

# Ethics of Quantification

Andrea Saltelli

Course MNF990, University of Bergen,  
March 19, 2024  
(in remote)



# Where to find this talk: [www.andreasaltelli.eu](http://www.andreasaltelli.eu)



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## 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](http://abc.net.au/listen/programs/sun)

View on [mstdn.social](https://mstdn.social)





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

… 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

Source: Saltelli, A., Andreoni, A., Drechsler W., Ghosh, J., Kattel, R., Kvangraven, I. H., Rafols, I., Reinert, E. S., Stirling, A. and Xu, T. (2021). Why ethics of quantification is needed now. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2021/05)  
<https://www.ucl.ac.uk/bartlett/public-purpose/publications/2021/jan/why-ethics-quantification-needed-now>.



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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.

Source: Saltelli, A., Andreoni, A., Drechsler W., Ghosh, J., Kattel, R., Kvangraven, I. H., Rafols, I., Reinert, E. S., Stirling, A. and Xu, T. (2021). Why ethics of quantification is needed now. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2021/05)  
<https://www.ucl.ac.uk/bartlett/public-purpose/publications/2021/jan/why-ethics-quantification-needed-now>.



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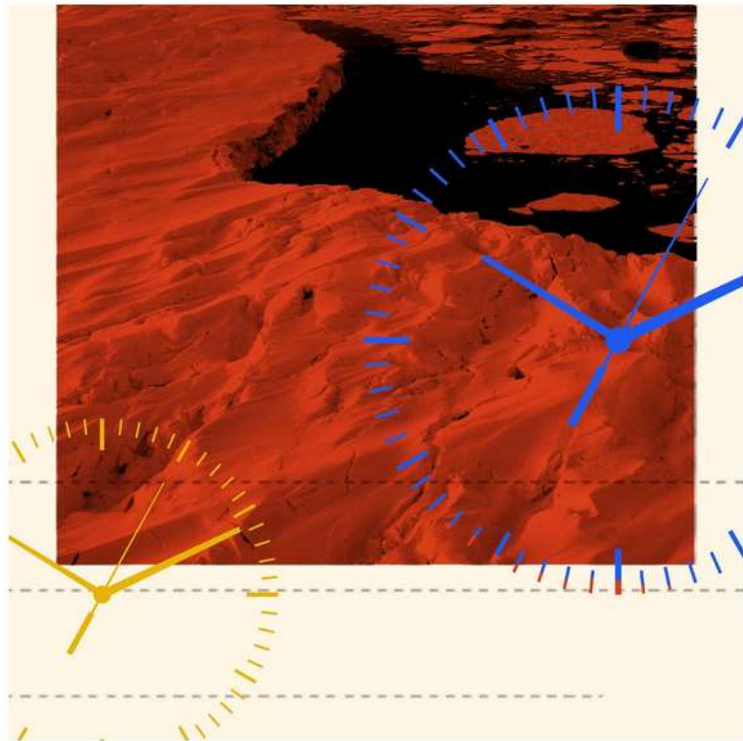
WORKING PAPER  
WP 2021/05

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

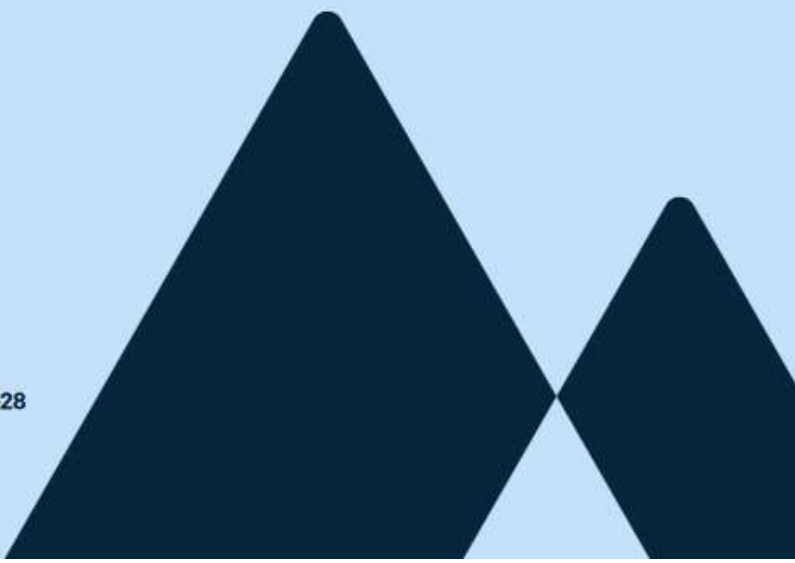
Mathematical models predicting the damage in dollars from hurricanes and draughts up to the year 2300

  
RESOURCES  
for the FUTURE

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

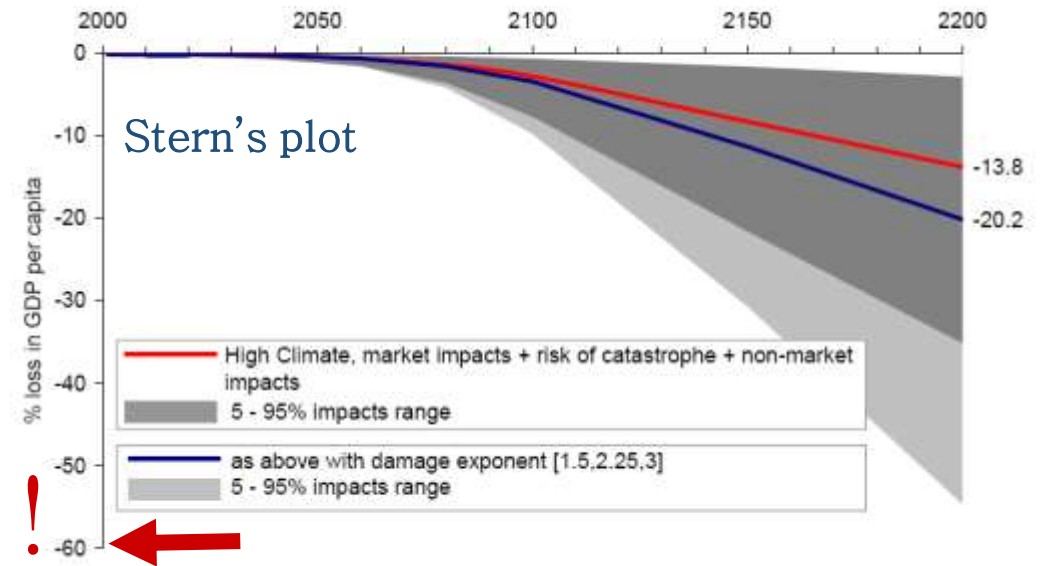
Kevin Rennert, Brian C. Prest, William A. Pizer, Richard G. Newell, David Anthoff, Cora Kingdon, Lisa Rennels, Roger Cooke, Adrian E. Raftery, Hana Ševčíková, and Frank Errickson

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



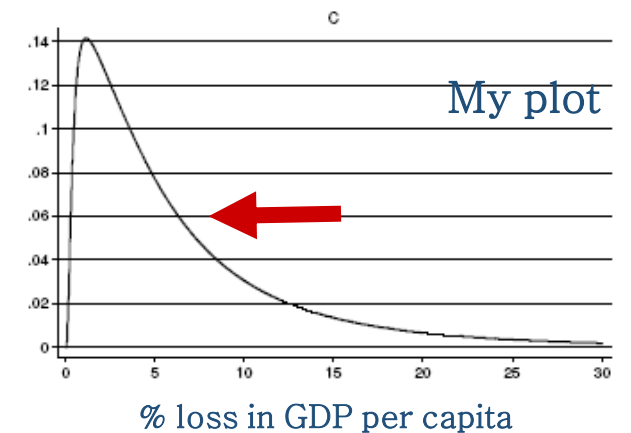
Global Environmental Change 20 (2010) 298–302



Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: [www.elsevier.com/locate/gloenvcha](http://www.elsevier.com/locate/gloenvcha)

