

The challenge of quantification: an interdisciplinary reading

Andrea Saltelli



Seminar at the Society for the Social Study of Quantification, SSSQ, May 31st 2023



<https://en.ird.fr/project-sssq-society-social-studies-quantification>



Coming Out Soon: The politics of modelling




Praise for the volume

"A long awaited examination of the role —and obligation —of modeling."

Nassim Nicholas Taleb , Distinguished Professor of Risk Engineering, NYU Tandon School of Engineering. Author, of the 5 -volume series *Incerto*.


"A breath of fresh air and a much needed

Mastodon Toots by
@AndreaSaltelli




[Boost]
JustSaba
2023/3/27 10:08

[Boost]:0
[Favourite]:0



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AndreaSaltelli
2023/3/27 9:05
Fresh from the press

The Challenge of Quantification: An Interdisciplinary Reading MINERVA 2022

Models with higher effective dimensions tend to produce more uncertain estimates SCIENCE ADVANCES 2022

What can mathematical modelling contribute to a sociology of quantification? HUMANITIES SOCIAL SCIENCE COMMUNICATIONS 2023

A series of recent works spanning sociology of quantification and mathematical modelling

FORTHCOMING



**the politics
of modelling**
*numbers between
science and policy*

edited by
Andrea Saltelli
& Monica Di Fiore

OXFORD

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



**UCL Institute for
Innovation and
Public Purpose**

WORKING PAPER
WP 2021/05



A constant concern: the
treatment of uncertainty in
quantification

Uncertainty is the locus of power conflicts; it can be inflated or deflated according to interests e.g. in regulatory capture





Futures

Volume 135, January 2022, 102860



Science, the endless frontier of regulatory capture

[Andrea Saltelli](#)^a  , [Dorothy J. Dankel](#)^{b c}, [Monica Di Fiore](#)^d, [Nina Holland](#)^e, [Martin Pigeon](#)^e

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<https://doi.org/10.1016/j.futures.2021.102860> 

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Readings I liked

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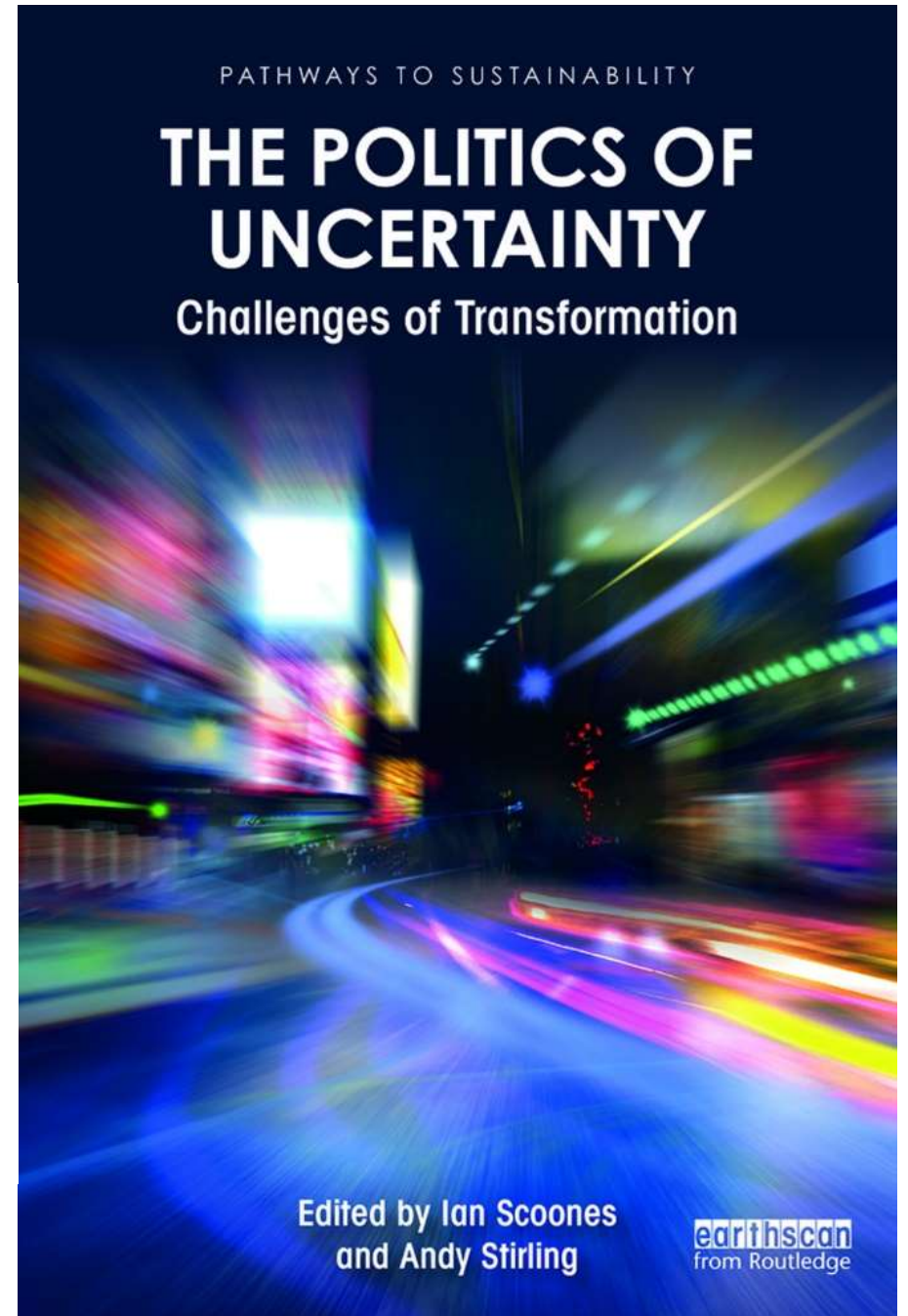
Suggested chapter



THE UNRAVELLING OF TECHNOCRATIC ORTHODOXY?

Contemporary knowledge politics
in technology regulation

Patrick van Zwanenberg



Readings I liked

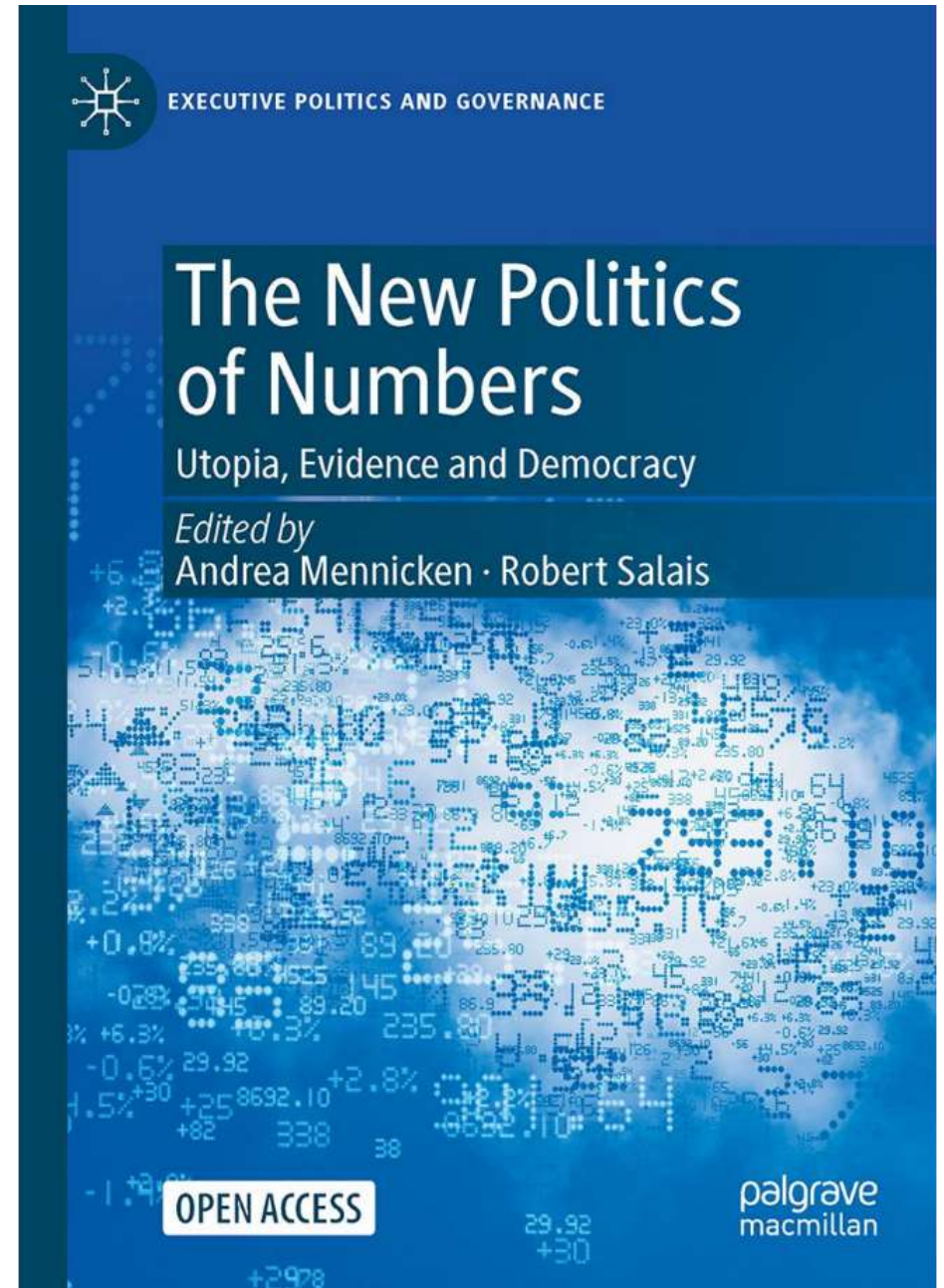
Suggested chapter



CHAPTER 12











“La donnée n’est pas un donné”: Statistics,
Quantification and Democratic Choice

Robert Salais





Impact assessment culture in the European Union. Time for something new?



[Andrea Saltelli](#)^{a b}  , [Marta Kuc-Czarnecka](#)^c , [Samuele Lo Piano](#)^d ,
[Máté János Lőrincz](#)^d , [Magdalena Olczyk](#)^c , [Arnald Puy](#)^e , [Erik Reinert](#)^{f g} ,
[Stefán Thor Smith](#)^d , [Jeroen P. van der Sluijs](#)^{b h} 

Own works:
uncertainty in impact
assessment

Use more ‘lenses’
Non-Ricardian Economics
Post normal science
System ecology (a-la-Rosen)
(Feminist economics)



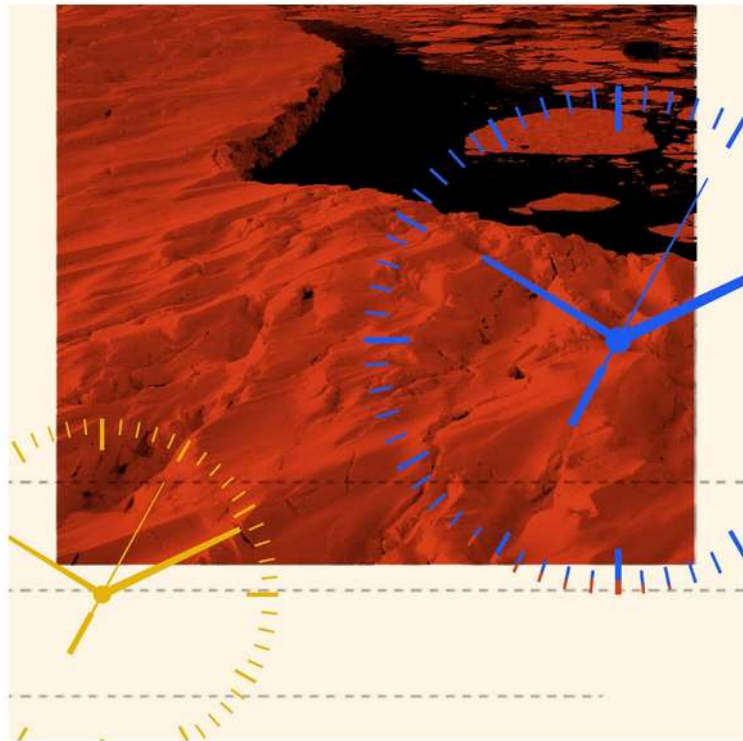
The technique is never neutral. How methodological choices condition the generation of narratives for sustainability

[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}

Do we live immersed in
fantastic numbers?

'The Most Important Number You've Never Heard Of'

Sept. 17, 2021



“social cost of carbon:

=\$56 a ton on average at a 3 percent discount rate

=\$171 a ton on average at a 2 percent discount rate”

The New York Times

nature climate change

Article

<https://doi.org/10.1038/s41558-023-01680-x>


Social cost of carbon estimates have increased over time

Richard S. J. Tol

Received: 3 August 2022

Accepted: 23 April 2023

Published online: 15 May 2023

 Check for updates

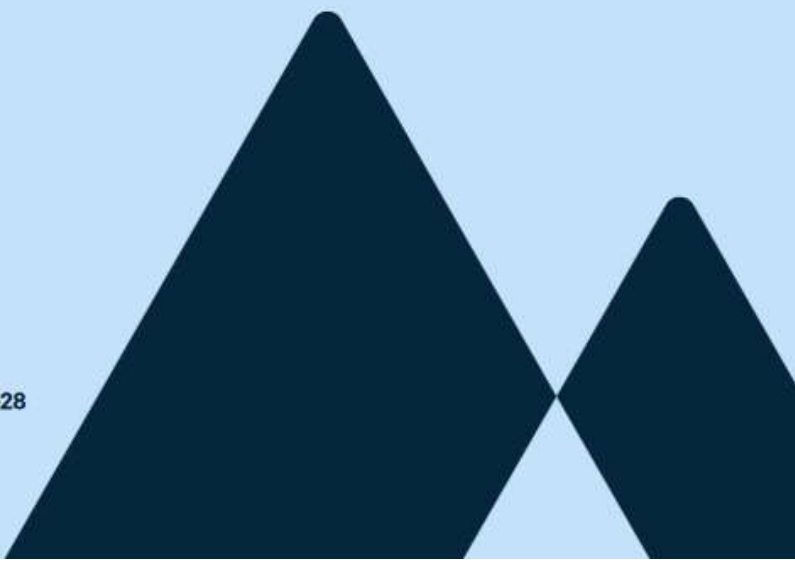
Mathematical models predicting the damage in dollars from hurricanes and draughts up to the year 2300


RESOURCES
for the FUTURE

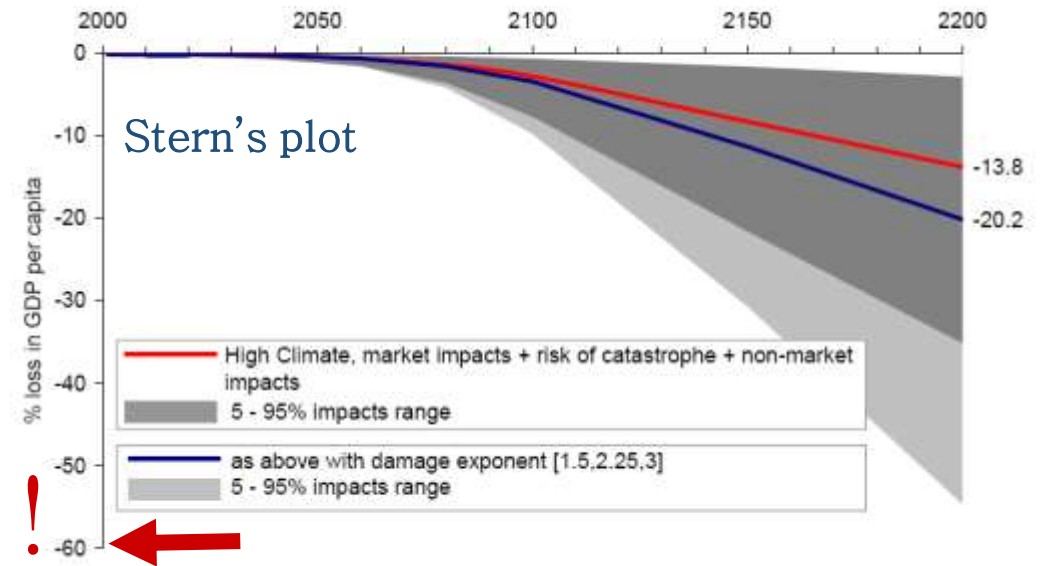
The Social Cost of Carbon: Advances in Long-Term Probabilistic Projections of Population, GDP, Emissions, and Discount Rates

Kevin Rennert, Brian C. Prest, William A. Pizer, Richard G. Newell, David Anthoff, Cora Kingdon, Lisa Rennels, Roger Cooke, Adrian E. Raftery, Hana Ševčíková, and Frank Errickson

Working Paper 21-28
October 2021



The Stern–Nordhaus controversy;
 a reverse engineering the model:
 → uncertainty is too large to take
 decisions → both Stern and
 Nordhaus are wrong



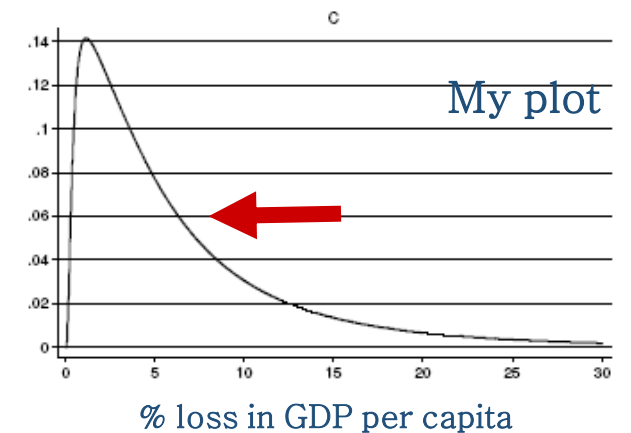
Global Environmental Change 20 (2010) 298–302



Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha



Sensitivity analysis didn't help. A practitioner's critique of the Stern review

Andrea Saltelli *, Beatrice D'Hombres

Joint Research Centre, Institute for the Protection and Security of the Citizen, Ispra, Italy

Still we have mega initiatives such as Destination Earth and its Digital Twins to ‘tame the uncertainty’ in climate science

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Review Article | [Published: 02 May 2023](#)

Big Data in Earth system science and progress towards a digital twin

[Xin Li](#) , [Min Feng](#) , [Youhua Ran](#), [Yang Su](#), [Feng Liu](#), [Chunlin Huang](#), [Huanfeng Shen](#), [Qing Xiao](#), [Jianbin Su](#), [Shiwei Yuan](#) & [Huadong Guo](#)

[Nature Reviews Earth & Environment](#) **4**, 319–332 (2023) | [Cite this article](#)

