



Ethics of quantification

Andrea Saltelli

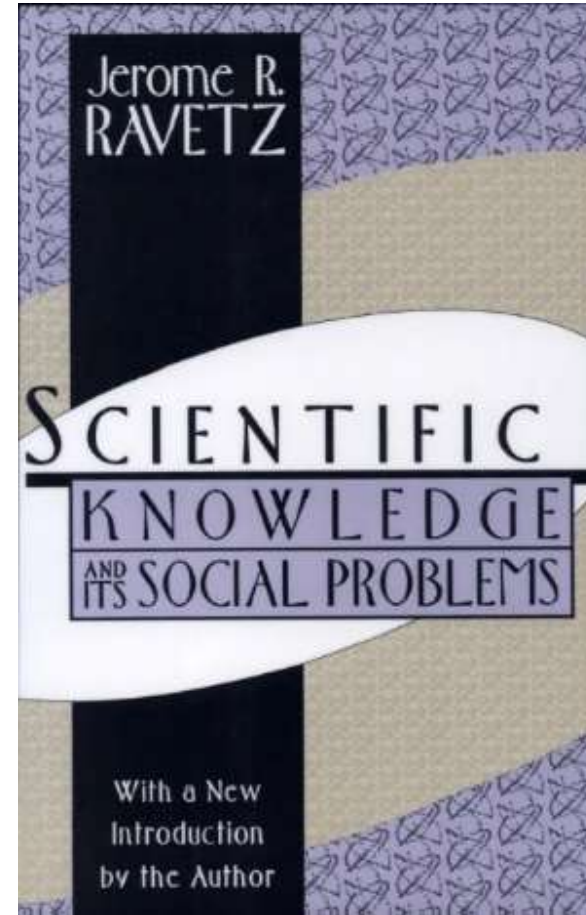
Open Evidence Research, Open University of Catalonia



Che valore ha il dato? Quantificare l'effetto di un intervento è un'azione neutra? Spunti per una riflessione critica, Seminario interattivo, 9 marzo 2021 ore 17.00, Università degli Studi di Milano



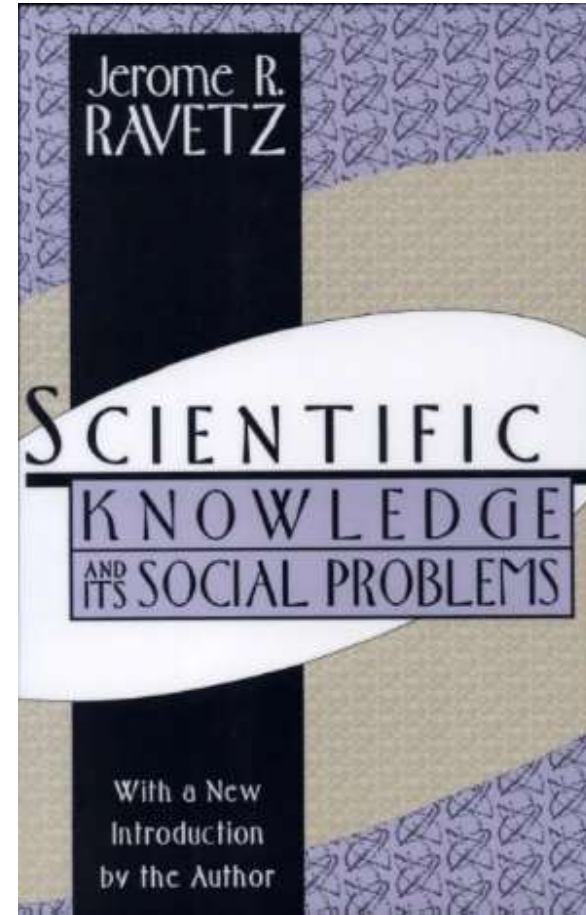
p.81 “No set of data can be 'perfect' as a report of properties of the objects of investigation, nor can it be independent of the plans and expectations for the later stages of the work”



Jerome R.
Ravetz

de Solla Price, D.J., **1963**, Little science big science, Columbia University Press;
Ravetz, J., **1971**, Scientific Knowledge and its Social Problems, Oxford University Press.

p. 185 “Science does not begin with facts; indeed, when facts are achieved [most of the work is done and the research] is settling down to a routine”



Jerome R.
Ravetz

de Solla Price, D.J., **1963**, Little science big science, Columbia University Press;
Ravetz, J., **1971**, Scientific Knowledge and its Social Problems, Oxford University Press.

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



... 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



**UCL Institute for
Innovation and
Public Purpose**

WORKING PAPER
WP 2021/05

Numbers, visible and invisible...

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

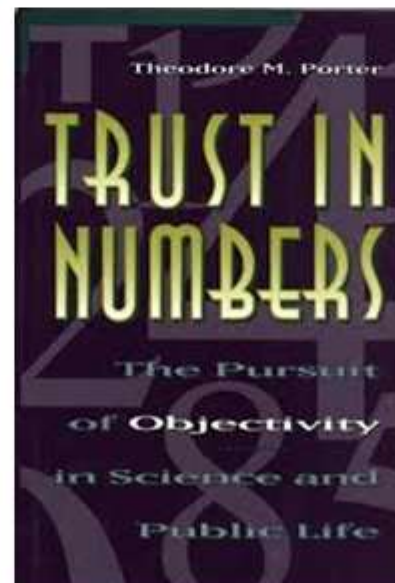
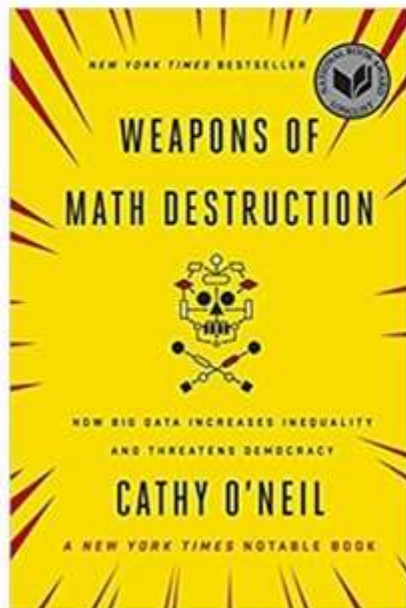
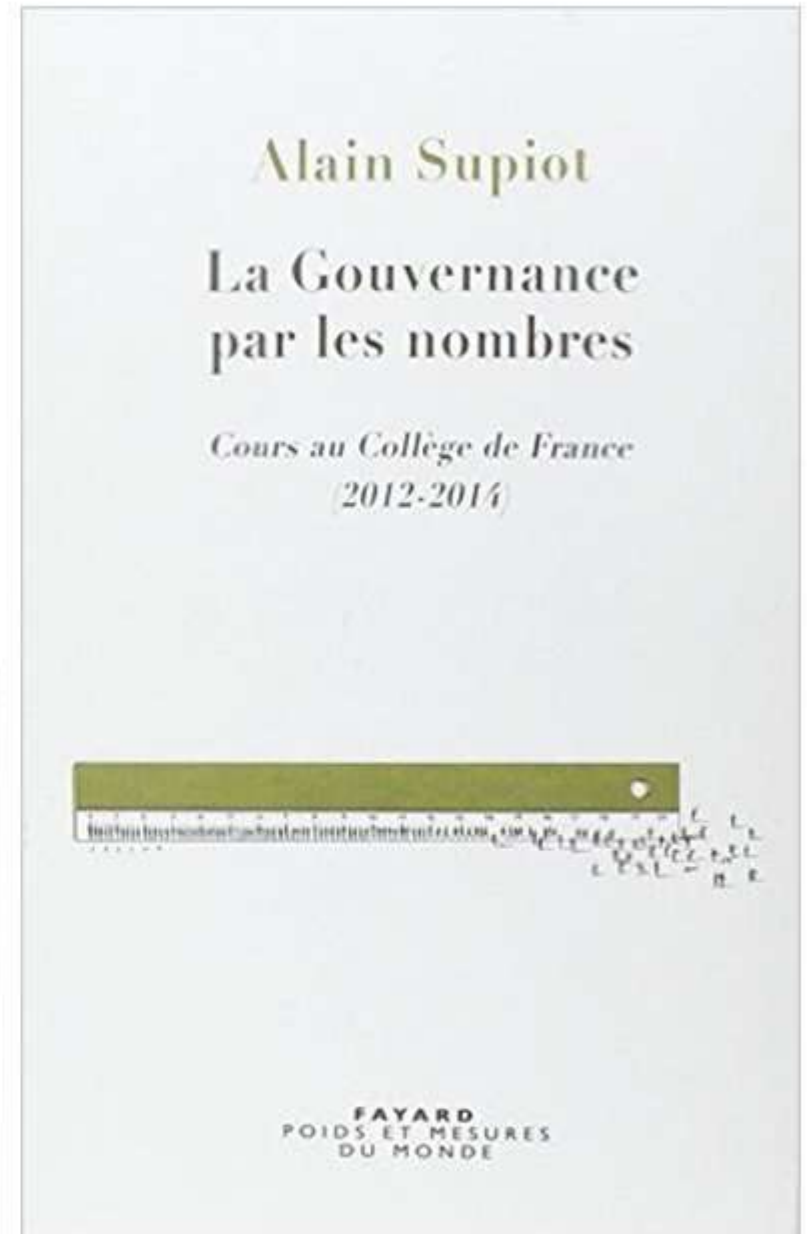
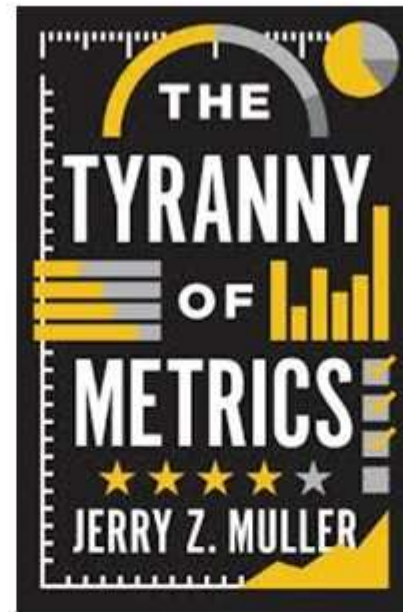
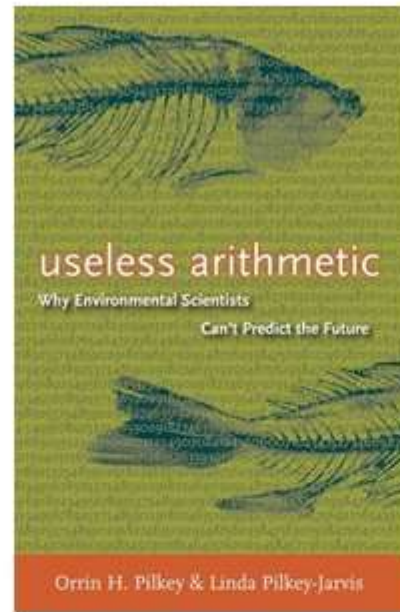
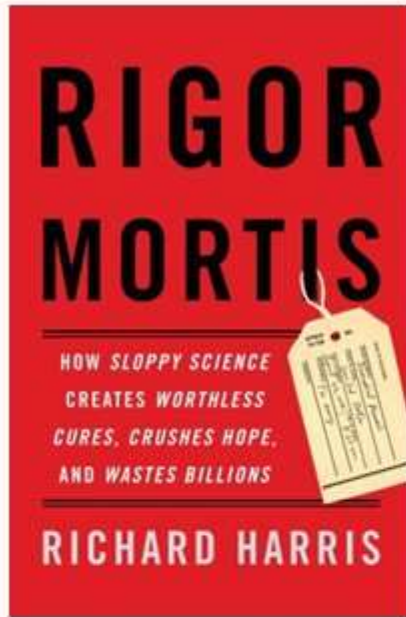


