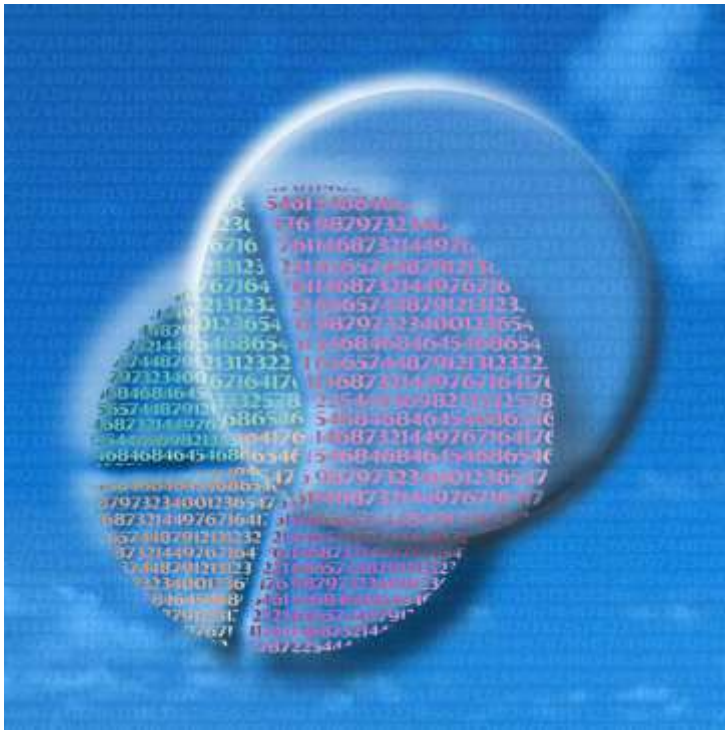


Ethics of Quantification

Andrea Saltelli

Course MNF990, University of Bergen,
September 21, 2023



Where to find this talk: www.andreasaltelli.eu



HOME ABOUT ME PUBLICATIONS NEWS & VIDEOS RESOURCES



August 25 2023: The politics of modelling is out!



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 cautionary view of the ever-widening dependence on mathematical modeling."

Orrin H. Pilkey, Professor at Duke University's Nicholas School of the Environment, co-author with Linda Pilkey-Jarvis of *Useless Arithmetic: Why Environmental Scientists Can't Predict the Future*, Columbia University Press 2009.

"The methods by which power insinuates itself

Mastodon Toots by

@AndreaSaltelli



AndreaSaltelli

2023/8/28 11:24

August 26 Podcast (16m) - interview for ABC NET RADIO, AUS: Assumptions and consequences: the politics of modelling, Guests: Ehsan Nabavi and Andrea Saltelli, Producer - Chris Bullock.

abc.net.au/listen/programs/sun

View on mstdn.social

Fantastic numbers
Stern controversy
Crosby
Sociology of quantification exploding
Porter, trust, Luhmann, Ravetz
Goodhart, Ravetz
O'Neil, Coded bias
Zuboff, Social Dilemma
Supiot
Economists
Muller's Tyranny of metrics
Statactivism
Modelling Manifesto
Beck, Majone
Salais, Desrosières
Thévenot
Scoones, Stirling
Fishing Expeditions, Forking Paths
How about ChatGPT?

**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
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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 capture our attention; they illuminate the part of reality which is being numerified, and fatally push those parts into the background which come without the clothing of ...

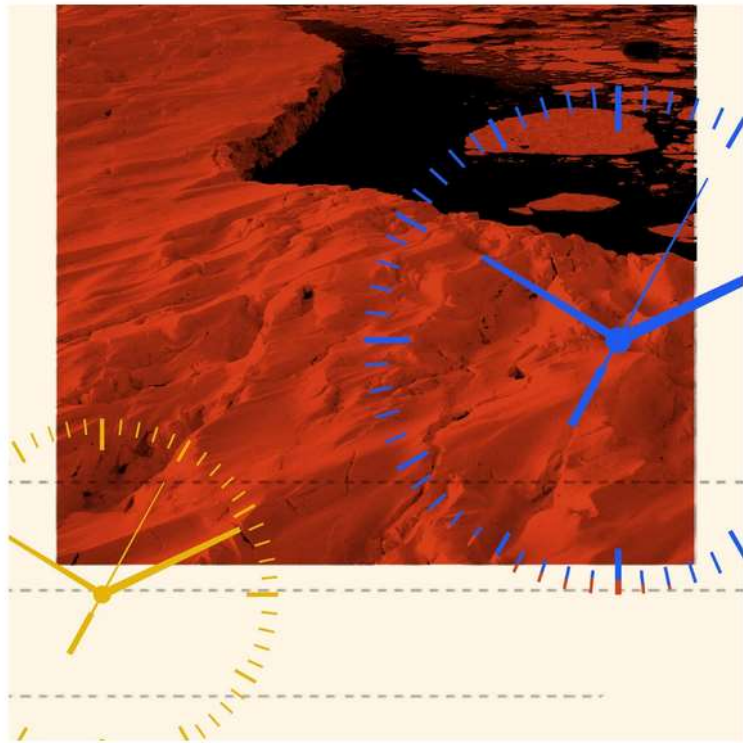
... numbers are so deeply entrenched in our existence that we barely reflect on them critically them anymore — too close to us, they have become part of the very lens through which we attend to and comprehend the world.

Do we live immersed in
fantastic numbers?

OPINION
PETER COY

‘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


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

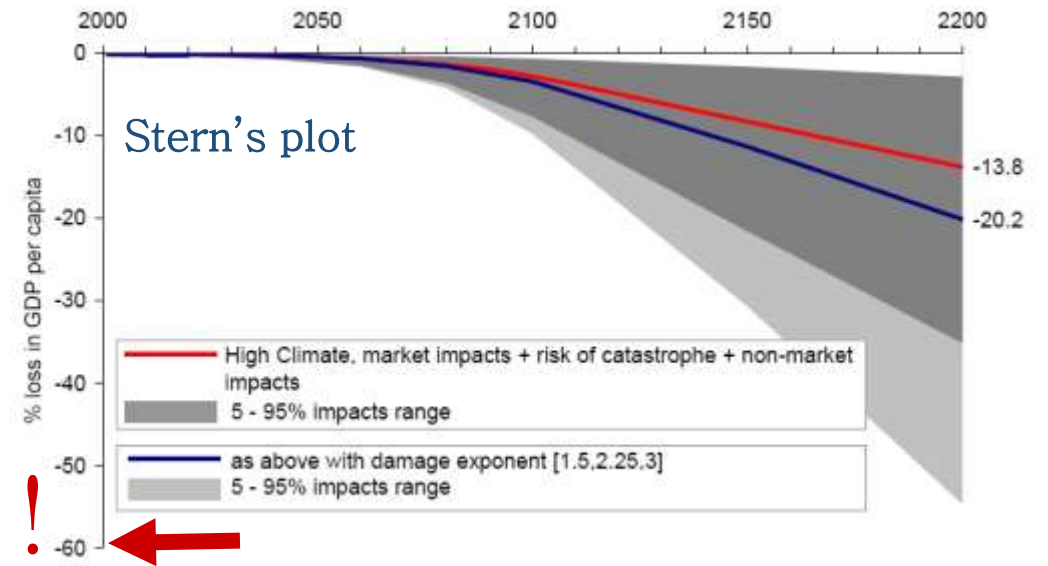
The Social Cost of Carbon: Advances in Long-Term Probabilistic Projections of Population, GDP, Emissions, and Discount Rates

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



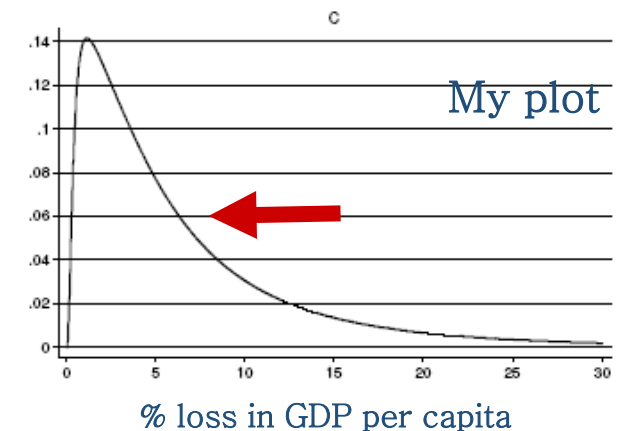
Global Environmental Change 20 (2010) 298–302



Contents lists available at ScienceDirect

Global Environmental Change

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

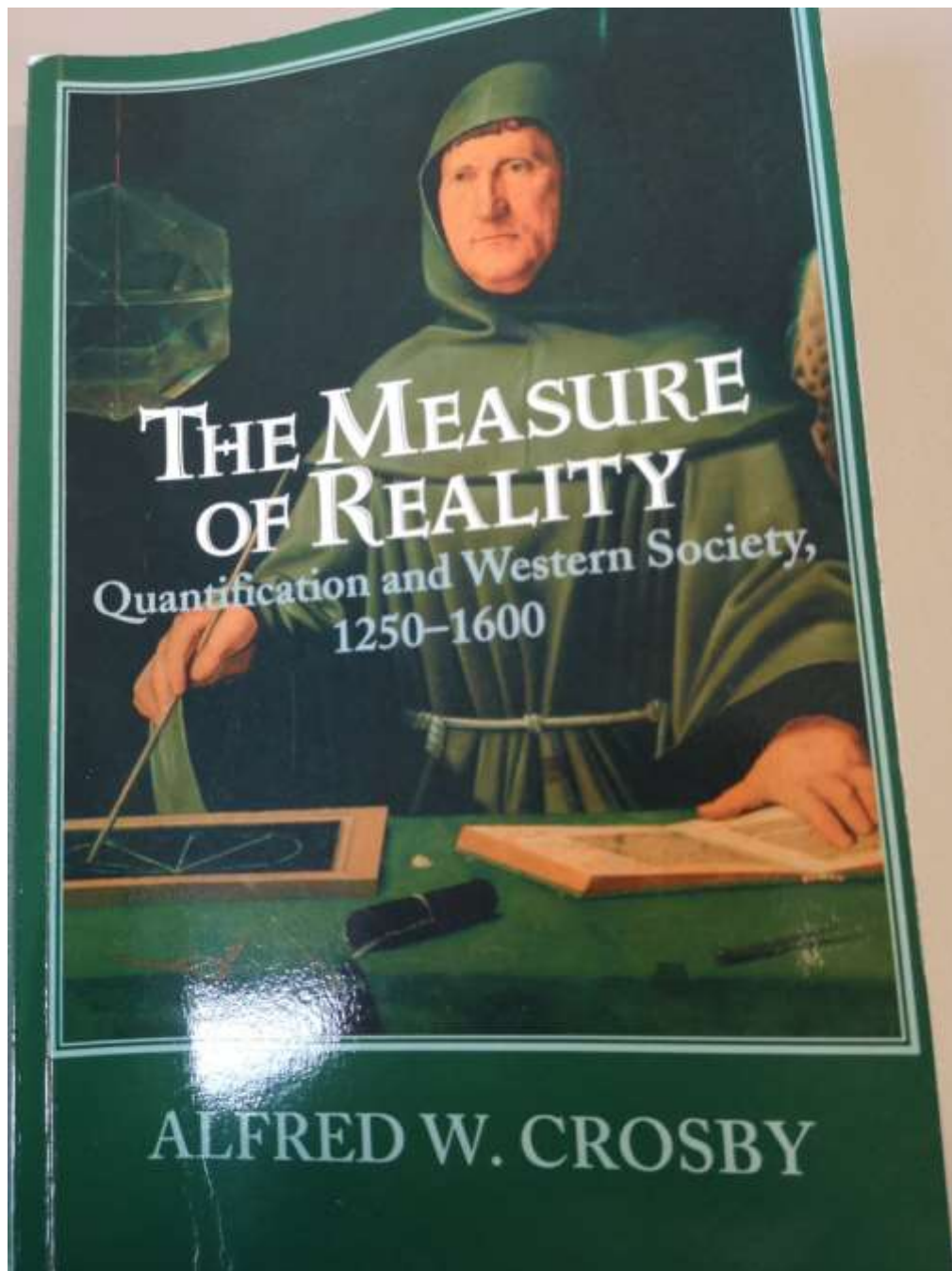


Sensitivity analysis didn't help. A practitioner's critique of the Stern review

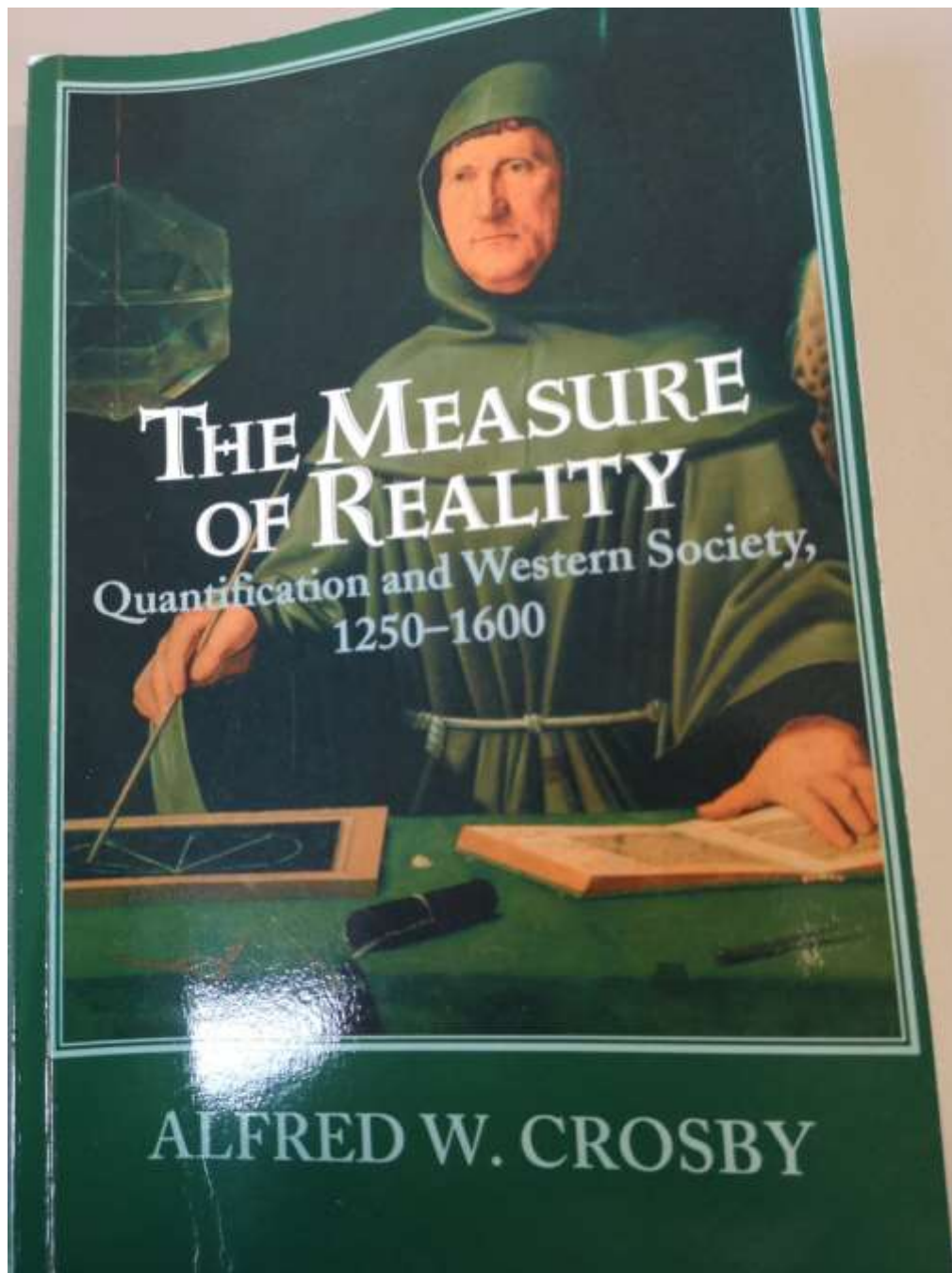
Andrea Saltelli *, Beatrice D'Hombres

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

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 ...

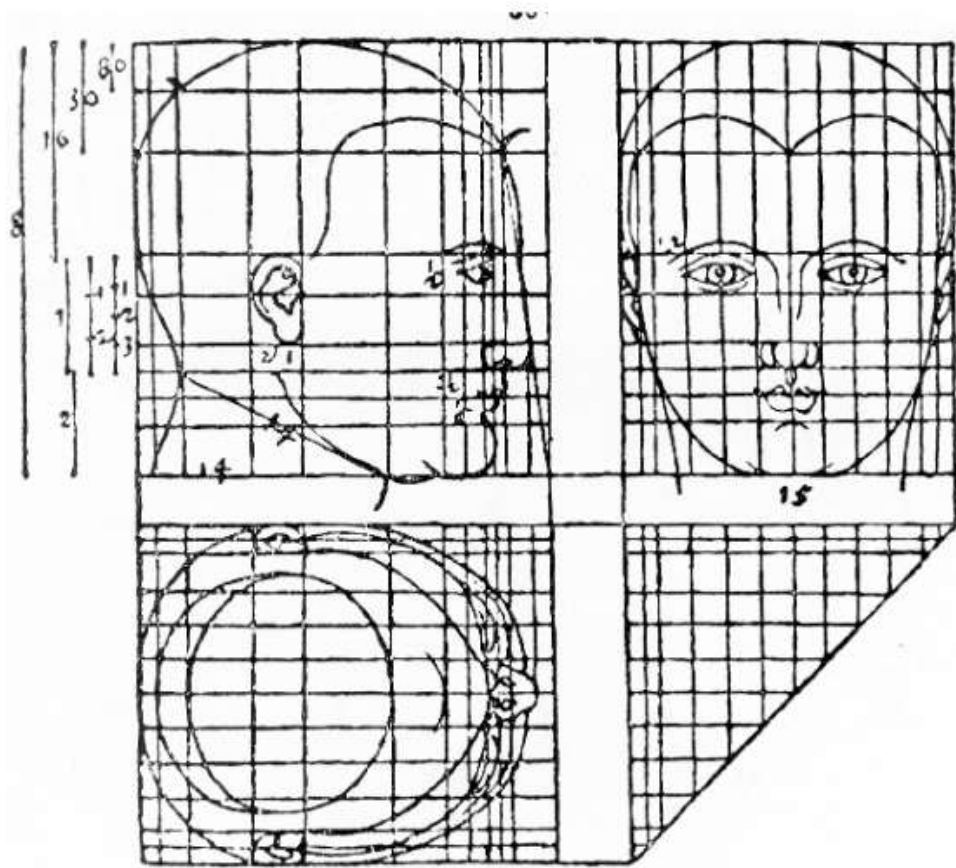




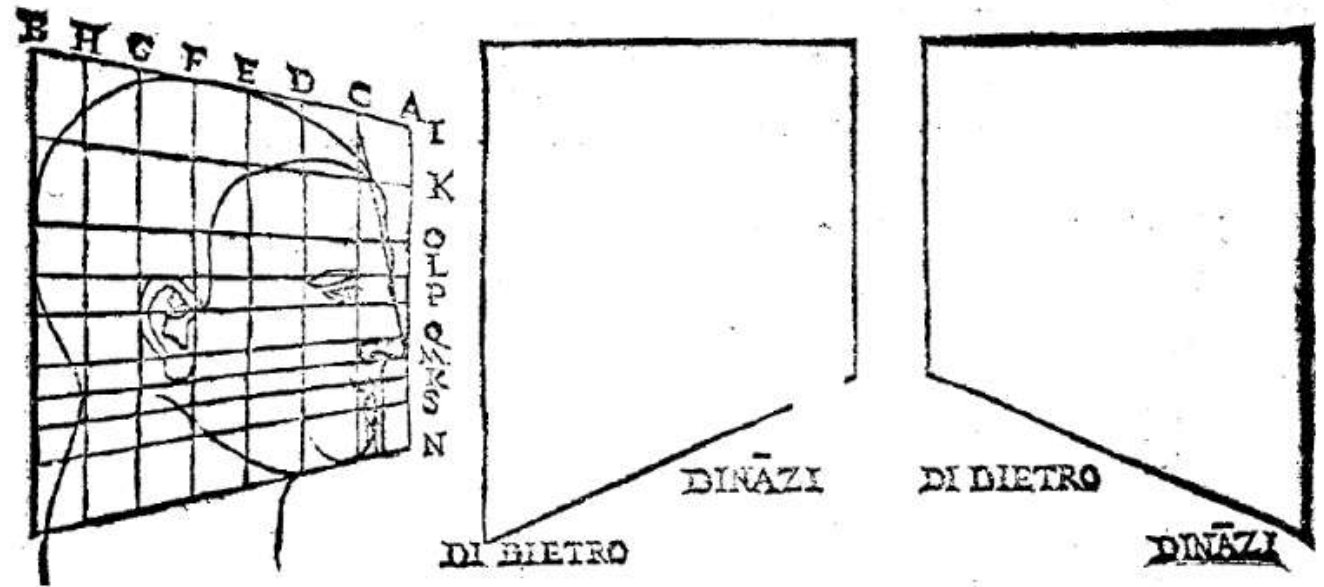
The Annunciation,
Carlo Crivelli
(1435, 1495)



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



DELLA SIMMETRIA



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

Many voices of alarm as to
misuse of quantification

With numbers both visible and
invisible...

