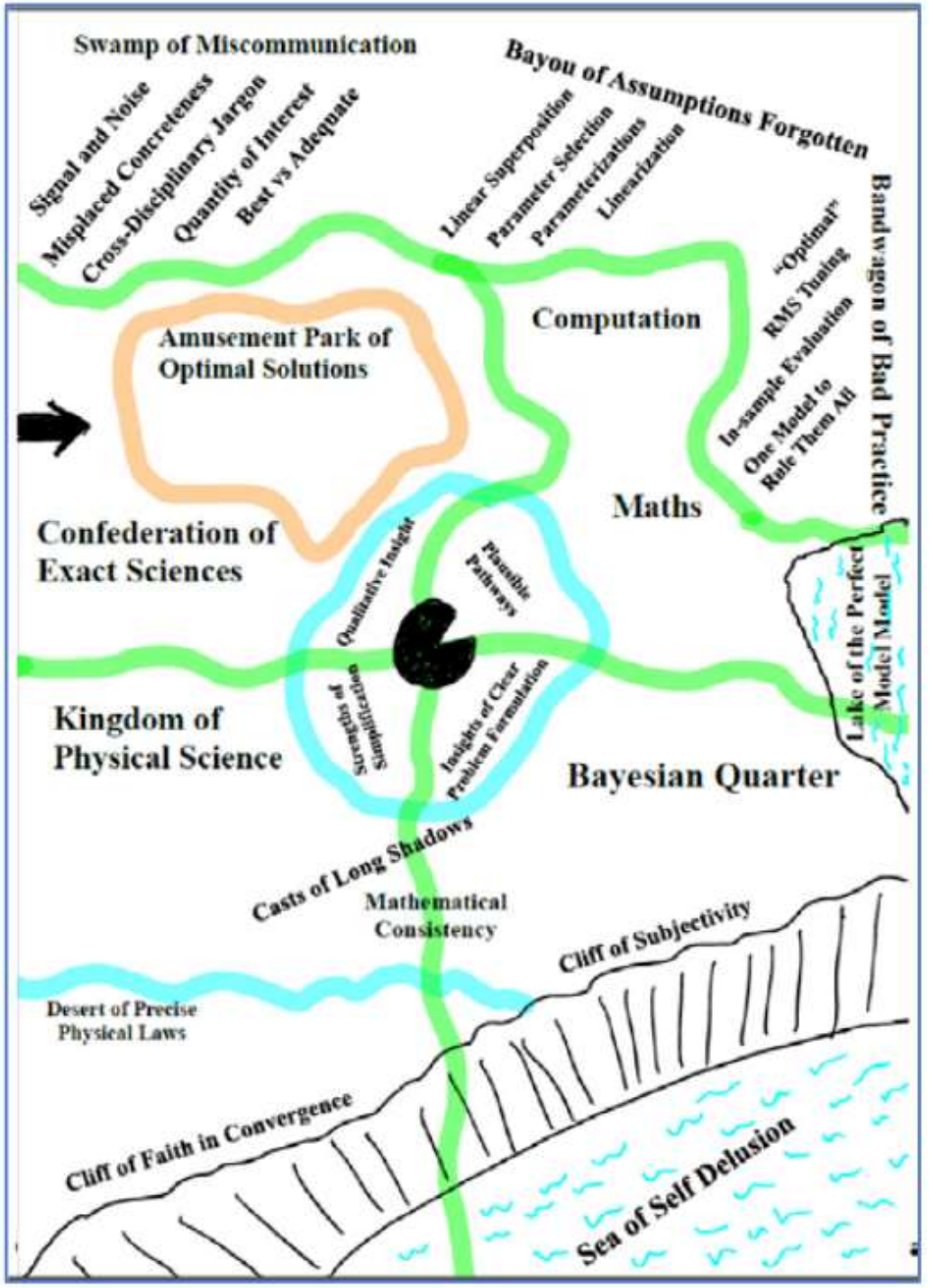
Economics
The Open-Access, Open-Assessment E-Journal