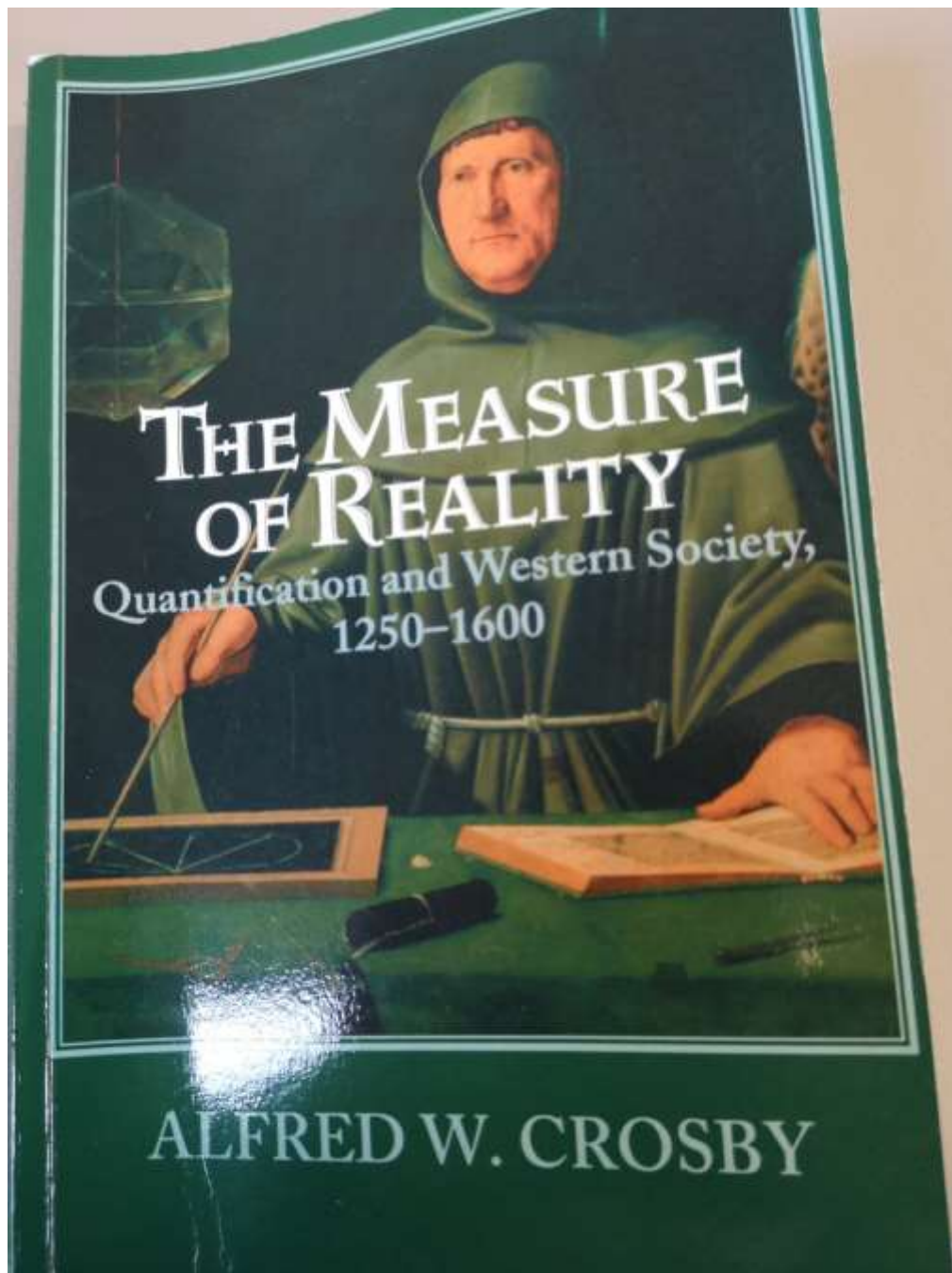


Sensitivity analysis didn't help. A practitioner's critique of the Stern review

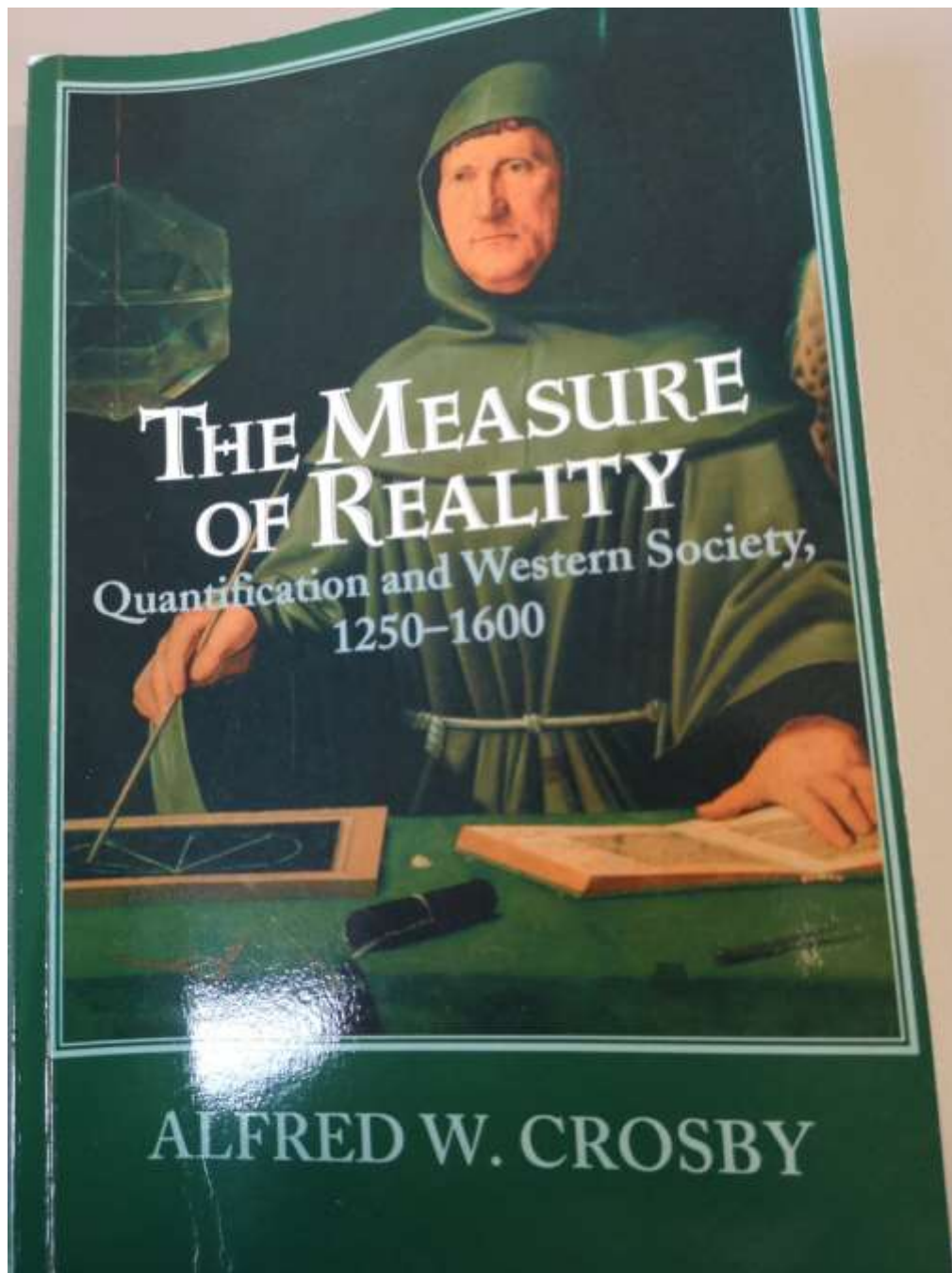
Andrea Saltelli \*, Beatrice D'Hombres

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 ...

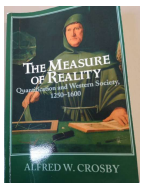


Pieter Bruegel the Elder, Temperance, 1560

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



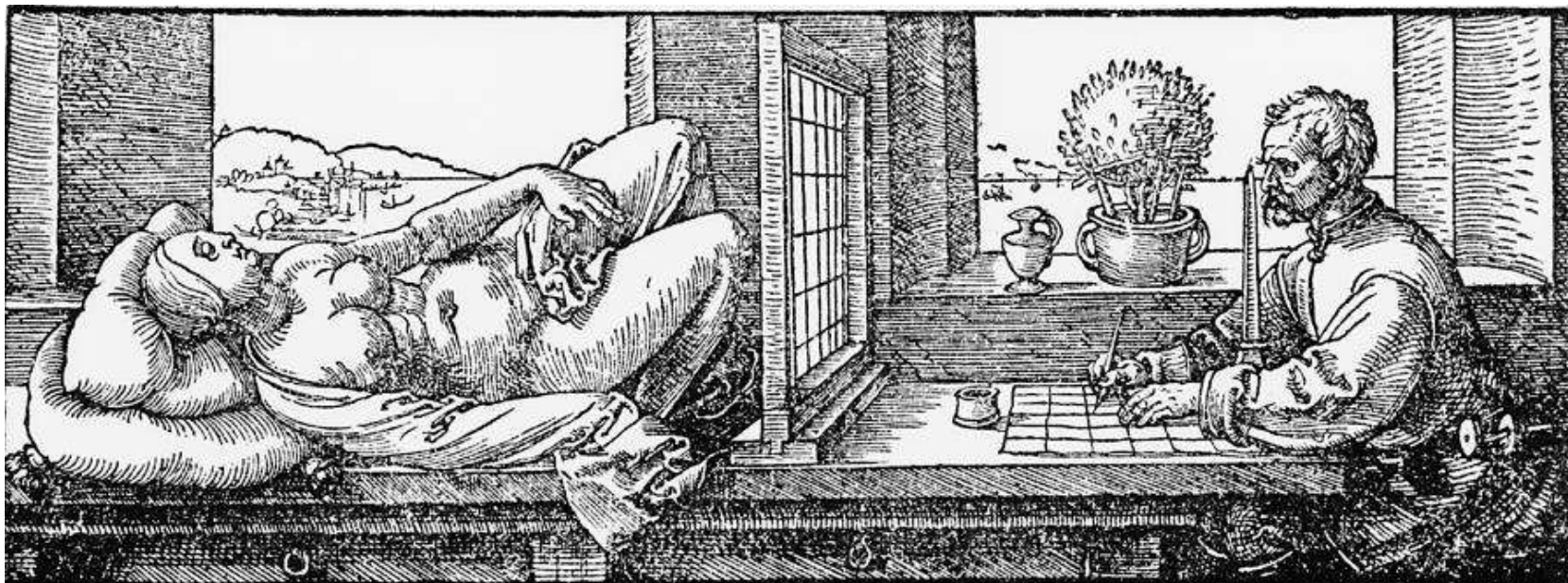
VIDENDVM, VT NEC VOLVPTATI DEDITI PRODIGI ET LVXVRIOSI  
APPAREAMVS, NEC AVARA TENACITATI SORDIDI AVT OBCVRI EXISTAMVS