Blurring lines:

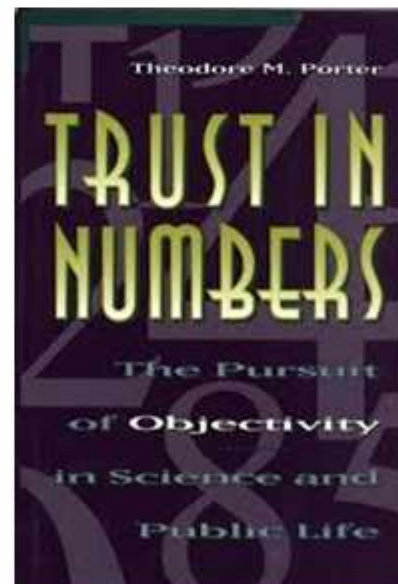
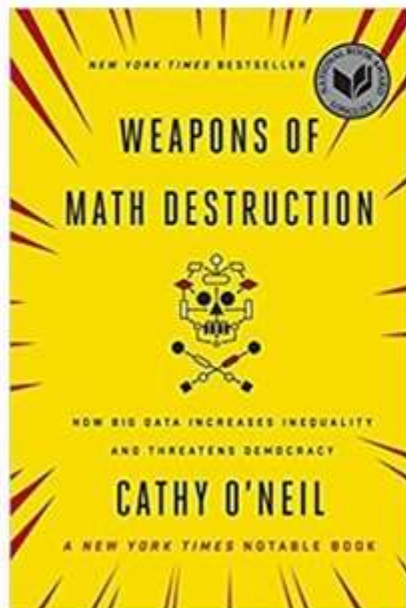
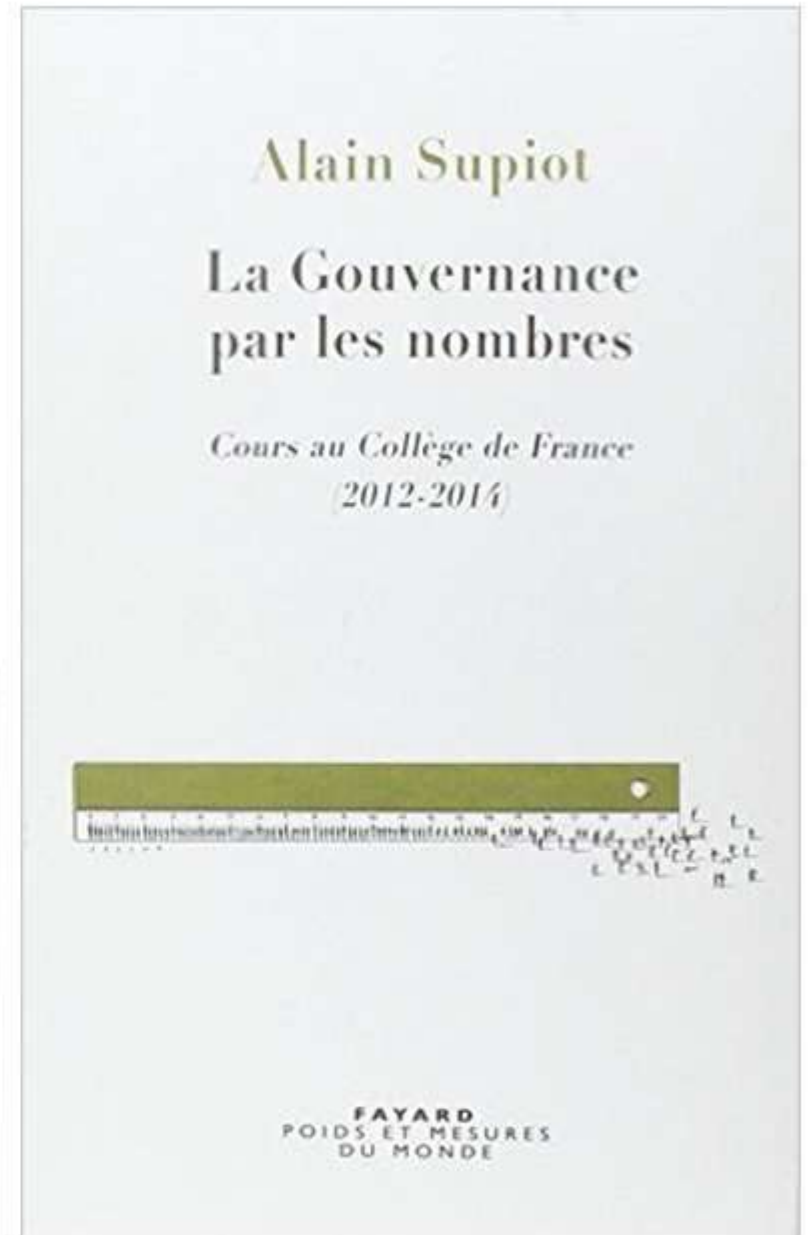
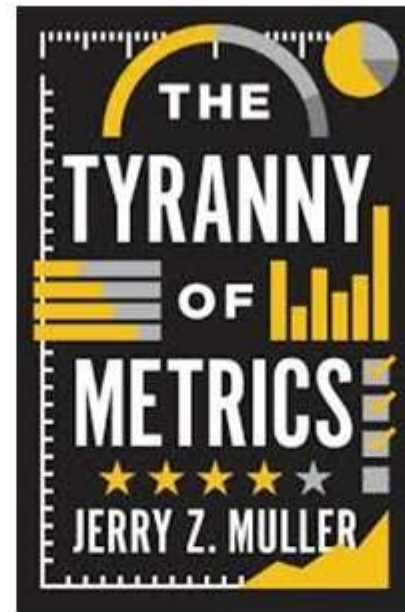
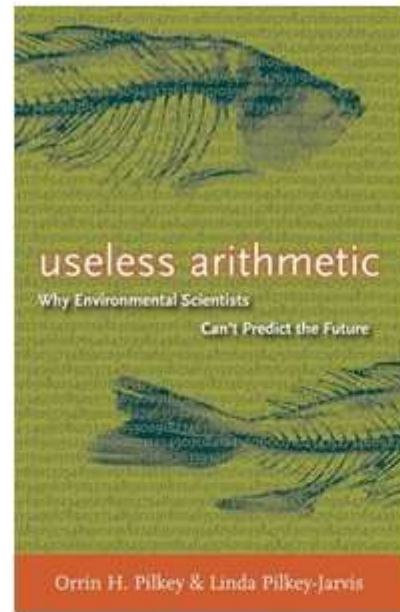
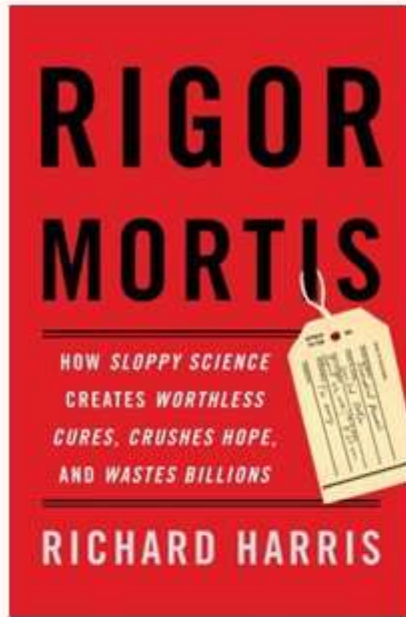
“what qualities are specific to rankings, or indicators, or models, or algorithms?”



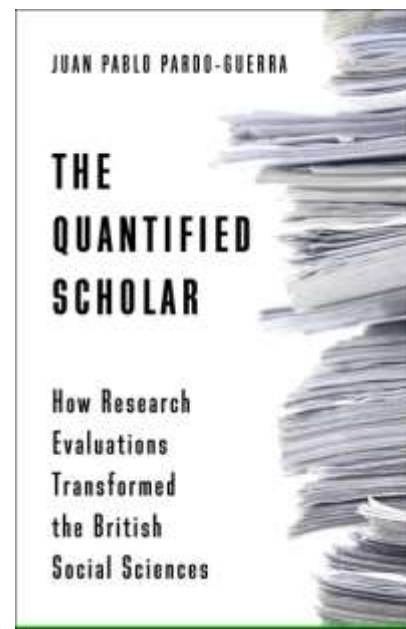
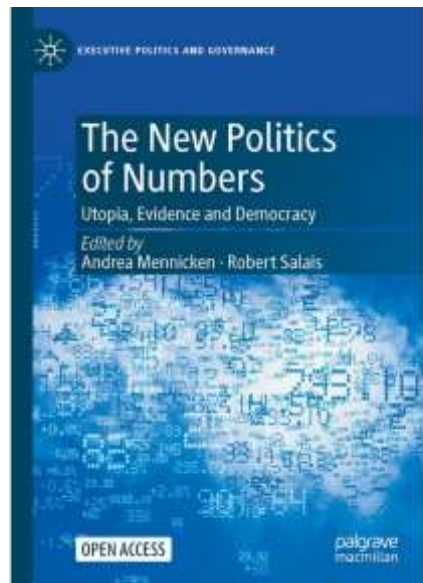
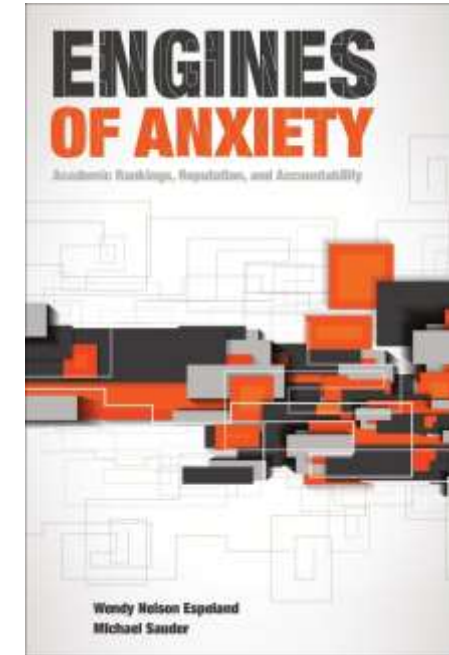
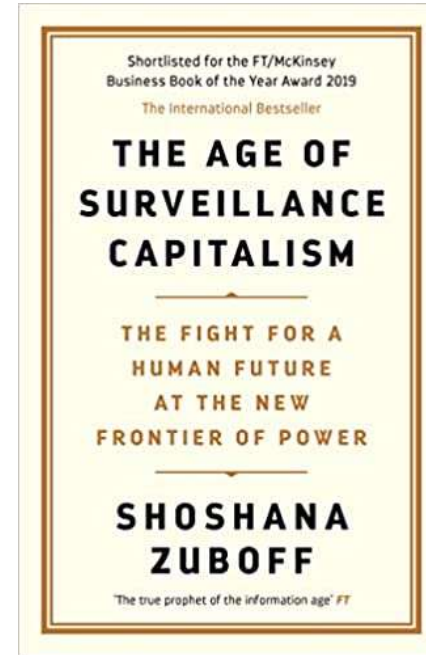
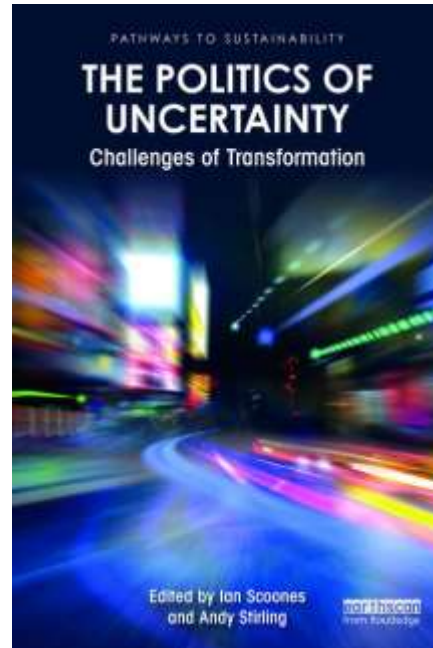
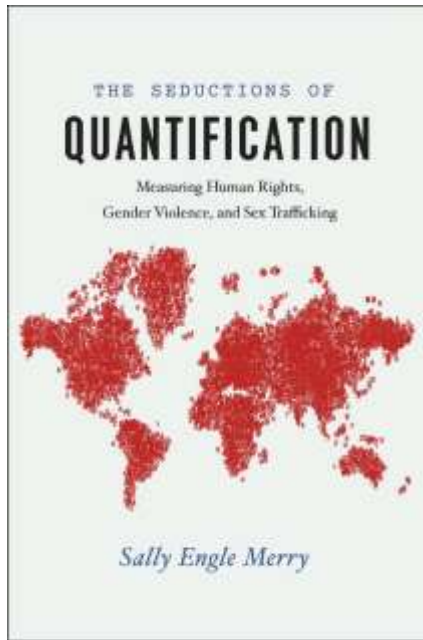
Elizabeth
Popp Berman

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

Algorithms, models, metrics, statistics...



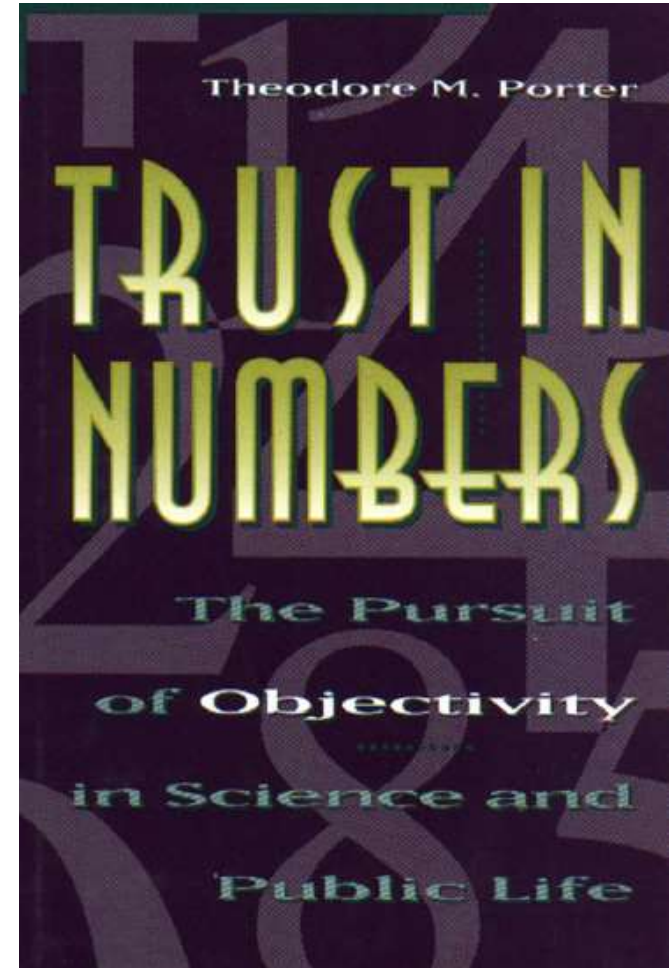
Algorithms, models, metrics, statistics...



Numbers and trust



Theodor
M. Porter



Theodore M. Porter, *Trust in Numbers, The Pursuit of Objectivity in Science and Public Life*, Princeton 1995

Porter's story: Quantification needs judgment which in turn needs trust ...without trust quantification becomes mechanical, a system, and 'systems can be played'.



‘System trust’, is social system theory:

“The reduction of complexity
[made possible by generalized media of
communication as money, power and truth]
assumes trust on the part of those
who are expecting such reduction
and of those who are supposed to
accept it once it is accomplished”



Niklas Luhmann

N. Luhmann, Trust and Power. Polity Press, 2017.

‘the essential fiduciary status’ of science= Trust in science is necessary for the general society to continue to support it, materially and with recruits. And mutual trust within science is necessary for its systems of quality assurance to function



Jerome R.
Ravetz

For Ravetz (1971, pp. 295–296), when the goals of a task are complex, sophisticated, or subtle, then crude systems of measurements can be played exactly by those persons possessing the skills to execute the tasks properly, who thus manage to achieve their own goals to the detriment of those assigned.

Ravetz, J.R., 1971, *Scientific Knowledge and Its Social Problems*, 1996 Edition, Transaction Publishers. See examples in Muller, J.Z., 2018, *The Tyranny of Metrics*, Princeton.



Charles Goodhart

p. 44 “Any ... measures necessarily involve a loss of information ... [and distorts behavior]” (Porter, 1995)

This is what we normally call Goodhart’s law, from Charles Goodhart. “When a measure becomes a target, it ceases to be a good measure.”

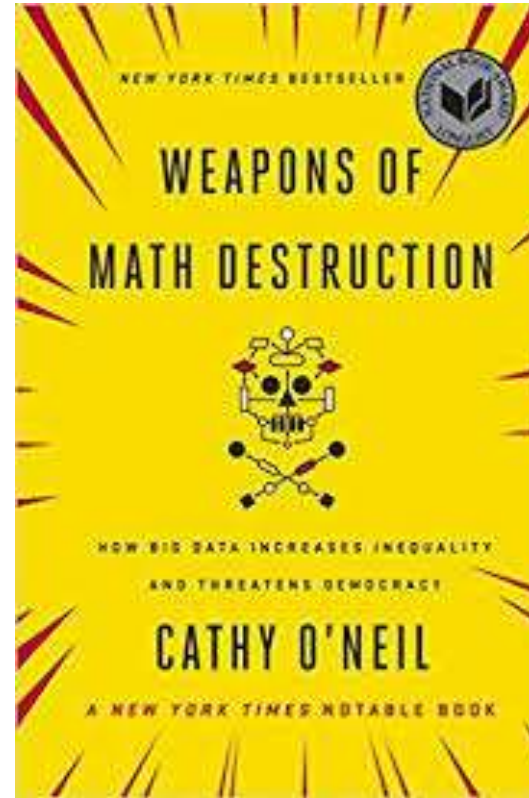
Also known as Campbell's law (1976);

https://en.wikipedia.org/wiki/Goodhart%27s_law

Alarm for Weapons of Math Destruction



Cathy O'Neil

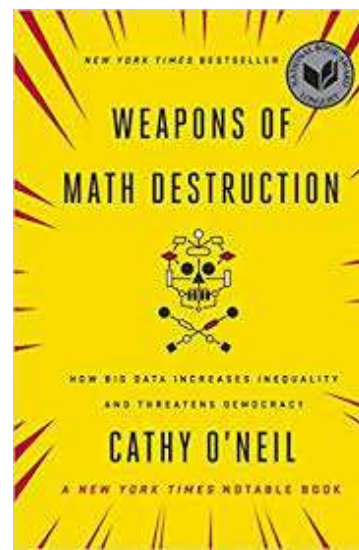


O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

Opacity (also because of trade secrecy) of algorithms used to decide on recruiting, carriers (including of researchers), prison sentencing, paroling, custody of minors, political campaigns...

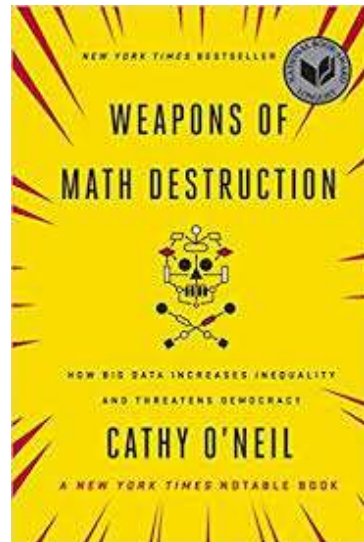
O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

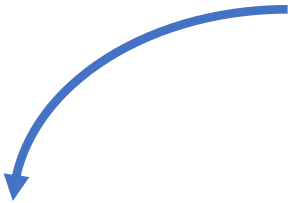
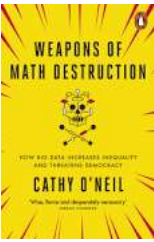
Brauneis, R., & Goodman, E. P. (2018). Algorithmic Transparency for the Smart City. *Yale Journal of Law & Technology*, 20, 103–176. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3012499



Opacity coupled with opportunity for scale and damage and with non-appealability make them an instrument of oppression & inequality

Cathy O'Neil Google talk <https://www.youtube.com/watch?v=TQHs8SA1qpk>





NETFLIX

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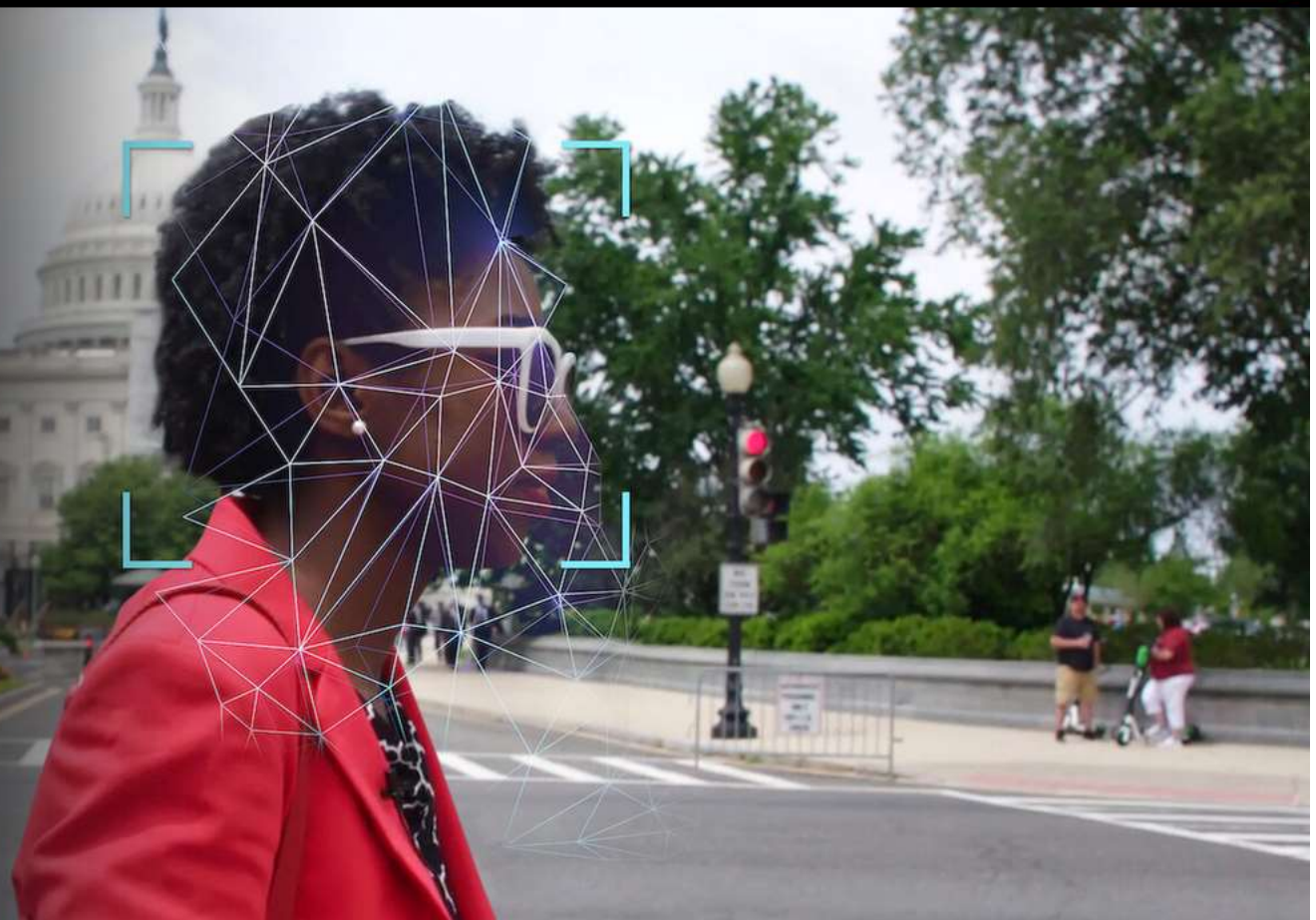
JOIN NOW

C O D E D B I A S

Coded Bias

2020 | 12+ | 1h 25m | Science & Nature Docs

This documentary investigates the bias in algorithms after M.I.T. Media Lab researcher Joy Buolamwini uncovered flaws in facial recognition technology.