Elizabeth
Popp Berman

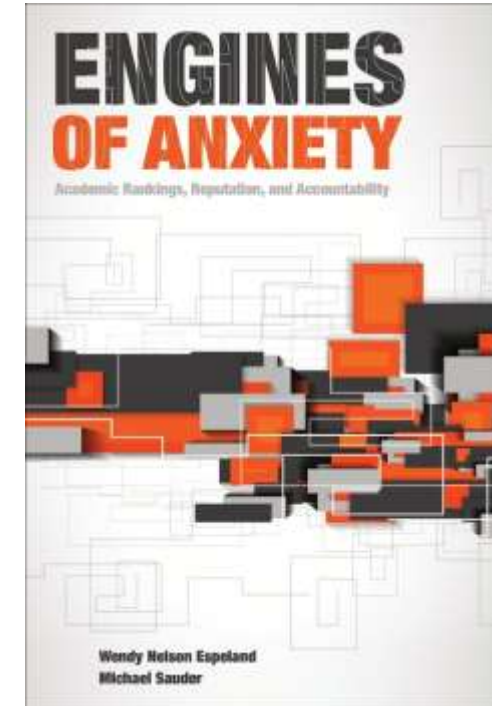
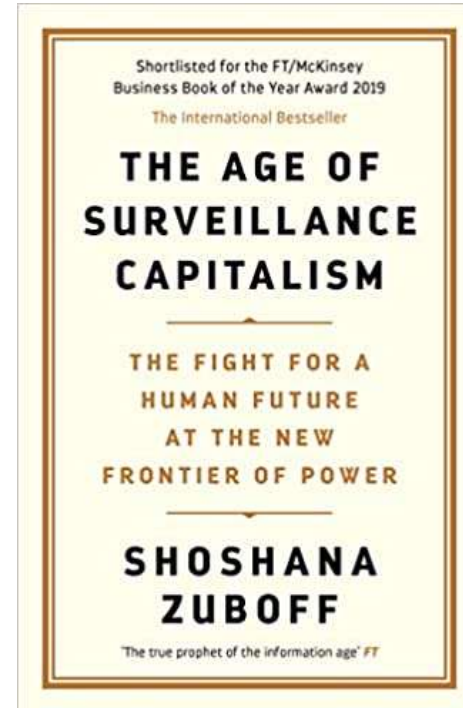
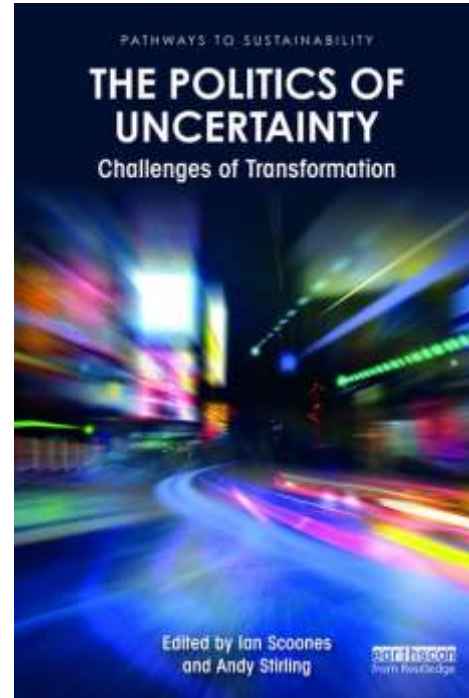
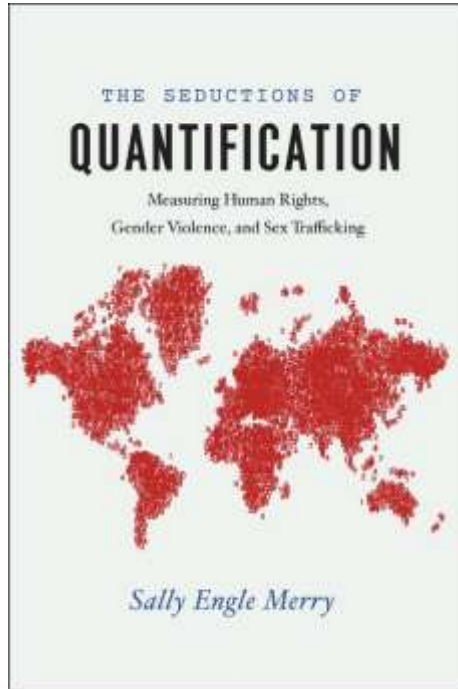
E. Popp Berman and D. Hirschman, *The Sociology of Quantification*: Where Are We Now?, *Contemp. Sociol.*, 47, 257–266, 2018.

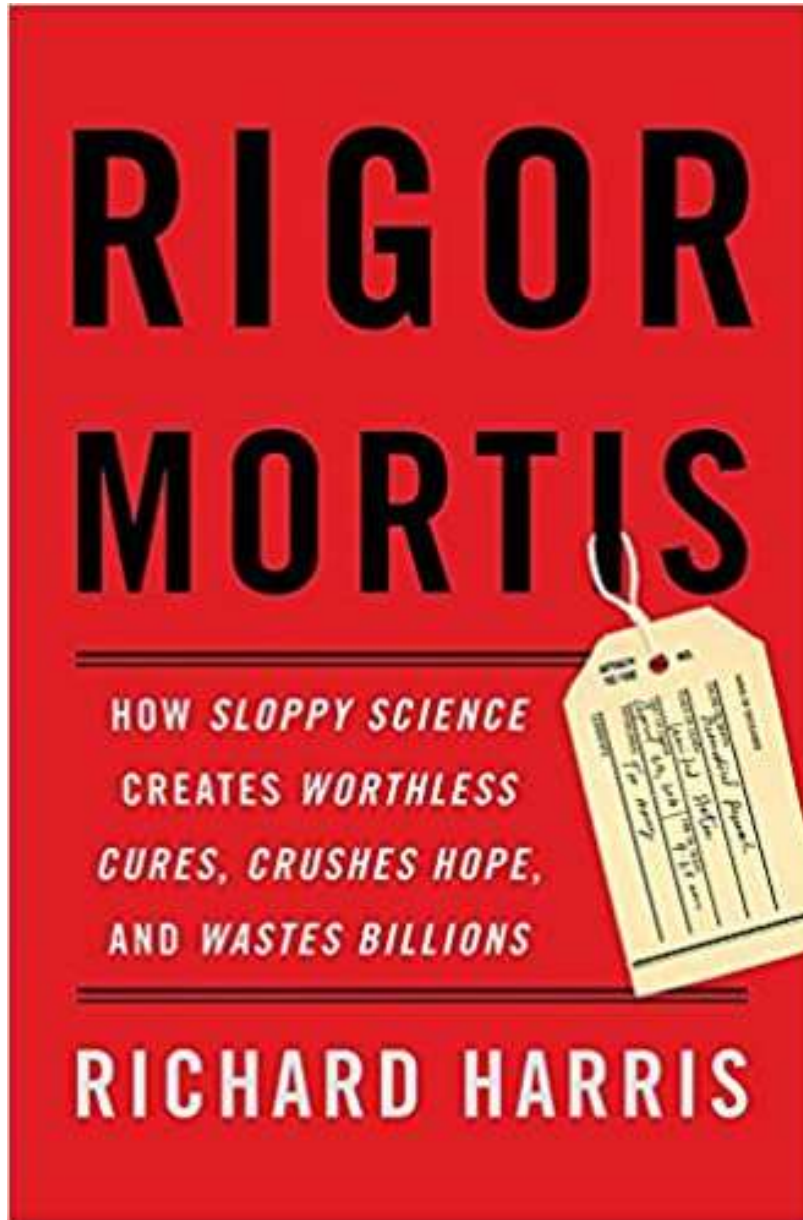
And an explosion of works, from
within and without, from many
disciplines

Algorithms, models, metrics, statistics...