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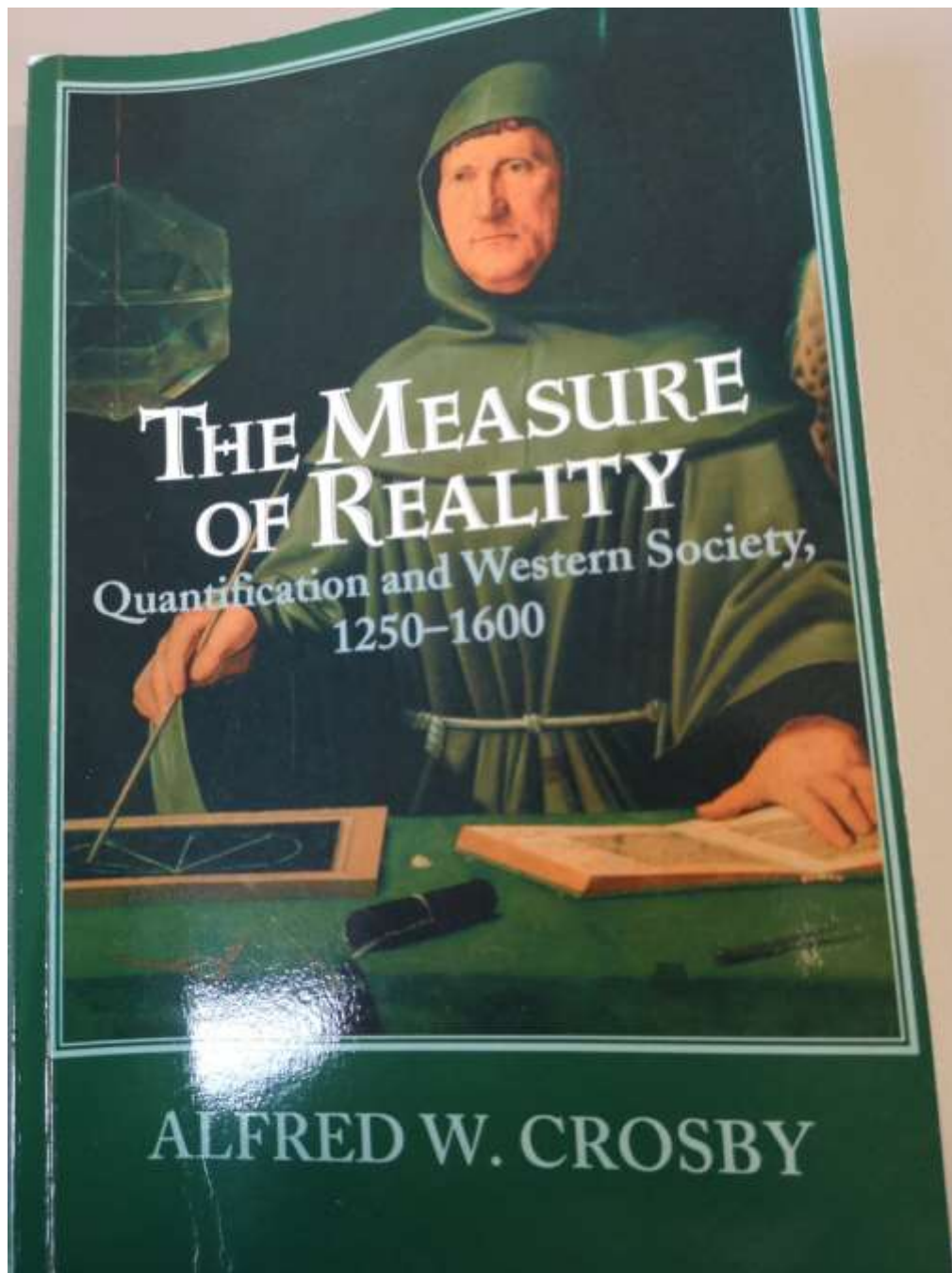
A digital twin of Earth for the green transition

[Peter Bauer](#) , [Bjorn Stevens](#) & [Wilco Hazeleger](#)

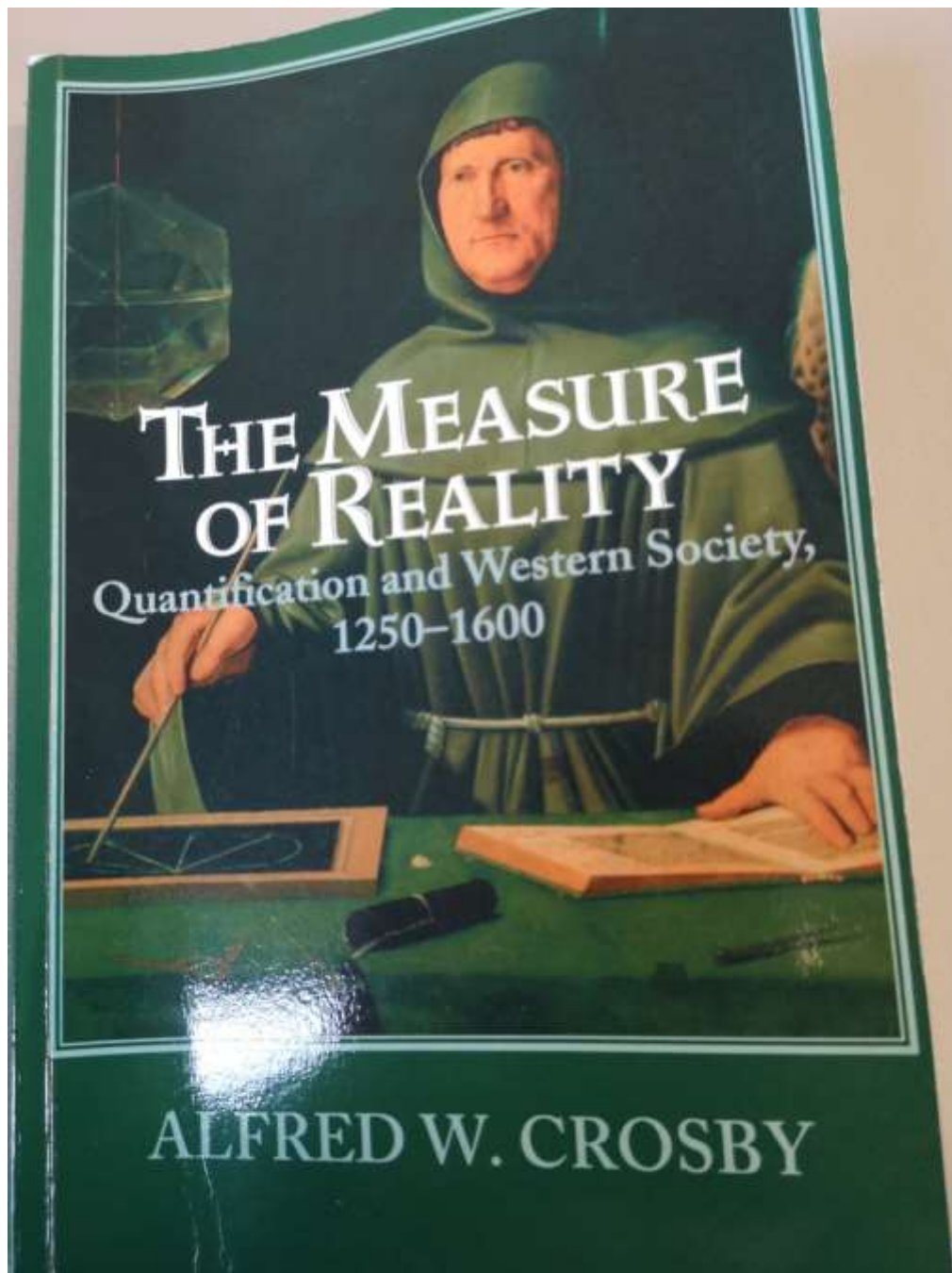
[Nature Climate Change](#) **11**, 80–83 (2021) | [Cite this article](#)

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How did we get there?



Were quantification and visualization the engine inside the engine of western success and domination?



Quantification and visualization of space and time gave rise in the XIV century to a true revolution, in music, painting, accounting, cartography, astronomy ...

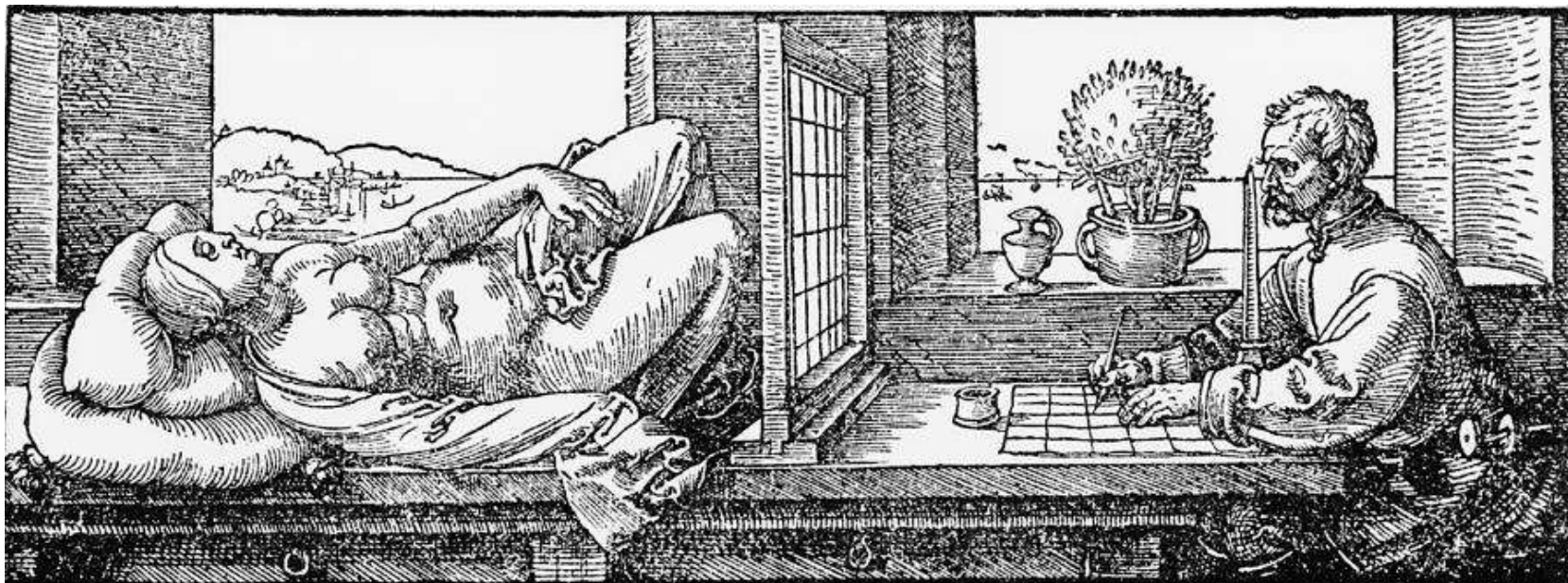
Pieter Bruegel the Elder, Temperance, 1560

Measuring:
military
technology,
accounting,
perspective,
polyphonic
music, the
windmill,
the watch ...

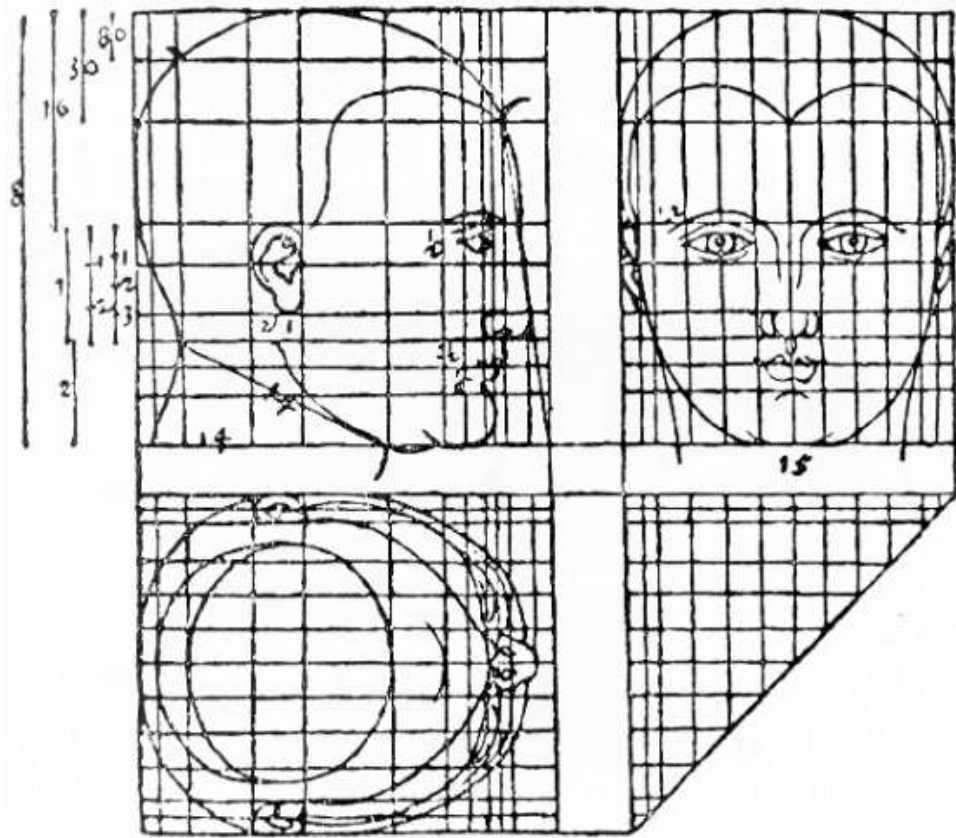




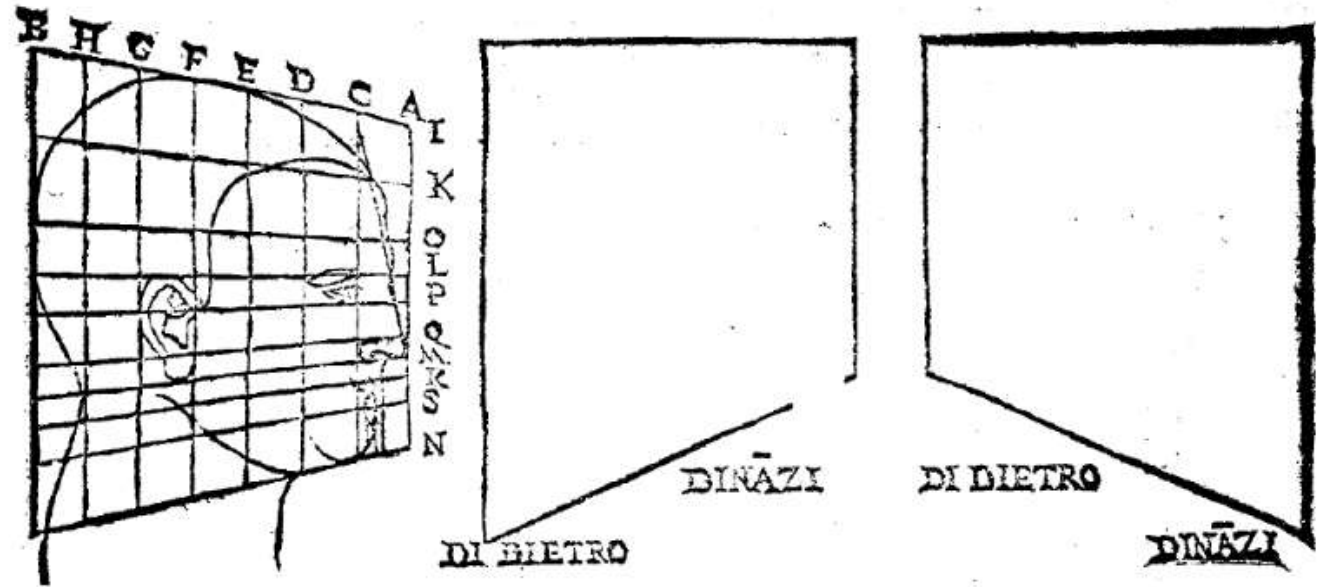
The Annunciation,
Carlo Crivelli
(1435, 1495)



Draftsman Drawing a Reclining Nude
Albrecht Dürer (1471–1528)



DELLA SIMMETRIA



From “De Varietate figurarum”
Albrecht Dürer (1471–1528)

More in this video recorded by UOC:
<https://www.youtube.com/watch?v=eHtJUSxoioI&t=921s>

In the formulation of Condorcet: “All the errors in politics and in morals are founded upon philosophical mistakes, which, themselves, are connected with physical errors” (Ninth Epoch)



Nicolas de Caritat, marquis de
Condorcet
(1743– 1794)

‘Sketch for a Historical Picture of
the Progress of the Human Spirit’

<http://oll.libertyfund.org/titles/1669>

Ethics of quantification

Andrea
Saltelli



Many voices of alarm as to
misuse of quantification

With numbers both visible and
invisible...