Discussion Paper
No. 2019-23 | March 08, 2019 | http://www.economics-ejournal.org/economics/discussionpapers

Escape from model-land

Erica L. Thompson and Leonard A. Smith

Beware <<"optimal" model-land quantities obtained from imperfect simulations>>



FELIX SALMON BUSINESS 02.23.2009 12:00 PM

Recipe for Disaster: The Formula That Killed Wall Street

David X. Li's Gaussian copula function as first published in 2000. Modelling gamma as a constant calibrated during periods of market growth simplified the pricing of financial products (e.g. CDO) but led to disasters when the market went the other way

https://www.wired.com/2009/02/wp-quant/

Edward E. Leamer

“Conclusions are judged to be sturdy only if the neighborhood of assumptions is wide enough to be credible and the corresponding interval of inferences is narrow enough to be useful”

Edward E. Leamer, 1990, Let's Take the Con Out of Econometrics, American Economics Review, 73 (March 1983), 31-43.

With the ashes of the mathematical models used to rate mortgage-backed securities still smoldering on Wall Street, now is an ideal time to revisit the sensitivity issues.

Edward E. Leamer

Tantalus on the Road to Asymptopia, Edward E. Leamer, 2010 *Journal of Economic Perspectives*, **24**, (2), 31-46.

"… economists at work who routinely pass their data through the filters of many models and then choose a few results for reporting purposes" *Ibidem*

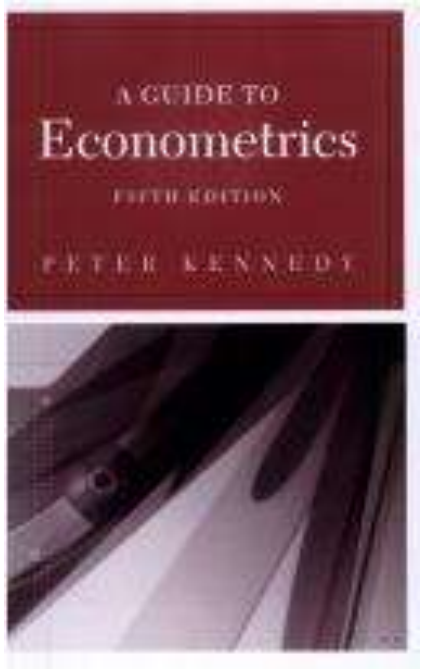
"One reason these methods [global sensitivity analysis] are rarely used is their honesty seems destructive;"

Ibidem

"or, to put it another way, a fanatical commitment to fanciful formal models is often needed to create the appearance of progress."

Ibidem

Peter Kennedy, A Guide to Econometrics.



Peter Kennedy

Anticipating criticism by applying sensitivity analysis. This is one of the ten commandments of applied econometrics according to Peter Kennedy:

“Thou shall confess in the presence of sensitivity. Corollary: Thou shall anticipate criticism “

New WHO estimates: Up to 190 000 people could die of COVID-19 in Africa if not controlled

07 May 2020

Brazzaville – Eighty-three thousand to 190 000 people in Africa could die of COVID-19 and 29 million to 44 million could get infected in the first year of the pandemic if containment measures fail, a new study by the World Health Organization (WHO) Regional Office for Africa finds. The research, which is based on prediction modelling, looks at 47 countries in the

Speculative scenario in which ten uncertain input probabilities are increased by an arbitrary 10% — as if they were truly equally uncertain — with no theoretical or empirical basis for such a choice