Algorithms, models, metrics, statistics...





Begley's bombshell
(reproducibility crisis)

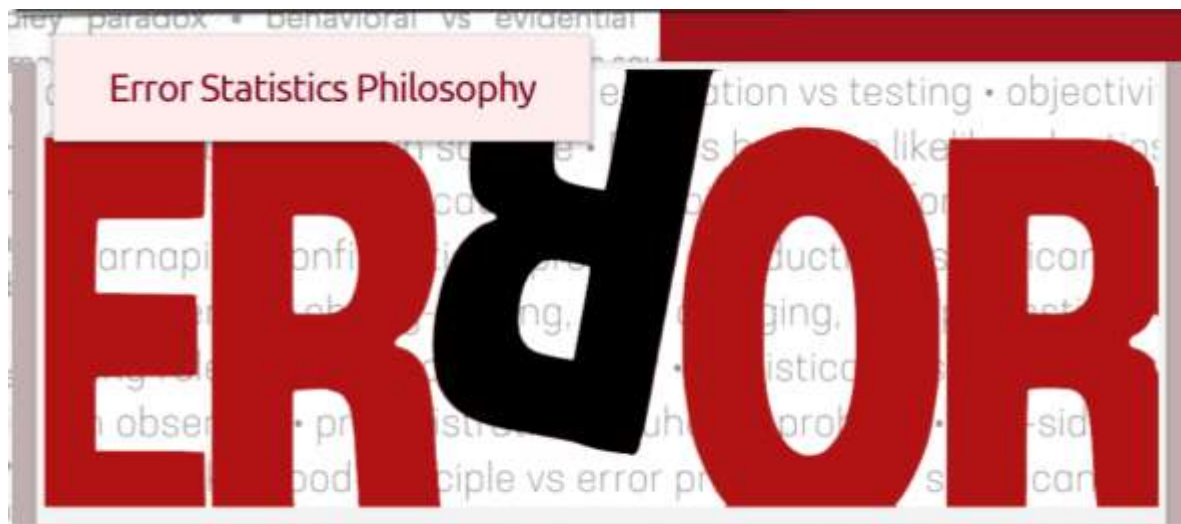
Lou Gehrig disease

Misleading animal studies

Henrietta Lacks
(since 1951)

Is the problem about methods,
epistemologies, ethics, politics &
power?

Methods? Statistical inference,
rating & rankings, mathematical
modelling





A. Saltelli (Guest post): What can we learn from the debate on statistical significance?

Posted on November 22, 2019 by Mayo



Professor Andrea Saltelli
Centre for the Study of the Sciences and the Humanities (SVT), University of Bergen (UIB, Norway),
&
Open Evidence Research, Universitat Oberta de Catalunya (UOC), Barcelona

What can we learn from the debate on statistical significance?

Recent Comments:



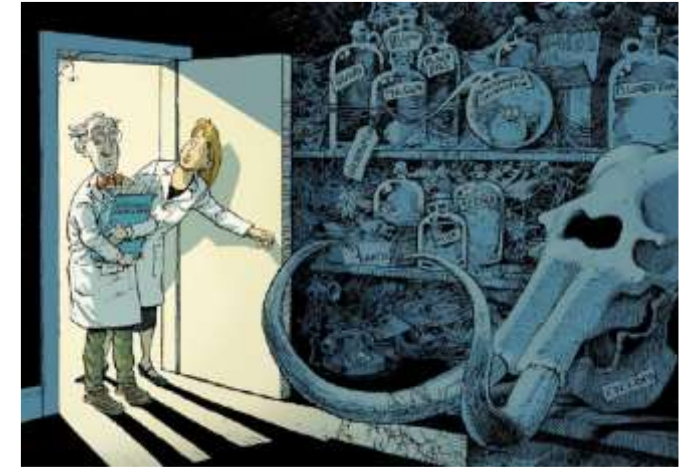
Cargo-cult statistics and scientific crisis

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?



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

↑
A petition about
scientific
methodology?

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



Contents lists available at ScienceDirect

Research Policy

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



Rickety numbers: Volatility of university rankings and policy implications

Michaela Saisana*, Béatrice d'Hombres, Andrea Saltelli

Econometrics and Applied Statistics, Joint Research Centre, European Commission, Enrico Fermi 2749, 21027 Ispra, Italy

University ranking are
volatile ...

Journal of the
Royal Statistical Society

SERIES A
Statistics
in Society



J. R. Statist. Soc. A (2013)
176, Part 3, pp. 609–634

... and methodologically
unsound

Ratings and rankings: voodoo or science?

Paolo Paruolo

University of Insubria, Varese, Italy

and Michaela Saisana and Andrea Saltelli

European Commission, Ispra, Italy

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.