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**TECHNOLOGY SHOULD
SERVE ALL OF US. NOT JUST
THE PRIVILEGED FEW.**

Join the Algorithmic Justice League in the movement towards equitable and accountable AI.

Enter your email

JOIN THE MOVEMENT



Algorithmic Justice
League

<https://www.ajl.org/>

The New York Times

Bloomberg
Business

Forbes

TIME

FORTUNE

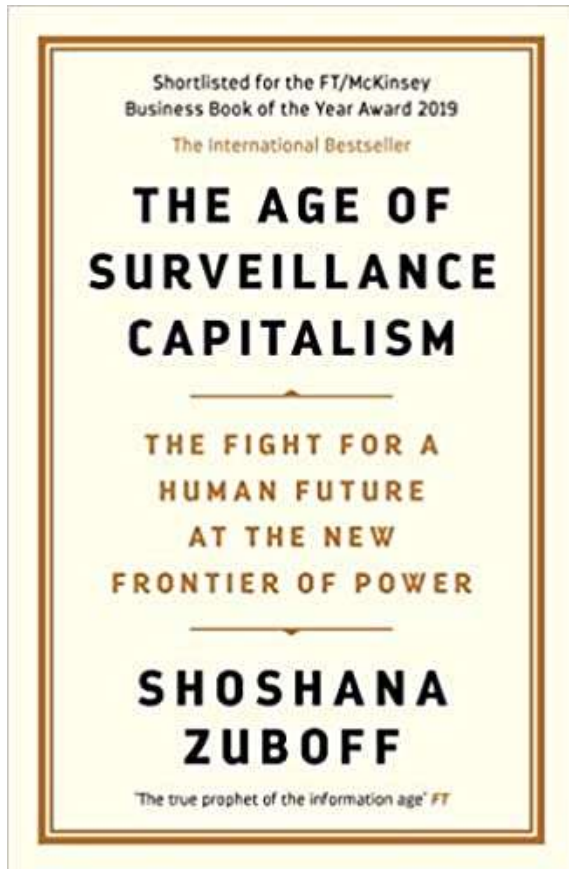
TED

WIRED

The Telegraph



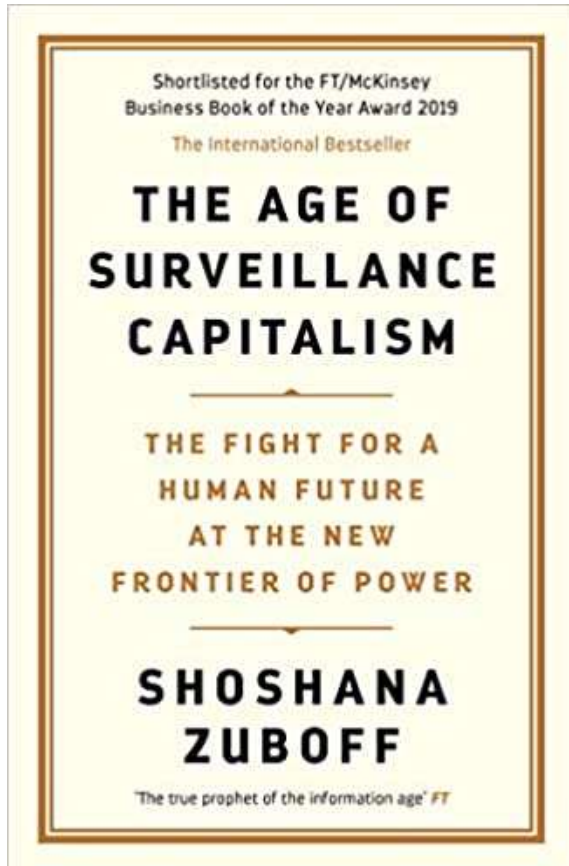
A project of domination of consumers and voters is made possible by artificial intelligence, big data & cognitive psychology



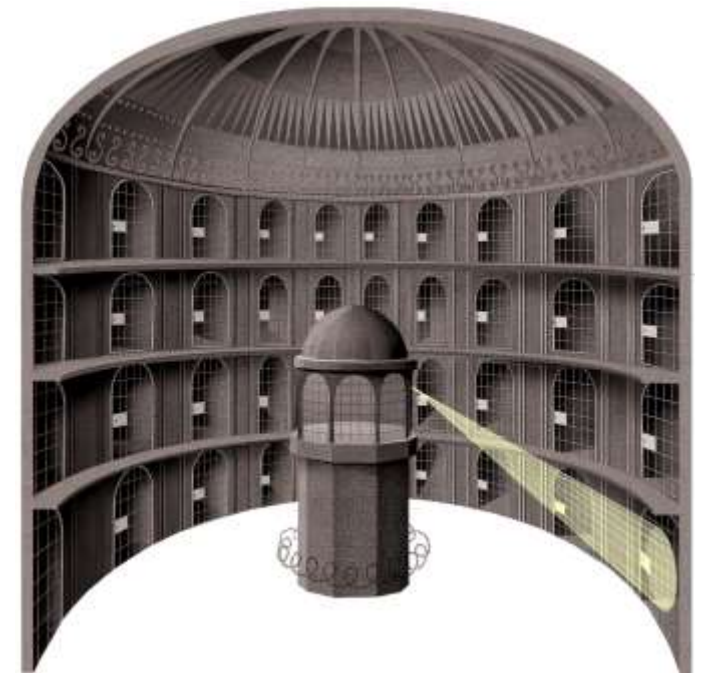
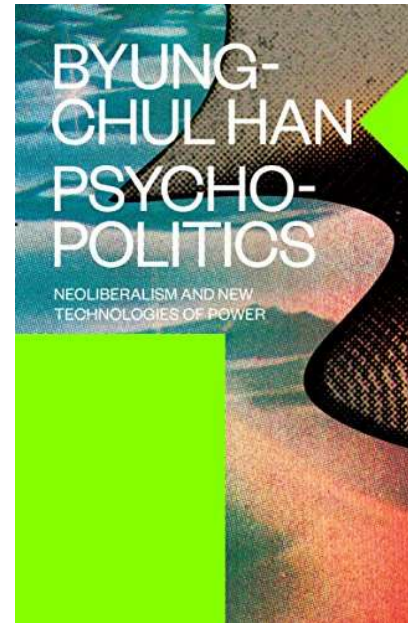
Inequality, power asymmetries and the world of surveillance capitalism



... and the surveillance is voluntarily accepted



Byung Chul Han 'virtual panopticon'



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

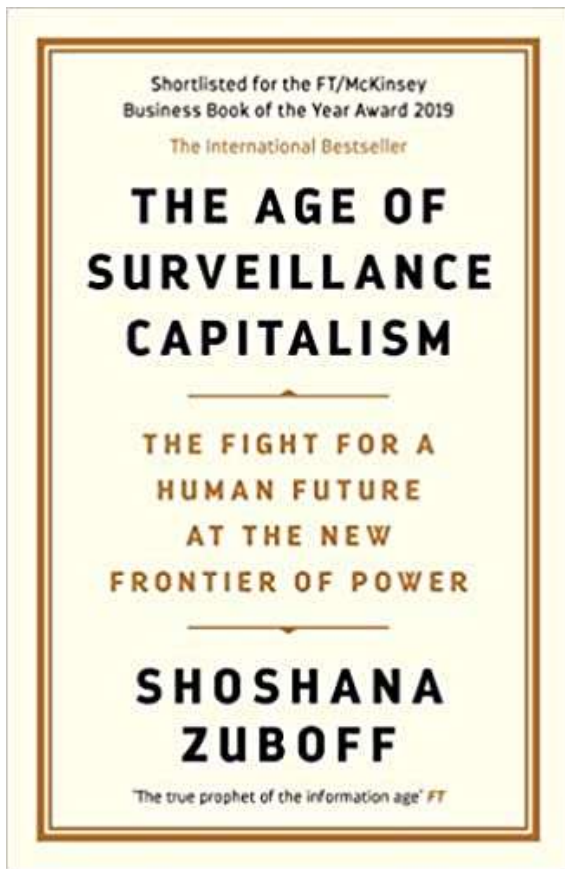
NETFLIX

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





Chapters 11 & 12

Instrumentarian
power



Chapter 10

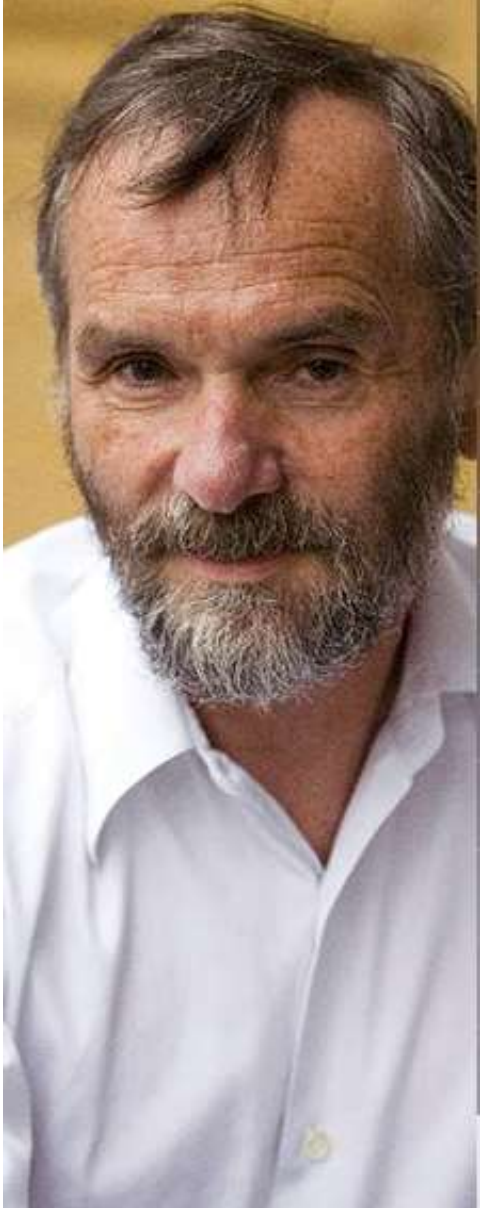
Néorationalism d'importation

*La trollisation de l'espace
public*

AI empowered with
cognitive psychology

A project of domination?

Alain Supiot

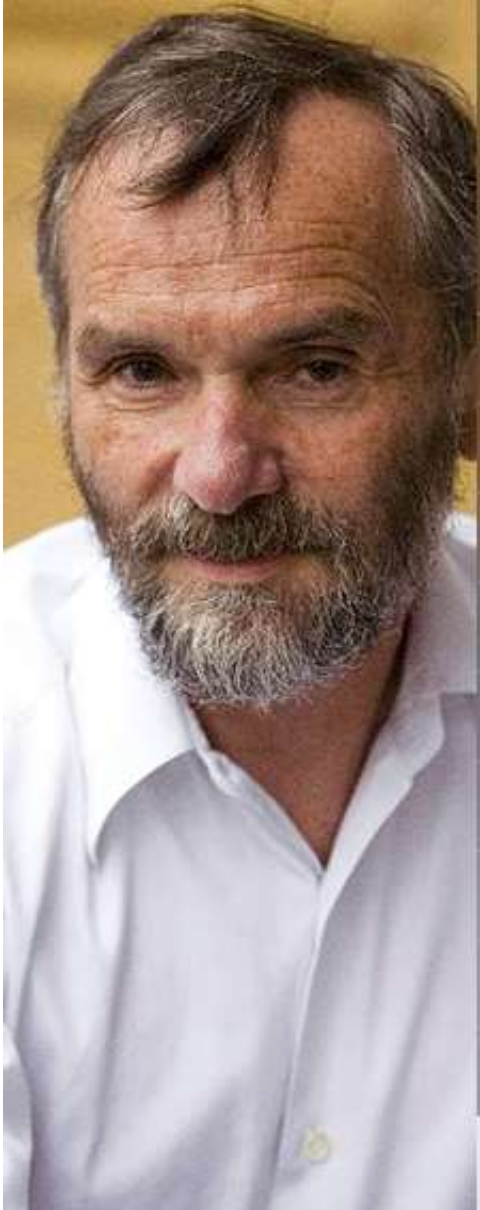


An indictment of the Total Market and the normative uses of economic quantification

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



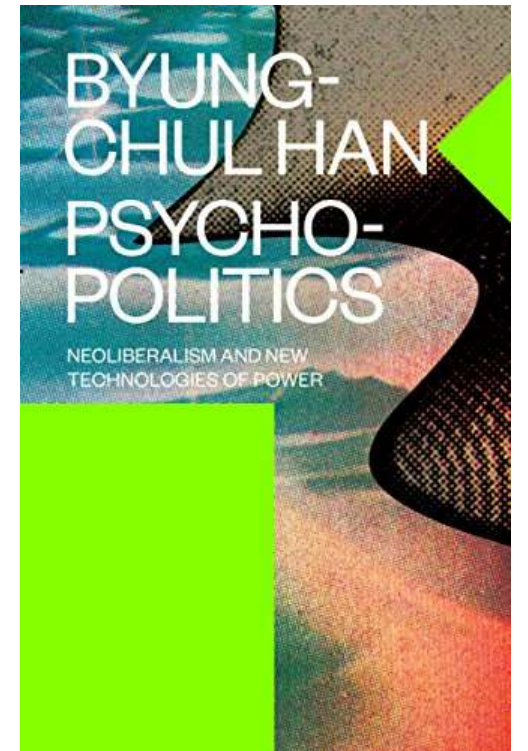
Alain Supiot



...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.



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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

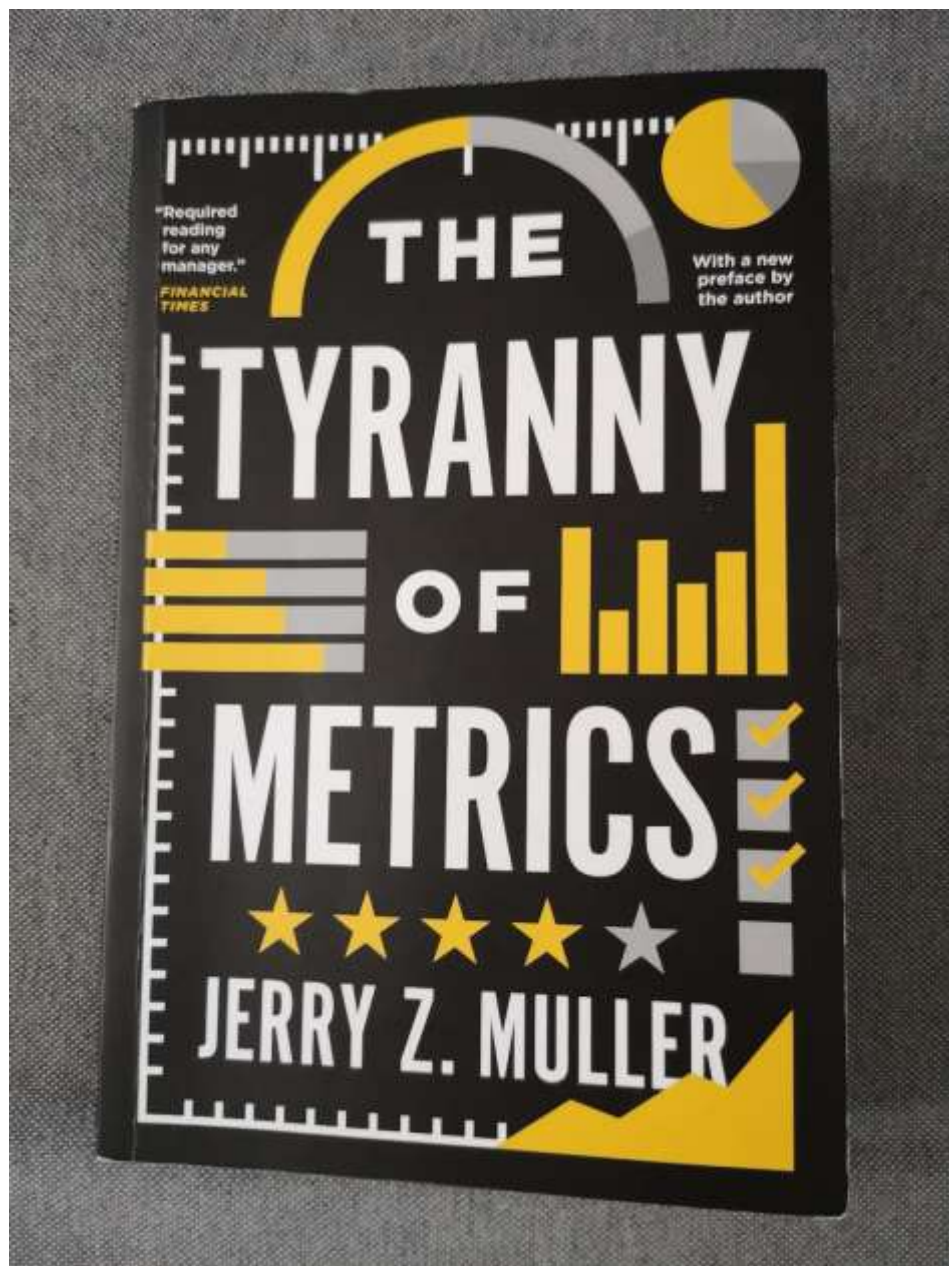
Institute for Cognitive Sciences and Technologies, Consiglio Nazionale delle Ricerche

Andrea Saltelli

Open Evidence Research, Universitat Oberta de Catalunya (UOC)

Jerome R. Ravetz

Institute for Science, Innovation and Society, University of Oxford

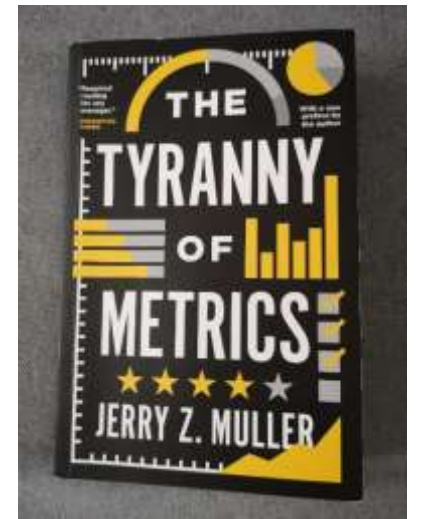


J. Z. Muller, *The tyranny of metrics*. Princeton University Press , 2018.

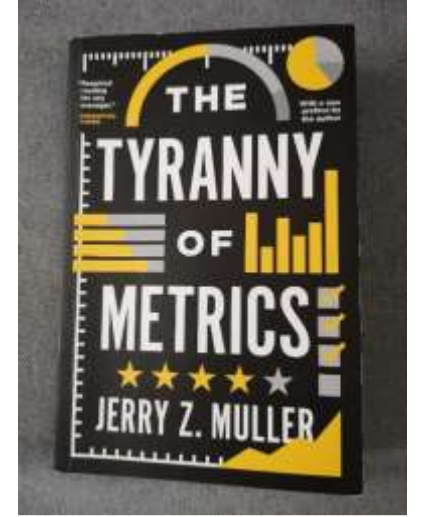
Metric fixation, or the irresistible pressure to measure performance

Gaming of metrics (recall Goodhart law)

A wealth of case studies from education to war to medicine to foreign aid..