Blurring lines:

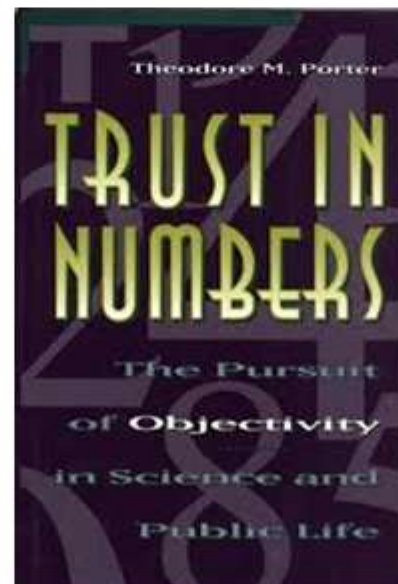
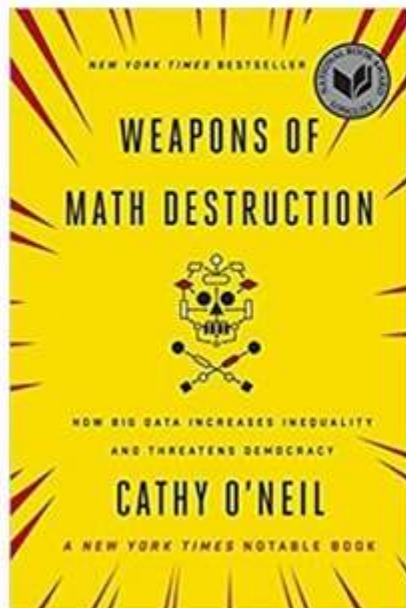
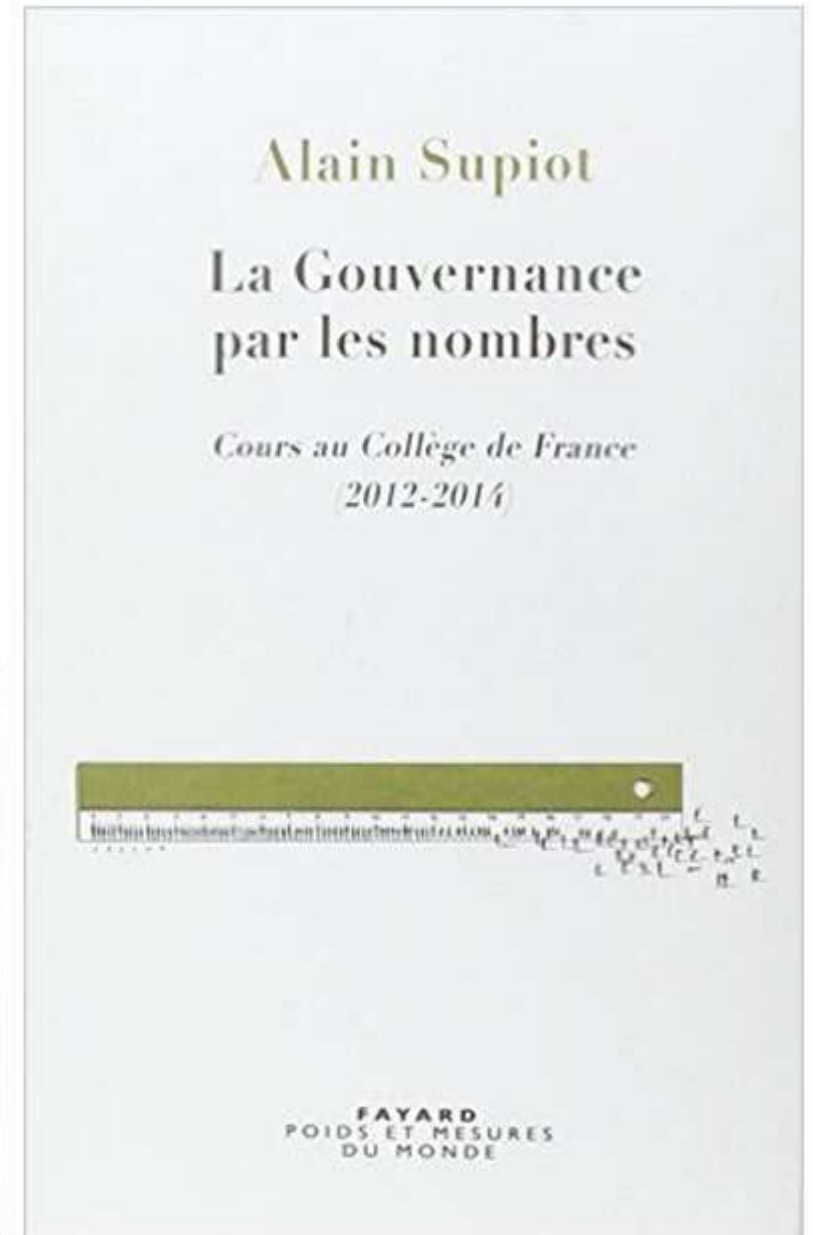
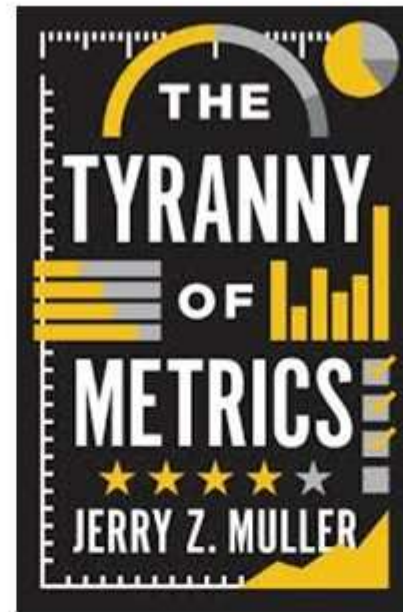
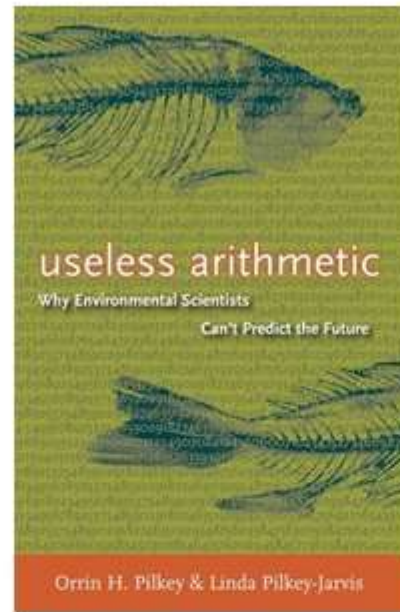
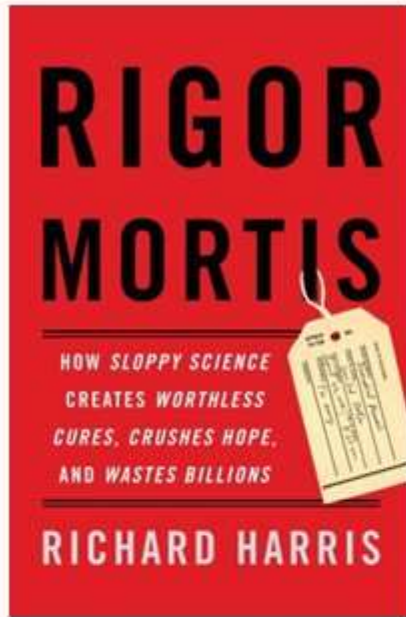
“what qualities are specific to rankings, or indicators, or models, or algorithms?”



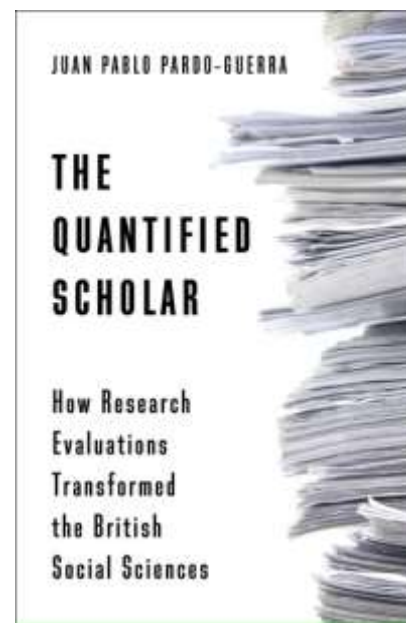
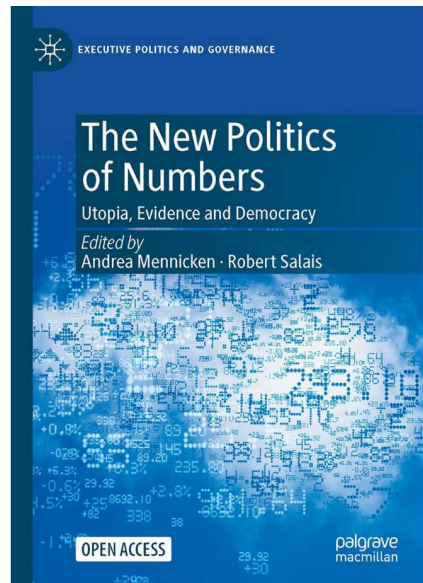
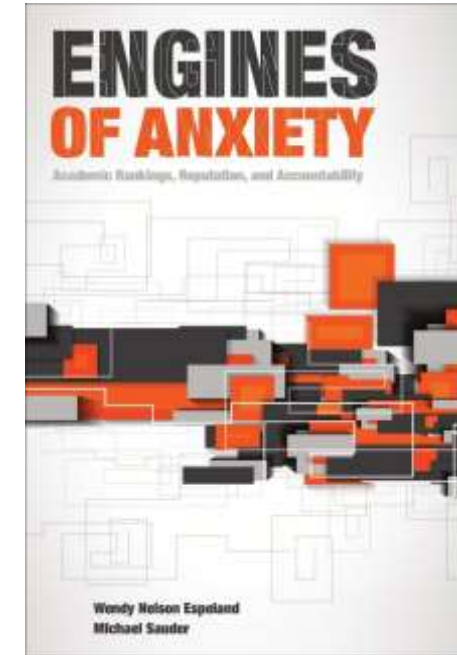
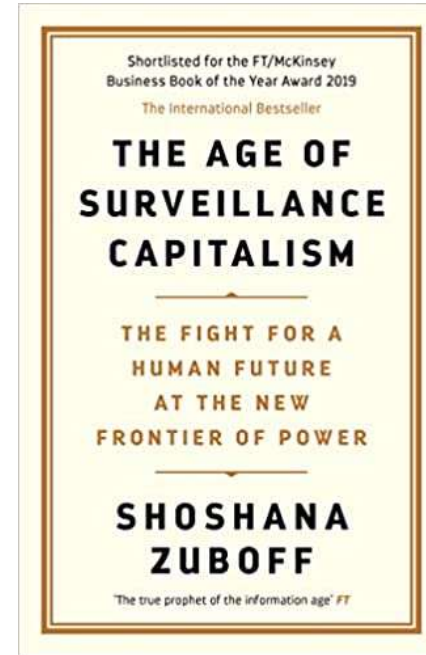
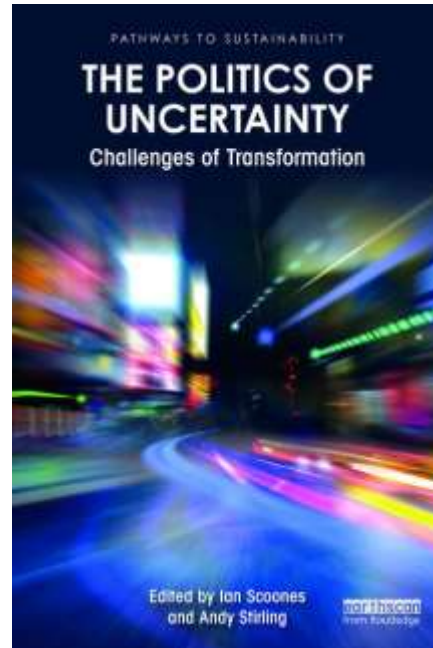
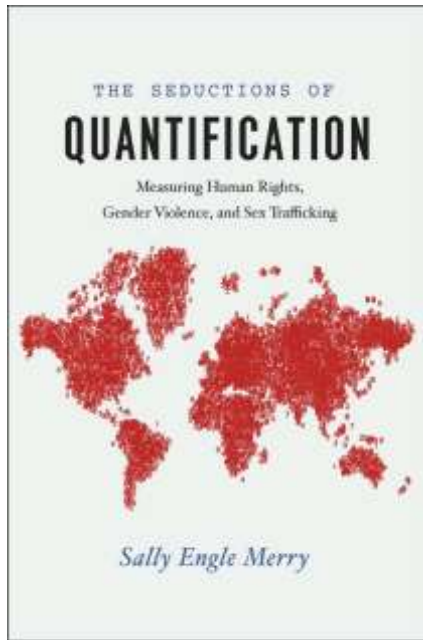
Elizabeth
Popp Berman

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

Algorithms, models, metrics, statistics...

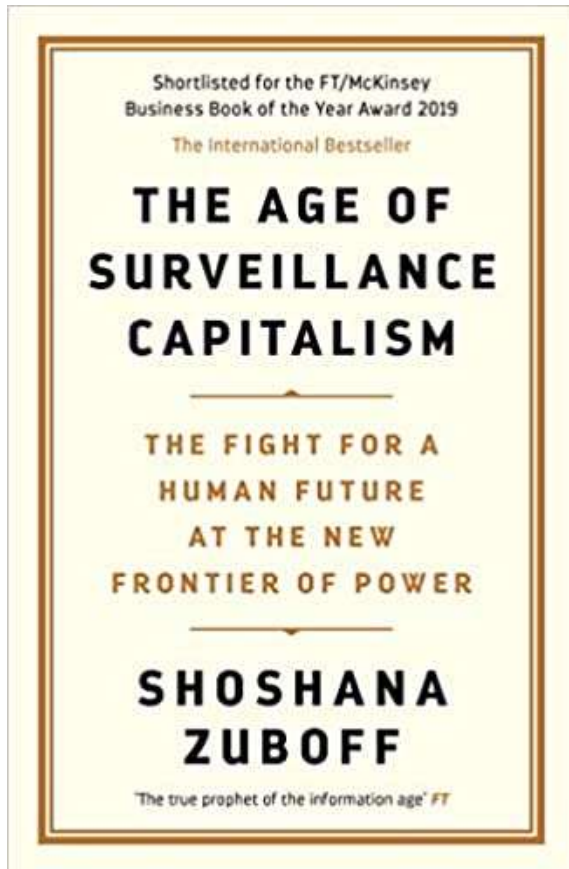


Algorithms, models, metrics, statistics...





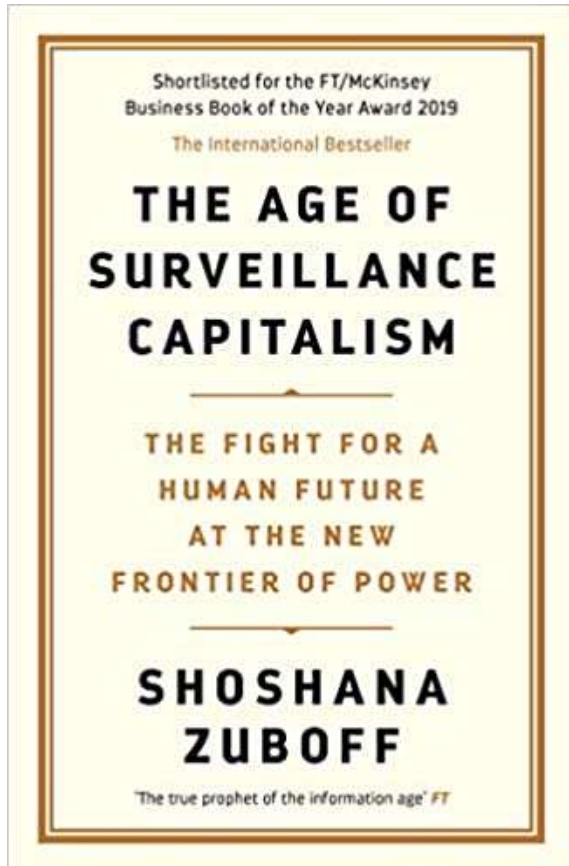
A project of domination of consumers and voters is made possible by artificial intelligence, big data & cognitive psychology



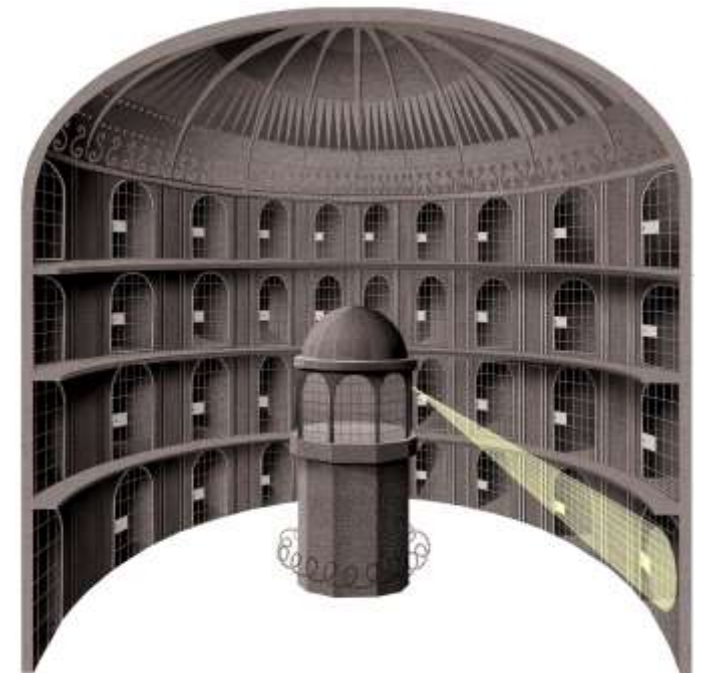
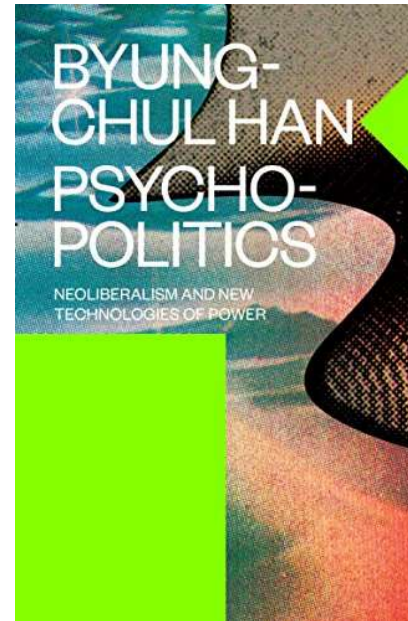
Inequality, power asymmetries and the world of surveillance capitalism

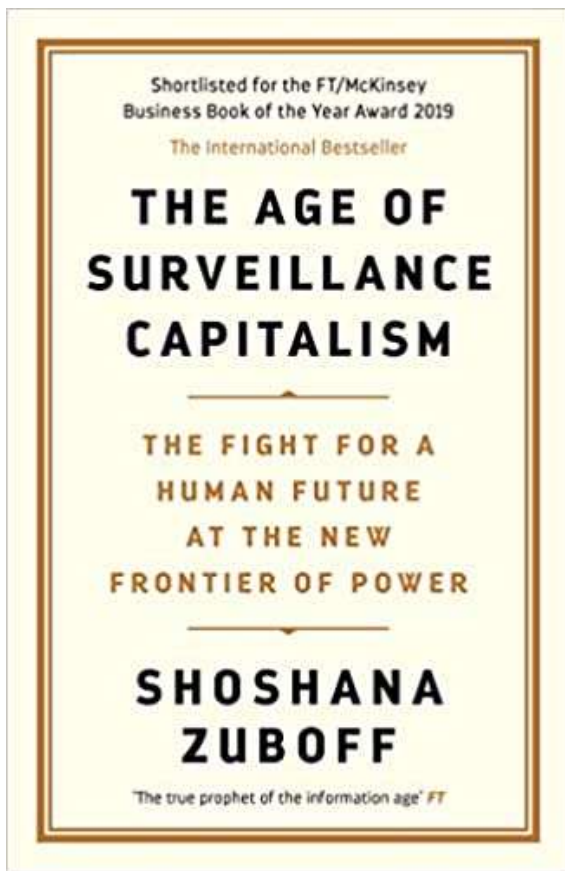


... and the surveillance is voluntarily accepted



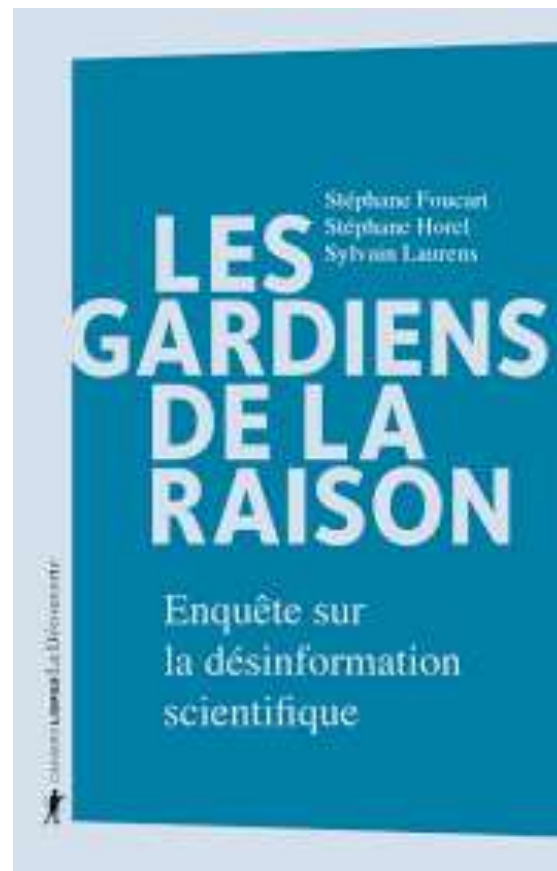
Byung Chul Han 'virtual panopticon'