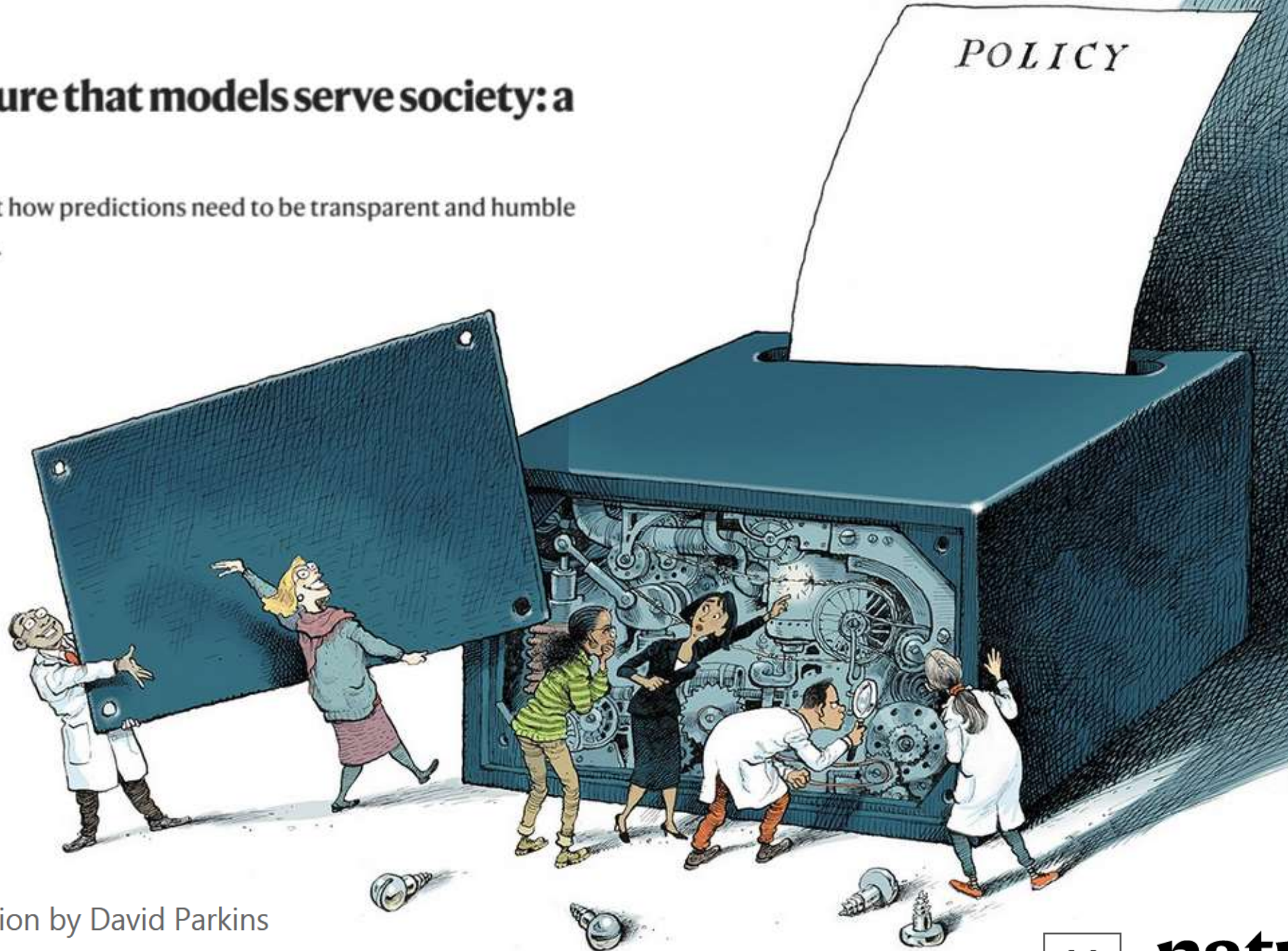


Illustration by David Parkins



nature

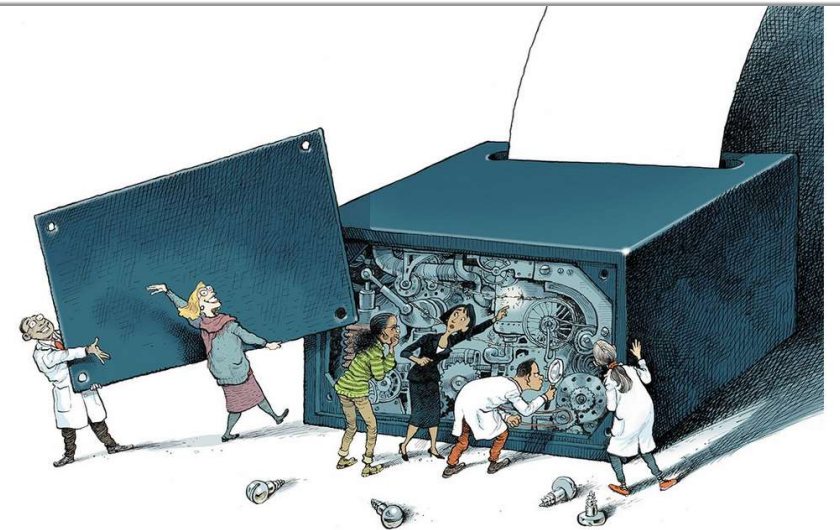


Five ways to ensure that models serve society: a

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



Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance

Mind the framing

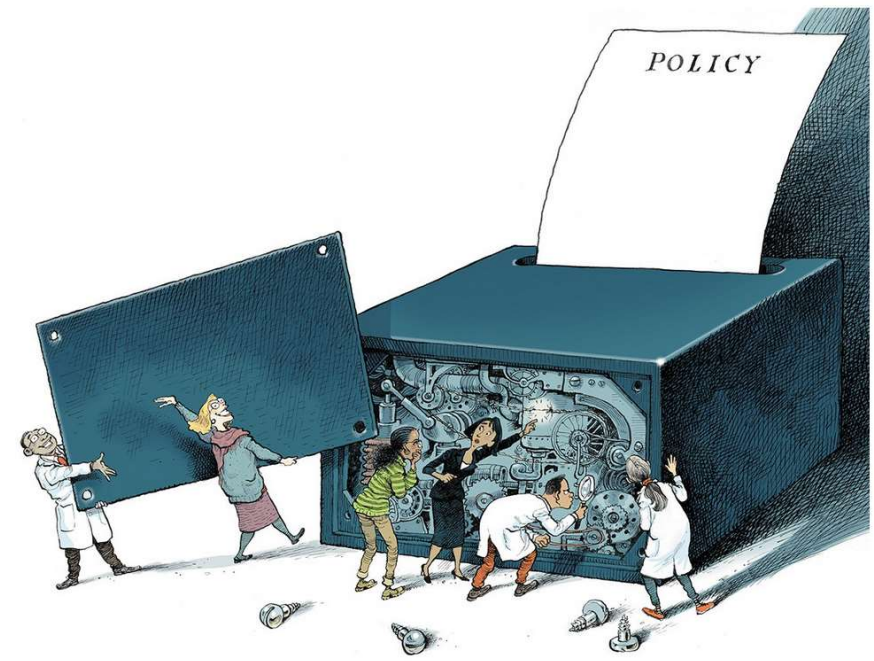
Match purpose and context

Mind the consequences

Quantification can backfire.

Mind the unknowns

Acknowledge ignorance

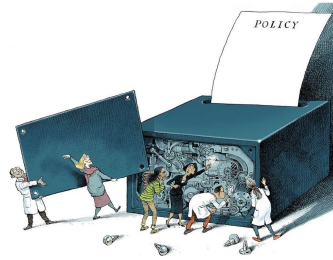


SUPPLEMENTARY INFORMATION

1. Additional information and references

>260 references

COVID-19 policies dictated by
'science' with several digits
precision in the presence of
fundamental uncertainties



Undocumented research code used
as a policy tool (chameleon models)



Pfleiderer, P. Chameleons: The Misuse of Theoretical Models in Finance and Economics. *Economica* 87, 81–107 (2020).

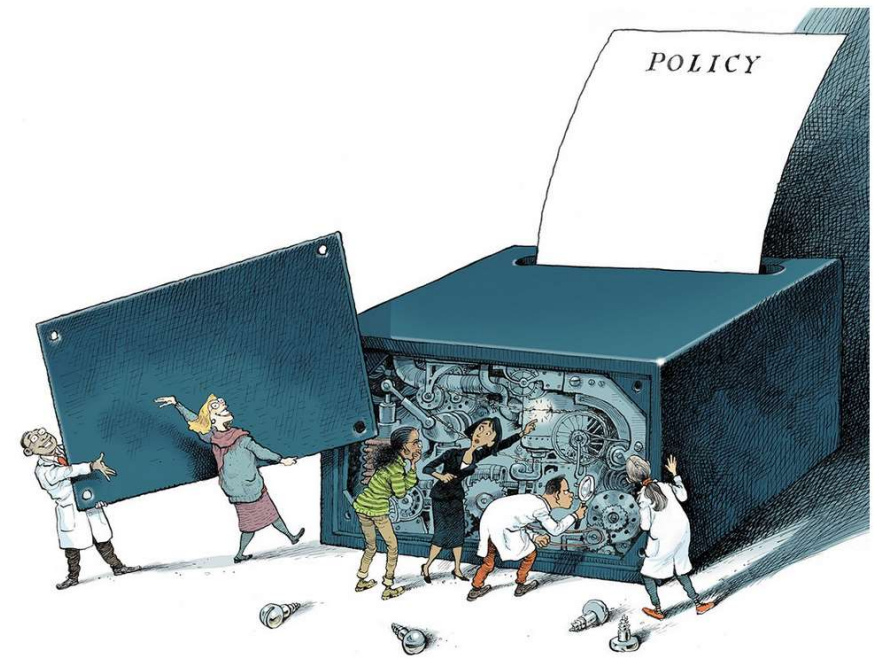
Mind the assumptions

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.