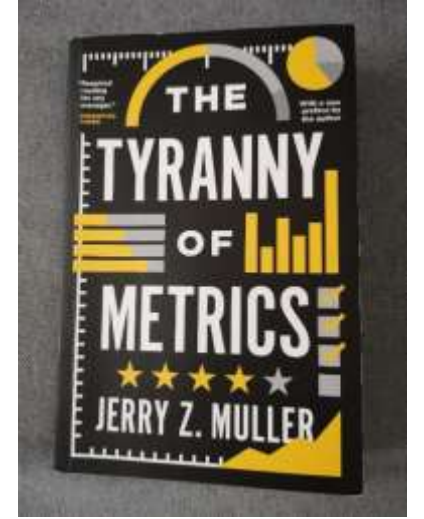
Unintended consequences



- Goal displacement
- Short termism
- Diminishing utility
- Rule cascade
- Discouraging risk taking
- Discouraging innovation
- Rewarding luck
- Discouraging cooperation and common purpose
- Degrading work
- Time waste
- Loss of productivity

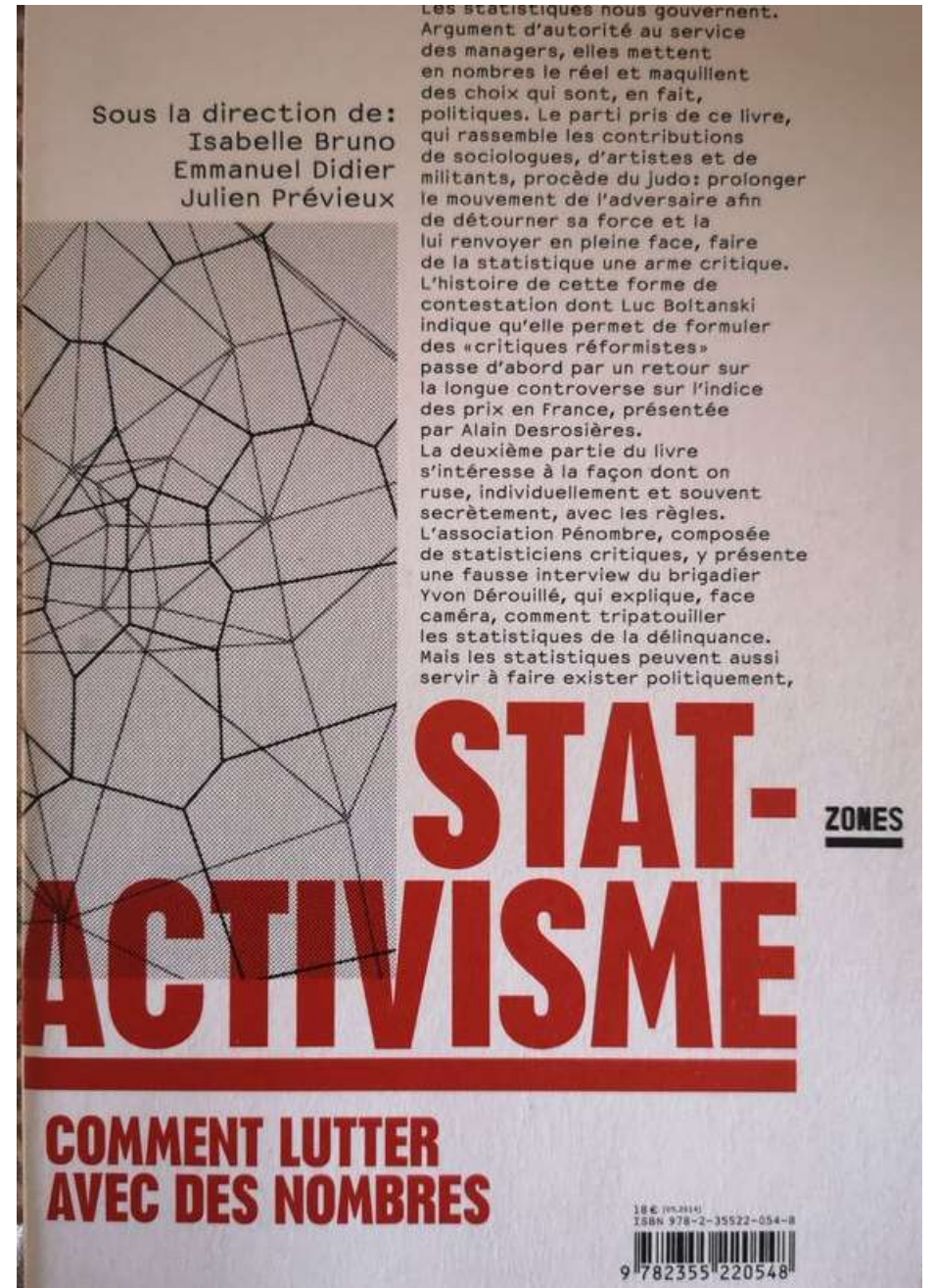
A concluding remark of Muller

Considering all of the above keep in mind at every step that “the best use of metrics **may** be not to use it at all”



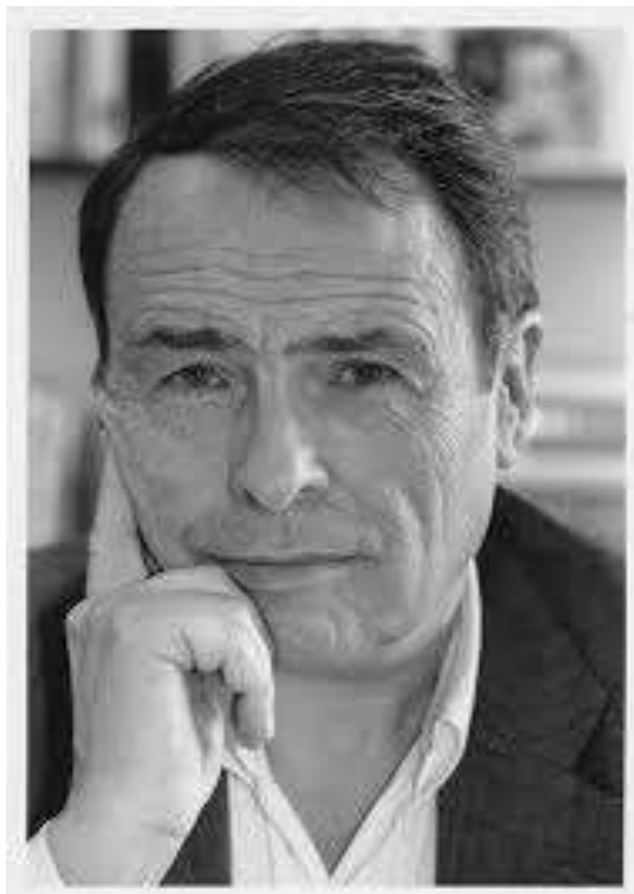
Do we need a movement of resistance?

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

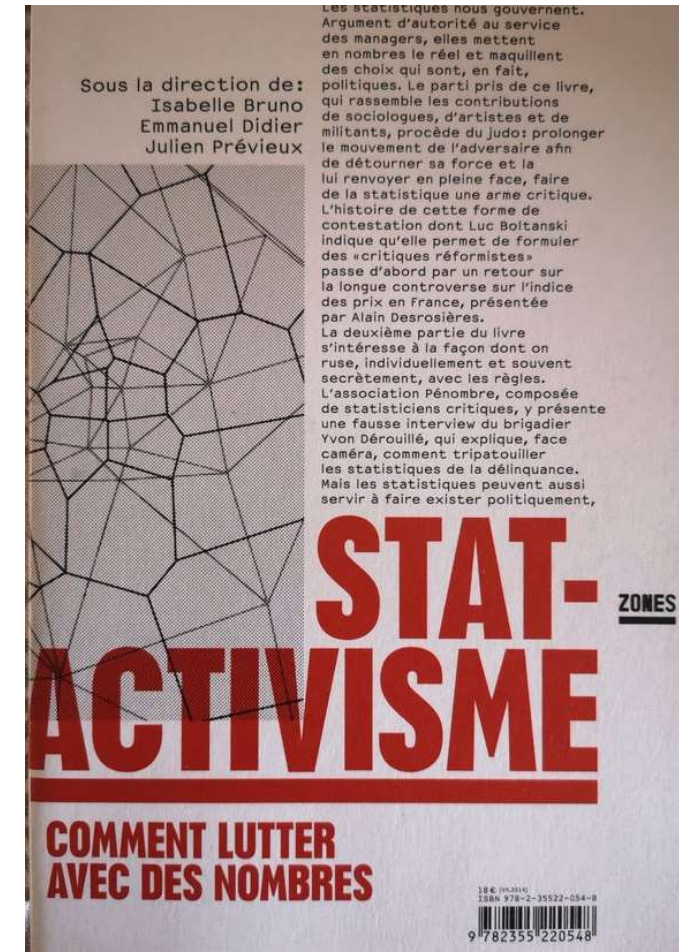
(Sociology must be fun)



How to be a "statactiviste"?

2. Gaming metrics (statistical judo) – use Goodhart's law to your advantage – or make the ruse public.

- Police statistics in NY



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”



Mathematical and statistical models

nature communications

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Comment | [Open Access](#) | [Published: 27 August 2019](#)

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.

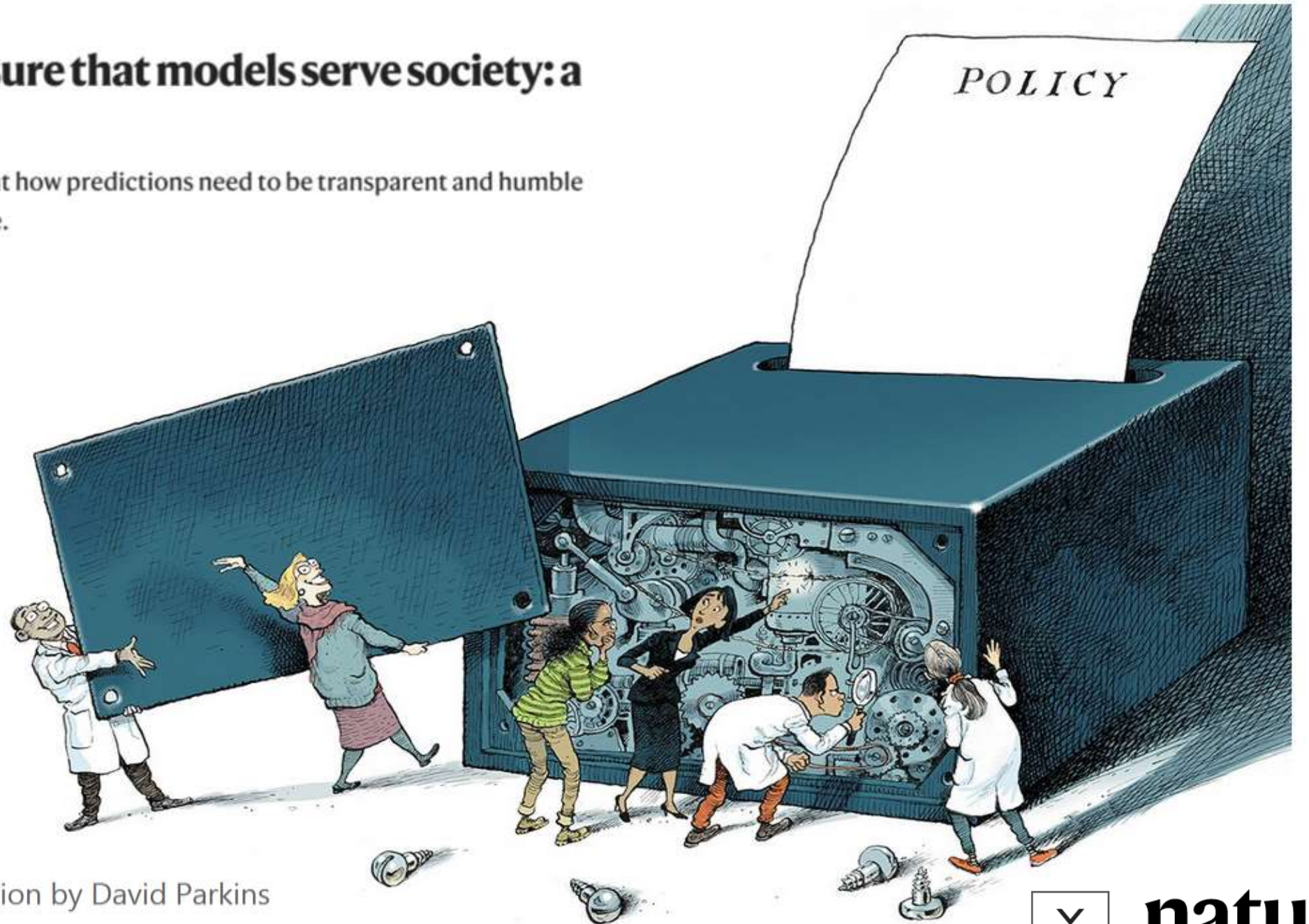


Illustration by David Parkins



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 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

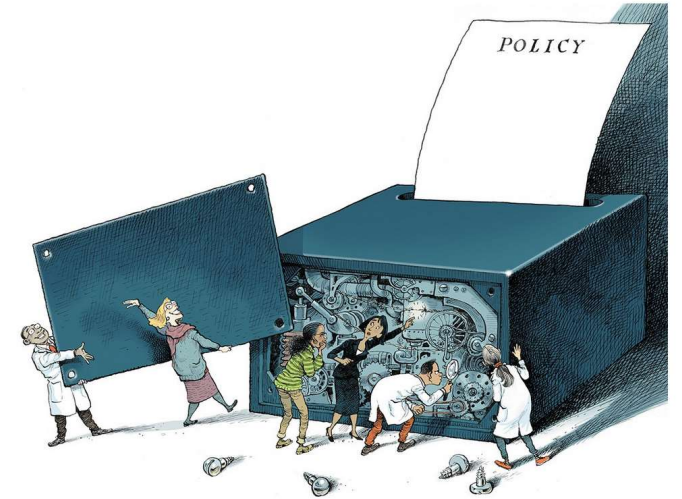
1 political scientists Di Fiore

1 expert RRI - Open Science Rafols



COVID has put mathematical models in the limelight

→ Power & controversy



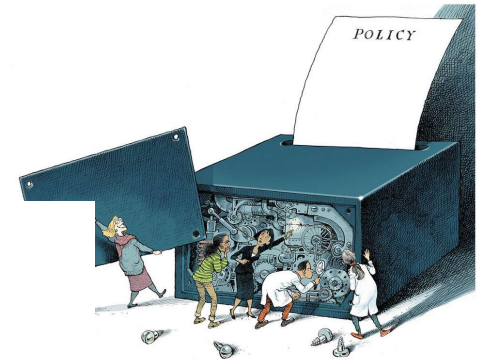
Power

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

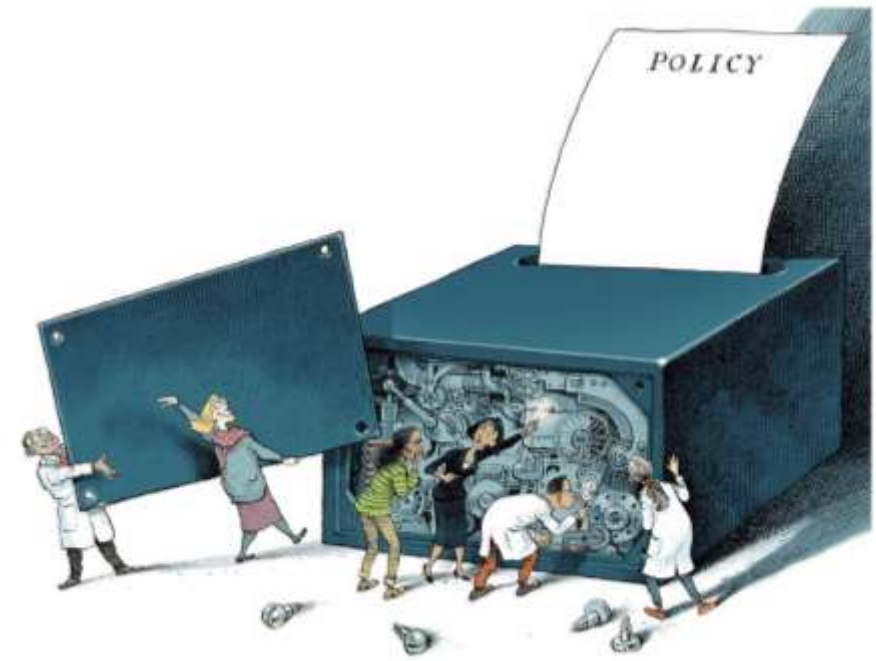
Match purpose and context

Mind the consequences

Quantification can backfire.

Mind the unknowns

Acknowledge ignorance



Mind the assumptions

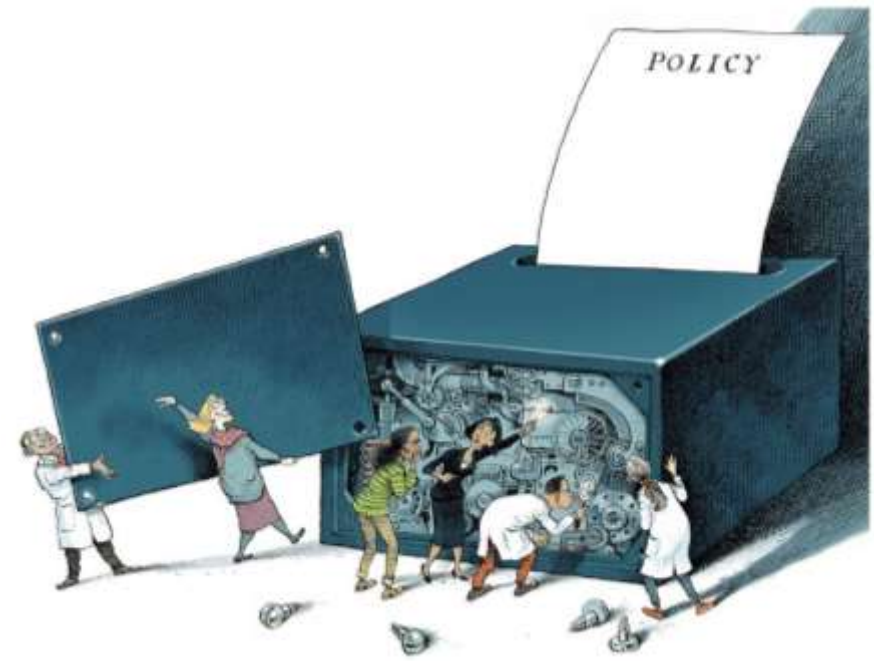
Assess uncertainty and sensitivity



... 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

...