World Health Organization
REGIONAL OFFICE FOR Africa

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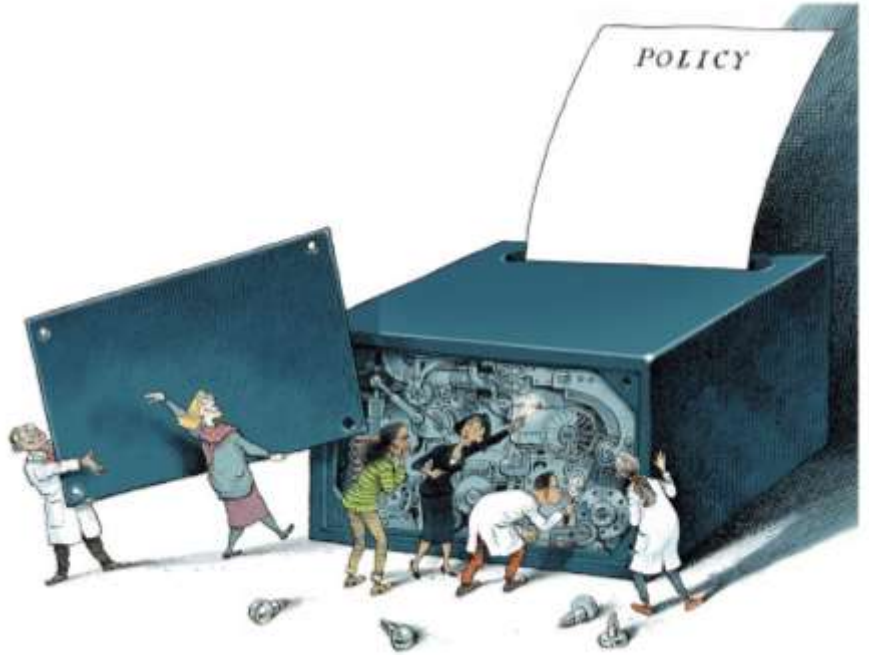
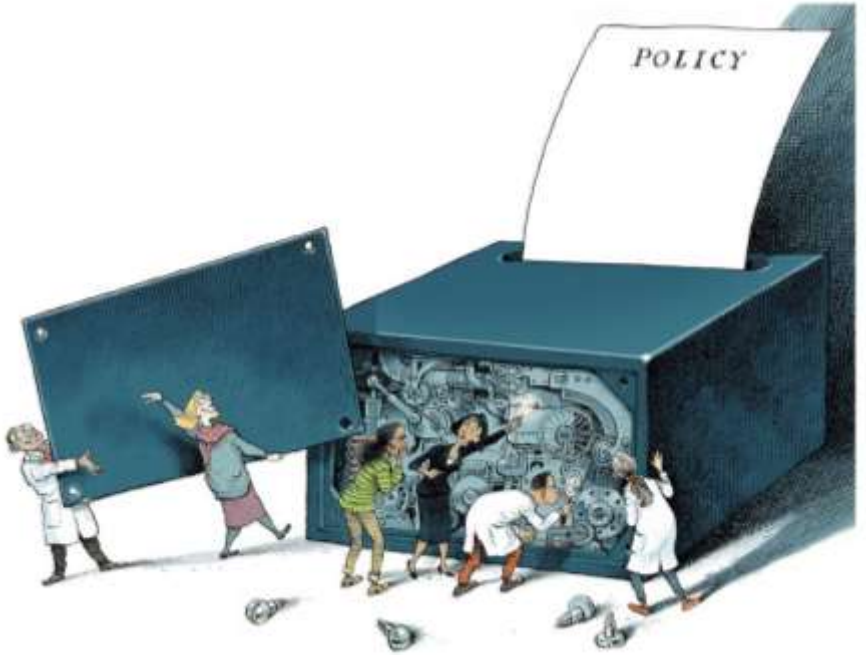


Mind the unknowns

Acknowledge ignorance

Mind the unknowns

Acknowledge ignorance



"there is no number-answer to your question"