Chapters 11 & 12

Instrumentarian
power



Chapter 10

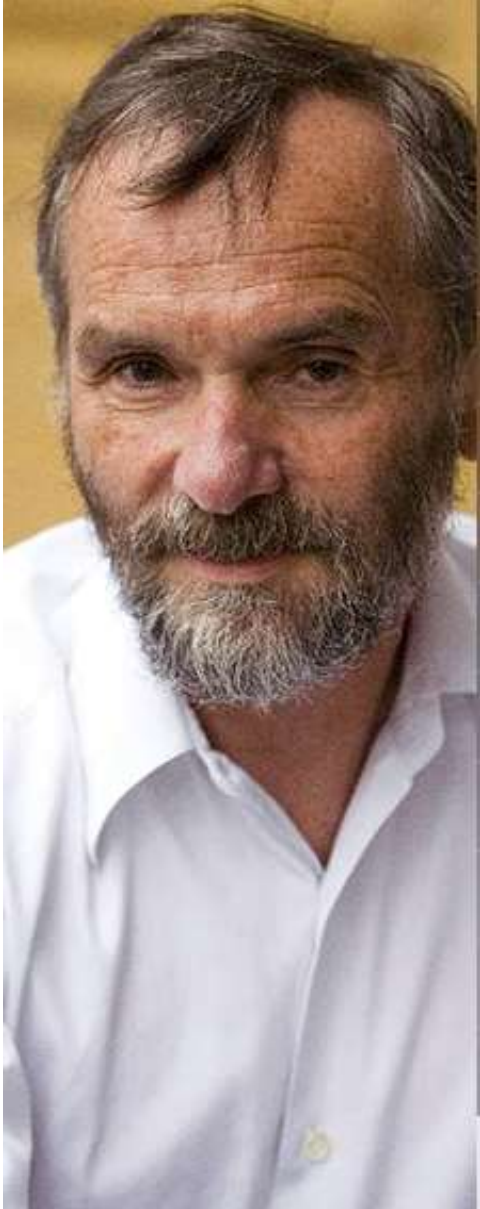
Néorationalism d'importation

*La trollisation de l'espace
public*

AI empowered with
cognitive psychology

A project of domination?

Alain Supiot

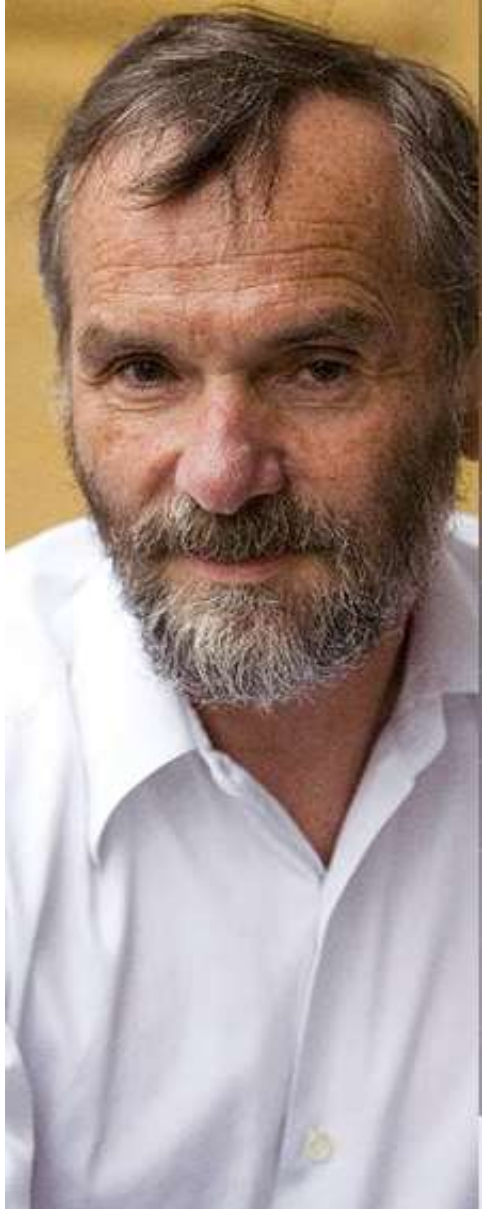


An indictment of the Total Market and the normative uses of economic quantification

<https://www.college-de-france.fr/site/en-alain-supiot/Governance-by-Numbers-Introduction.htm>



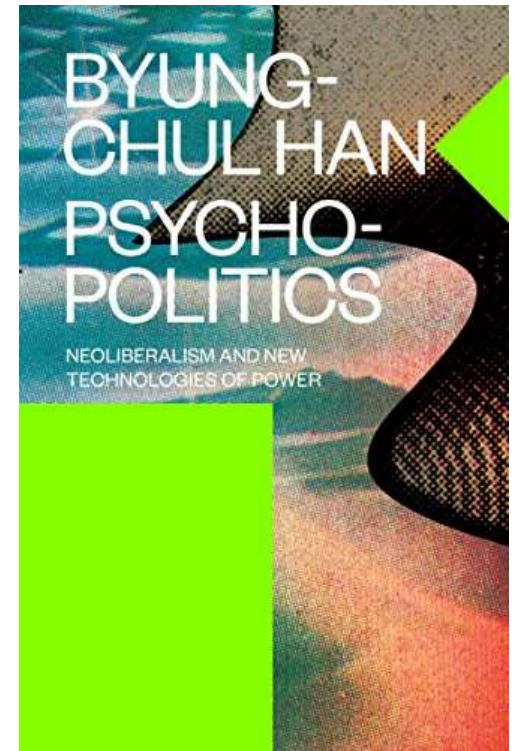
Alain Supiot



...we have entered the era of the cybernetic imaginary, which revives the West's age-old dream of grounding social harmony in calculations.

Same diagnosis about the neoliberal 'exploitation of freedom' from Byung Chul Han

Slave of ourselves



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.



UCL Institute for
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Public Purpose



UCL

WORKING PAPER
WP 2021/07

Altered States: Cartesian and Ricardian dreams

Erik S. Reinert

Tallinn University of Technology

UCL Institute for Innovation and Public Purpose

Monica di Fiore

Institute for Cognitive Sciences and Technologies, Consiglio Nazionale delle Ricerche

Andrea Saltelli

Open Evidence Research, Universitat Oberta de Catalunya (UOC)

Jerome R. Ravetz

Institute for Science, Innovation and Society, University of Oxford

Again ;-) more in this video recorded by UOC:
<https://www.youtube.com/watch?v=eHtJUSxoioI&t=921s>

In the formulation of Condorcet: “All the errors in politics and in morals are founded upon philosophical mistakes, which, themselves, are connected with physical errors” (Ninth Epoch)



Nicolas de Caritat, marquis de
Condorcet
(1743- 1794)

'Sketch for a Historical Picture of
the Progress of the Human Spirit'

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Ethics of quantification

Andrea
Saltelli



Mathematical and statistical models

nature communications

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A short comment on statistical versus mathematical modelling

[Andrea Saltelli](#) 

[Nature Communications](#) **10**, Article number: 3870 (2019) | [Cite this article](#)

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.

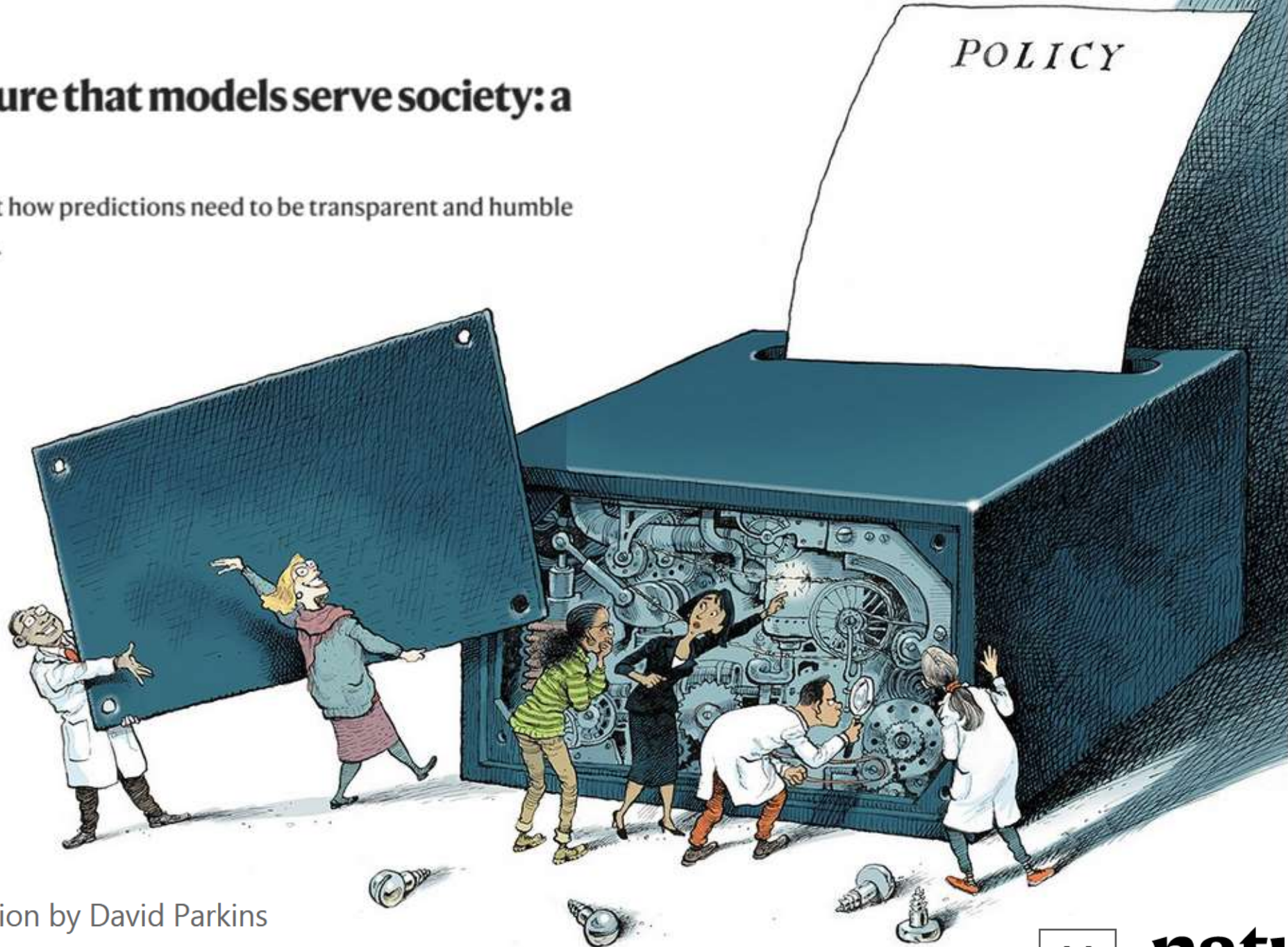


Illustration by David Parkins



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 Lo Piano, Puy, Saltelli

2 experts models and

society Pielke, van der Sluijs

3 statisticians Mayo, Stark, Portaluri

2 statactivistes Bruno, Didier

2 economists Kay, Raynert

1 epidemiologist Vineis

2 sociologists of quantification

Espeland, Porter

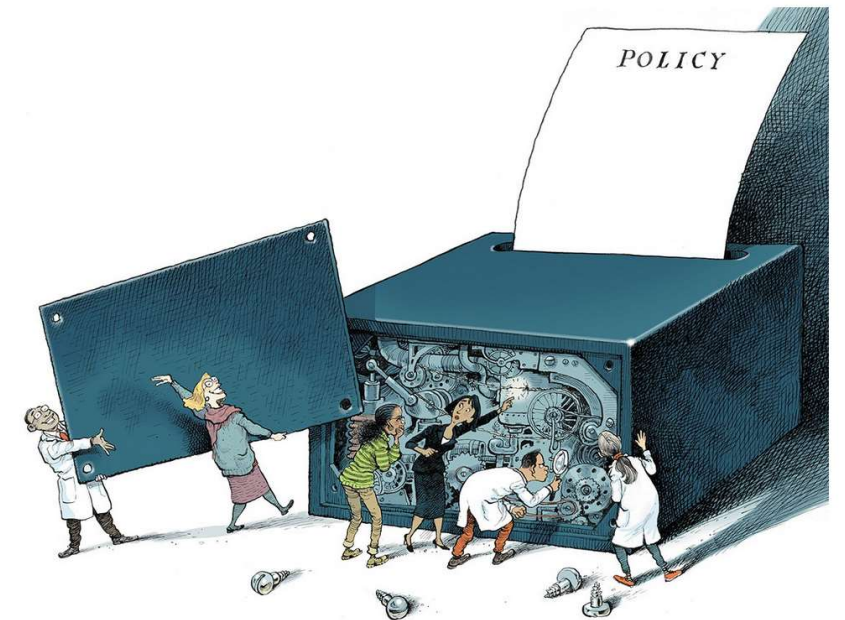
3 STS scholars Bammer, Sarewitz, Stirling

1 philosopher Ravetz

1 historian Charters

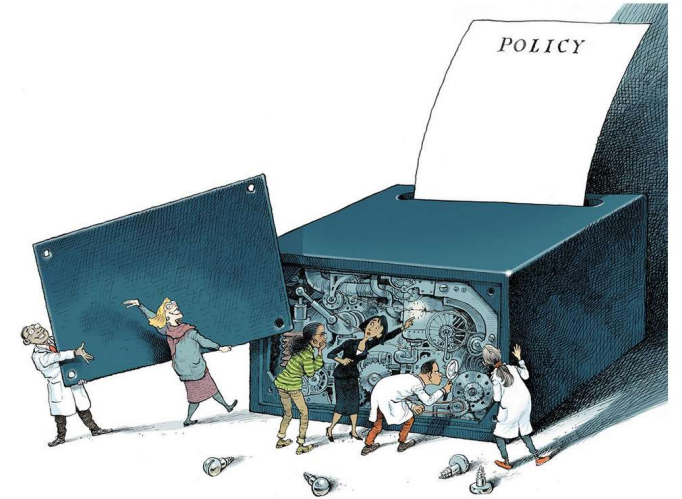
1 political scientists Di Fiore

1 expert RRI - Open Science Rafols



COVID has put mathematical models in the limelight

→ Power & controversy



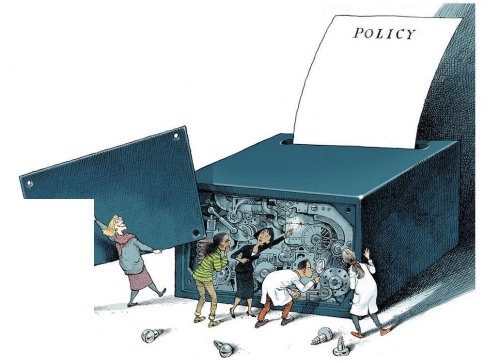
Power

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

Rush Limbaugh

“Wild-Ass Covid numbers
... The minute I hear
anybody start talking about
models and modeling, I
blanch”



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

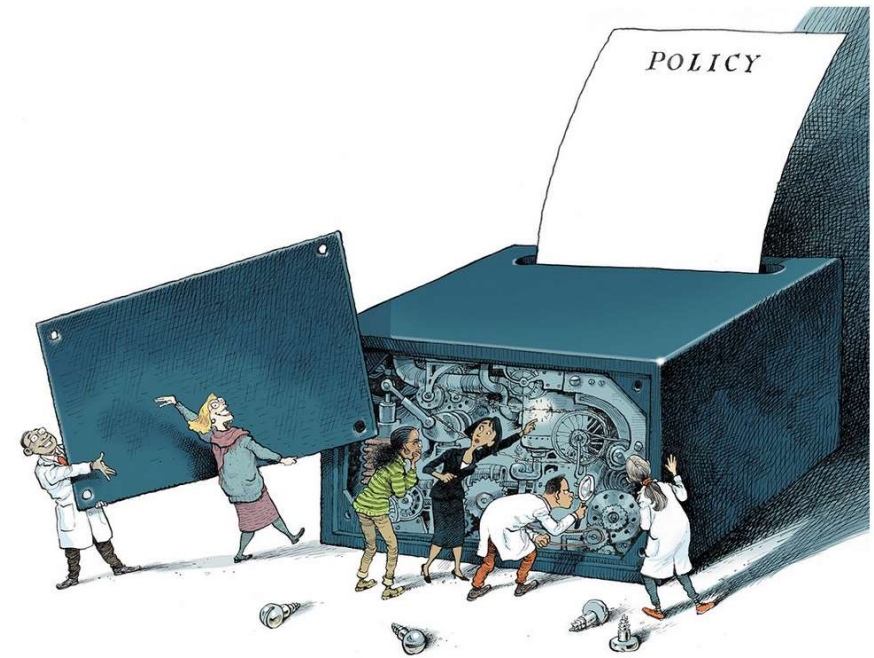
Match purpose and context

Mind the consequences

Quantification can backfire.