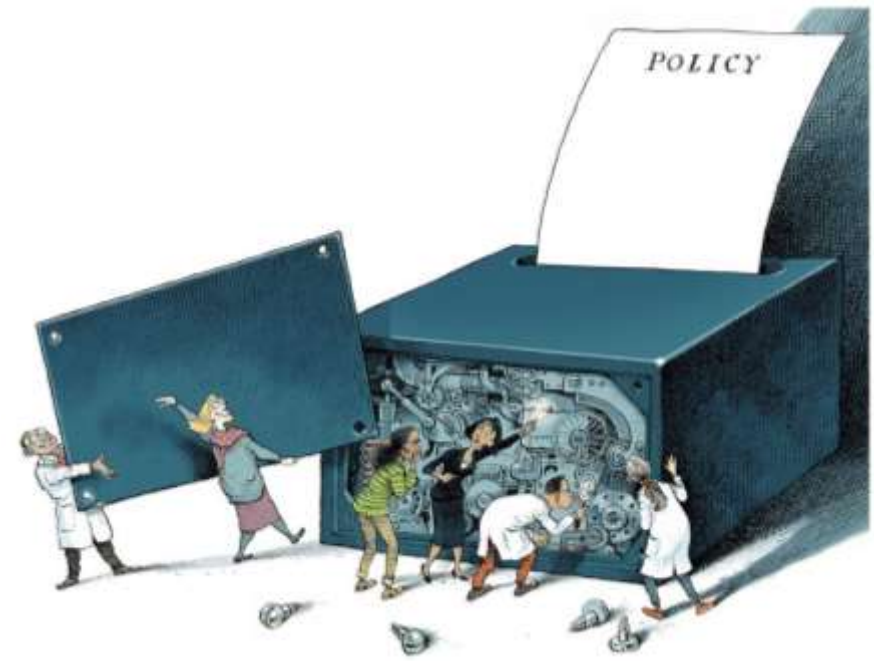


Mind the assumptions

Assess uncertainty and sensitivity



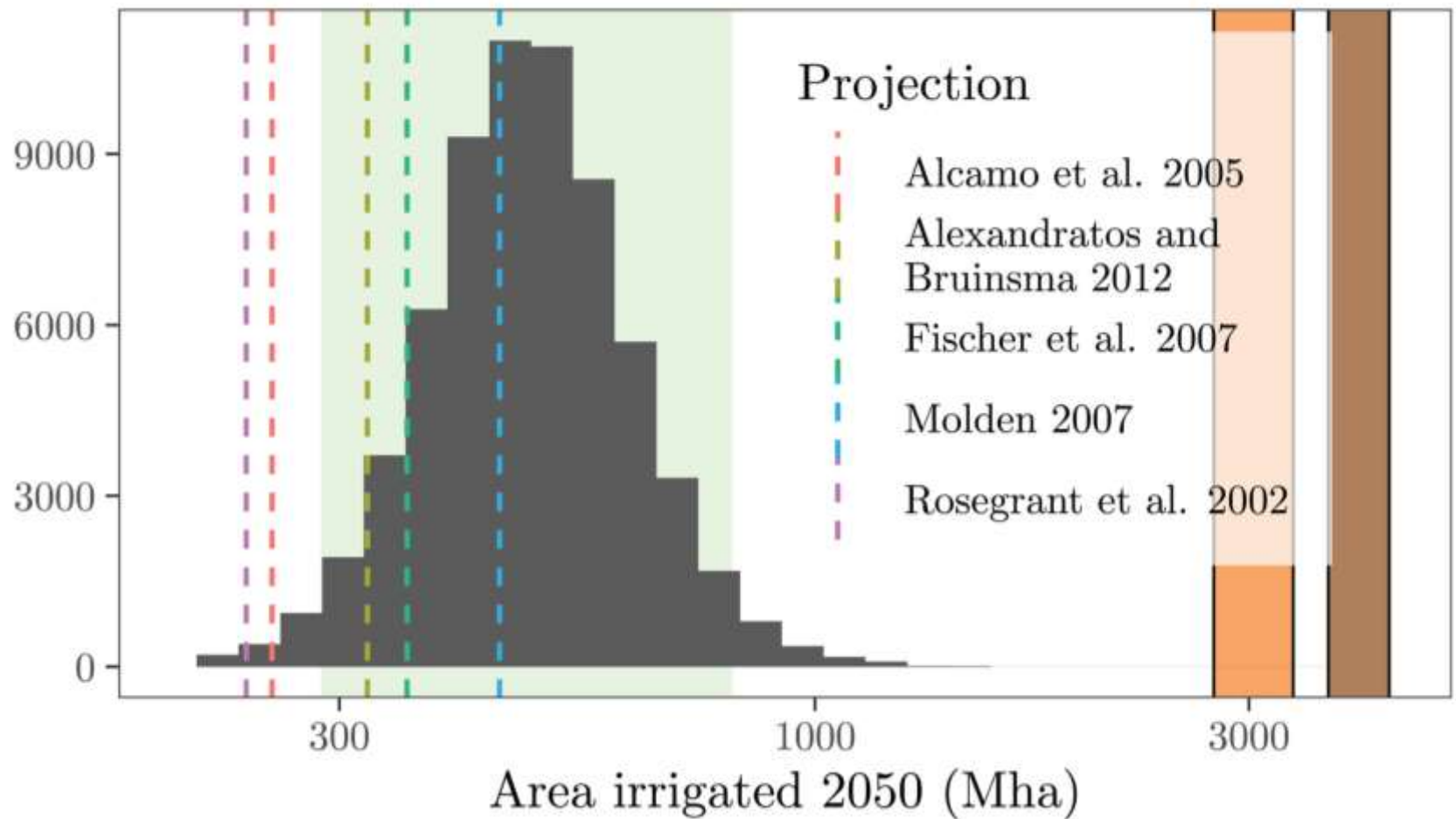
... this may lead to interesting discoveries ...



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> |



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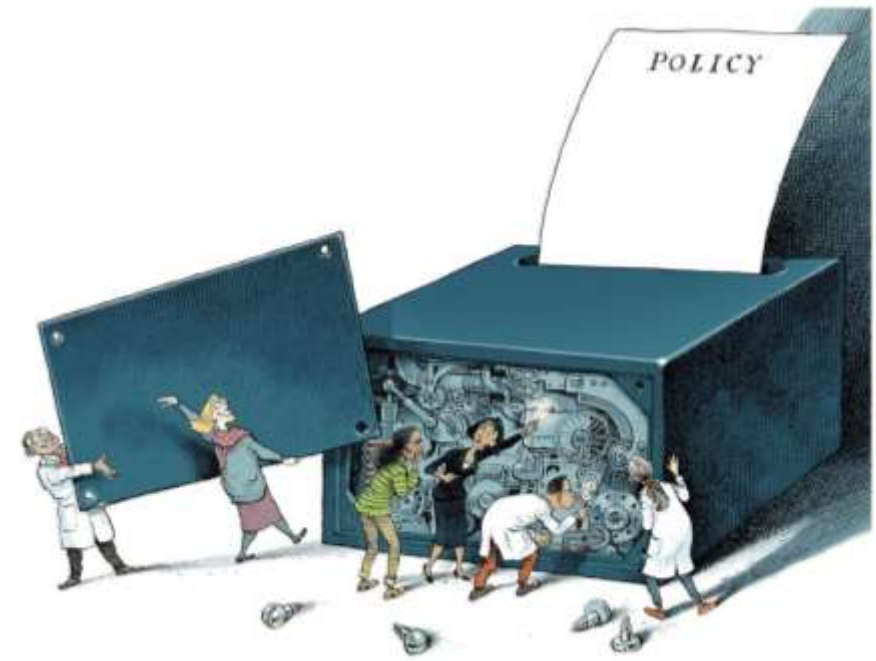
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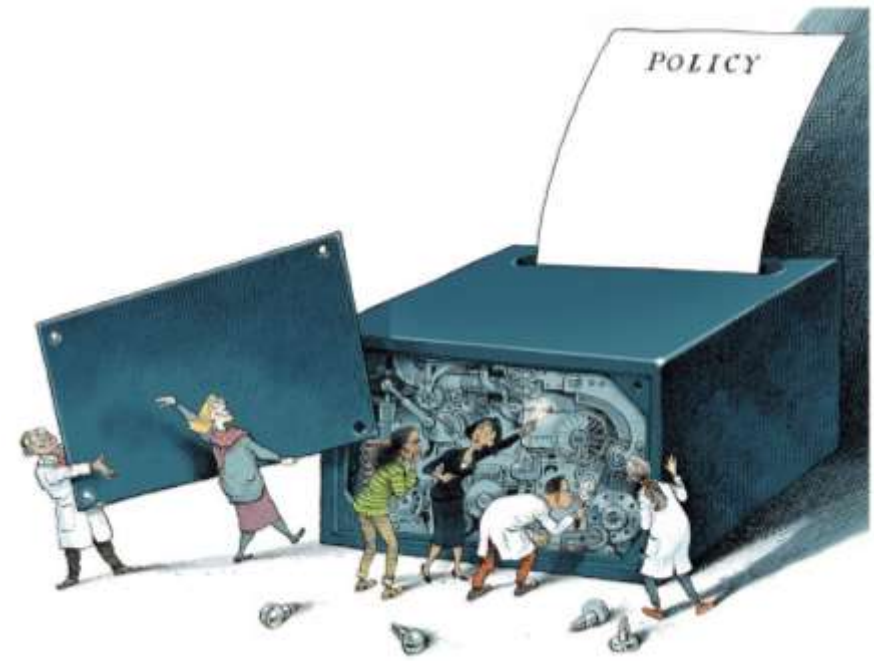
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Acknowledge ignorance



Mind the hubris

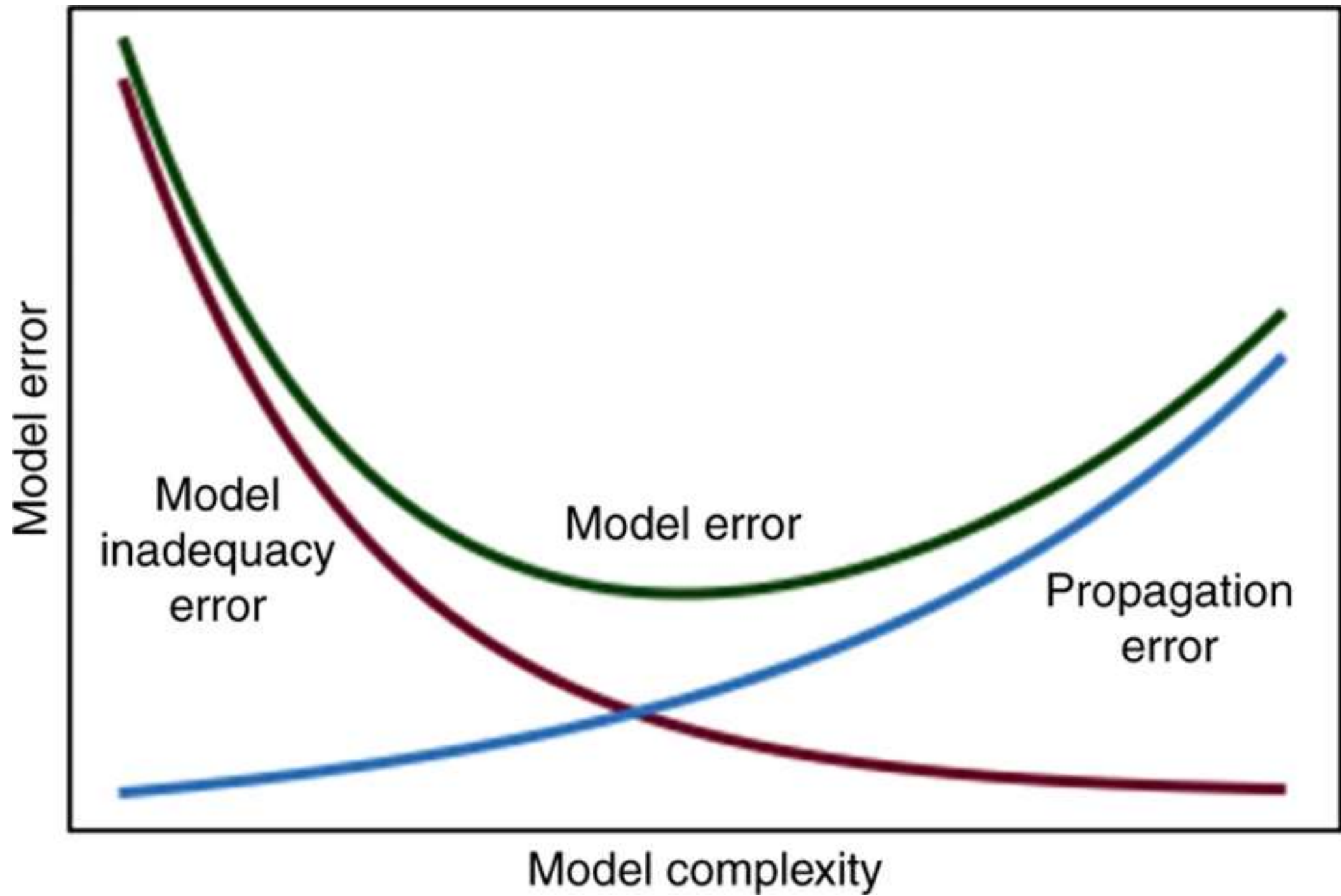
Complexity can be the enemy of relevance



... 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



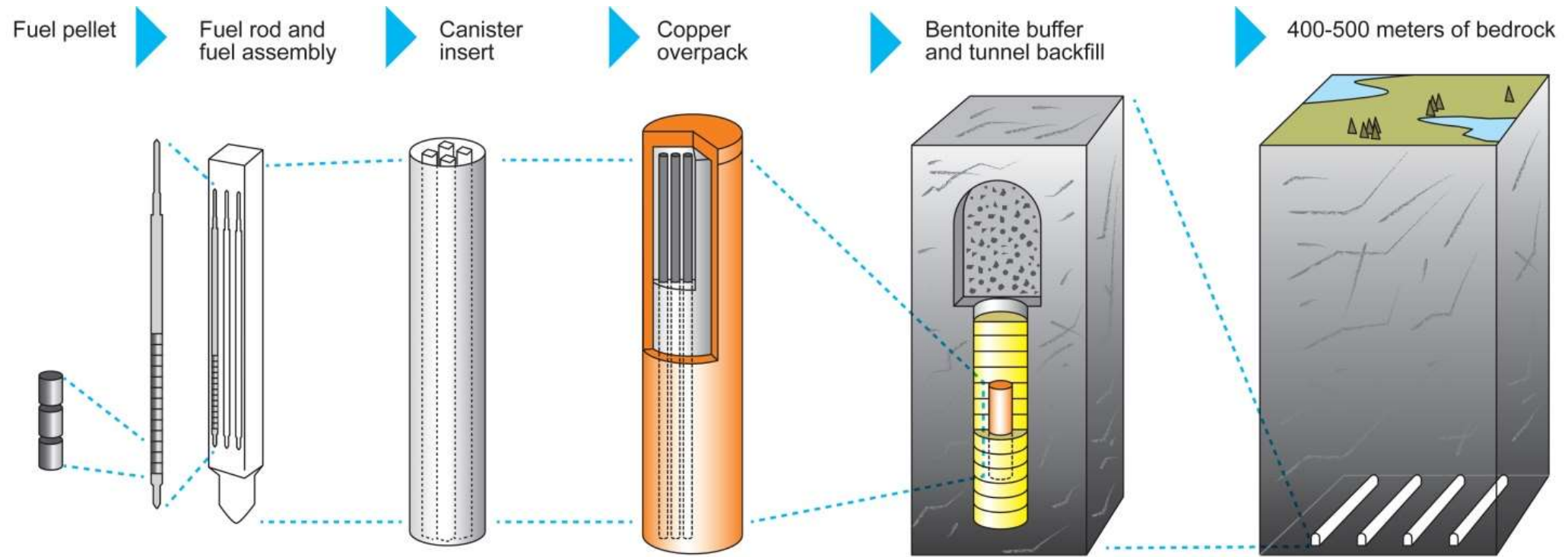
 | RESEARCH ARTICLE | MATHEMATICS



Models with higher effective dimensions tend to produce more uncertain estimates

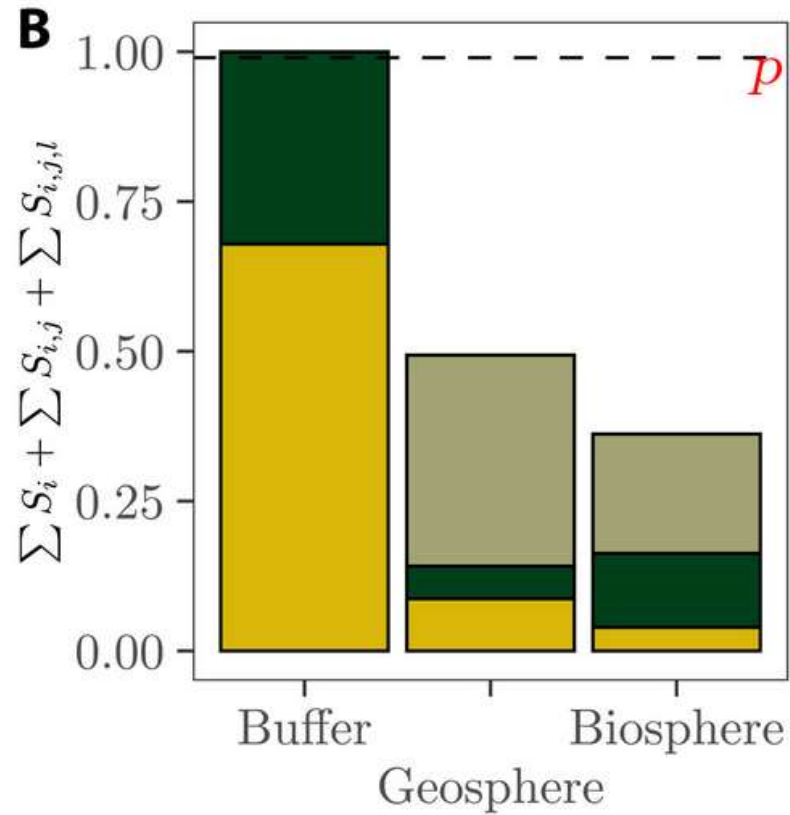
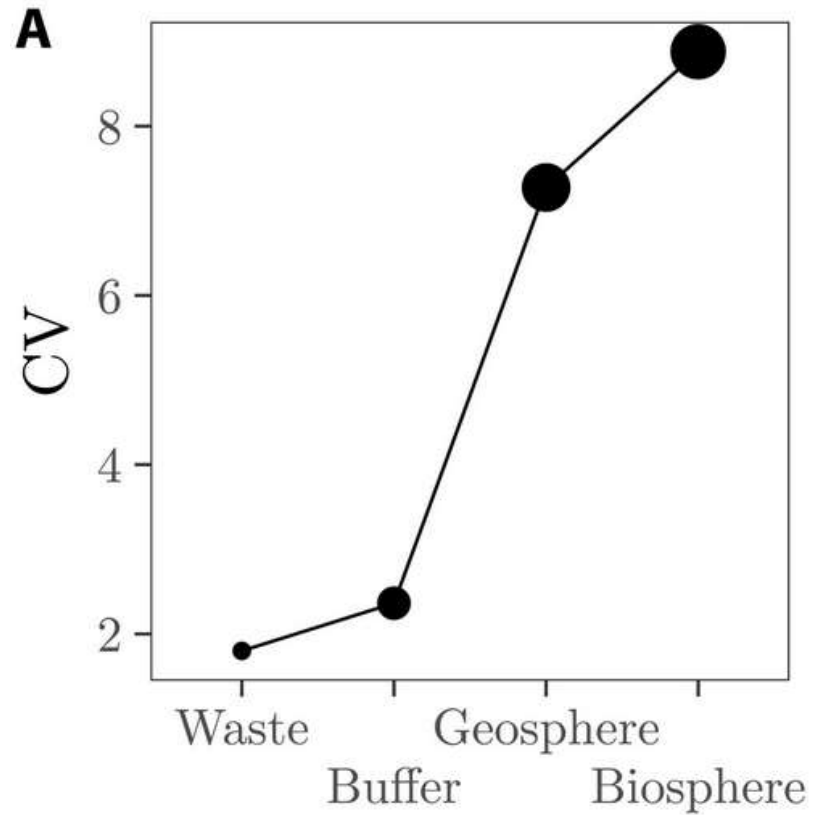
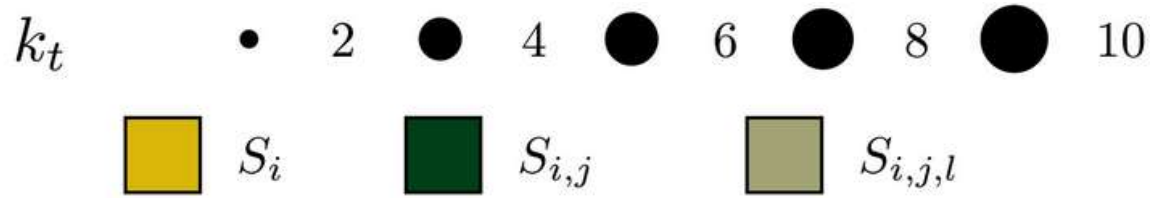
[ARNALD PUY](#) , [PIERFRANCESCO BENEVENTANO](#), [SIMON A. LEVIN](#) , [SAMUELE LO PIANO](#) , [TOMMASO PORTALURI](#), AND [ANDREA SALTELLI](#)  [Authors Info &](#)

[Affiliations](#)



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

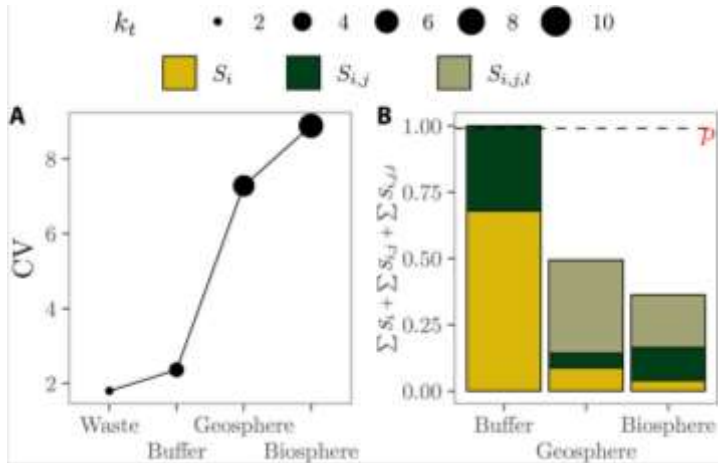
Source: World Nuclear Organization, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste.aspx>



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

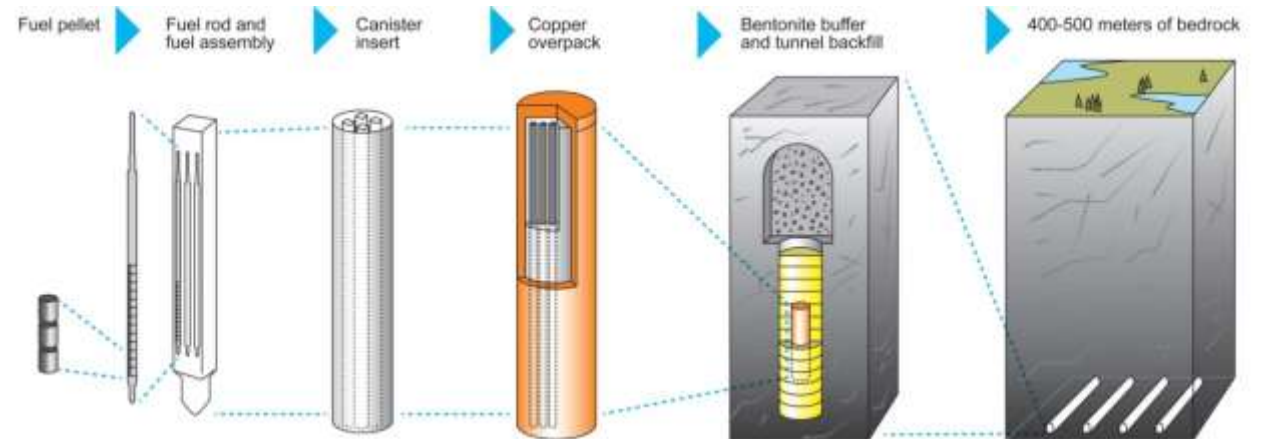
A more realistic and defensible safety standard could be set as a maximum level of radioactivity leaving the buffer