Anthony Fauci

SUPPLEMENTARY INFORMATION

1. Additional information and references

>260 references

ELSEVIER

Futures

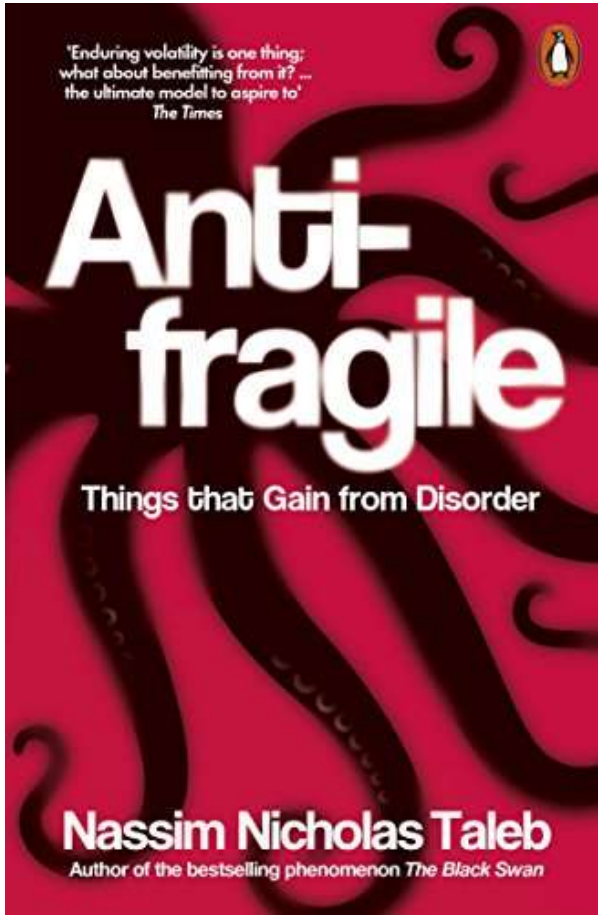
Volume 91, August 2017, Pages 62-71

Original research article

What is wrong with evidence based policy, and how can it be improved?

Andrea Saltelli [a, b, c] ✉, Mario Giampietro [a, c, d]

Responsible use of quantitative information; try via negativa (N. Taleb); instead of proving policy options try to falsify them



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Volume 91, August 2017, Pages 62-71

Original research article

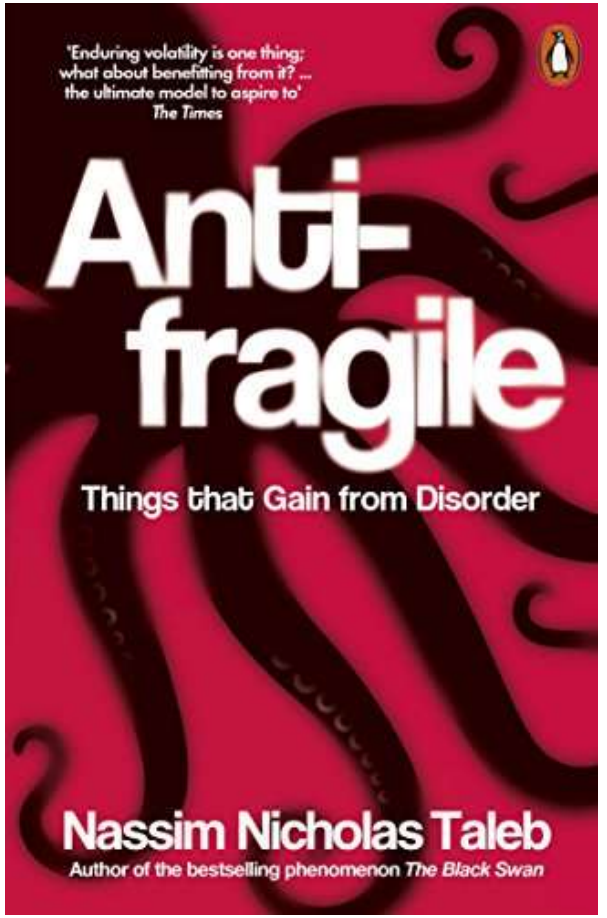
What is wrong with evidence based policy, and how can it be improved?

Andrea Saltelli [a, b, c] ✉, Mario Giampietro [a, c, d]

"…we know what is wrong with more clarity than what is right, and that knowledge grows by subtraction

… easier to know that something is wrong than to find the fix.