Mind the unknowns

Acknowledge ignorance



Mind the assumptions

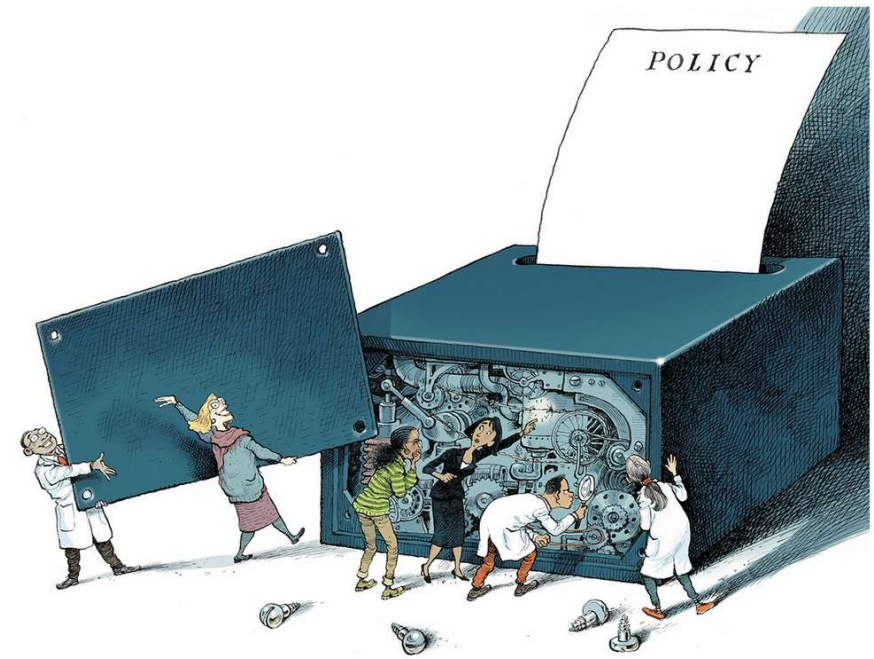
Assess uncertainty and sensitivity



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

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

...

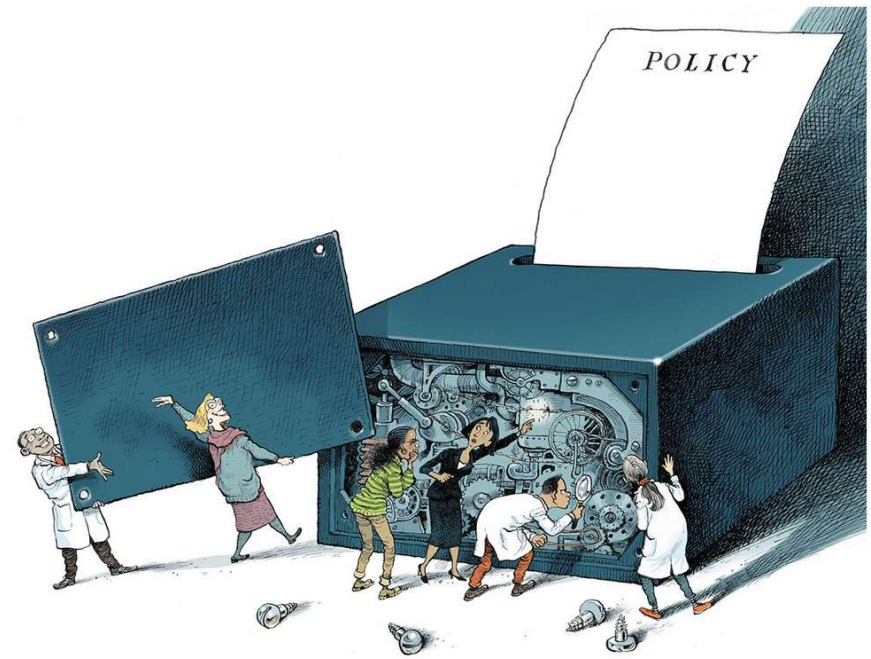


Mind the assumptions

Assess uncertainty and sensitivity



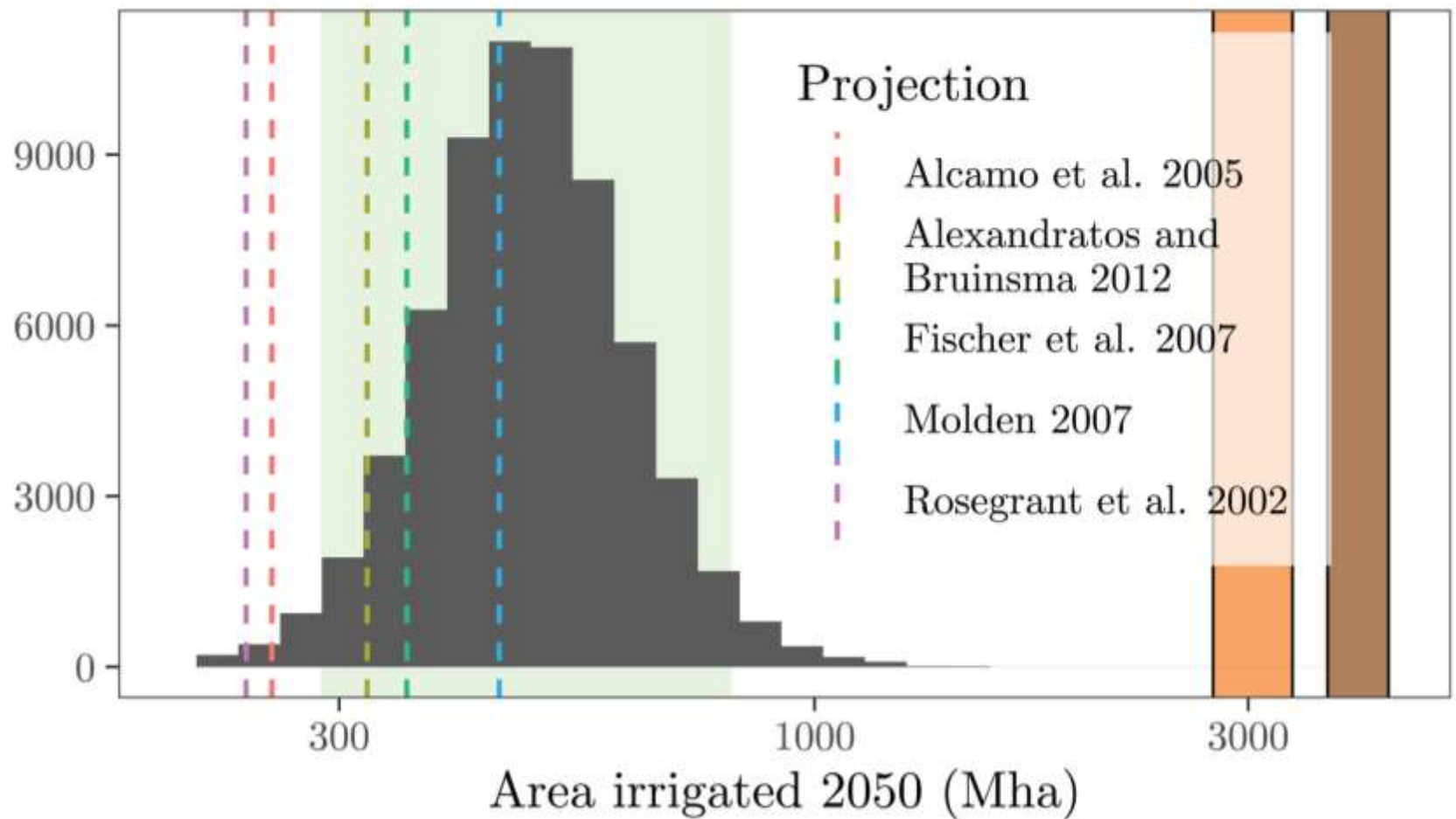
... this may lead to interesting discoveries ...



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> |



Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance

Mind the framing

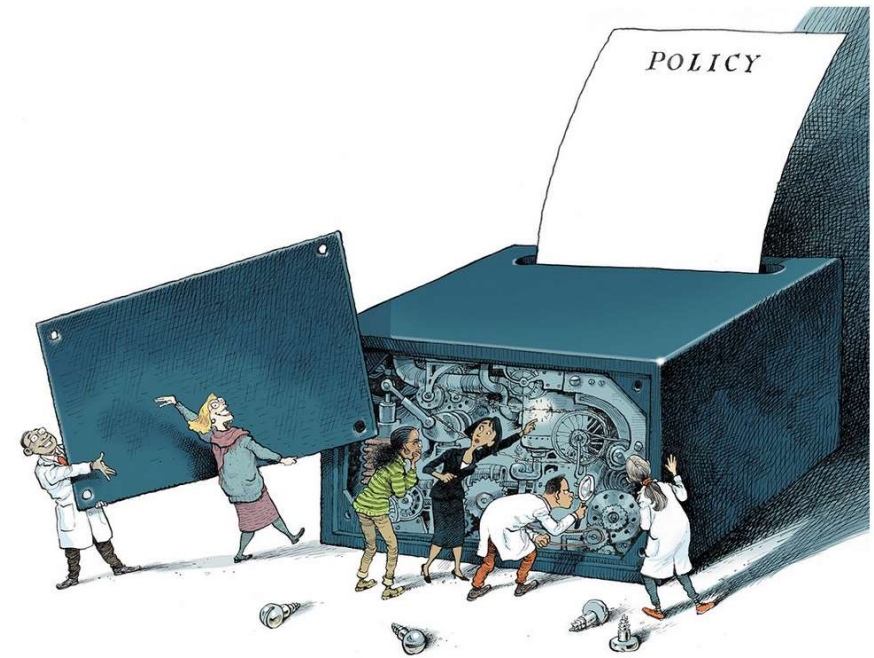
Match purpose and context

Mind the consequences

Quantification can backfire.

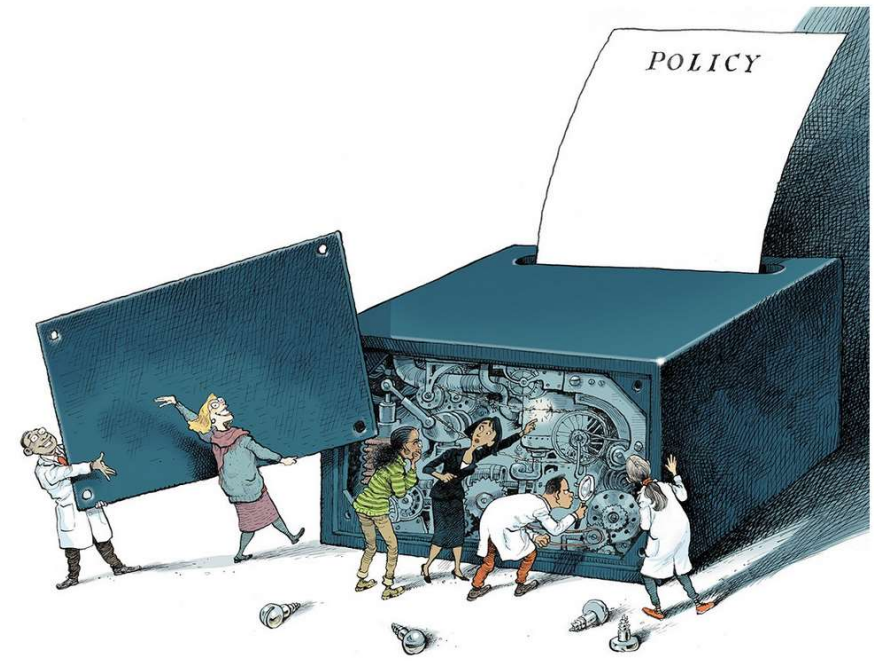
Mind the unknowns

Acknowledge ignorance



Mind the hubris

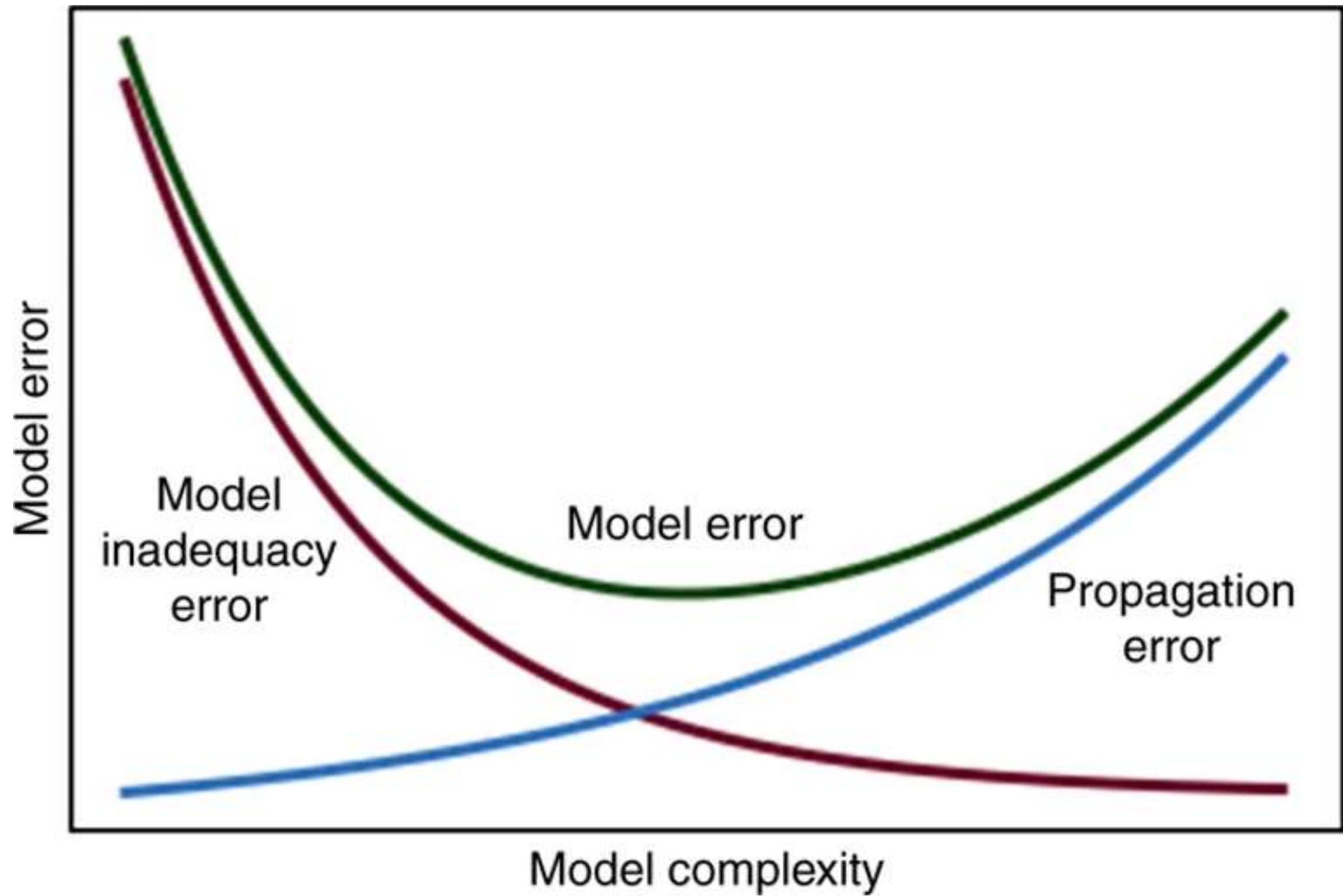
Complexity can be the enemy of relevance



... 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





HOME > SCIENCE ADVANCES > VOL. 8, NO. 42 > MODELS WITH HIGHER EFFECTIVE DIMENSIONS TEND TO PRODUCE MORE UNCERTAIN ESTIMATES