Models with higher effective dimensions tend to produce more uncertain estimates

ANALI PUI, PIERFRANCESCO RIVELANDI, SIMON A. LEVY, MARCELLO PAVAN, TOMMASO PORTALUSSI AND ANDREA SACELLI

Affiliations



Mind the assumptions

Assess uncertainty and sensitivity

Mind the hubris

Complexity can be the enemy of relevance



Mind the framing

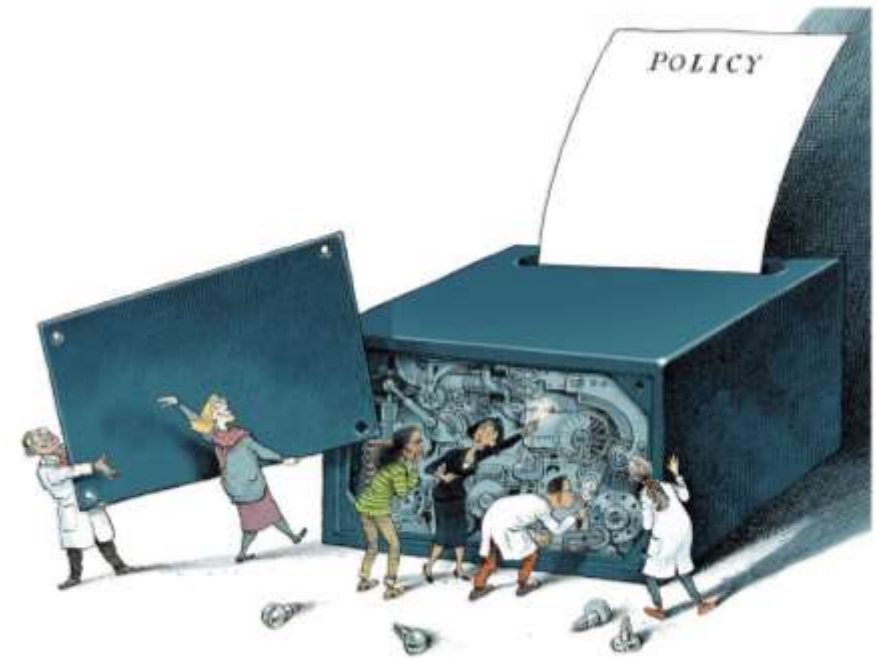
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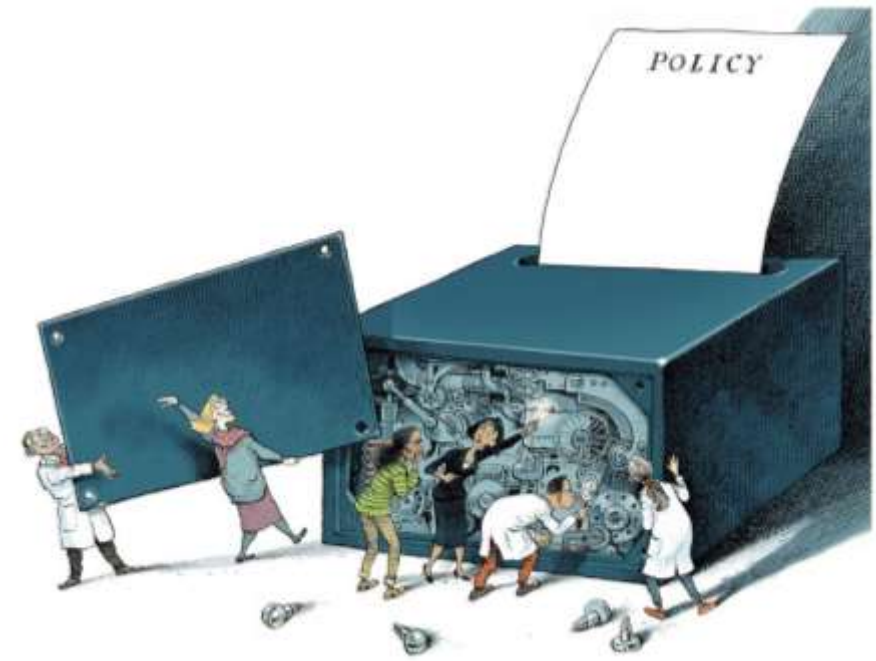
Mind the unknowns

Acknowledge ignorance



Mind the framing

Match purpose and context



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

SUPPLEMENTARY INFORMATION

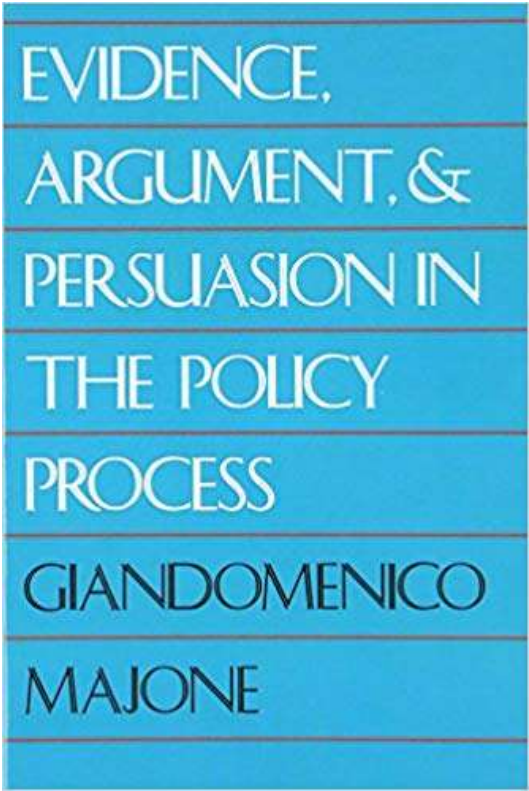
1. Additional information and references

>260 references

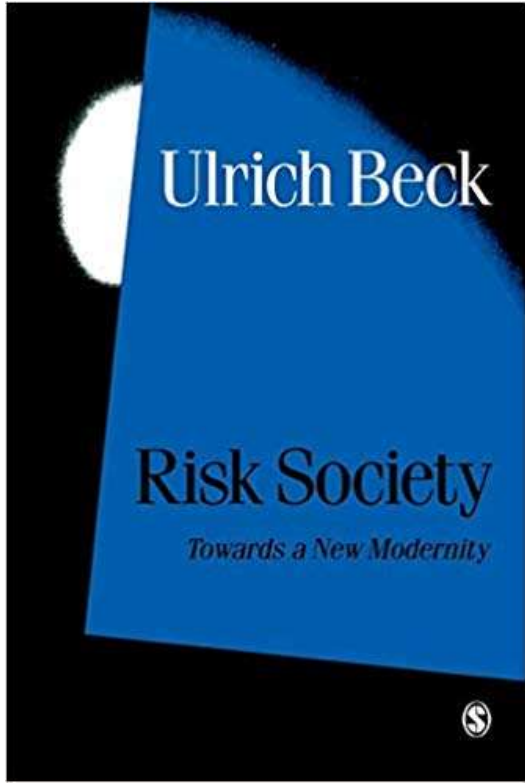
From Ulrich Beck to Giandomenico Majone: the technique is never neutral



Ulrich Beck
(1944 –2015)



1989



1992 (1986)



Environmental Science & Policy

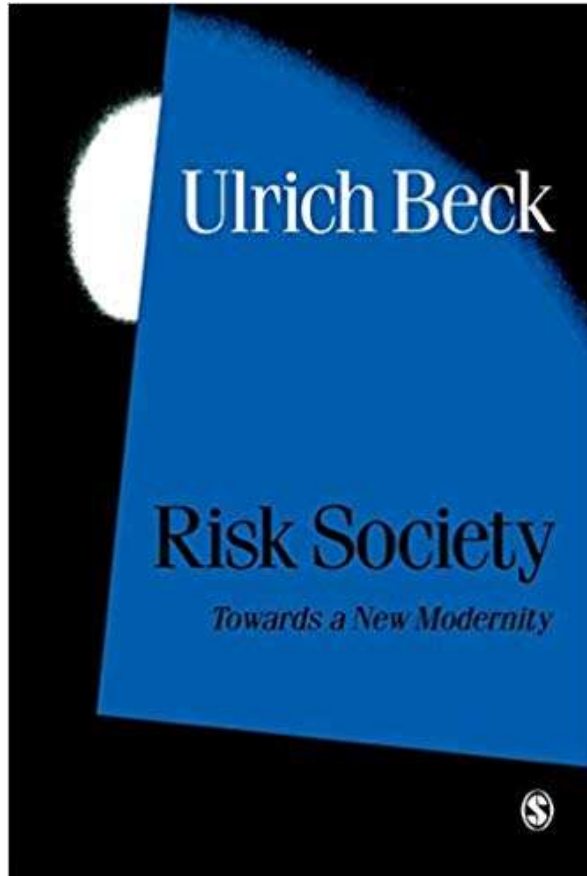
Volume 106, April 2020, Pages 87-98



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)



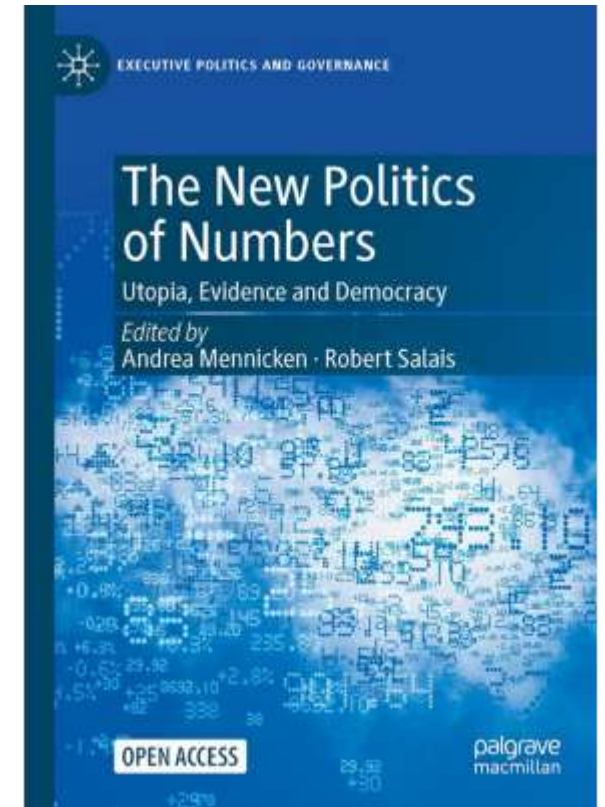
Ulrich Beck
(1944 –2015)

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

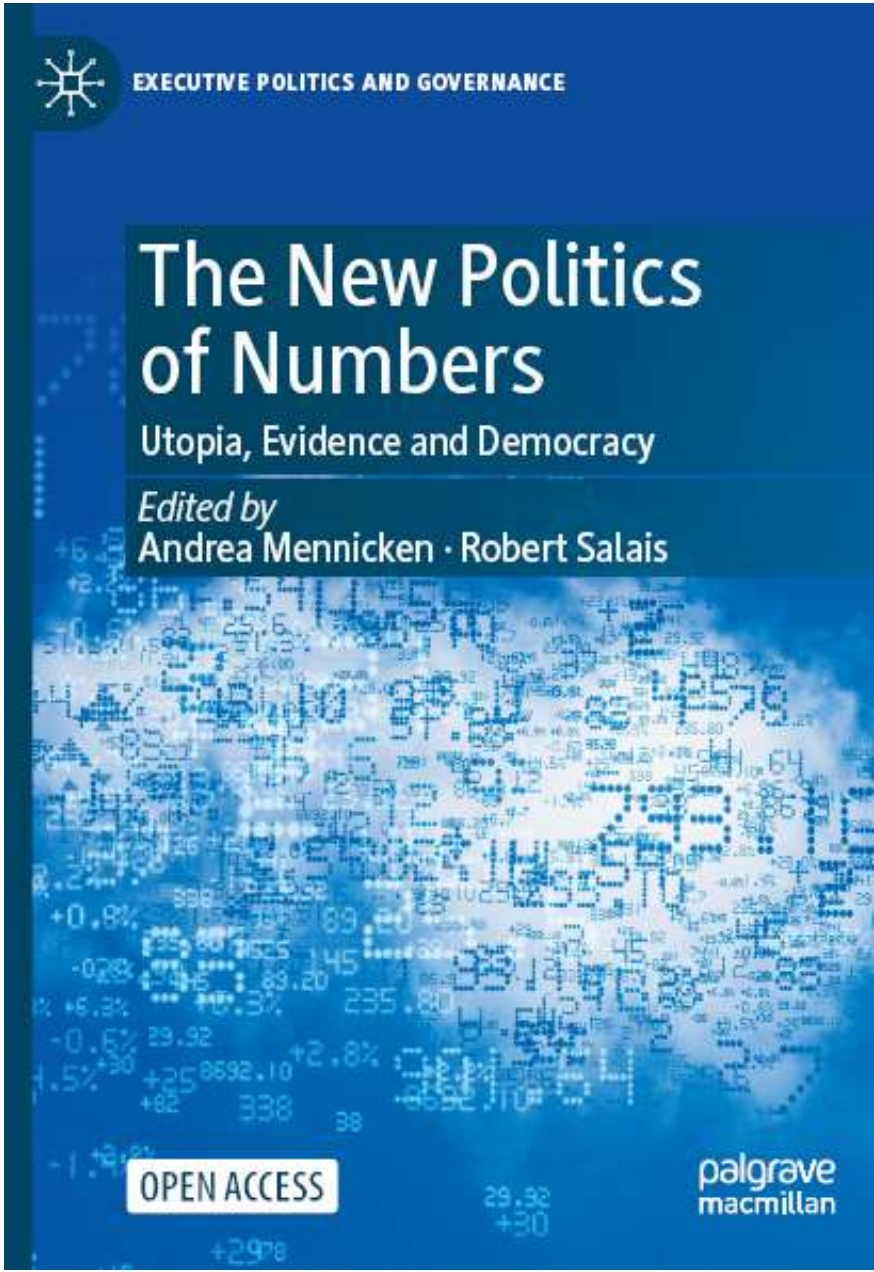


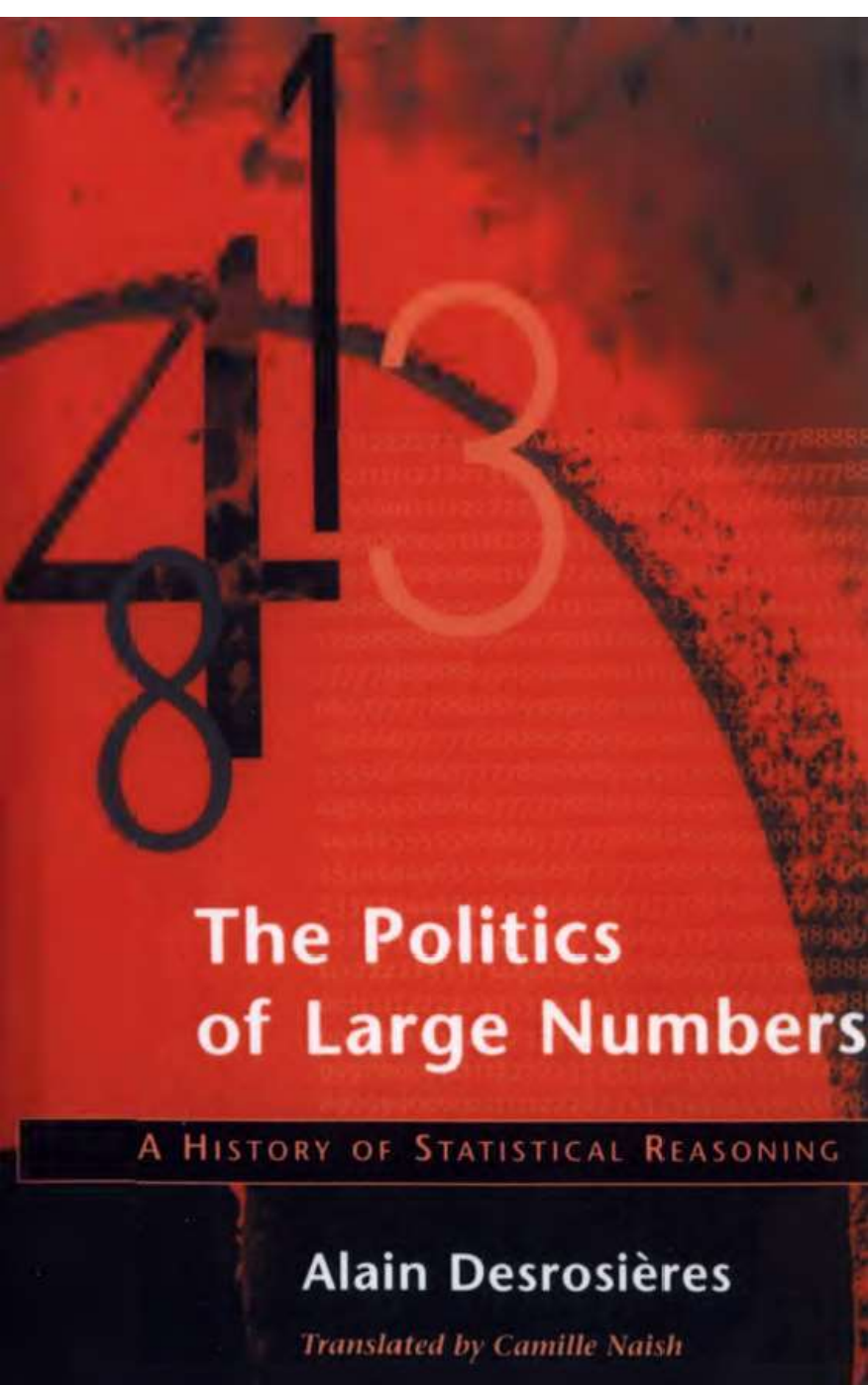
Salais, R. (2022). “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice. In *The New Politics of Numbers: Utopia, Evidence and Democracy*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 379–415.



<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”

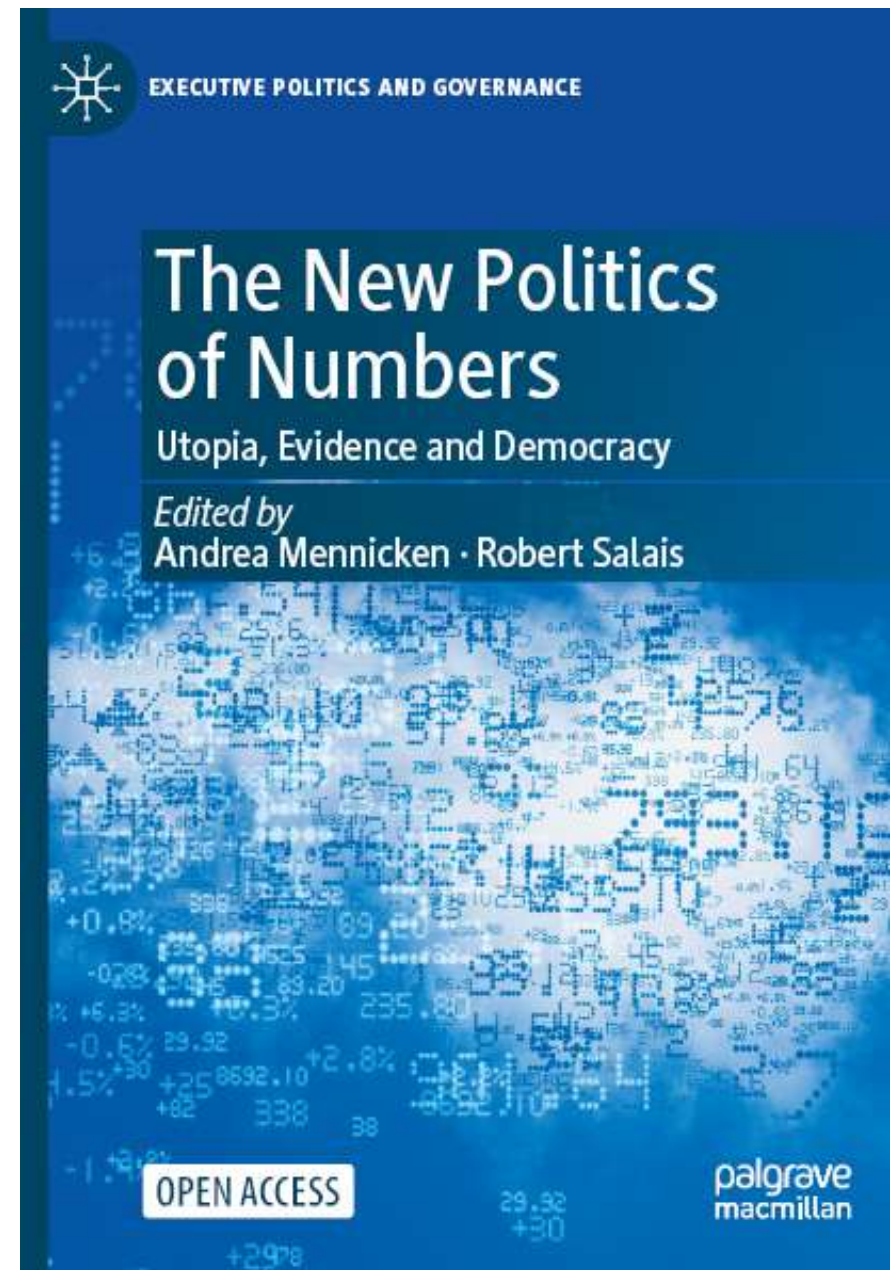
The construction of statistical concepts and categories that can serve for action