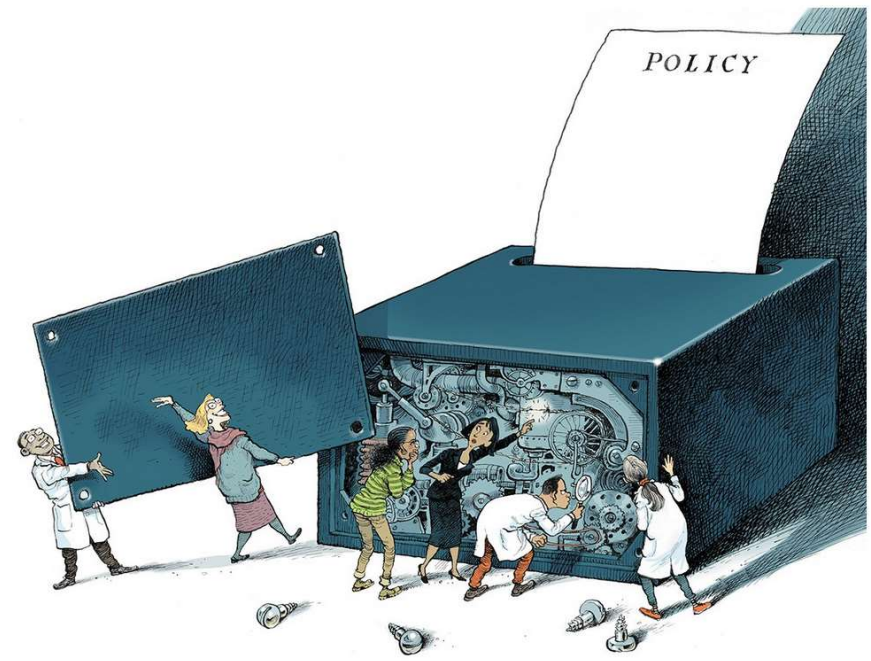
Mind the assumptions

Assess uncertainty and sensitivity

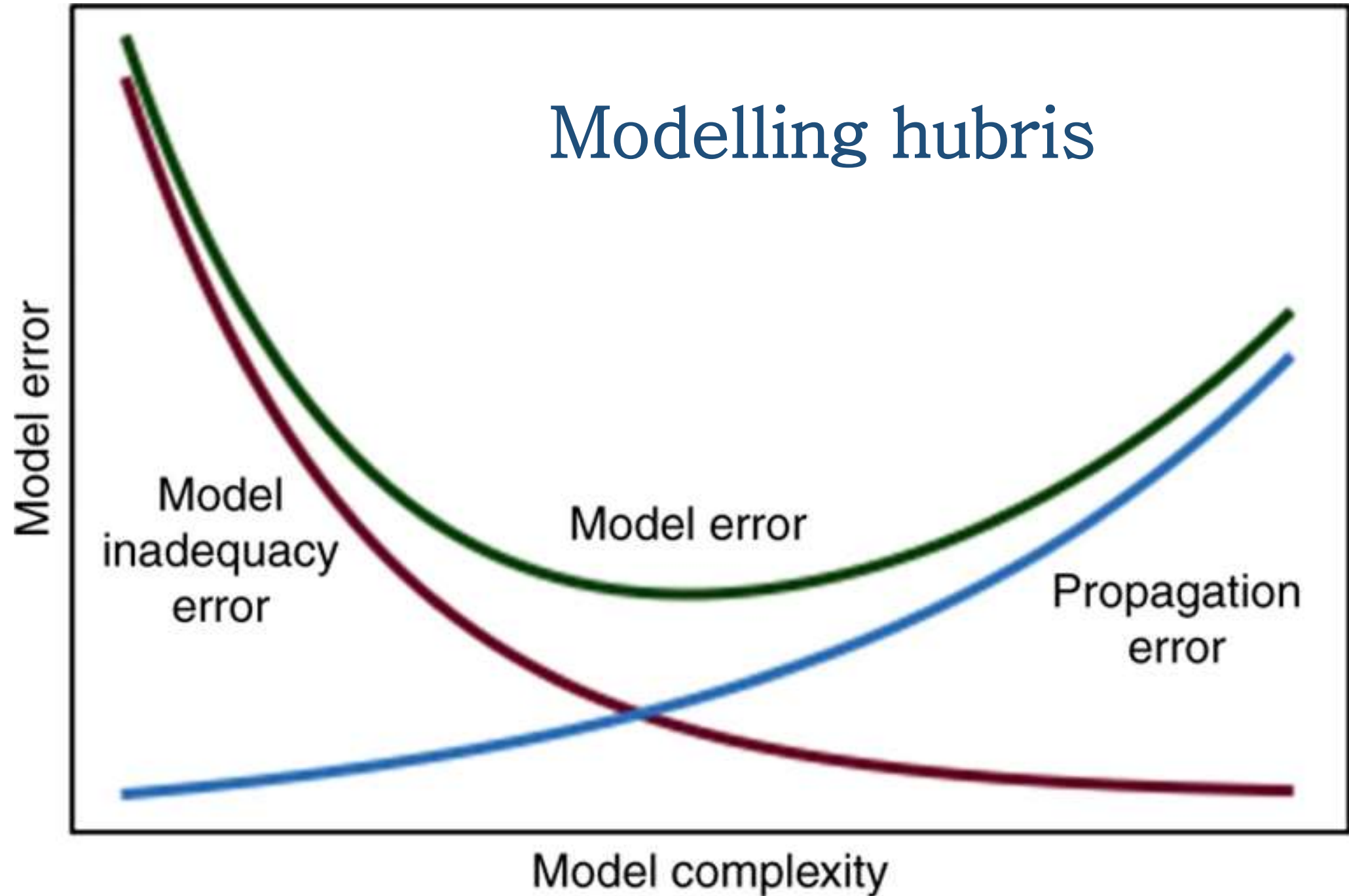


... to mitigate these issues:
perform global uncertainty and
sensitivity analyses ...

This often reveals that the uncertainty in
predictions is substantially larger than originally
asserted



Modelling hubris



Geophysical Research Letters / Volume 47, Issue 8

Research Letter

 Open Access



Current Models Underestimate Future Irrigated Areas

A. Puy✉, S. Lo Piano, A. Saltelli

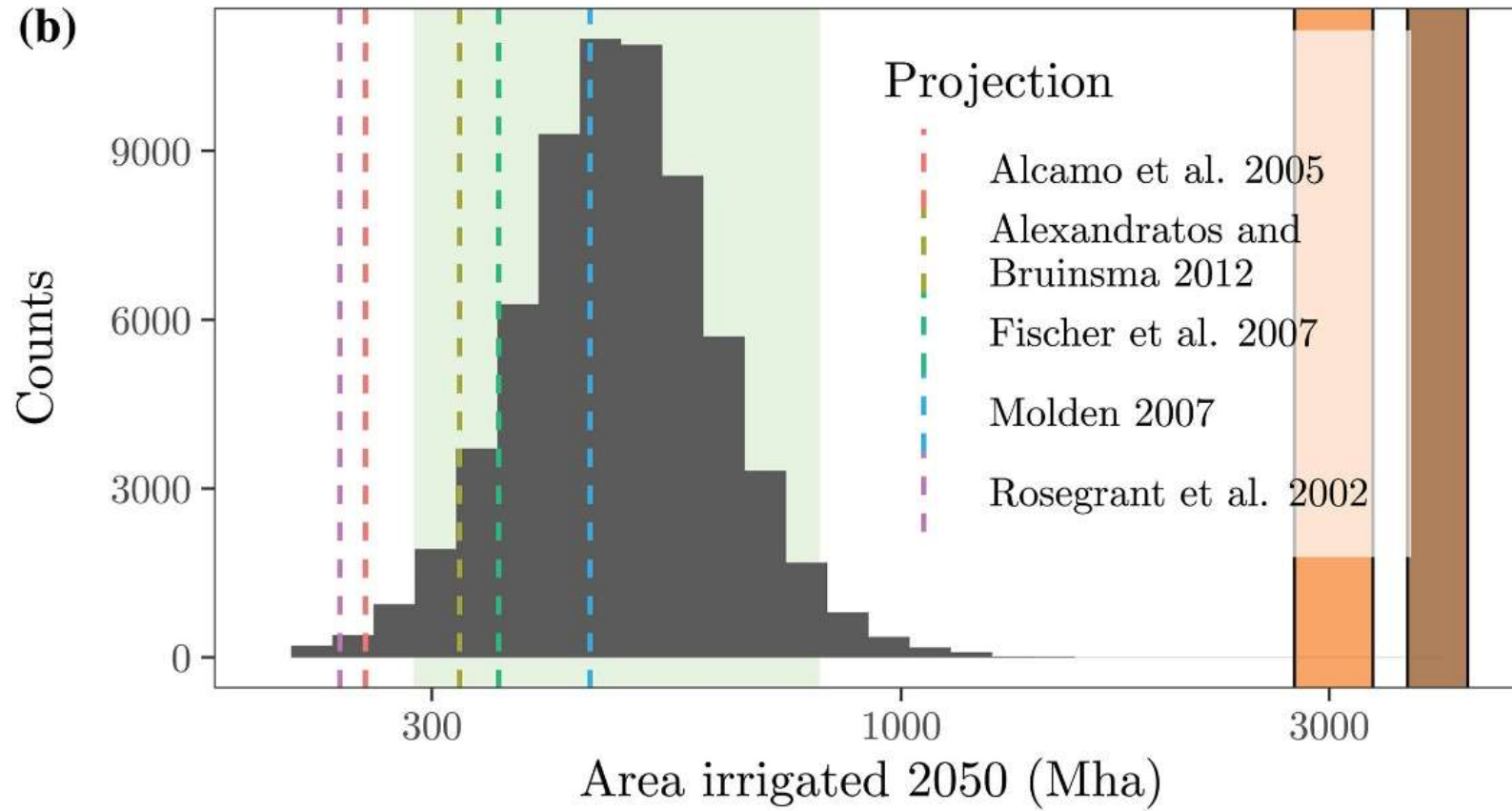
First published: 17 April 2020

<https://doi.org/10.1029/2020GL087360>

Citations: 2

Why sensitivity
analysis

(b)



Geophysical Research Letters / Volume 47, Issue 8

Research Letter | [Open Access](#) |

Current Models Underestimate Future Irrigated Areas

A. Puy , S. Lo Piano, A. Saltelli

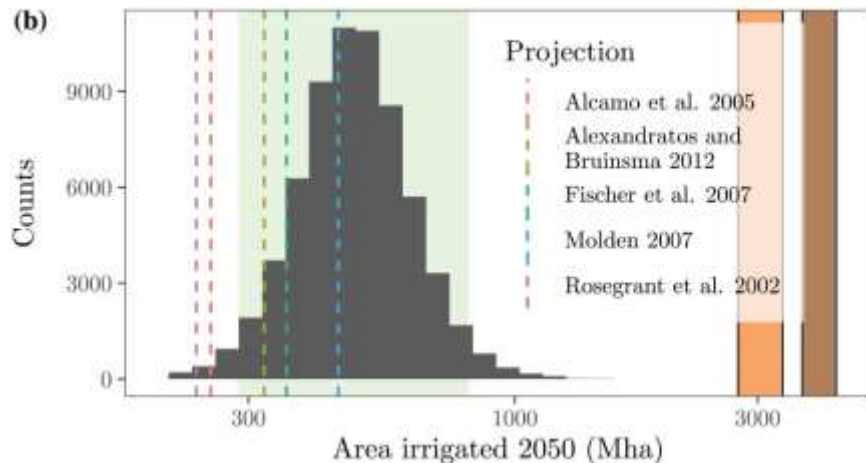
First published: 17 April 2020

<https://doi.org/10.1029/2020GL087360>

Citations: 2

Why sensitivity
analysis

Predictions underestimate the potential extension of irrigation ... uncertainty is mostly irreducible as it is largely caused by either population-related parameters or the assumptions behind the model design