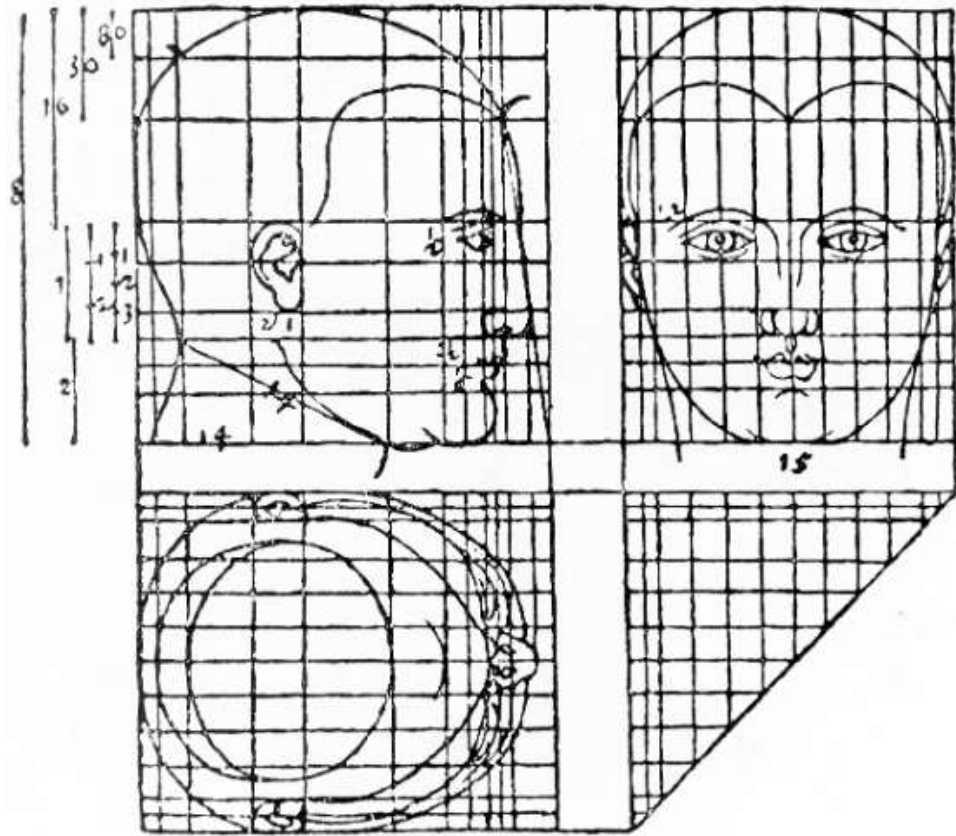


The Annunciation,  
Carlo Crivelli  
(1435, 1495)

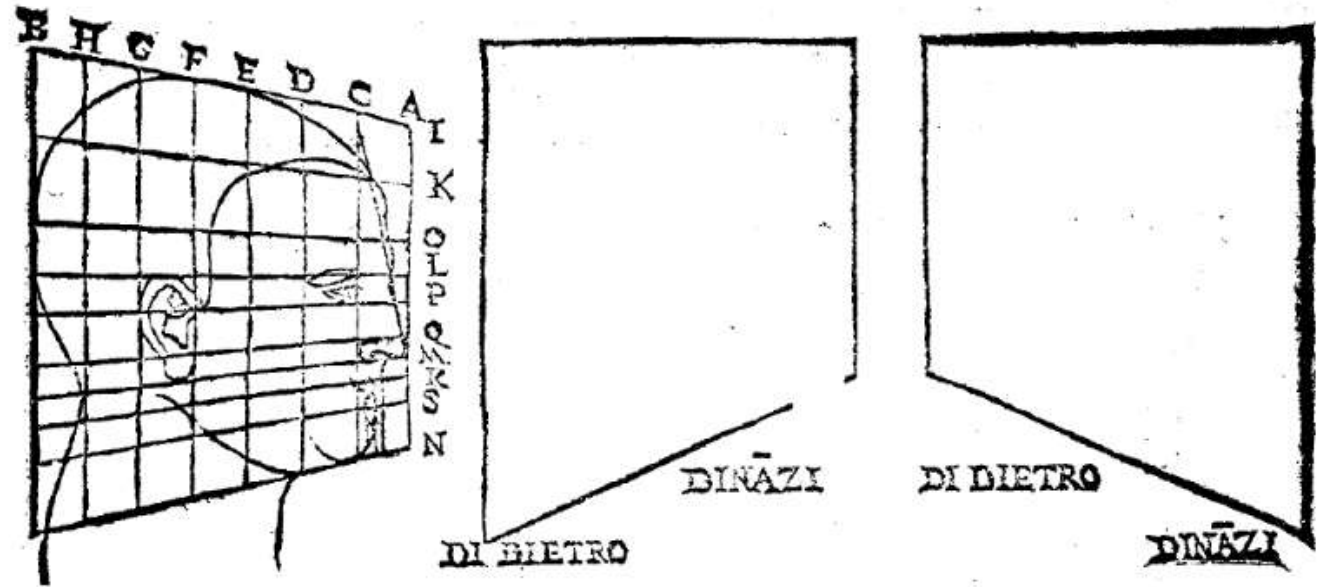


Draftsman Drawing a Reclining Nude  
Albrecht Dürer (1471–1528)

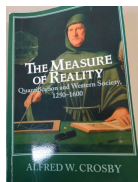




DELLA SIMMETRIA



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:

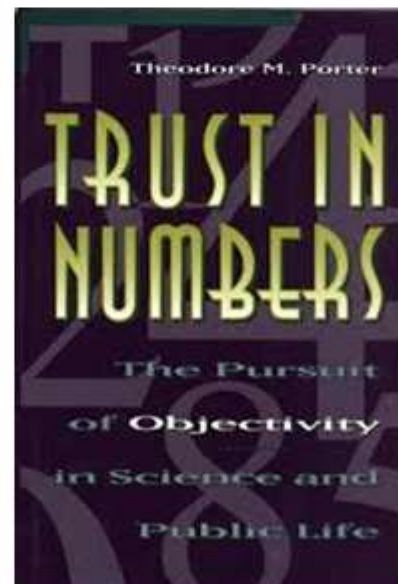
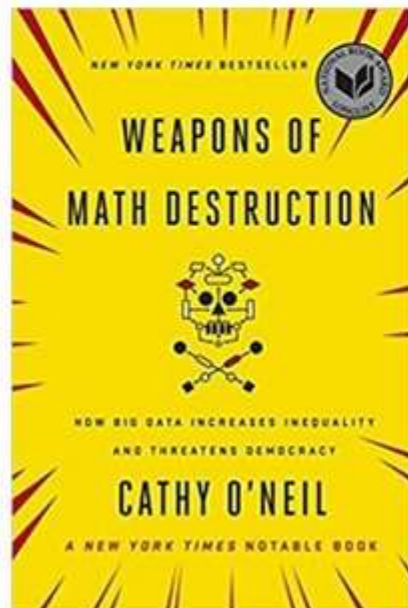
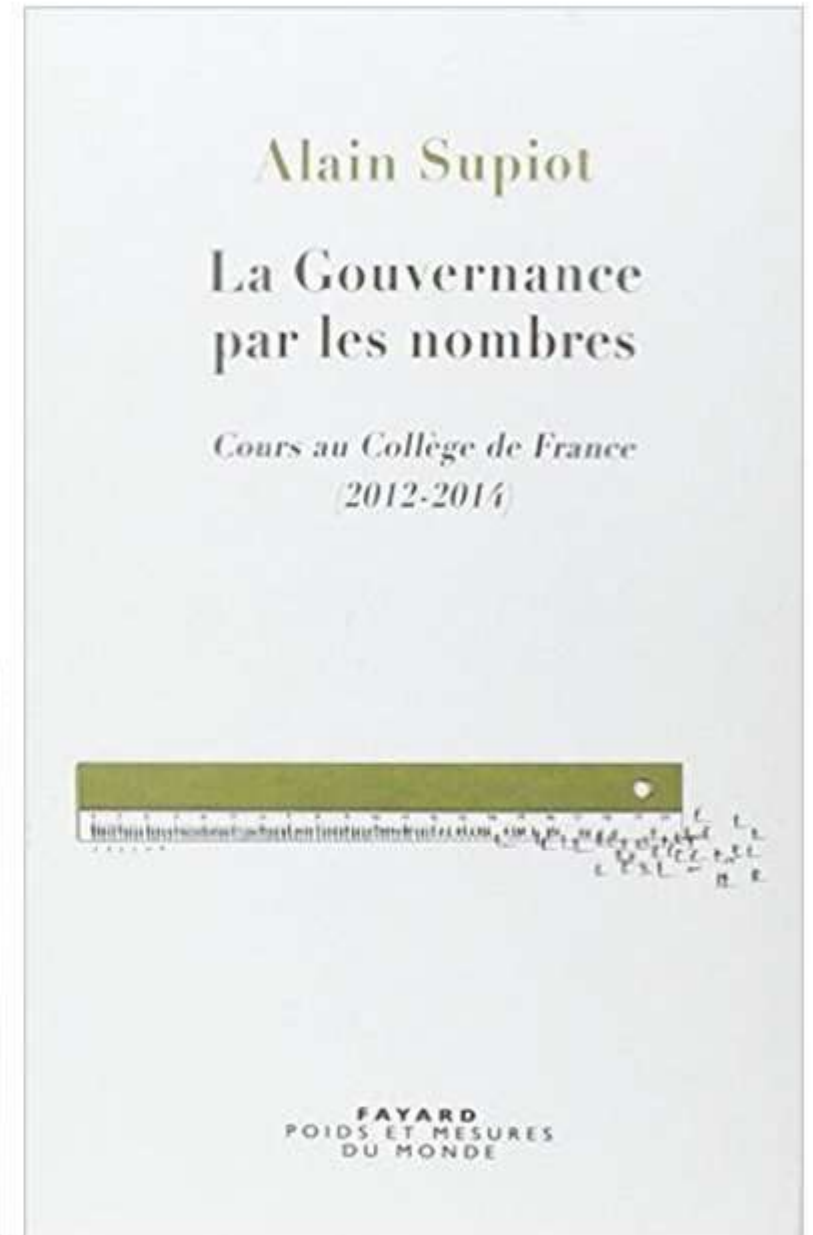
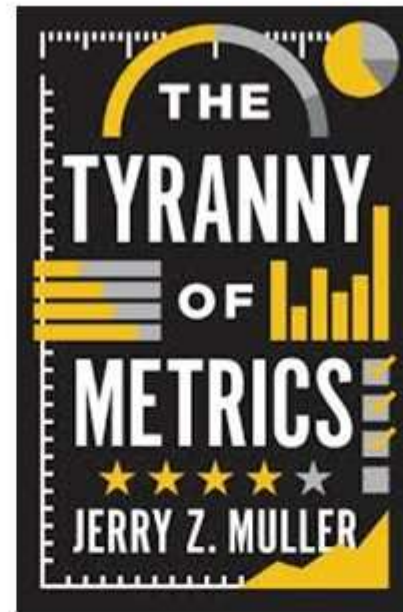
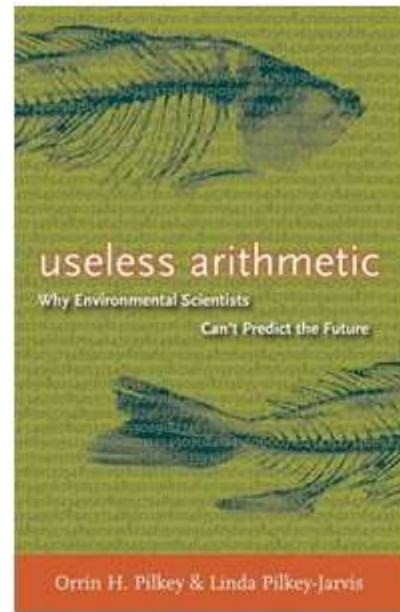
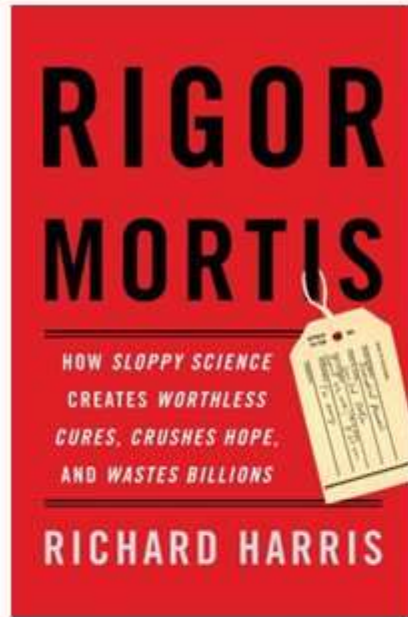
“what qualities are specific to rankings, or indicators, or models, or algorithms?”



Elizabeth  
Popp Berman

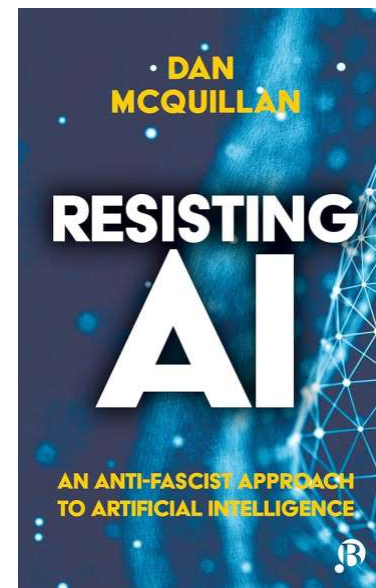
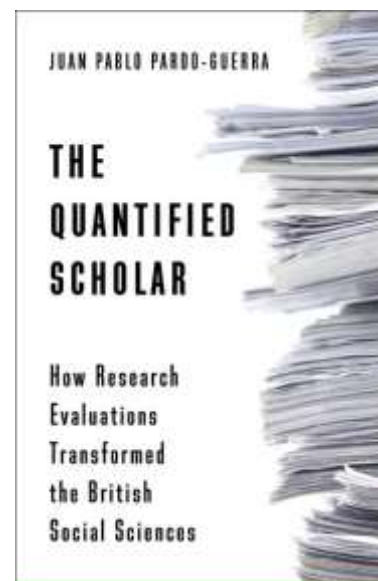
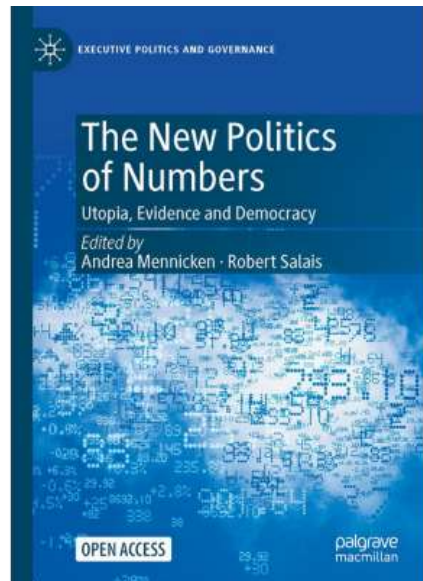
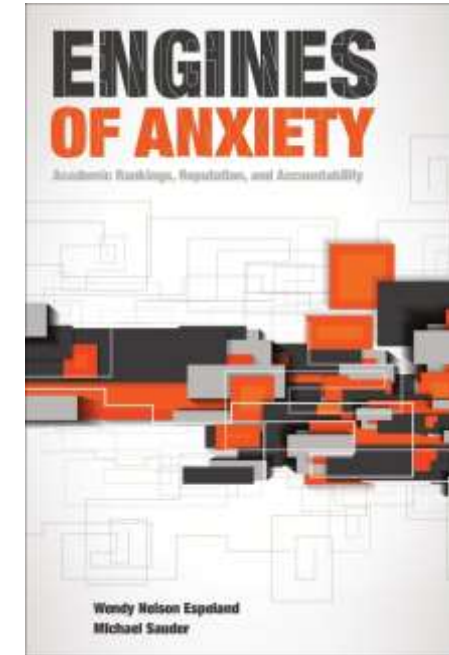
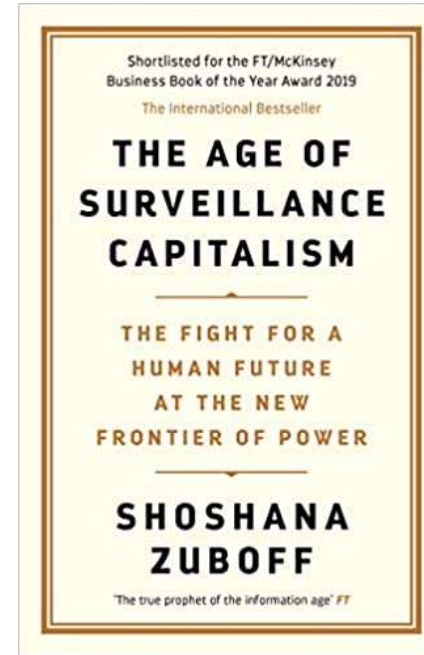
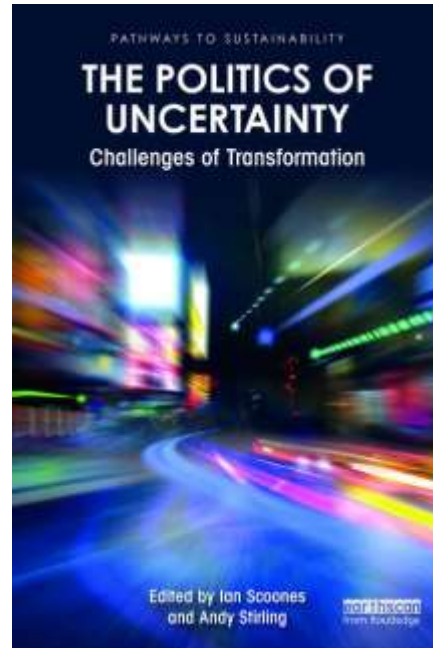
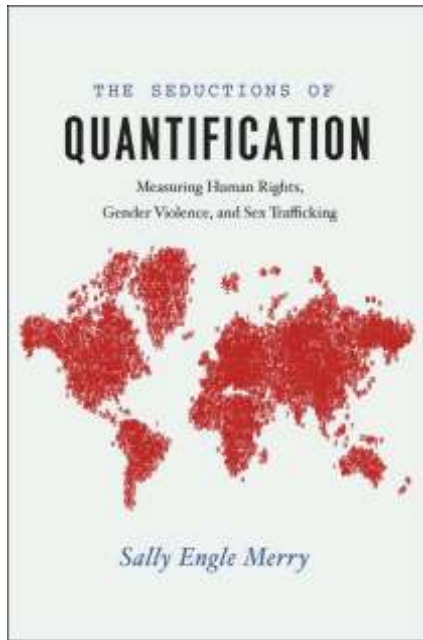
E. Popp Berman and D. Hirschman, **The Sociology of Quantification**: Where Are We Now?, *Contemp. Sociol.*, vol. in press, 2017.