BUT

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

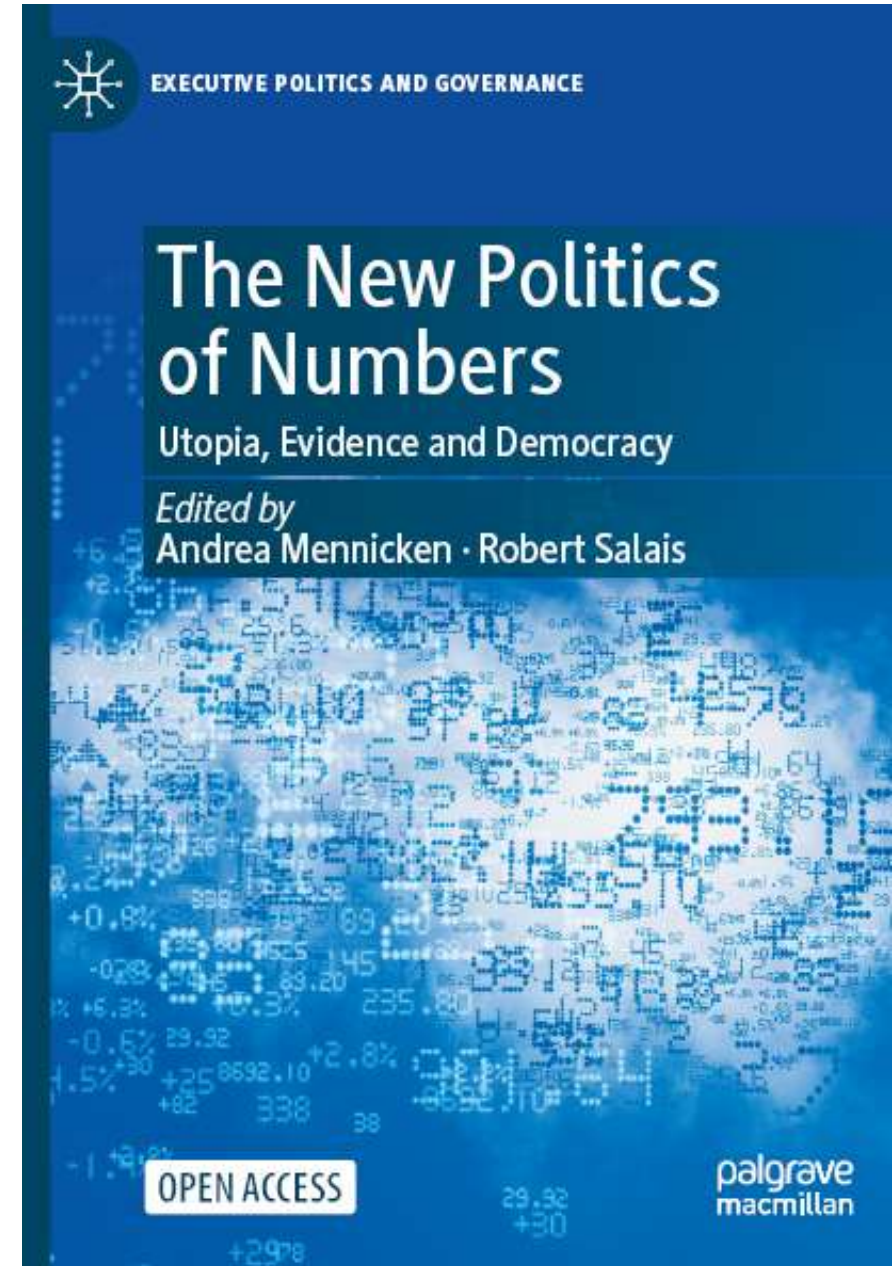
Governance driven quantification is based on pretended objectivity (neutrality), reductionism and justificationism that contribute to a loss of democratic agency (a-democracy)

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

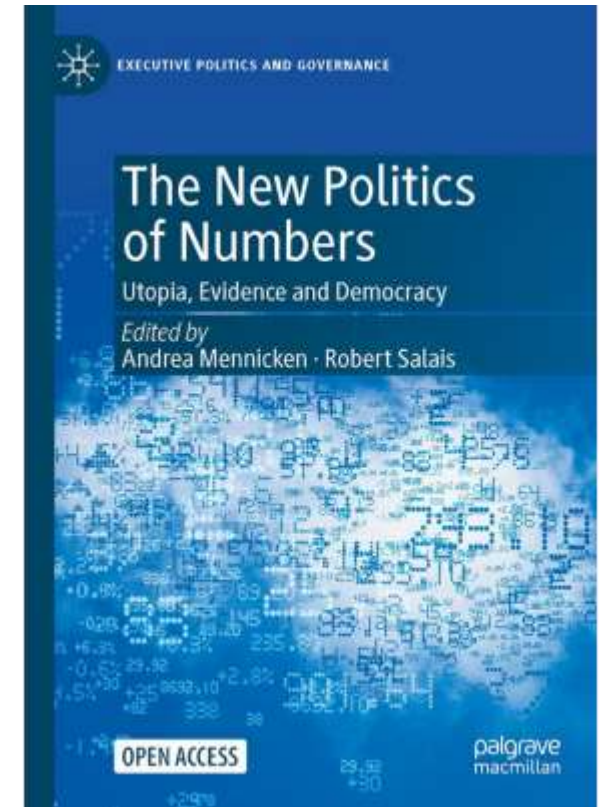


Contesting unjust/unfair governance arrangement is impossible without producing alternative constructions of evidence – that requires muscles not easily available to the lay citizen

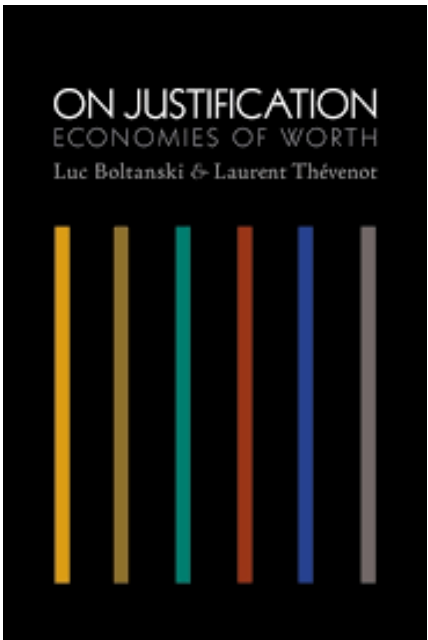
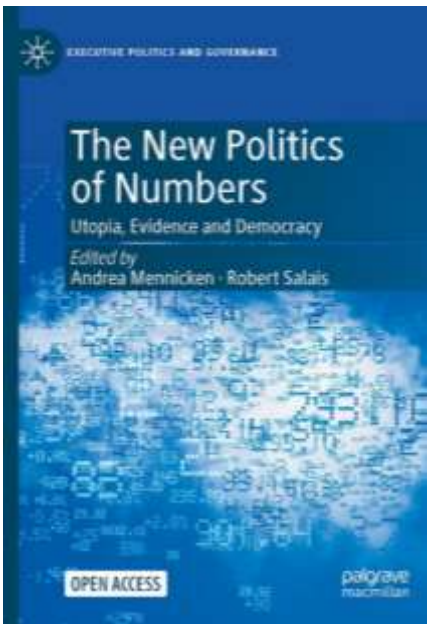
CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*



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

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Mind the framing

Match purpose and context

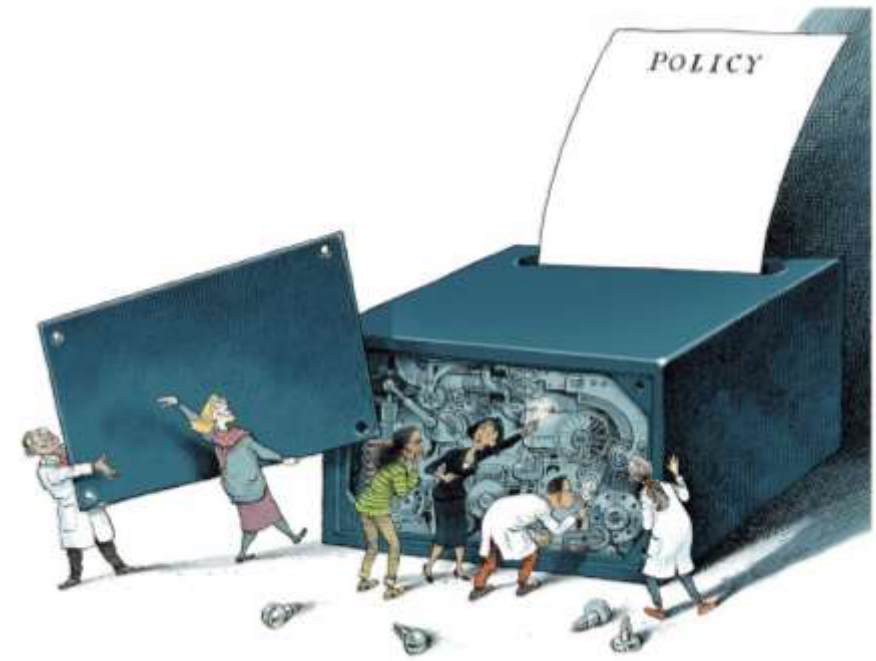


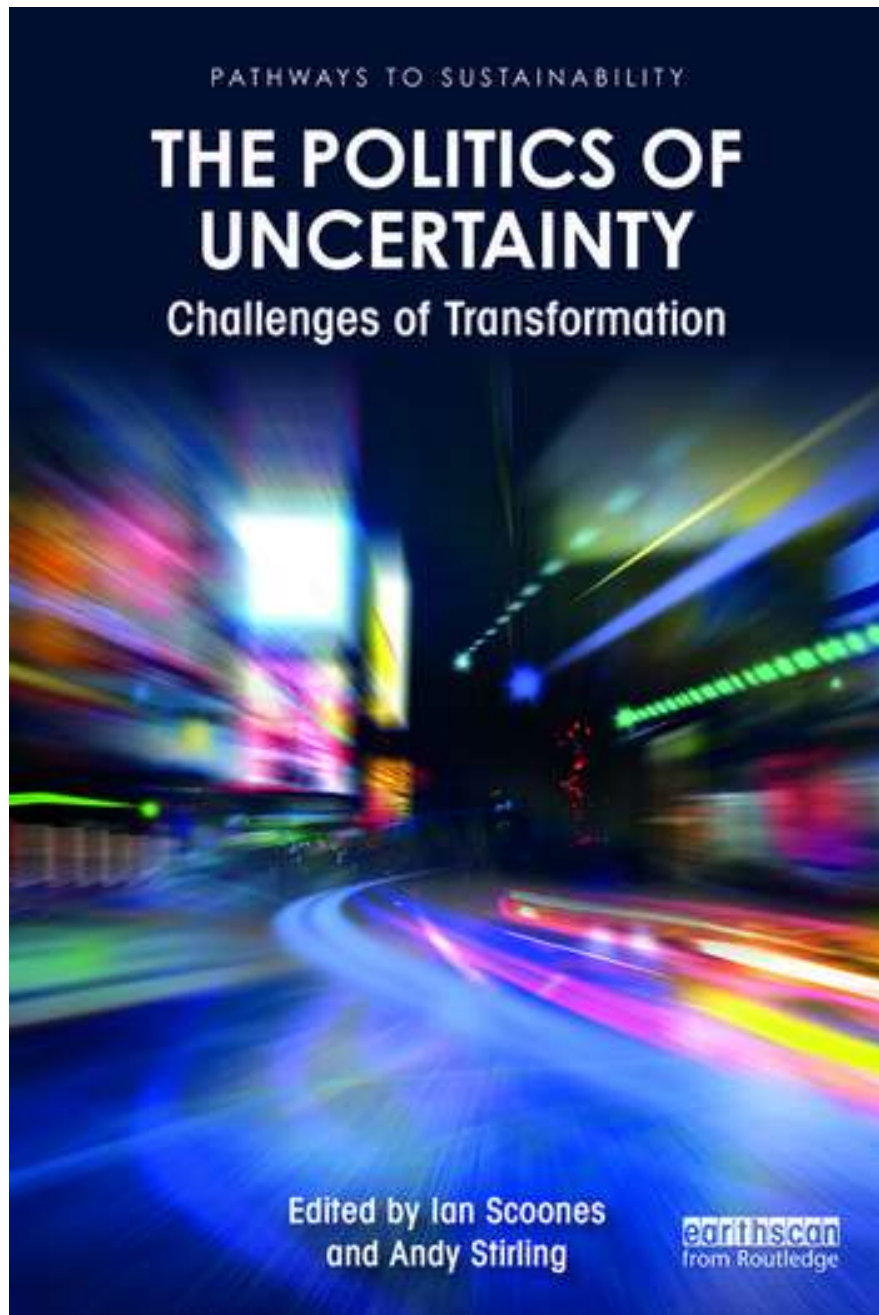
Mind the consequences

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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

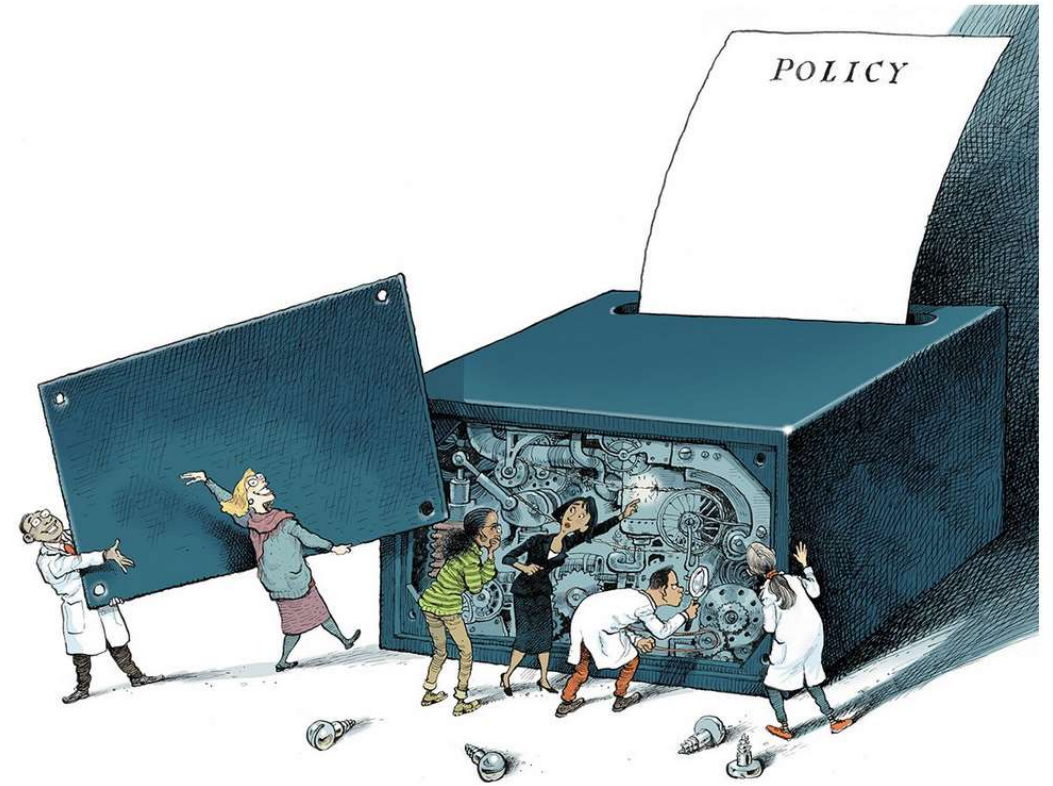
What is wrong with evidence based policy, and how can it be improved?

Andrea Saltelli ^{a, b, c, d}, 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



Article | [Open Access](#) | [Published: 06 May 2023](#)

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](#)

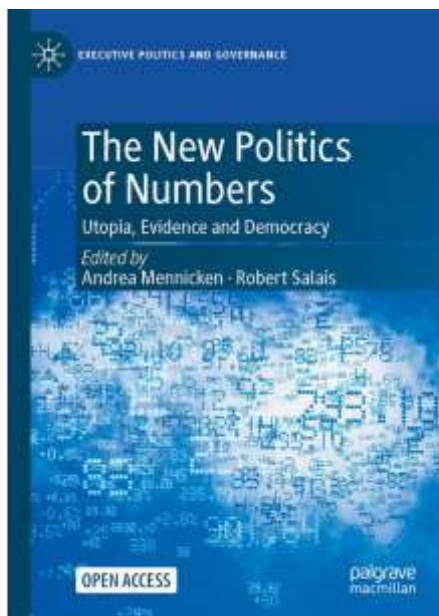
Technical Quality

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

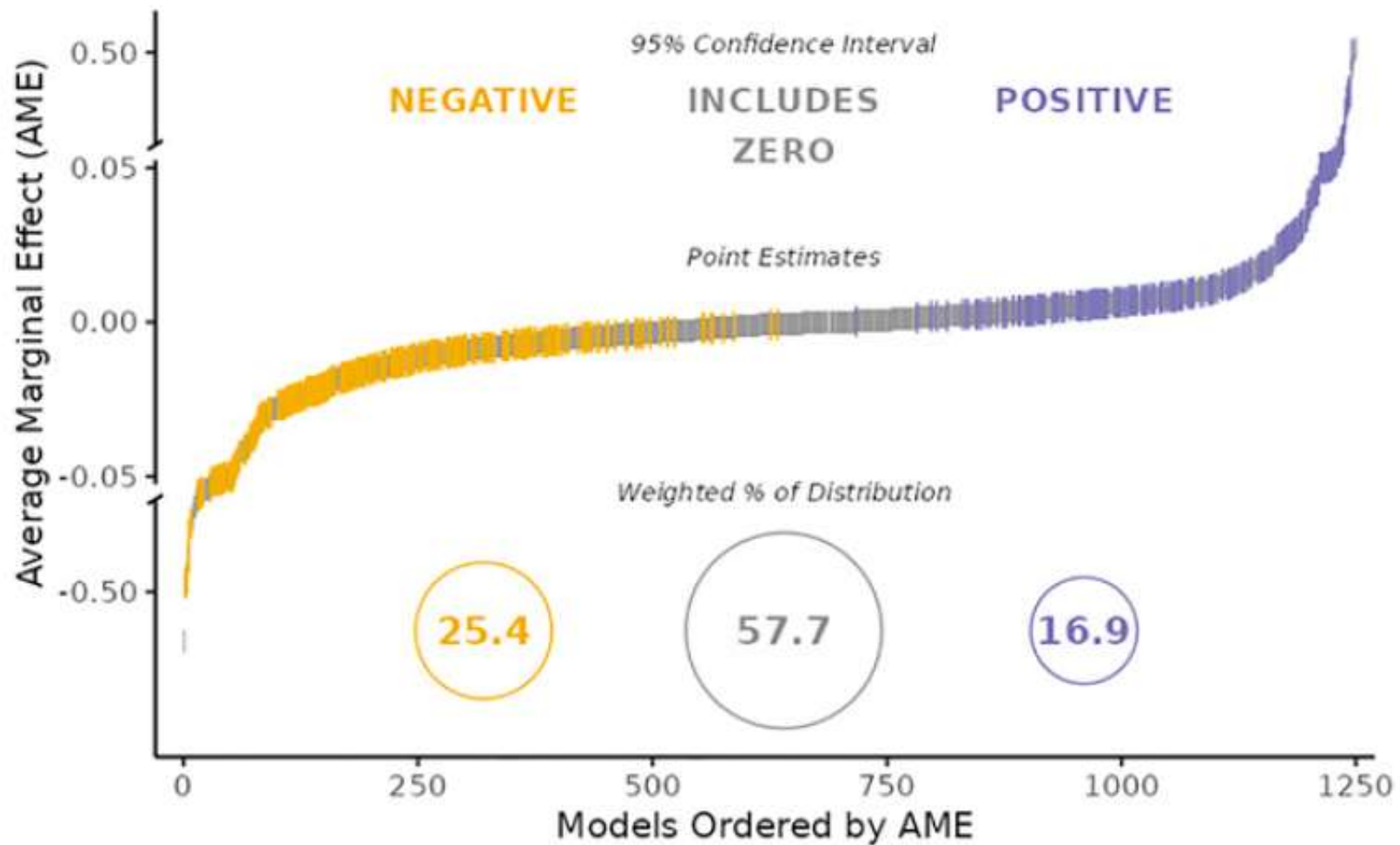
RESEARCH ARTICLE

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?”

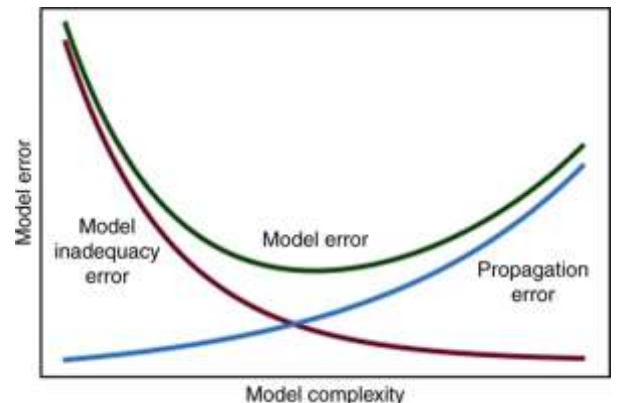
“...teams’ results varied greatly, ranging from large negative to large positive effects”
(Massey et al. 2022)

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)

...