Geophysical Research Letters / Volume 47, Issue 8

Research Letter | [Open Access](#) |

Current Models Underestimate Future Irrigated Areas

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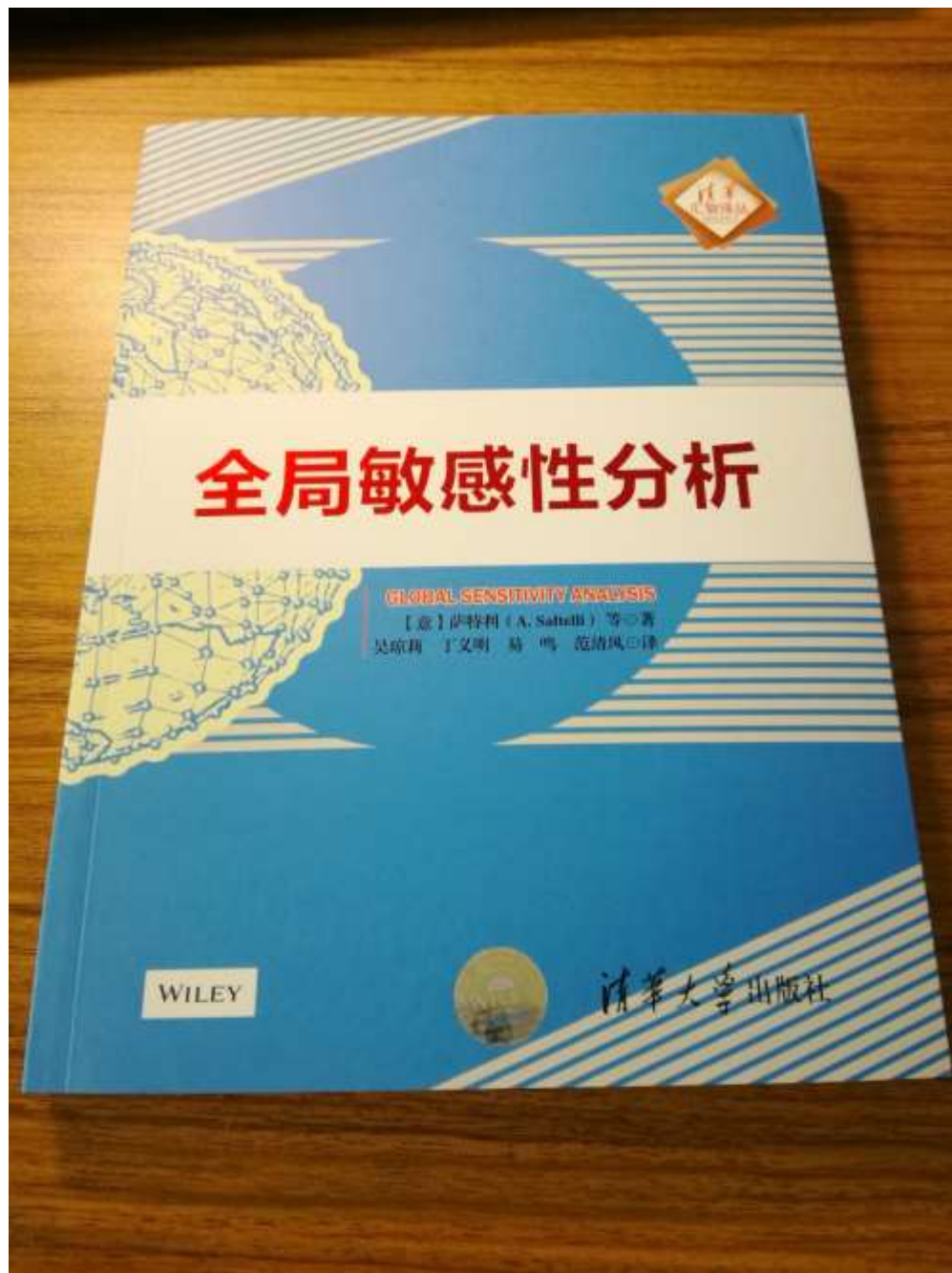
Why sensitivity analysis

A. Saltelli, M. Ratto,
T. Andres, F. Campolongo,
J. Cariboni, D. Gatelli,
M. Saisana, S. Tarantola

GLOBAL SENSITIVITY ANALYSIS

The Primer

 WILEY



Power?

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)

Too much is being read in the OECD–PISA data

IJCED
19,1

20

Received 14 December 2016
Revised 17 February 2017
Accepted 24 February 2017

Do PISA data justify PISA-based education policy?

Luisa Araujo

*Department of Human Capital and Employment,
European Commission Joint Research Centre Ispra Sector, Ispra, Italy*

Andrea Saltelli

*University of Bergen, Bergen, Norway and
Universitat Autònoma de Barcelona, Barcelona, Spain, and*

Sylke V. Schnepf

*Competence Centre on Microeconomic Evaluation,
European Commission Joint Research Centre Ispra Sector, Ispra, Italy*

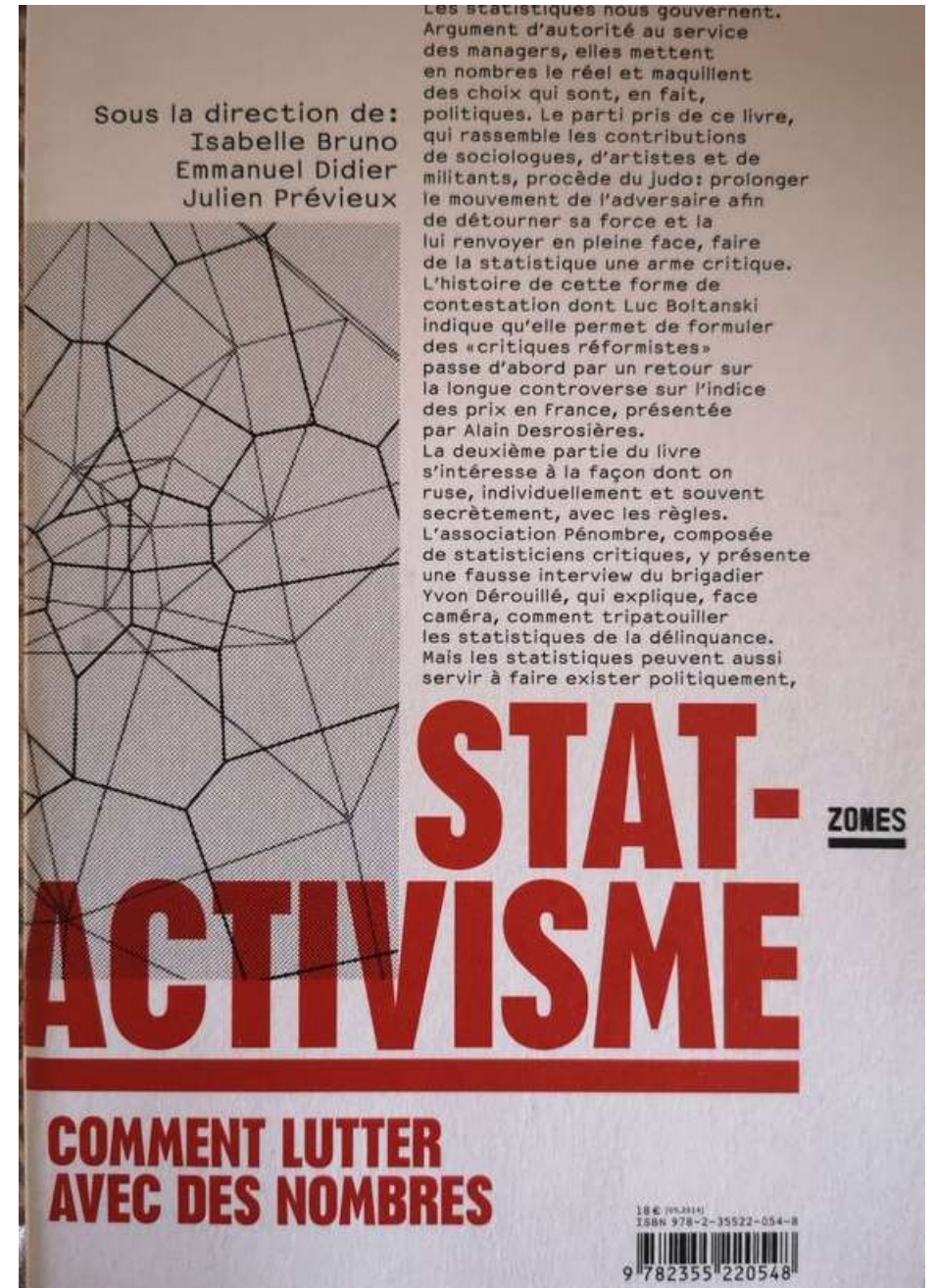


International Journal of
Comparative Education and
Development
Vol. 19 No. 1, 2017
pp. 20-34
© Emerald Publishing Limited
2396-7404
DOI 10.1108/IJCED-12-2016-0023

Through PISA, the OECD has (a) gained epistemic authority and (b) framed a trajectory for education

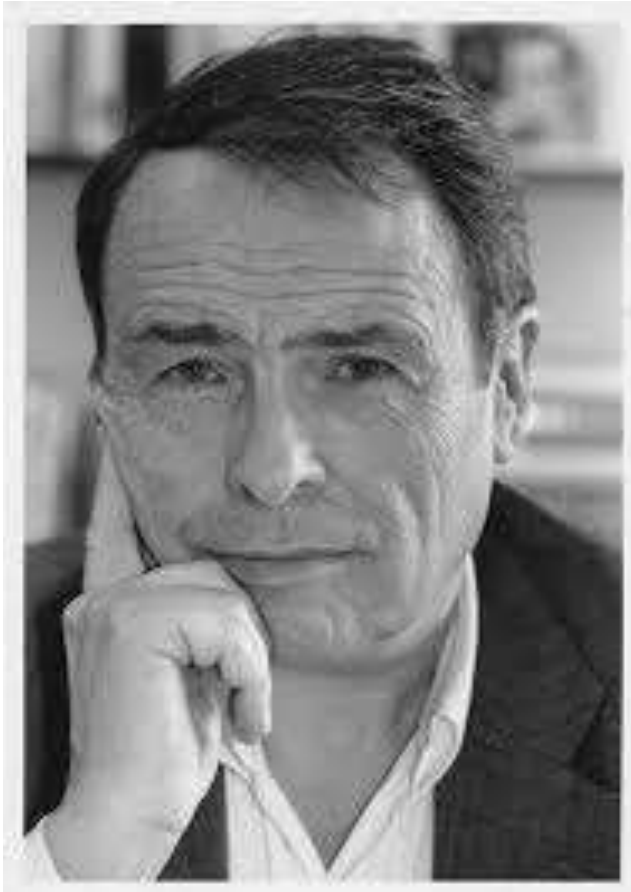
Do we need a movement of resistance?