# Algorithms, models, metrics, statistics...





# Algorithms, models, metrics, statistics...

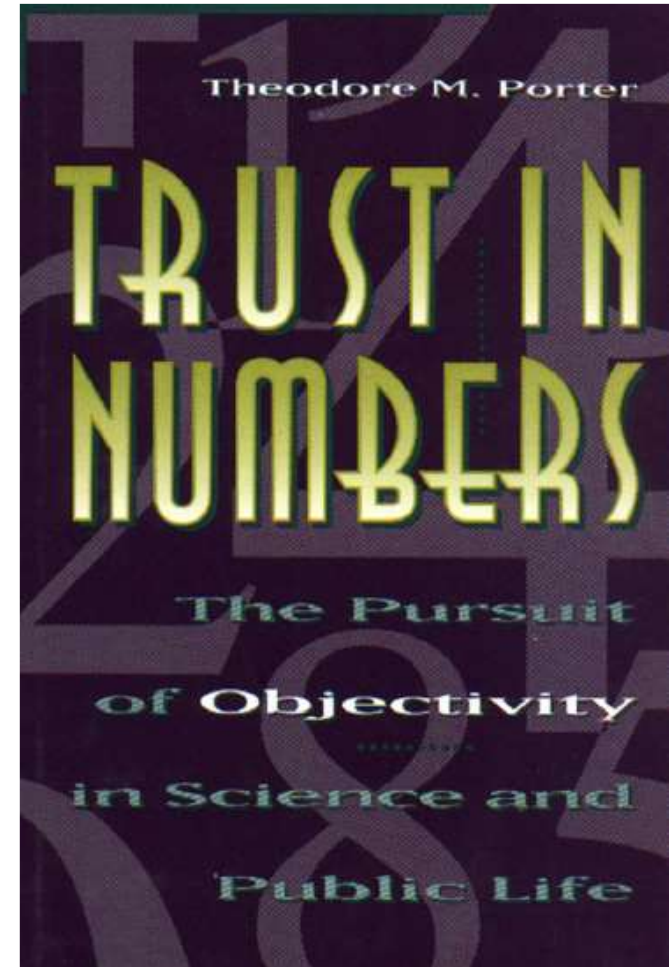




# Numbers and trust



Theodor  
M. Porter



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

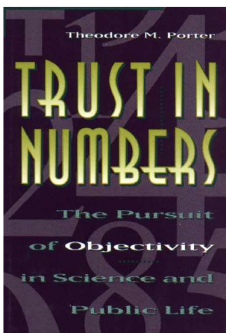
Porter's story: Quantification needs judgment which in turn needs trust ...without trust quantification becomes mechanical, a system, and 'systems can be played'.



The appeal of numbers is especially compelling to bureaucratic officials who lack the mandate of a popular election, or divine right, p. 8

...

A decision made by the numbers (or by explicit rules of some other sort) has at least the appearance of being fair and impersonal, p. 8





‘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);

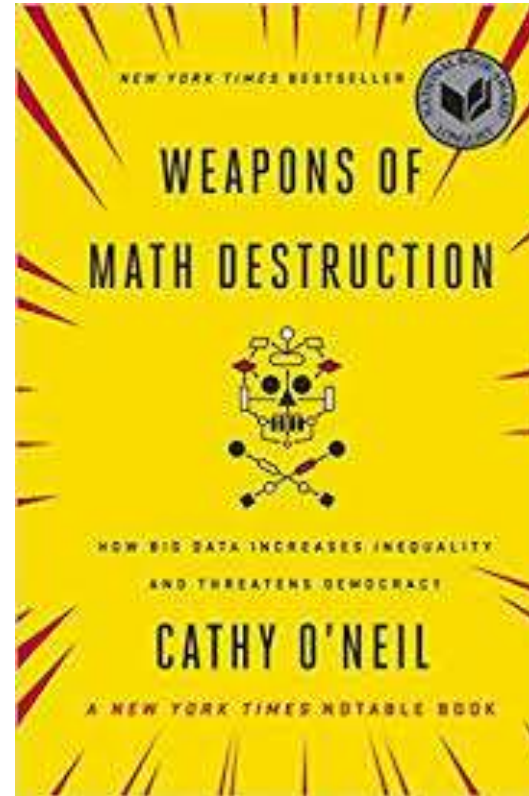
[https://en.wikipedia.org/wiki/Goodhart%27s\\_law](https://en.wikipedia.org/wiki/Goodhart%27s_law)



# Alarm for Weapons of Math Destruction



Cathy O'Neil

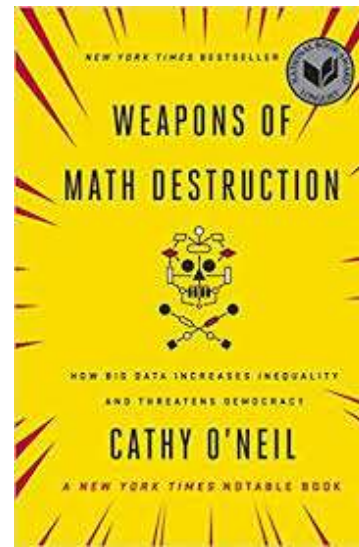


O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

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...