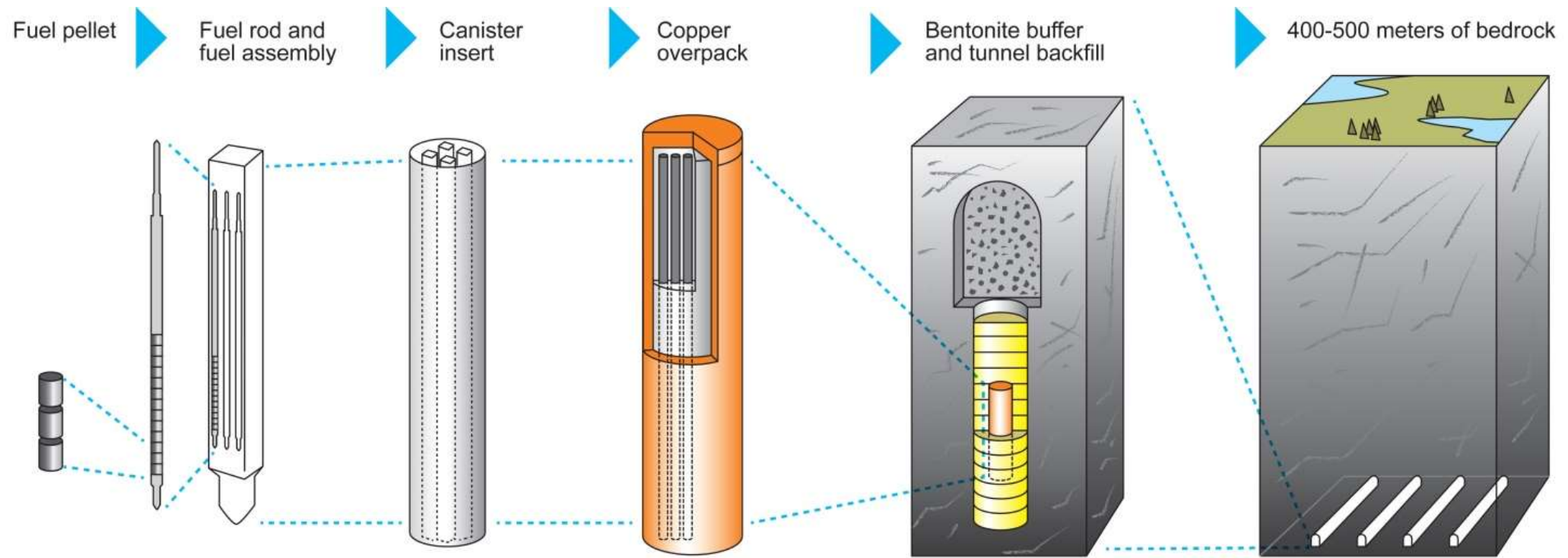
 | RESEARCH ARTICLE | MATHEMATICS



Models with higher effective dimensions tend to produce more uncertain estimates

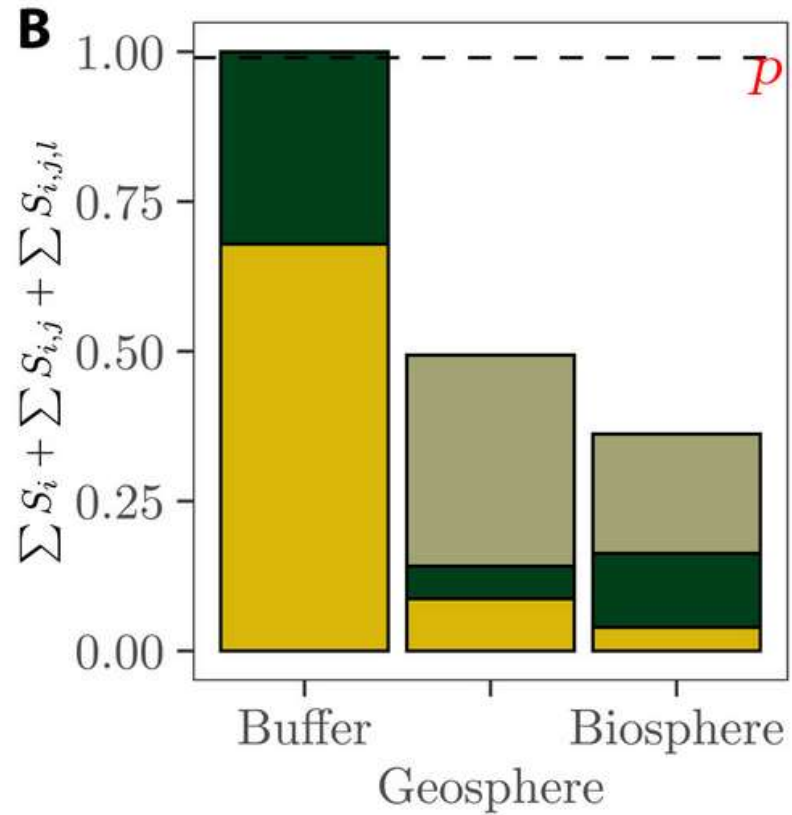
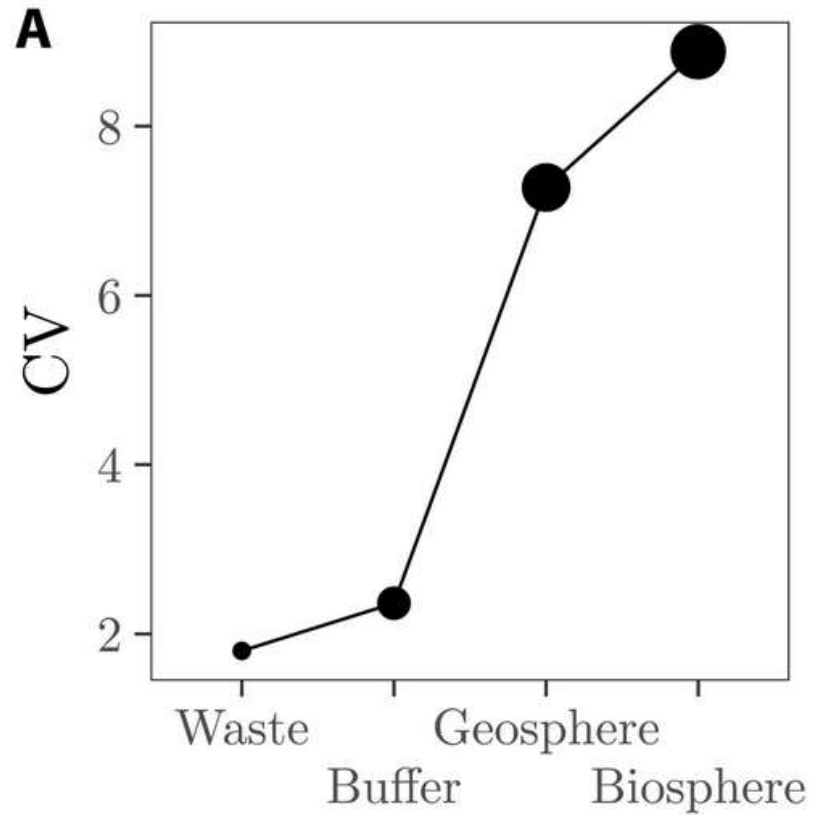
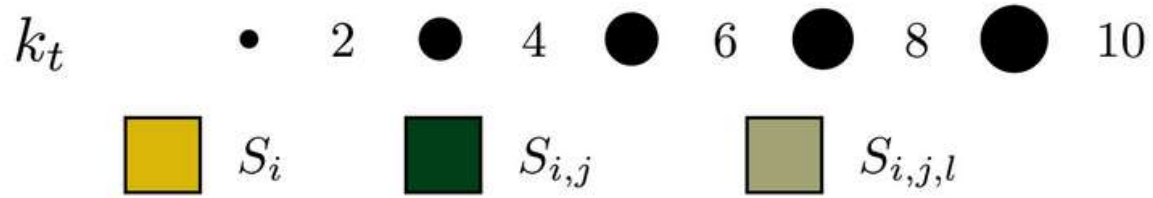
[ARNALD PUY](#) , [PIERFRANCESCO BENEVENTANO](#), [SIMON A. LEVIN](#) , [SAMUELE LO PIANO](#) , [TOMMASO PORTALURI](#), AND [ANDREA SALTELLI](#)  [Authors Info &](#)

[Affiliations](#)



A typical nuclear waste disposal concept: the waste is separated from humans by a series of barriers

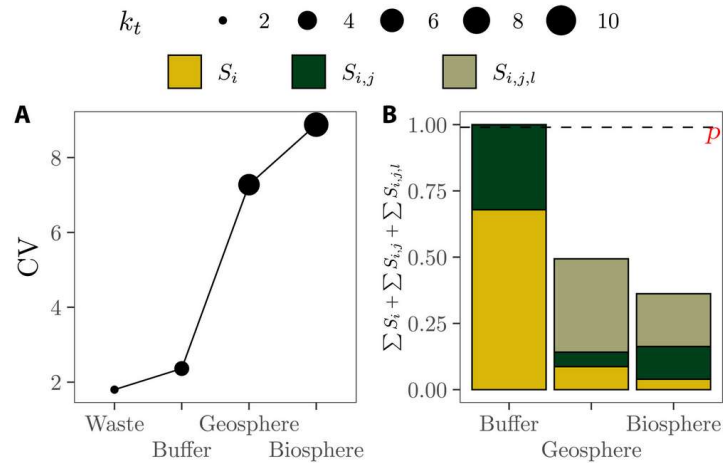
Source: World Nuclear Organization, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste.aspx>



Propagating uncertainty across the barriers increases variability (CV=mean/std), effective dimension (k_t), and the importance of interactions (S_{ij} , S_{ijk})

The regulation should not set limits on doses to humans in the biosphere, as done e.g. in the US, since these are impossible to predict with any certainty

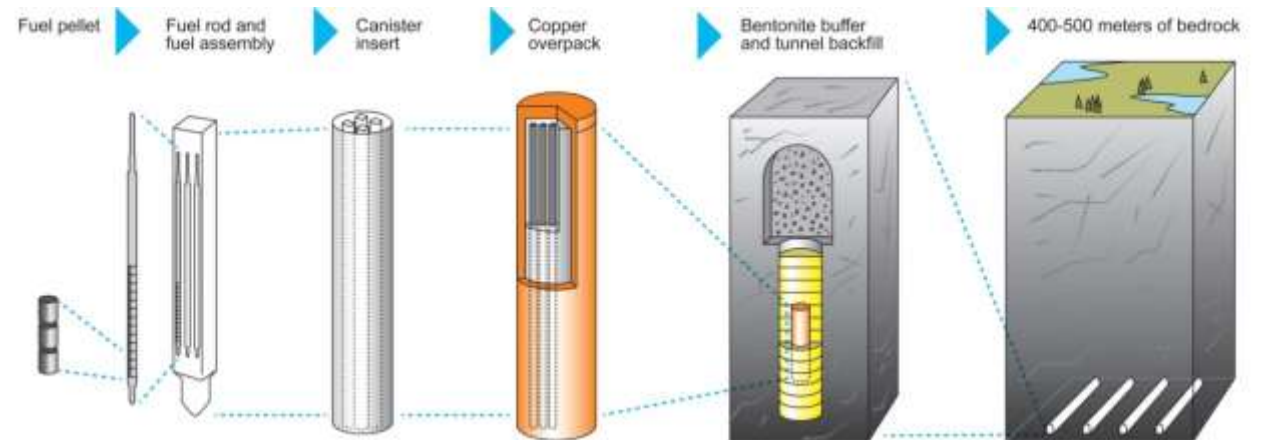
A more realistic and defensible safety standard could be set as a maximum level of radioactivity leaving the buffer



Models with higher effective dimensions tend to produce more uncertain estimates

ARNALD PUY, PIERFRANCESCO BENEVENTANO, SIMON A. LEVIN, SAMUELE LO PIANO, TOMMASO PORTALURI, AND ANDREA SALTIELLI

Affiliations



Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance



Mind the framing

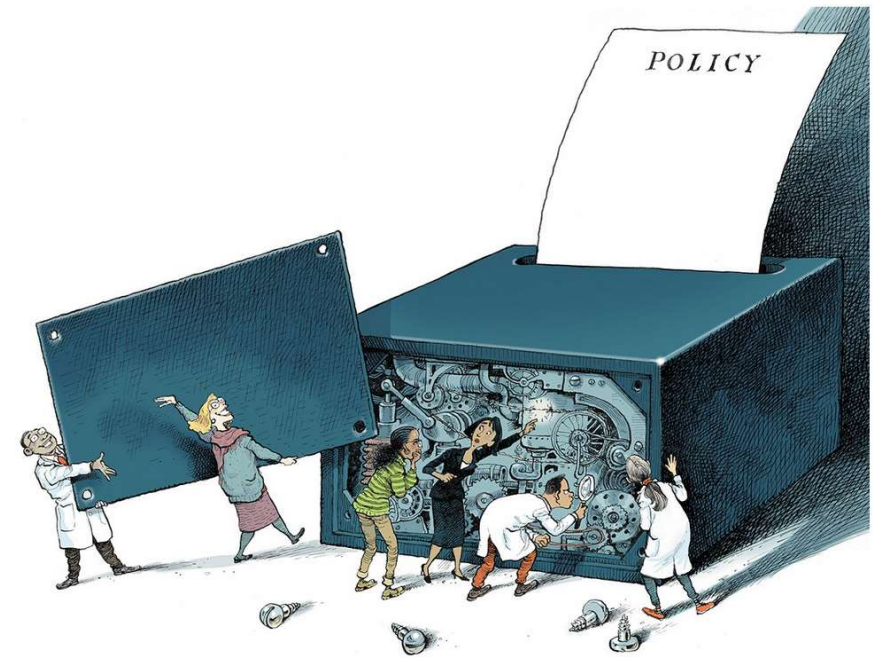
Match purpose and context

Mind the consequences

Quantification can backfire.

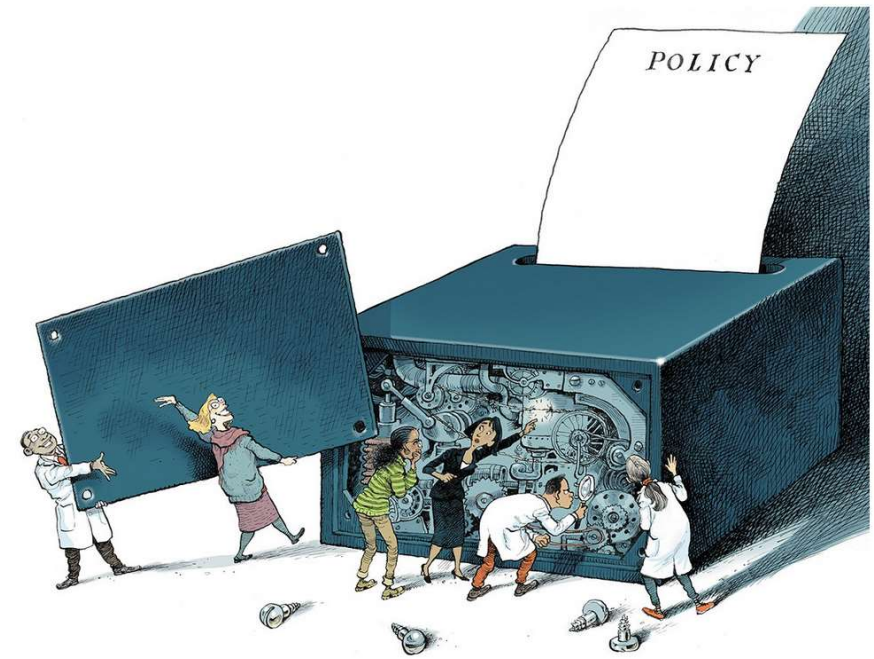
Mind the unknowns

Acknowledge ignorance



Mind the framing

Match purpose and context



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

SUPPLEMENTARY INFORMATION

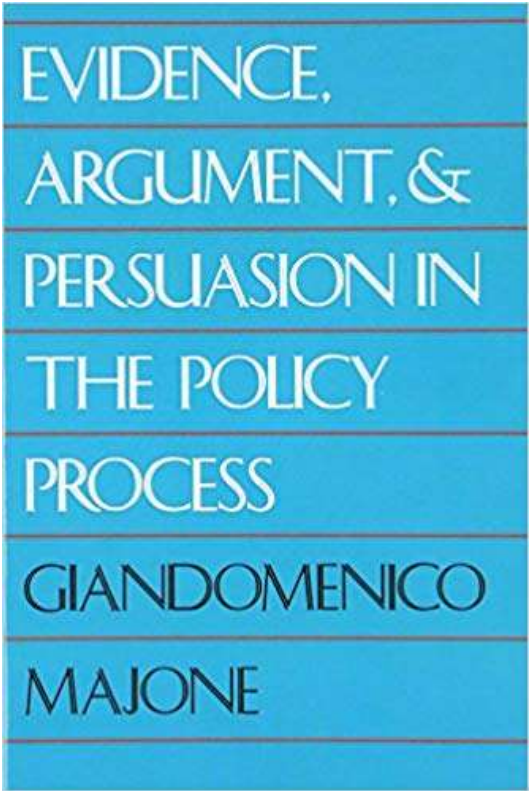
1. Additional information and references

>260 references

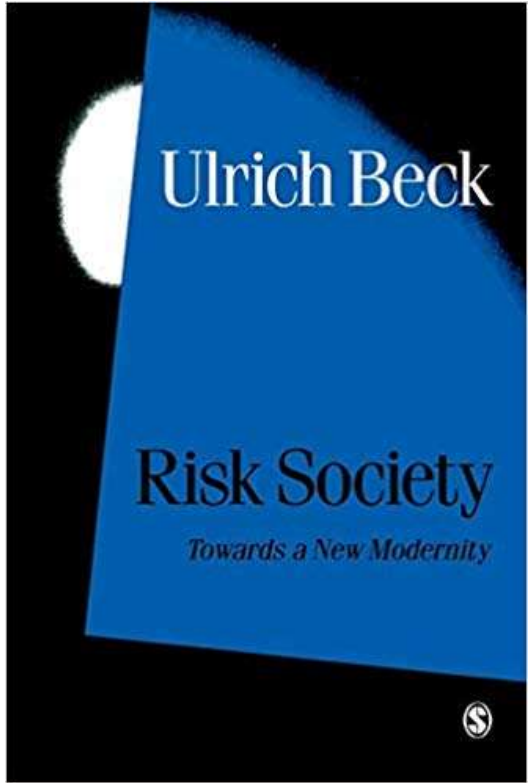
From Ulrich Beck to Giandomenico Majone: the technique is never neutral



Ulrich Beck
(1944 –2015)



1989



1992 (1986)



Environmental Science & Policy

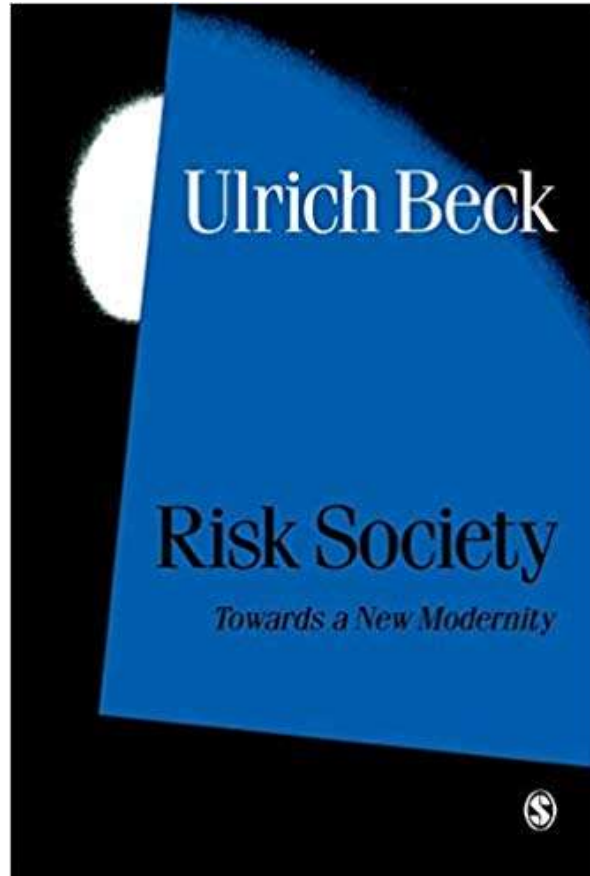
Volume 106, April 2020, Pages 87-98



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)



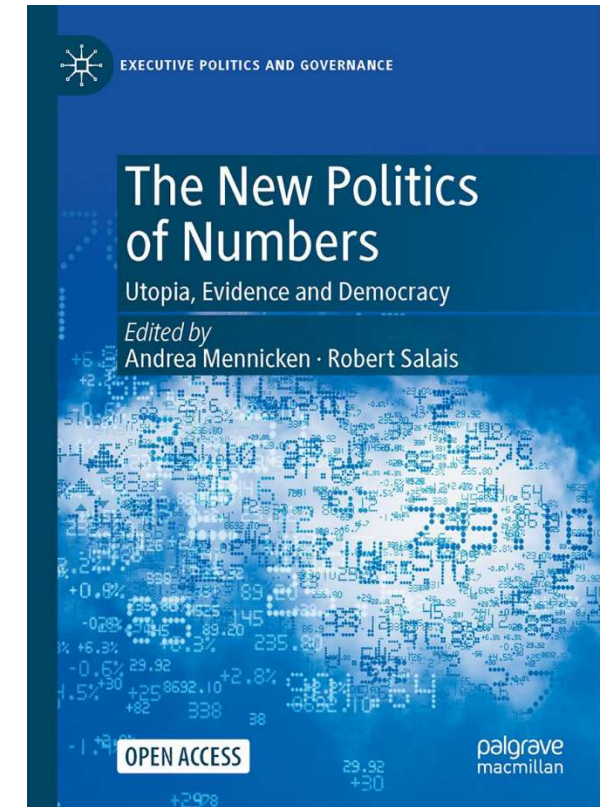
Ulrich Beck
(1944 –2015)