Actions that remove are more robust than those that add because addition may have unseen, complicated feedback loops."



Falsification of the available options based on:

- Feasibility (compatibility with external constraints),
- Viability (compatibility with internal constraints), and
- Desirability (compatibility with normative values adopted in the given society)

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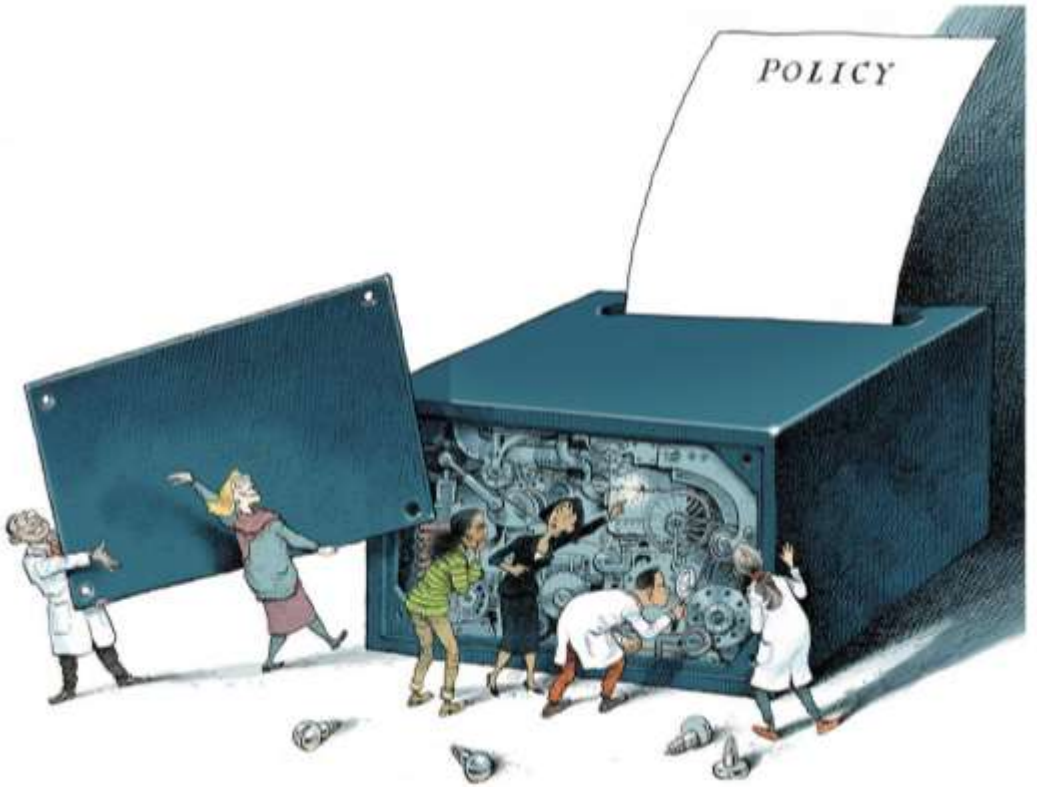
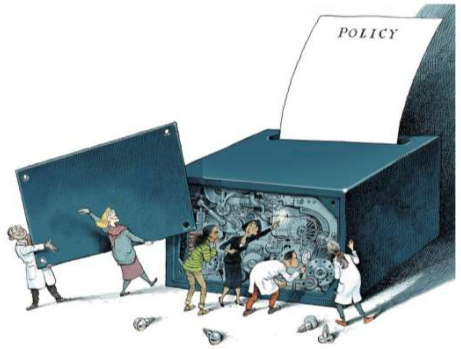
Five ways to ensure that models serve society: a manifesto



➔ Responsible modelling; reciprocal domestication between models and society



“Modellers must not be permitted to project more certainty than their models deserve;

and politicians must not be allowed to offload accountability to models of their choosing”

When All Models Are Wrong

BY ANDREA SALTELLI, SILVIO FUNTOWICZ

From sensitivity analysis to sensitivity auditing

The End

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