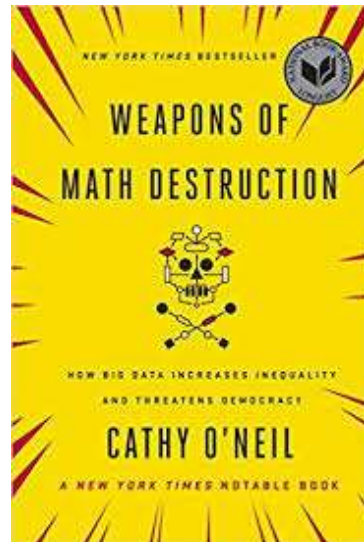
O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

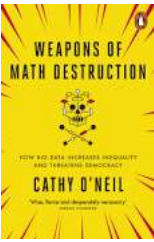
Brauneis, R., & Goodman, E. P. (2018). Algorithmic Transparency for the Smart City. *Yale Journal of Law & Technology*, 20, 103–176. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3012499](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3012499)



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>





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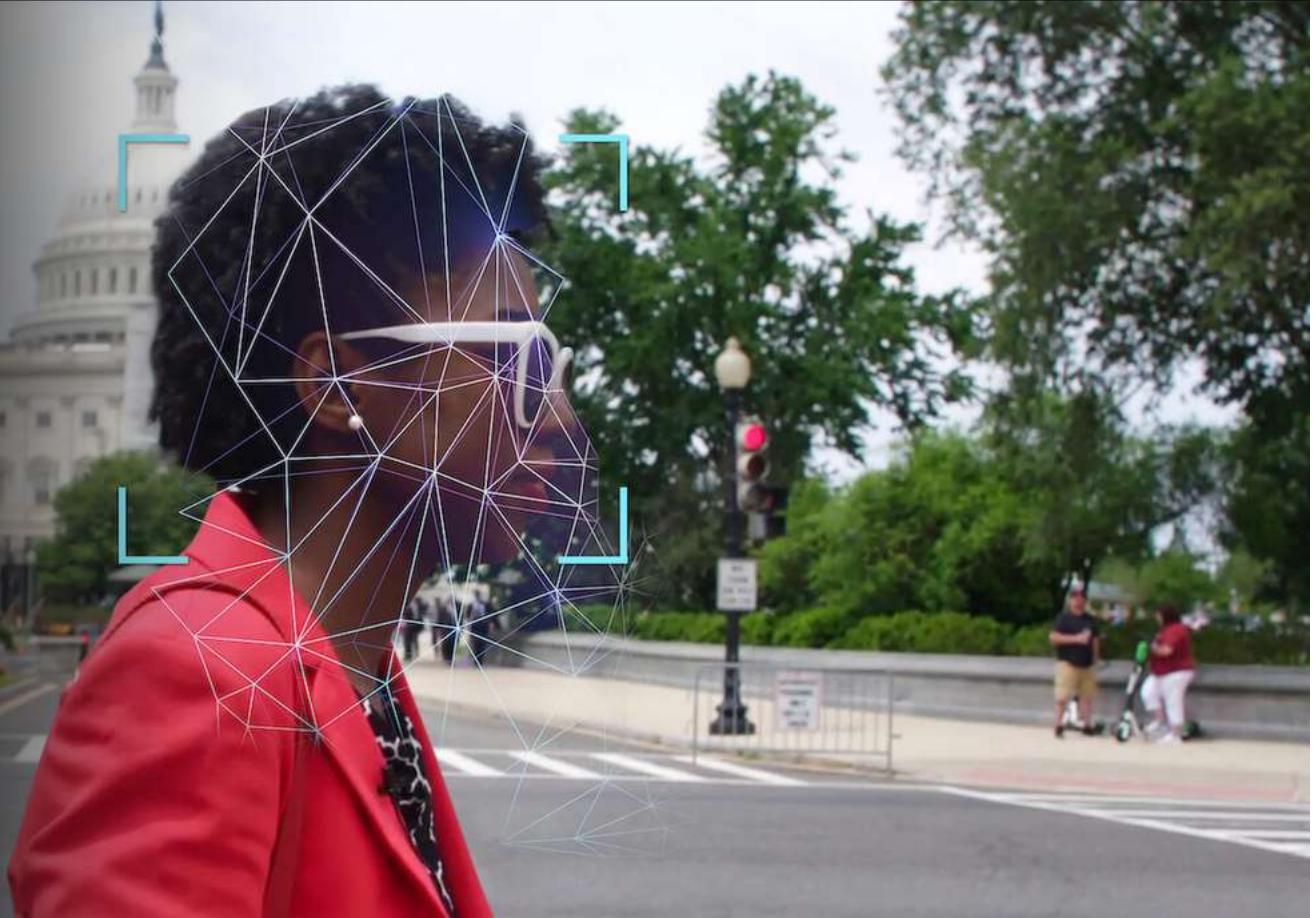
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# C O D E D B I A S

## 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

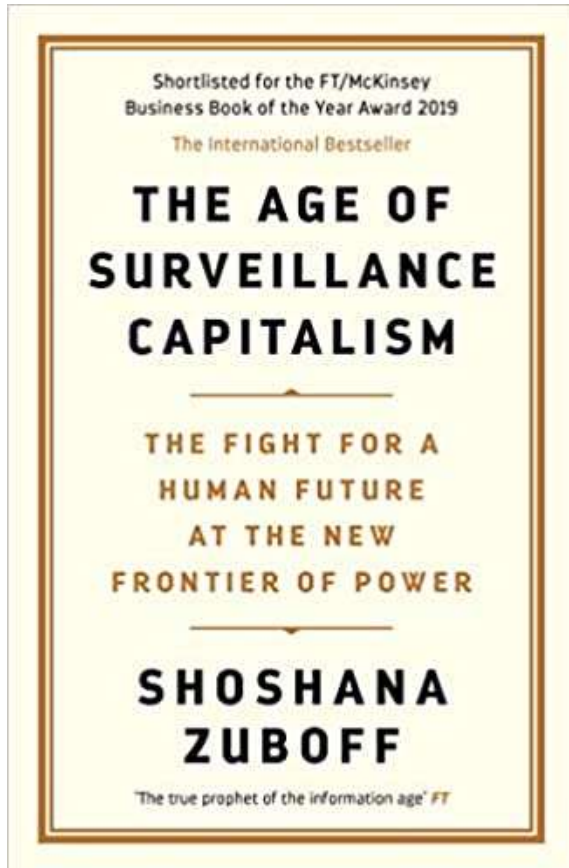
TED

WIRED

The Telegraph



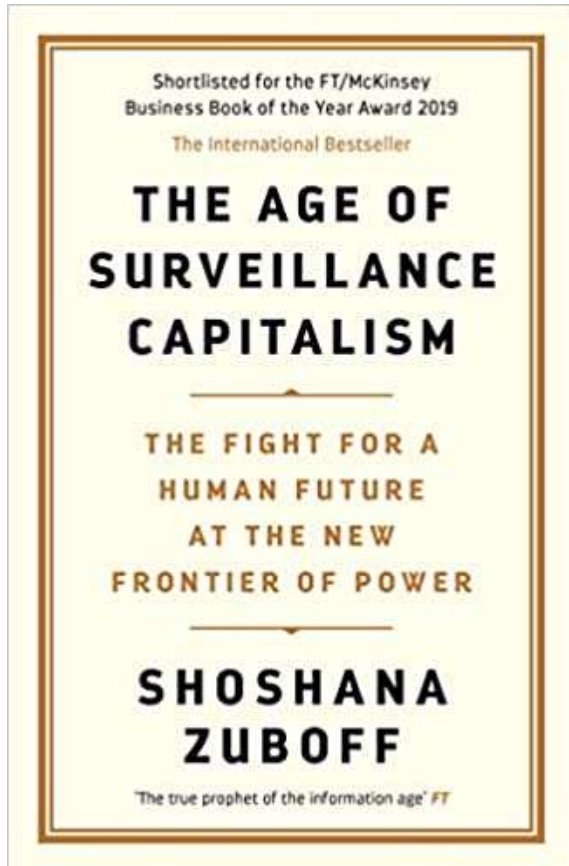
A project of domination of consumers and voters is made possible by artificial intelligence, big data & cognitive psychology



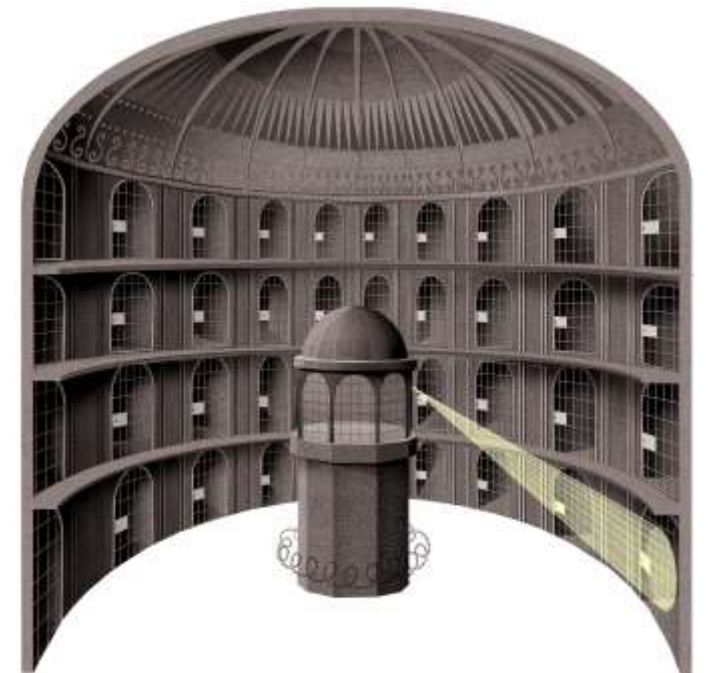
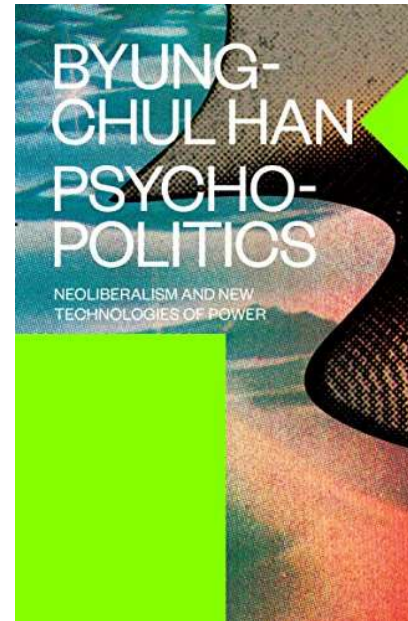
Inequality, power asymmetries and the world of surveillance capitalism