I. Bruno, E. Didier, and J. Prévieux, Stat-activisme. Comment lutter avec des nombres. Paris: Zones, La Découverte, 2014



How to be a "statactiviste"?

1. Deconstruct existing metrics, including using irony (Pierre Bourdieu, *Les héritiers*).



La sociologie,
ça doit être
rigolo

(Sociology must be fun)



How to be a "statactiviste"?

3. Bring to the surface what is hidden / unsaid/ excluded – new social classes, marginalization, minorities:

- ‘Creative class’ or ‘precarious intellectuals’?



How to be a "statactiviste"?

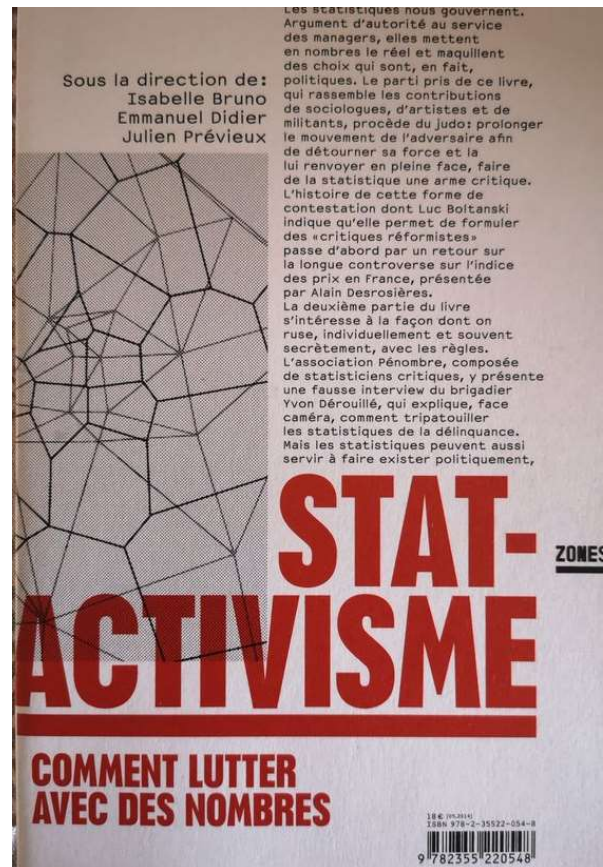
4. Measure something different.

- Suicides at France Telecom;
- BIP 40, a new French measure of poverty/inequality



Important:

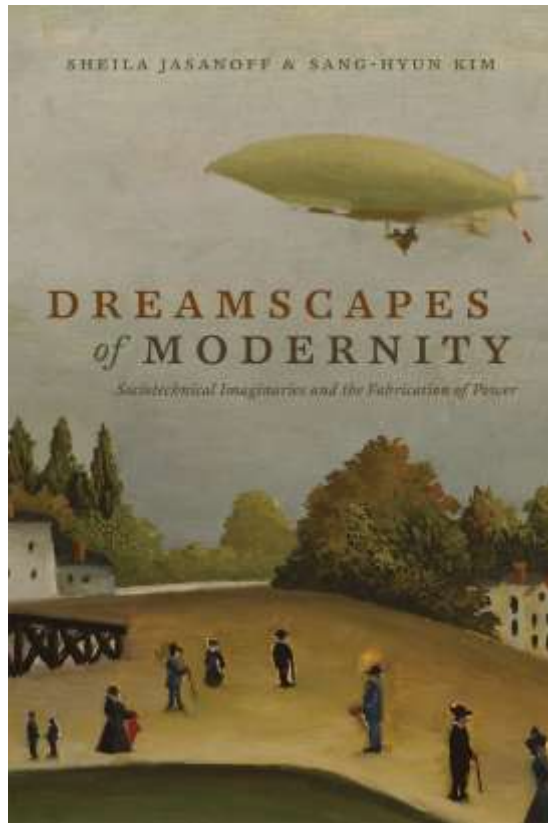
“Quantification should not be abandoned to the advantage of exalting qualities, singularities, and the incommensurable. Such an abandon would be a tactical error” (p.29)



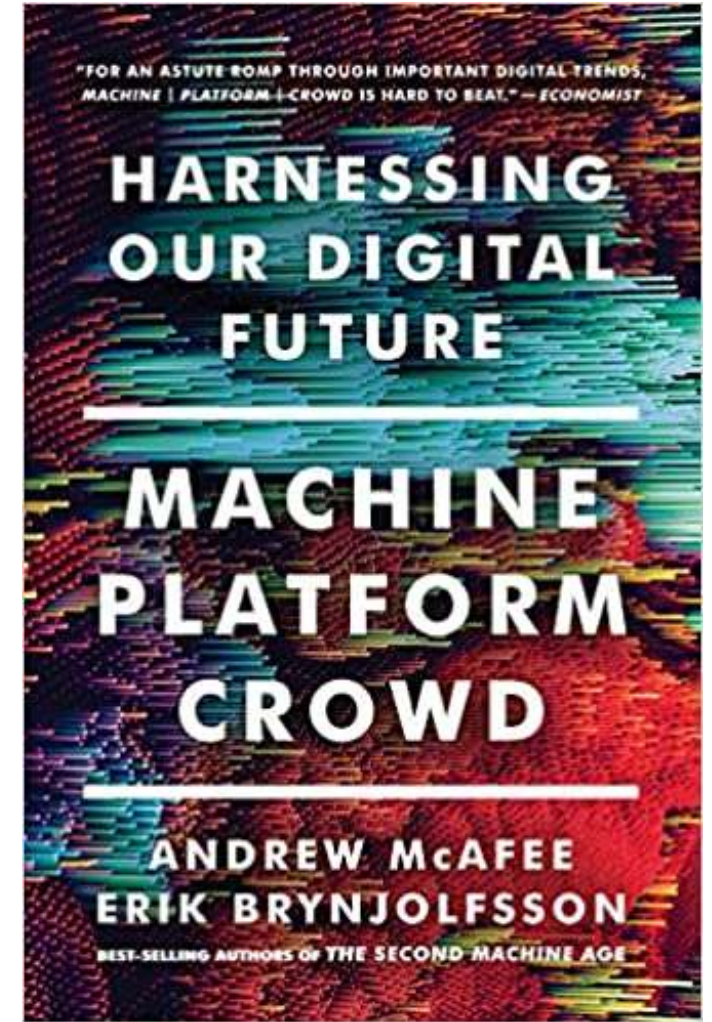
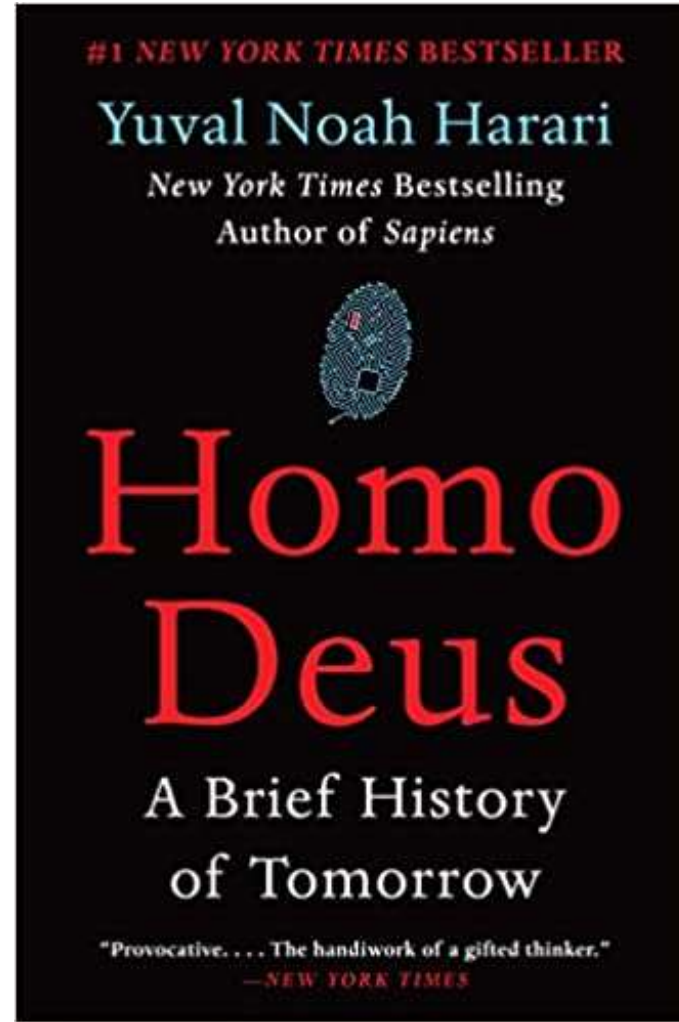
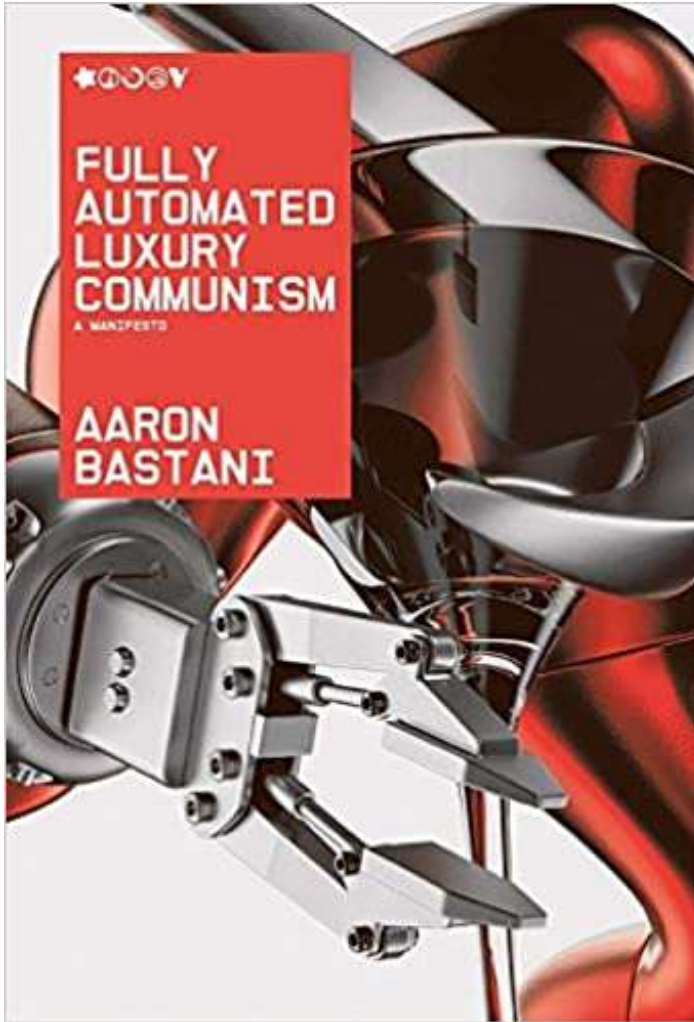
And yet ... which is the
prevailing sociotechnical
imaginary?