Since the technique is never neutral a technical proof of quality is illusory without a parallel investigation of normative quality

Technical Quality

Normative quality

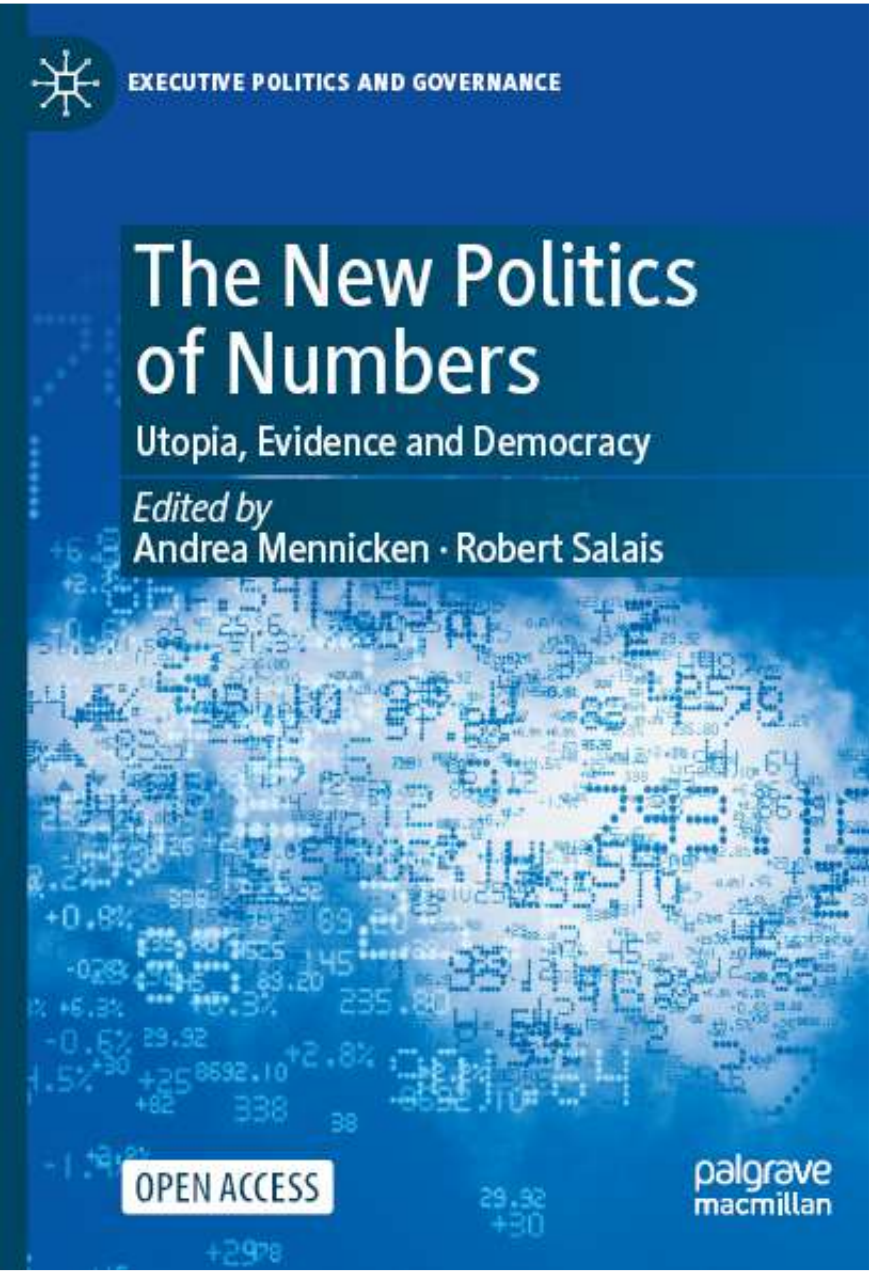
How the numbers of neoliberalism (New Public Management) constitute a regime of a-democracy; the example of indicators of employment

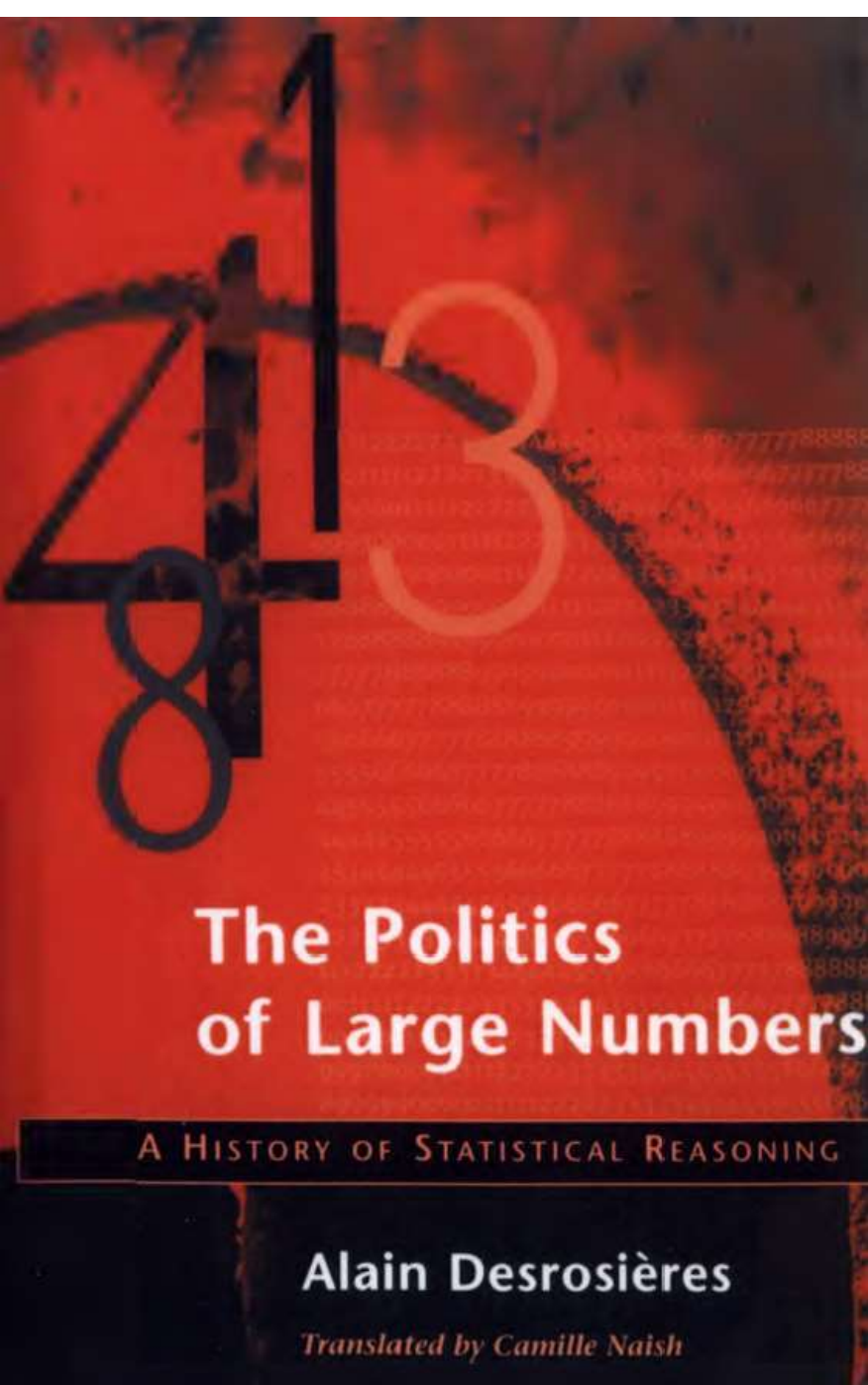


Salais, R. (2022). “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice. In *The New Politics of Numbers: Utopia, Evidence and Democracy*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 379–415.

<p>Evidence based policy</p>	<p>Statistics (creating things that hold together for the solution of practical problems)</p>
<p>Policy based evidence</p>	<p>Governance driven quantification (a reversal of the statistical pyramid)</p>

CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*





Alain Desrosières: “Making things that hold”

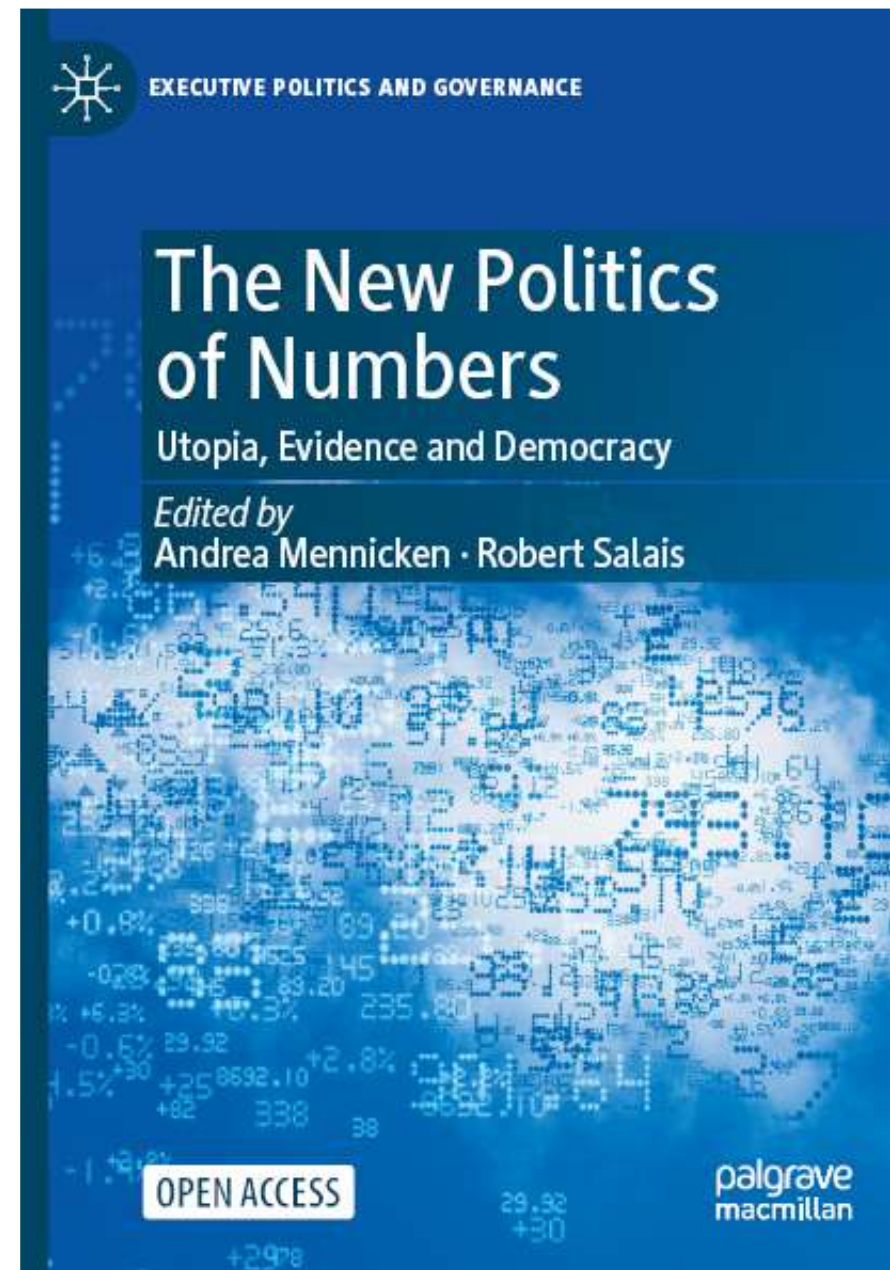
The construction of statistical concepts and categories that can serve for action

BUT

“It is because the moment of objectification can be made autonomous that the moment of action can be based on firmly established objects”

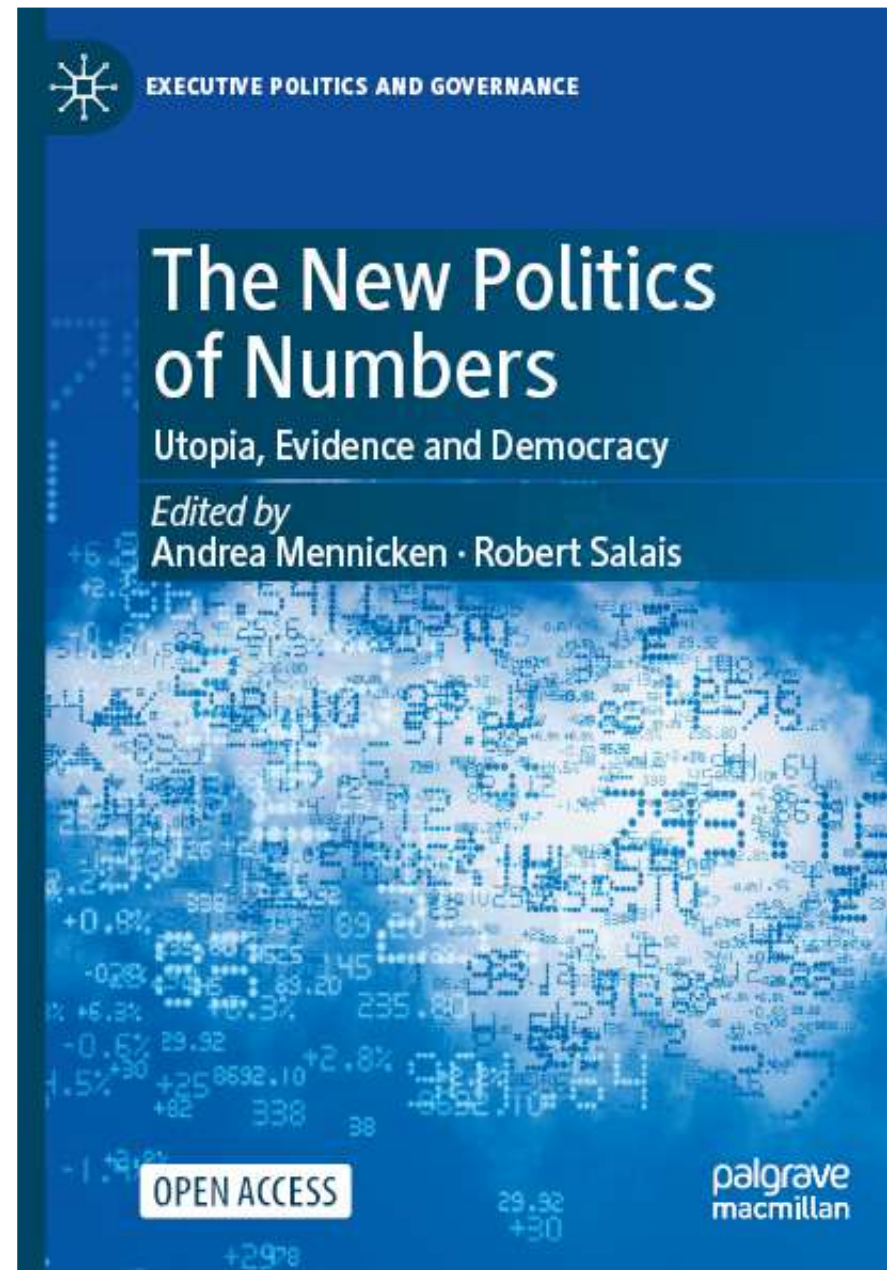
Governance driven quantification is based on pretended objectivity (neutrality), reductionism and justificationism that contribute to a loss of democratic agency (a-democracy)

CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*

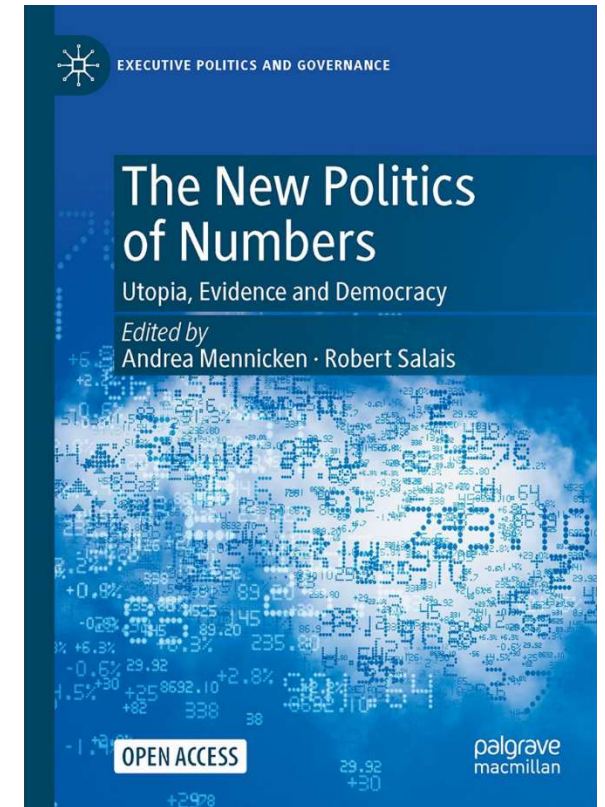


Contesting unjust/unfair governance arrangement is impossible without producing alternative constructions of evidence – that requires muscles not easily available to the lay citizen

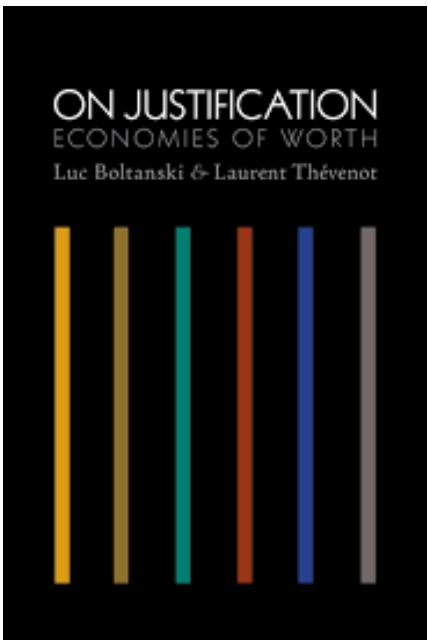
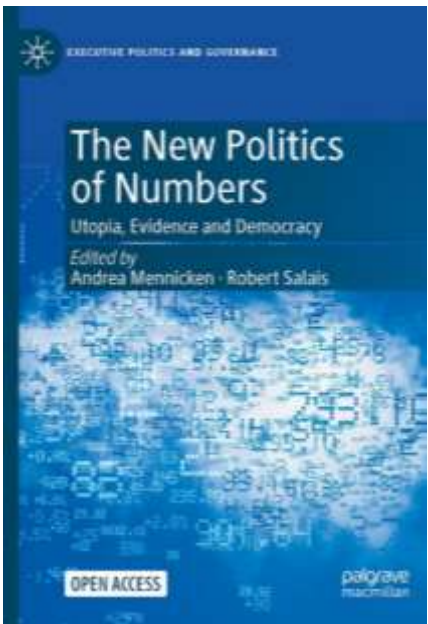
CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*



Normative quality ... yes but which norms?