... 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**

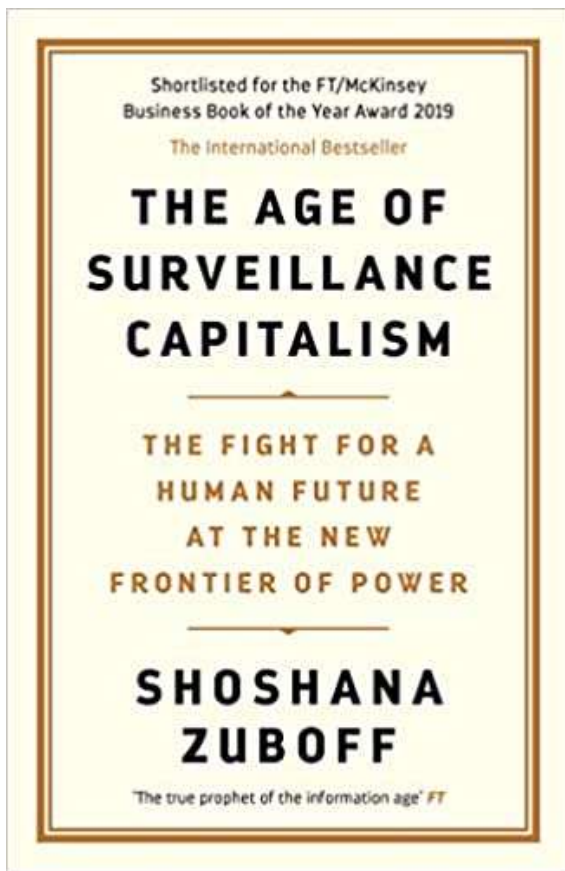
**N** FILM  
**/the**  
**social dilemma**





... 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

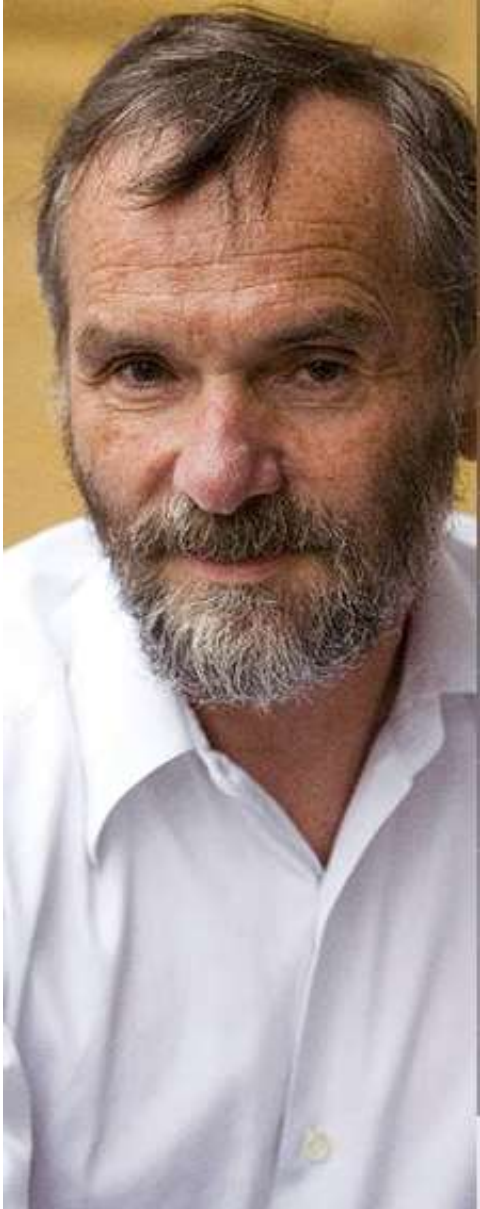
*Néorationalism d'importation*

*La trollisation de l'espace  
public*

AI empowered with  
cognitive psychology

A project of domination?

# Alain Supiot



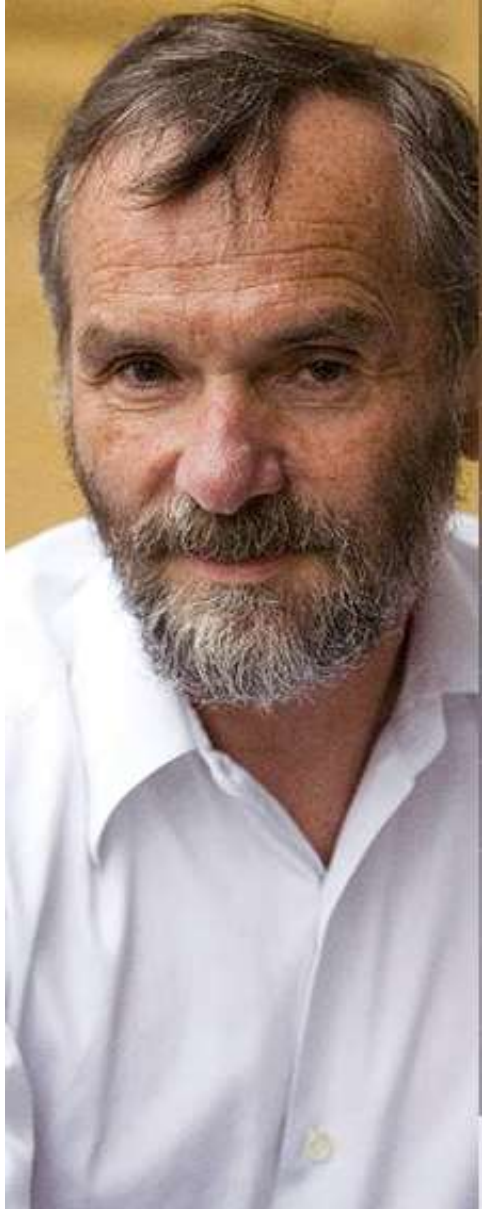
An indictment of the  
Total Market and the  
normative uses of  
economic quantification