1. Techno-optimism
2. Numbers are neutral

How visions of scientific and technological progress carry with them implicit ideas about public purposes, collective futures, and the common good



Sheila Jasanoff



Techno-optimism

Numbers are neutral

“Often, immersion in the facts often makes value disagreements feel much less relevant” (C. Sunstein)



Cass Sunstein, winner of the 2018 Holberg Prize

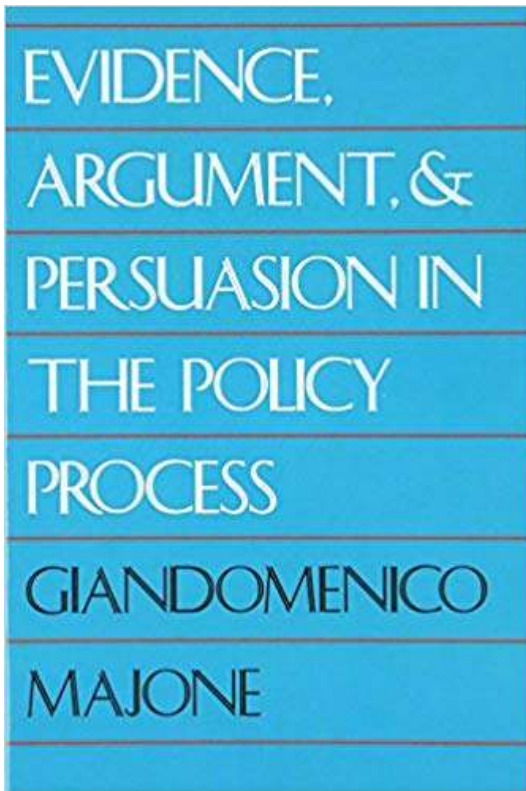


But...

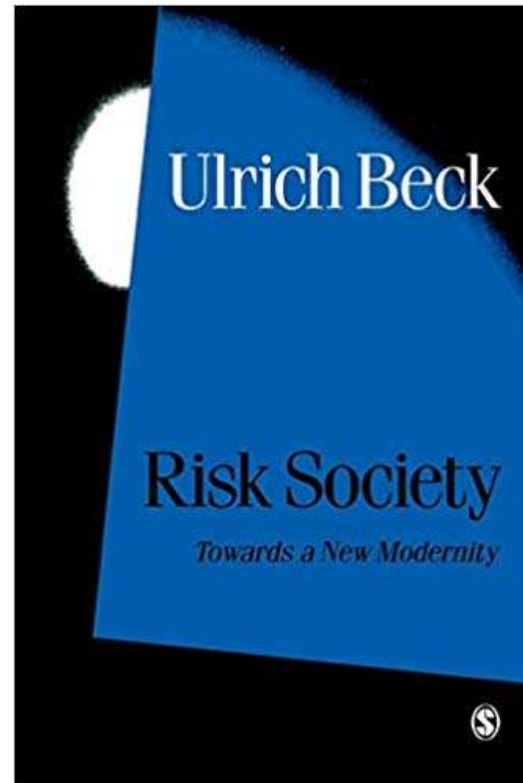
From Ulrich Beck to Giandomenico Majone: the technique is never neutral



Ulrich Beck
(1944 –2015)



1989



1992 (1986)



Environmental Science & Policy

Volume 106, April 2020, Pages 87-98



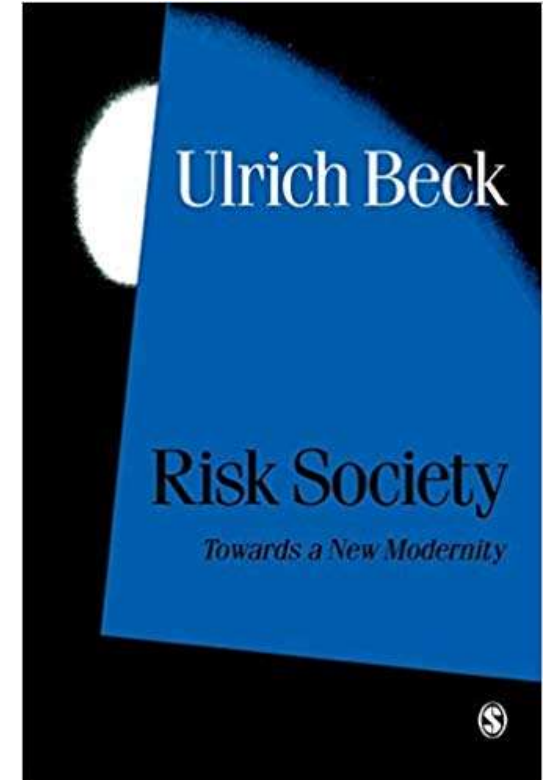
The technique is never neutral. How
methodological choices condition the
generation of narratives for sustainability

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.” (Beck, 1986)



Ulrich Beck
(1944 –2015)



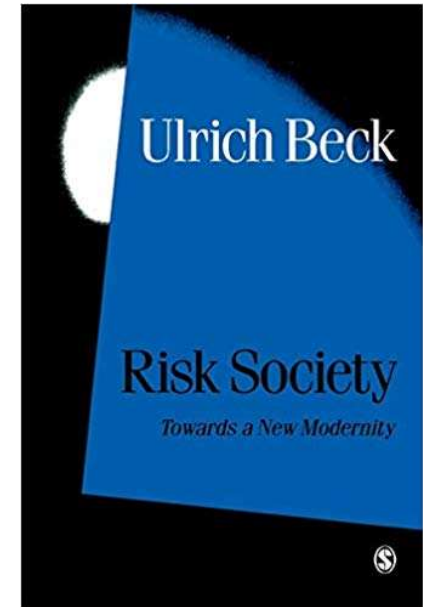
1992 (1986)

Chapter 7 Science beyond truth and enlightenment

- Feudalization of cognitive practices

In developed civilizations, scientific cognitive practice becomes a manipulation of latently political variables

➔ On transforming a political problem into a technical one

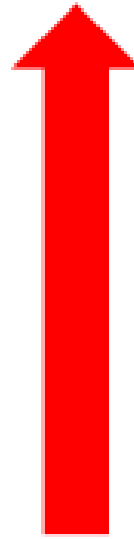


(society)
Practical problem

translate



interpret



Technical problem
(science)

Courtesy of Jeroen
van der Sluijs



After Ravetz, J., 1971,
Scientific Knowledge
and its Social
Problems, Oxford
University Press.

EVIDENCE,
ARGUMENT, &
PERSUASION IN
THE POLICY
PROCESS
GIANDOMENICO
MAJONE

Majone: “In any area of public policy the choice of instruments, far from being a technical exercise that can be safely delegated to the experts, reflects as in a microcosm all the political, moral, and cultural dimensions of policy-making”

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}

- The choice of the methodology conditions the narrative produced by an analysis.
- Pooled methodologies are proposed here to tackle uncertainties and ensure quality in sustainability integrated assessment.

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}

- We combine six lenses and illustrate their applications both in isolation and combined.
- The lenses are (i) Post-normal science (PNS), (ii) Controversy studies, (iii) Sensitivity auditing, (iv) Bioeconomics, (v) Ethics of science for governance, and (vi) Non-Ricardian economics.

The End



@andreasaltelli