→ Avoid “quantifying at all costs”, expose ‘funny numbers’



Culture Unbound

Journal of Current Cultural Research

Funny Numbers

By Theodore M. Porter

How about ChatGPT?

Sources mostly from works of Daniela Tafani,
University of Pisa, Department of Political
Sciences,

<https://www.sp.unipi.it/it/didattica/docenti/docenti/?p=daniela-tafani>

Papers

<https://arpi.unipi.it/cris/rp/rp162690>

<https://zenodo.org/record/7156364>



I use it myself!

```
Spyder (Python 3.11)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Usuario\Dropbox\Anaconda\CourseOR\untitled0.py
temp.py* x untitled0.py* x
1  #-*- coding: utf-8 -*-
2  """
3  Created on Tue Aug 29 11:58:16 2023
4
5  @author: Usuario
6  """
7
8  def func(x):
9      return 6*x - x**2 - (x**3)/3
10
11  def first_derivative(x):
12      return 6 - 2*x - x**2
13
14  def second_derivative(x):
15      return -2 - 2*x
16
17  def newton_max_search(starting_point, tolerance=1e-6, max_iterations=100):
18      x = starting_point
19
20      for i in range(max_iterations):
21          prev_x = x
22          x = x - first_derivative(x) / second_derivative(x)
23
24          print(f"Iteration {i+1}: x = {x:.6f}, y = {func(x):.6f}")
25
26          if abs(x - prev_x) < tolerance:
27              print("\nConverged!")
28              return x
29
30      print("\nMaximum not found within the specified number of iterations.")
31      return None
32
33  starting_point = 1
34  max_value = newton_max_search(starting_point)
35
36  if max_value is not None:
37      print(f"\nMaximum value: y = {func(max_value):.6f} at x = {max_value:.6f}")
38  |
```

Question: Please find the maximum of the function $y=6x-x^{**2}-(x^{**3})/3$, using the method of Newton pure, using the first and the second derivative, with starting point $x=1$, and printing out all steps of the search.



To find the maximum of the function $y = 6x - x^2 - \frac{x^3}{3}$ using the Newton-Raphson method with the first and second derivatives, you can follow these steps:

1. Define the function $y = 6x - x^2 - \frac{x^3}{3}$.
2. Calculate the first and second derivatives of the function.
3. Implement the Newton-Raphson method using the formula: $x_{\text{new}} = x_{\text{old}} - \frac{f'(x_{\text{old}})}{f''(x_{\text{old}})}$.
4. Iterate until the change in x is smaller than a certain tolerance or a maximum number of iterations is reached.
5. Print out each iteration's x value and the corresponding function value.

Here's how you can implement this in Python:

Iteration 1: $x = 1.750000$, $y = 5.651042$

Iteration 2: $x = 1.647727$, $y = 5.680162$

Iteration 3: $x = 1.645752$, $y = 5.680173$

Iteration 4: $x = 1.645751$, $y = 5.680173$

The code was generated from ChatGPT

Is using ChatGPT cheating?

Calling it artificial intelligence is part of the problem, all the more so when referred to Large Language Models such as ChatGPT or GPT4

Though they are marketed as reasoning they do not reason – they “utilize statistics on the distribution of words to produce other strings of words” [*]

[*] Emily M. Bender, April 2023, Do we have an AI hype problem? Marketplace.org, <https://www.marketplace.org/shows/marketplace-tech/do-we-have-an-ai-hype-problem/>

We systematically anthropomorphize them; their marketing 'banks' on this assimilation



The screenshot shows the top portion of an arXiv paper page. At the top left is the Cornell University logo. To the right, it says "We gratefully acknowledge". Below this is a red navigation bar with the arXiv logo and the breadcrumb "cs > arXiv:2303.08774". On the right side of the red bar are search and help links. Below the red bar is a grey bar with the text "Computer Science > Computation and Language".

[Submitted on 15 Mar 2023 (v1), last revised 27 Mar 2023 (this version, v3)]

GPT-4 Technical Report

OpenAI

We report the development of GPT-4, a large-scale, multimodal model which can accept image and text inputs and produce text outputs. While less capable than humans in many real-world scenarios, GPT-4 exhibits human-level performance on various professional and academic benchmarks, including passing a simulated bar exam with a score around the top 10% of test takers. GPT-4 is a Transformer-based model pre-trained to predict the next token in a document. The post-training alignment process results in improved performance on measures of factuality and adherence to desired behavior. A core component of this project was developing infrastructure and optimization methods that behave predictably across a wide range of scales. This allowed us to accurately predict some aspects of GPT-4's performance based on models trained with no more than 1/1,000th the compute of GPT-4.

Comments: 100 pages

Subjects: **Computation and Language (cs.CL)**; Artificial Intelligence (cs.AI)

Cite as: [arXiv:2303.08774](https://arxiv.org/abs/2303.08774) [cs.CL]

(or [arXiv:2303.08774v3](https://arxiv.org/abs/2303.08774v3) [cs.CL] for this version)

<https://doi.org/10.48550/arXiv.2303.08774> 



GPT-4 exhibits human-level performance on various professional and academic benchmarks

Still the same developers admit: it may hallucinate

2.2 Hallucinations

GPT-4 has the tendency to “hallucinate,”⁹ i.e. “produce content that is nonsensical or untruthful in relation to certain sources.”[31, 32] This tendency can be particularly harmful as models become increasingly convincing and believable, leading to overreliance on them by users. [See further discussion in Overreliance]. Counterintuitively, hallucinations can become more dangerous as models become more truthful, as users build trust in the model when it provides truthful information in areas where they have some familiarity. Additionally, as these models are integrated into society and used to help automate various systems, this tendency to hallucinate is one of the factors that can lead to the degradation of overall information quality and further reduce veracity of and trust in freely available information.[33]

⁹We use the term “hallucinations,” though we recognize ways this framing may suggest anthropomorphization, which in turn can lead to harms or incorrect mental models of how the model learns.

OpenAI, *GPT-4 Technical Report*, 2023, <https://arxiv.org/abs/2303.08774>



LLM are the frontier of surveillance capitalism (Zuboff). They process huge amount of information (but which information?), and improve continuously thanks to the interaction with us users

Me Dear ChatGPT have you read Giacomo Casanova's "history of my life"?

ChatGPT I haven't read books or any specific works, but I do have knowledge about many topics, including Giacomo Casanova and his memoir, "The Story of My Life" (also known as "Histoire de ma vie" in French). This memoir is an autobiographical account written by Casanova, an 18th-century Italian adventurer and writer, which details his many escapades, travels, and romantic encounters. It is considered a significant literary and historical work, providing insight into the culture and society of the time.

If you have any questions or would like to know more about Giacomo Casanova or his memoir, please feel free to ask, and I'll do my best to provide information based on my knowledge up to September 2021.

Me Dear ChatGPT, is Giacomo Casanova memoir "The Story of My Life" part of the corpus of material you were trained with?

ChatGPT I don't have access to my training data, but I was trained on a mixture of licensed data, data created by human trainers, and publicly available data. It's possible that my training data includes text from "The Story of My Life" by Giacomo Casanova, as it is a publicly available historical text. However, I do not have direct access to specific books or documents, and I cannot confirm whether this particular memoir was part of the corpus used for my training. My responses are generated based on a mixture of licensed data, data created by human trainers, and publicly available data, but I do not have the ability to access or retrieve specific books or documents. If you have questions about the content of the memoir or related topics, feel free to ask, and I'll do my best to provide information based on my training.



They have engaged in unprecedented cultural regulatory capture; the objectives of the AI corporations are framed as desirable social goods

A domination of the sociotechnical imaginary



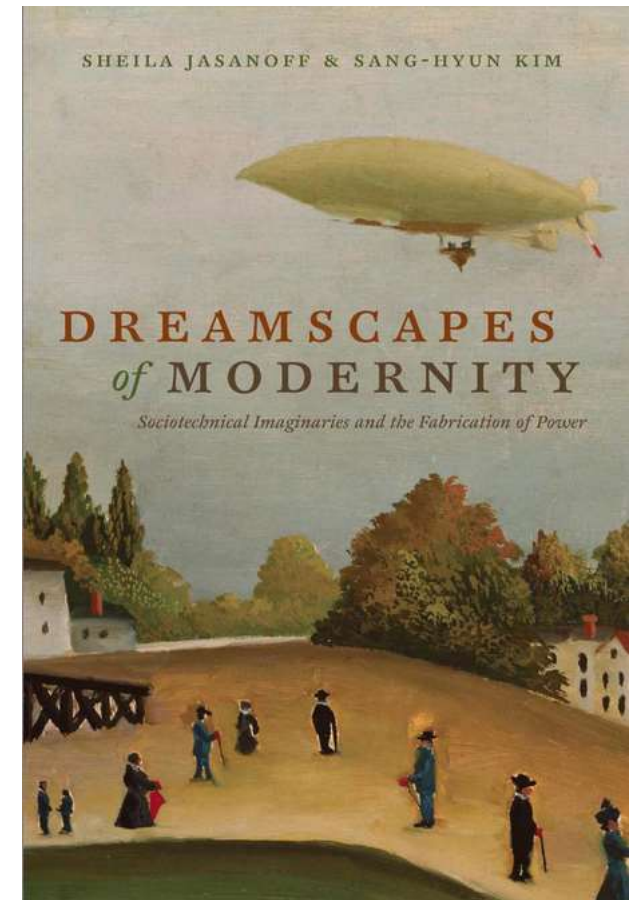
Science, the endless frontier of regulatory capture

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

[Show more](#) 



Sheila Jasanoff



The articulation of the story includes

- Technological determinism (there is no going back)
- The Principle of Innovation (regulation hampers profit and economic growth)
- Solutionism/technicism (political and legal issues are transformed into technical ones – thus amenable to a technical solution)

The articulation of the story includes

- Technological determinism (there is no going back)
- The Principle of Innovation (regulation hampers profit and economic growth)
- Solutionism/technicism (political and legal issues are transformed into technical ones – thus amenable to a technical solution)
- Anthropomorphising machines, dehumanizing people (the Human Brain Project)
- Legal exceptionalism (New rules are needed for a new technology)

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- Legal exceptionalism (New rules are needed for a new technology)
- Crying ‘wolf’ about future challenges to distract from present ones (Pause AI!)

← All Open Letters

Pause Giant AI Experiments: An Open Letter

We call on all AI labs to immediately pause for at least 6 months the training of AI systems more powerful than GPT-4.

Signature

33711

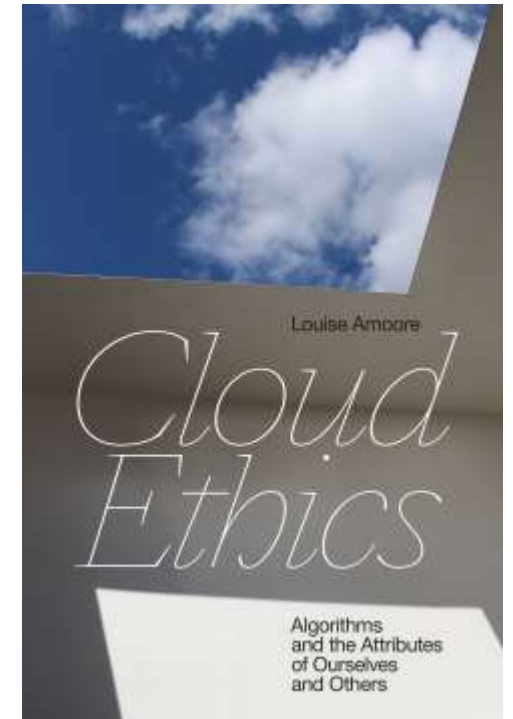
Add your signature

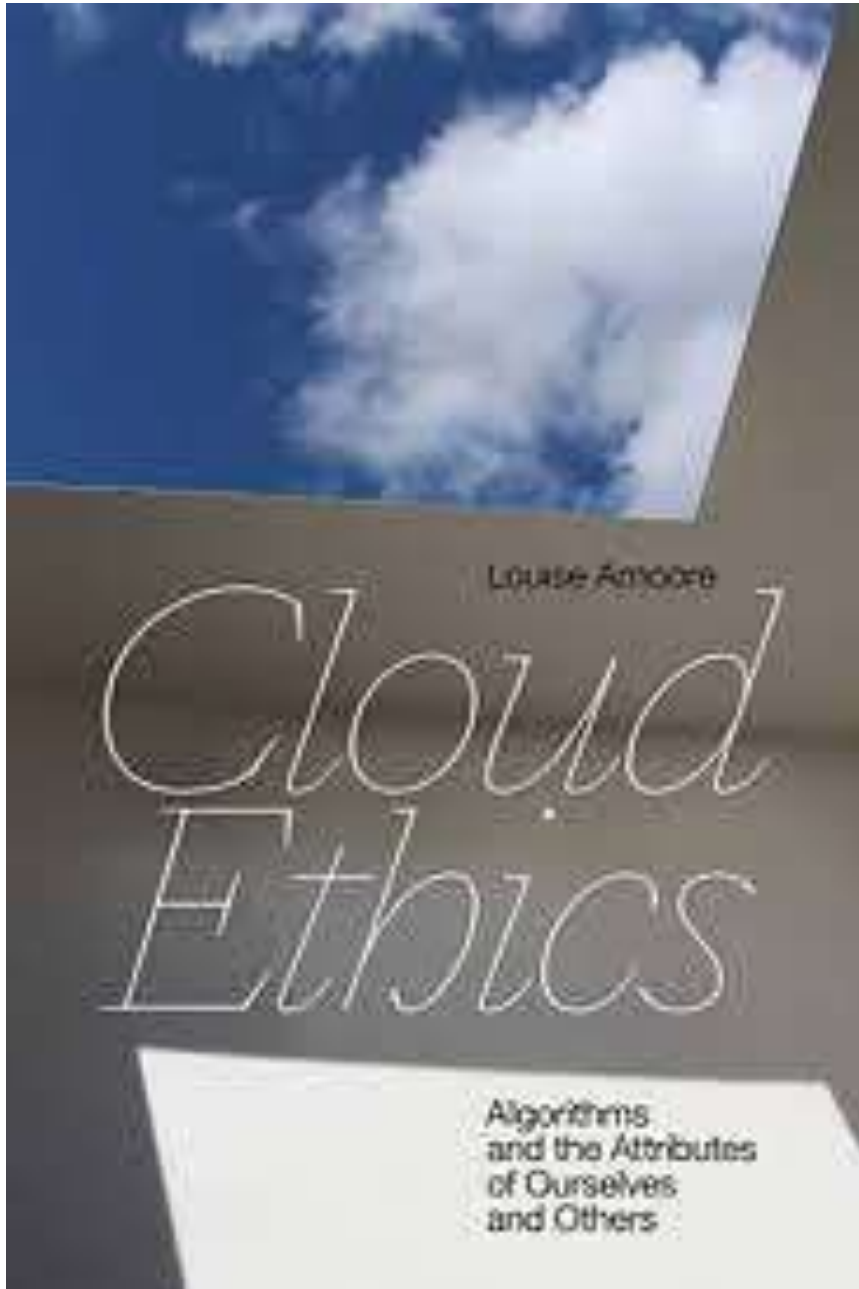
Published

March 22, 2023

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- Crying ‘wolf’ about future challenges to distract from present ones
- Distracting regulators with ‘ethics of algorithms’





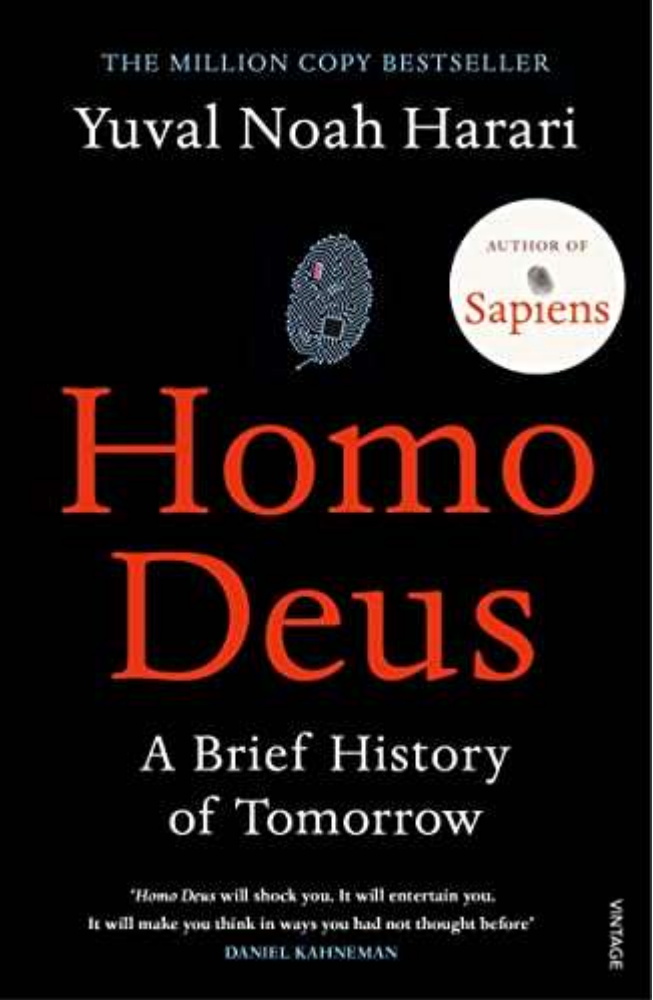
Making algorithms
'good' or 'transparent'
is beyond the point.
Algorithms create new
norms of good or bad.

Algorithm =
ethicopolitical
arrangement of
values, assumptions,
and propositions about
the world



Louise Amoore

An ideological substrate: Eugenics, transhumanism, logtermism...



The WASHINGTON
SPECTATOR

Politics World Culture Economy Letters Latest Issue Register FAQ Support

The Wide Angle: Understanding TESCREAL – the Weird Ideologies Behind Silicon Valley’s Rightward Turn

by Dave Troy
May 1, 2023 | Politics, The Wide Angle



PHOTO CREDIT: Thomas Hawk, RIA Novosti, Cointelegraph

“TESCREAL=Transhumanism, Extropianism, Singularitarianism, Cosmism, Rationalism, Effective Altruism, and Longtermism”

Some Slides from Sasha Luccioni

You can find me at:

sasha.luccioni@hf.co

@SashaMTL



Hi, I'm Sasha!

I'm the Climate Lead at HuggingFace, where I work on evaluating the environmental and societal impacts of AI models and datasets.

I'm also a Board Member of WiML (Women in Machine Learning) and a Founding member of Climate Change AI



Slides by Sasha Luccioni



Hugging Face

WiML
Women in Machine Learning



Costs of Generative AI

“AGI”

Chat about any topic

Answer all your burning questions

Generate realistic images

Do your homework for you

False and misleading information

Gather your data to improve models

Propaganda and deception

Exploitation of underpaid workers

Biases and hallucinations

Erosion of rich human practises

Homogeneity and misrepresentation of
language/culture
Harmful and violent content

Raising the barrier to entry in AI

Tonnes of carbon emissions

Huge quantities of energy/water

Private information

Rare metals for manufacturing hardware

Copyright infringement

Crowdsourced via [Twitter](#)

Data

- ⦿ Training recent generations of AI models requires large quantities of data, which are typically sourced from the Web
- ⦿ This raises questions of:
 - **Copyright:** who does Web content belong to? How can we enforce licenses and author rights?
 - **Content:** which websites are “acceptable”? (according to whom?)
 - **Consent:** should we have ‘opt-out’ mechanisms for removing one’s data from training sets? Or ‘opt-in’ to allow our data to be used?

Human Costs

- Filtering and annotating data is hard and thankless
- Most of the human workers hired for this come from underpaid and otherwise marginalized communities
- They are often left with psychological damage due to the content they moderate ([source](#))



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BUSINESS • TECHNOLOGY

Exclusive: OpenAI Used Kenyan Workers on Less Than \$2 Per Hour to Make ChatGPT Less Toxic



This image was generated by OpenAI's image-generation software, Dall-E 2. The prompt was: "A seemingly endless view of African workers at desks in front of computer screens in a printmaking style." TIME does not typically use AI-generated art to illustrate its stories, but chose to in this instance in order to draw attention to the power of OpenAI's technology and shed light on the labor that makes it possible. Image generated by Dall-E 2/OpenAI

Source: [TIME Magazine](#)



Slides by Sasha Luccioni



(Something of a) Conclusion

- ◎ Over the last 80 years, AI has legitimately brought with it innovations that have improved tools like search, navigation, etc
 - We are still coming to terms with evaluating the biases and impact of these tools on society and the planet
- ◎ The pace of AI has picked up in recent years, meaning that science is having trouble keeping up
- ◎ This, coupled with the increased closing of AI research, means that we don't have a good idea of what's going on under the hood of these models and what impacts they may have

Can we control
capitalism?


OPINION
EZRA KLEIN

The Imminent Danger of A.I. Is One We're Not Talking About

Feb. 26, 2023

The New York Times

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The Crisis of Intellectual Monopoly Capitalism

Cambridge Journal of Economics V. 38 pp. 1409-1431

21 Pages • Posted: 14 Dec 2014

Ugo Pagano

University of Siena - Department of Economics

Is intellectual monopoly capitalism
suffocating the economy?



The lobbying ghost in the machine

Or fight pervasive
lobbying?

Open questions

Is generative AI desirable?

Can it be stopped? By whom?

How will this affect me?

How will this affect (what we call) the real?

How should I act (now/in perspective)?

Your Practicum

More reading & watching

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

Recent works: sociology of
quantification and
mathematical modelling



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

edited by
Andrea Saltelli
& Monica Di Fiore

OXFORD

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



The End



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