Thévenot, L. (2022). A New Calculable Global World in the Making: Governing Through Transnational Certification Standards. In *The new politics of numbers*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 197–252.



A New Calculable Global World
in the Making: Governing Through
Transnational Certification Standards

Laurent Thévenot

critical public debates between
conceptions of the common good



individual consumers' choices
between certified market goods



Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance

Mind the framing

Match purpose and context

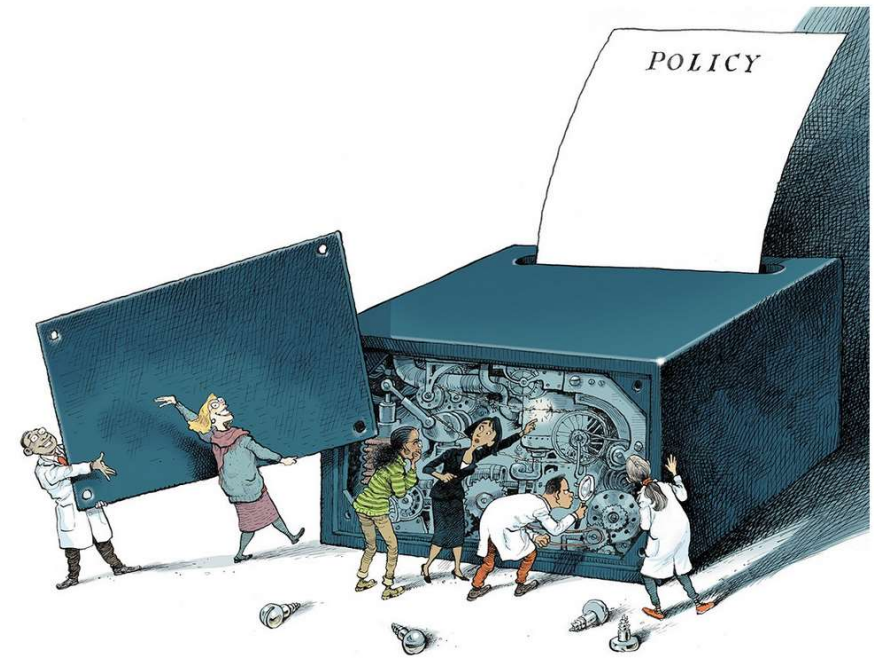


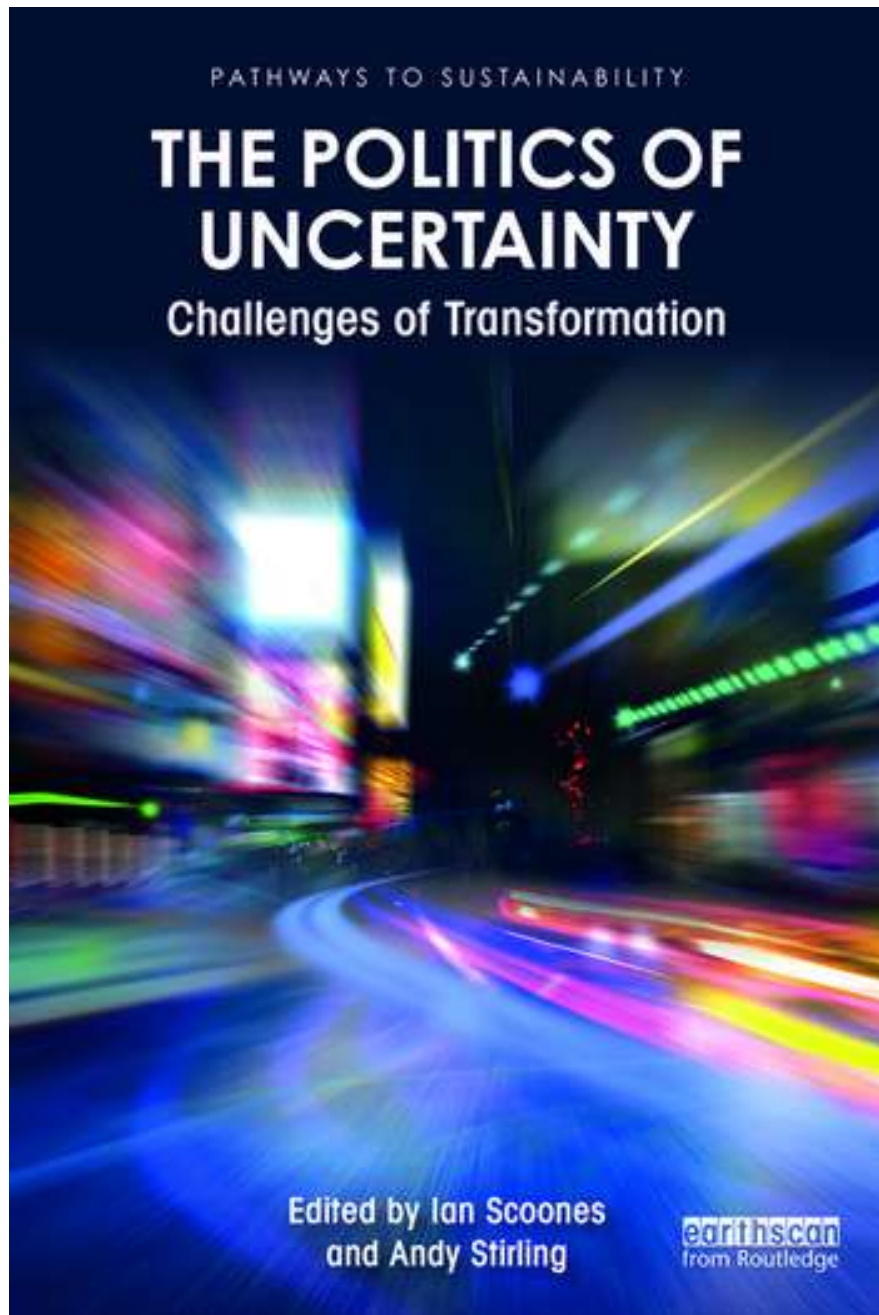
Mind the consequences

Quantification can backfire.

Mind the unknowns

Acknowledge ignorance





3

SHARING RISKS OR PROLIFERATING UNCERTAINTIES?

Insurance, disaster and development

Leigh Johnson

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

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

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)



Futures

Volume 91, August 2017, Pages 62-71



Original research article

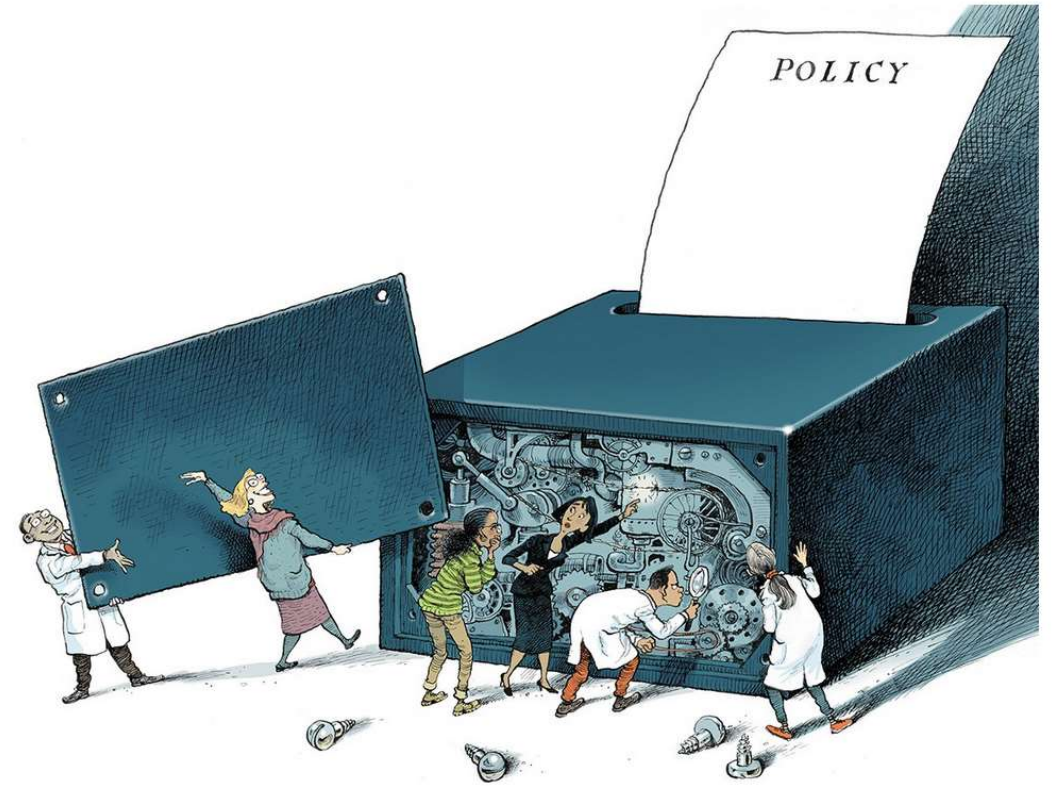
What is wrong with evidence based policy, and how can it be improved?

Andrea Saltelli ^{a, b, c, d, e}, Mario Giampietro ^{a, c, d}

COMMENT | 24 June 2020

Five ways to ensure that models serve society: a manifesto

→ Reciprocal domestication between models and society



What can mathematical modelling contribute to a sociology of quantification?

[Andrea Saltelli](#)  & [Arnald Puy](#)

Humanities and Social Sciences Communications **10**, Article number: 213 (2023) | [Cite this article](#)

448 Accesses | **4** Altmetric | [Metrics](#)

Sociology of quantification less active on mathematical modelling than in other venues of quantification

In the opposite direction, what can mathematical modelling contribute to Sociology of quantification?

What can mathematical modelling contribute to a sociology of quantification?

[Andrea Saltelli](#) & [Arnald Puy](#)

Humanities and Social Sciences Communications **10**, Article number: 213 (2023) | [Cite this article](#)

448 Accesses | 4 Altmetric | [Metrics](#)

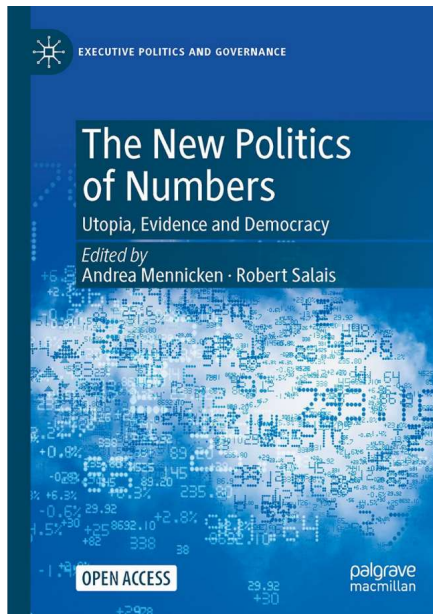
Technical Quality

Normative quality



Sensitivity analysis

Sensitivity auditing



Uncertainty analysis: the study of the uncertainty in model output—see also uncertainty cascade

Sensitivity analysis: the study of the relative importance of different input factors on the model output

Sensitivity auditing : “Sensitivity auditing is a wider consideration of the effect of all types of uncertainty, including structural assumptions embedded in the model, and subjective decisions taken in the framing of the problem” (European Commission, 2021).

Why is all this important? Fishing expeditions and forking paths ...





Jorge Luis Borges
(1899–1986)



Taking different
narratives within the
same novel like Ts'ui Pên

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*

Andrew Gelman[†] and Eric Loken[‡]

14 Nov 2013

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*

Andrew Gelman[†] and Eric Loken[‡]

14 Nov 2013

Why this matters?



PNAS

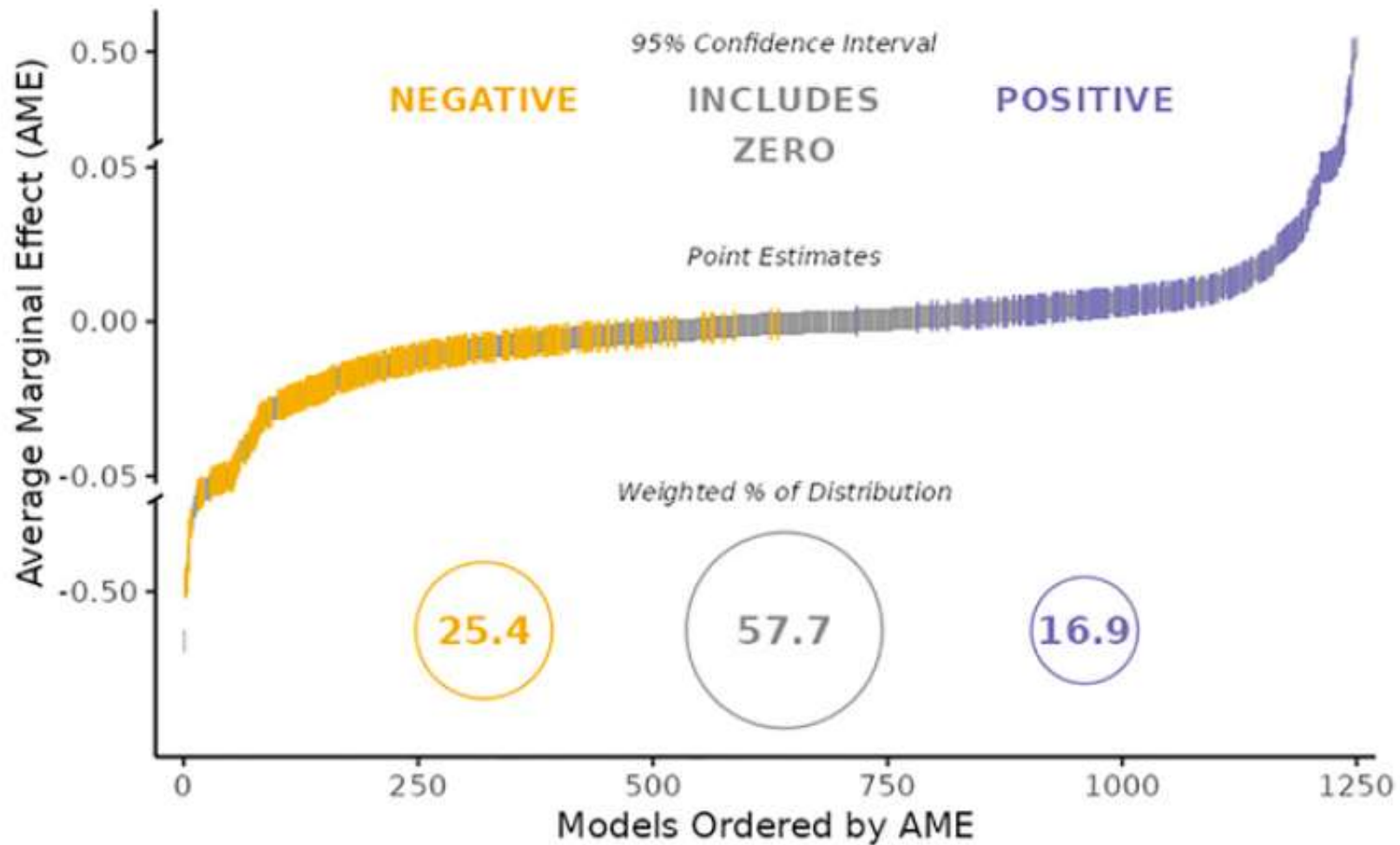
RESEARCH ARTICLE

SOCIAL SCIENCES

 OPEN ACCESS

Observing many researchers using the same data and hypothesis reveals a hidden universe of uncertainty

Edited by Douglas Massey, Princeton University, Princeton, NJ; received March 6, 2022; accepted August 22, 2022



“Will different researchers [73 teams] converge on similar findings when analyzing the same data?”

“...teams’ results varied greatly, ranging from large negative to large positive effects”
(Massey et al. 2022)

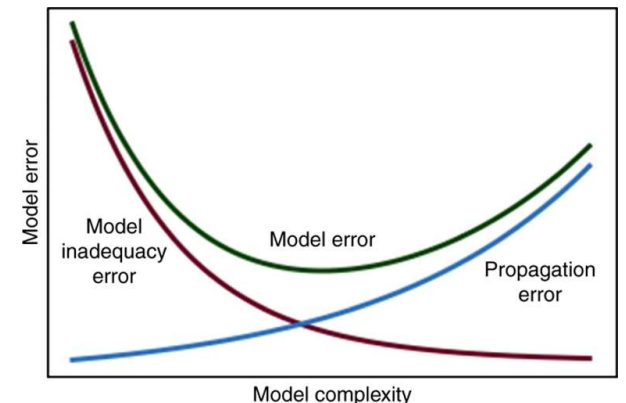
Sensitivity analysis and auditing can assist sociology of quantification in activities of de- and re-construction (e.g. for statactivists)



Modelling of the modelling process, to

- ➔ retrace what was assumed
- ➔ check the level of complexity

...



...

→ check simultaneously technical and normative quality

Example use SA to ascertain that an algorithm does not make implicit use of protected attributes

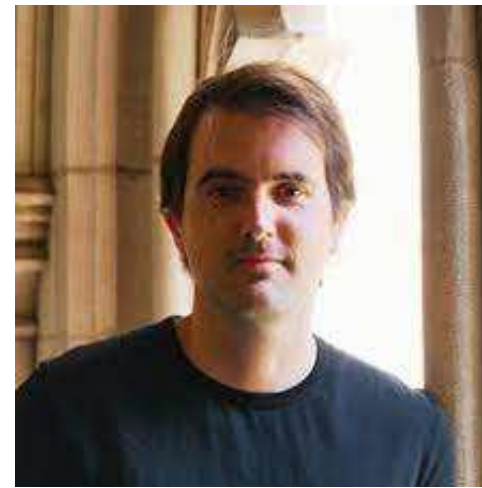
PROTECTED ATTRIBUTES:

- Age
- Disability
- National Origin
- Race/color
- Religion
- Sex
- (From the US Equal Opportunity Employment Commission)



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Birmingham

Samuele Lo Piano,
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University of
Oxford



Erik Reinert,
Tallinn University
of Technology

The End



<https://mstdn.social/@AndreaSaltelli/>

A useful illustration of strategies of capture, starring O'Neil, Zuboff, Lanier, and GAFA technologists...

NETFLIX

N FILM
/the
social dilemma



... such as Tristan Harris, former design ethicist at Google, explaining from inside how social media pursue addiction to maximize profit and manipulates people's behaviour