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





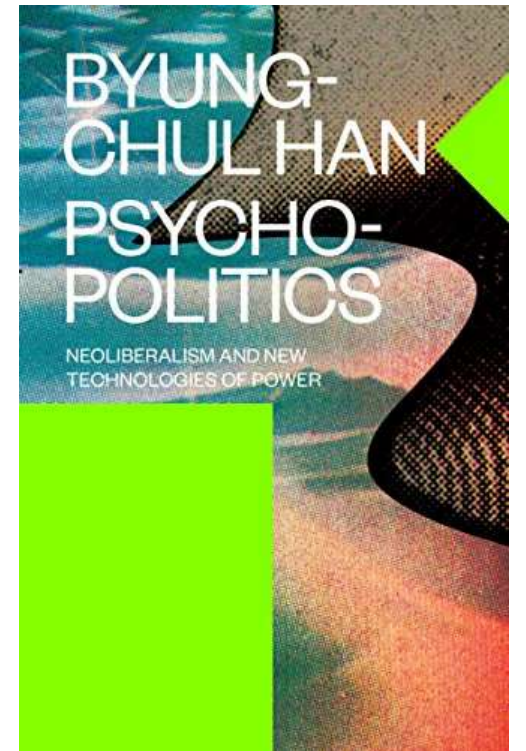
# Alain Supiot

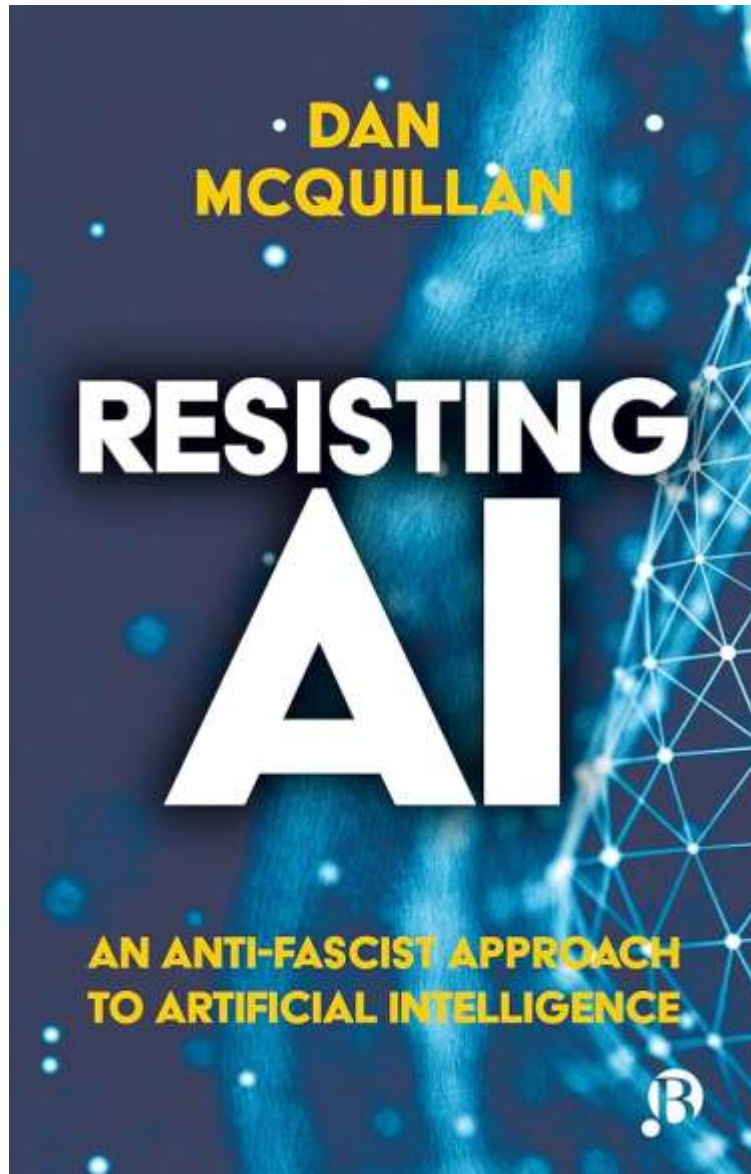


...we have entered the era of the cybernetic imaginary, which revives the West's age-old dream of grounding social harmony in calculations.

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

Slave of ourselves





*Resisting AI* contrasts optimistic visions about AI's ... AI may best be seen as a continuation and reinforcement of bureaucratic forms of discrimination and violence, ultimately fostering authoritarian outcomes

AI's promise of objective calculability is antithetical to an egalitarian and just society

... Based on opaque algorithms – various actors can discriminate against categories of people in accessing jobs, loans, medical care, and other benefits

# 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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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**

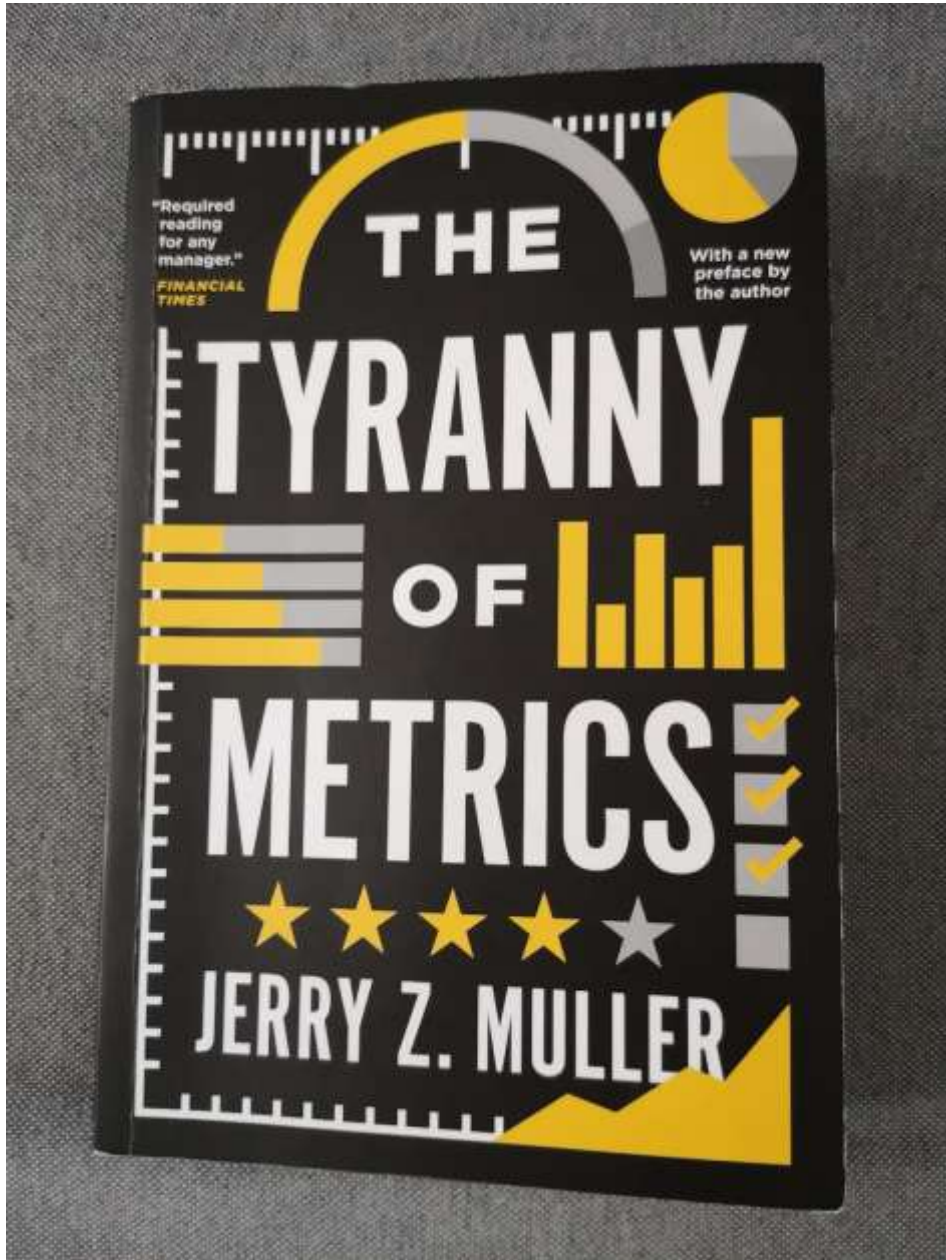
Institute for Cognitive Sciences and Technologies, Consiglio Nazionale delle Ricerche

**Andrea Saltelli**

Open Evidence Research, Universitat Oberta de Catalunya (UOC)

**Jerome R. Ravetz**

Institute for Science, Innovation and Society, University of Oxford

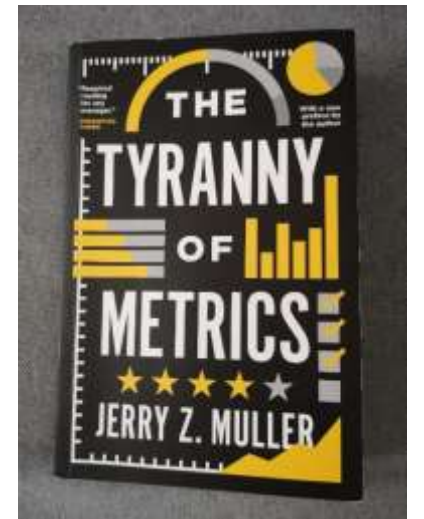


J. Z. Muller, *The tyranny of metrics*. Princeton University Press , 2018.

Metric fixation, or the irresistible pressure to measure performance

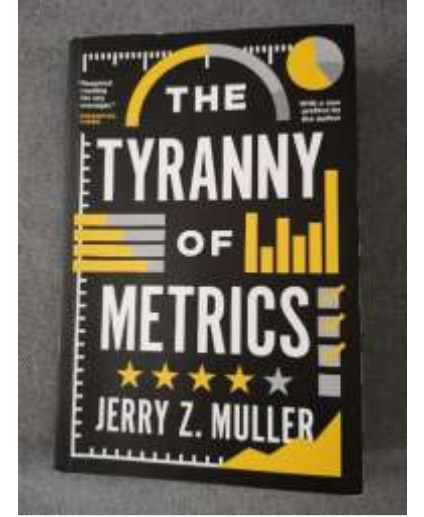
Gaming of metrics (recall Goodhart law)

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





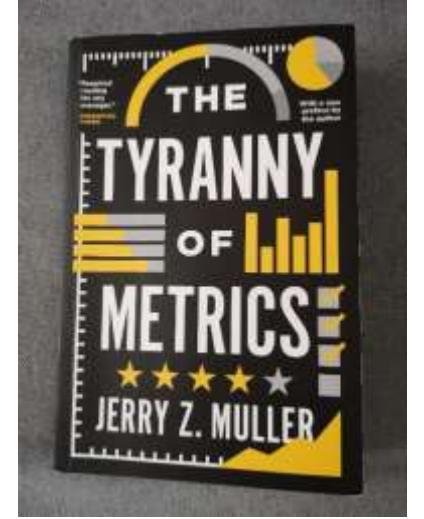
# Unintended consequences



- 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

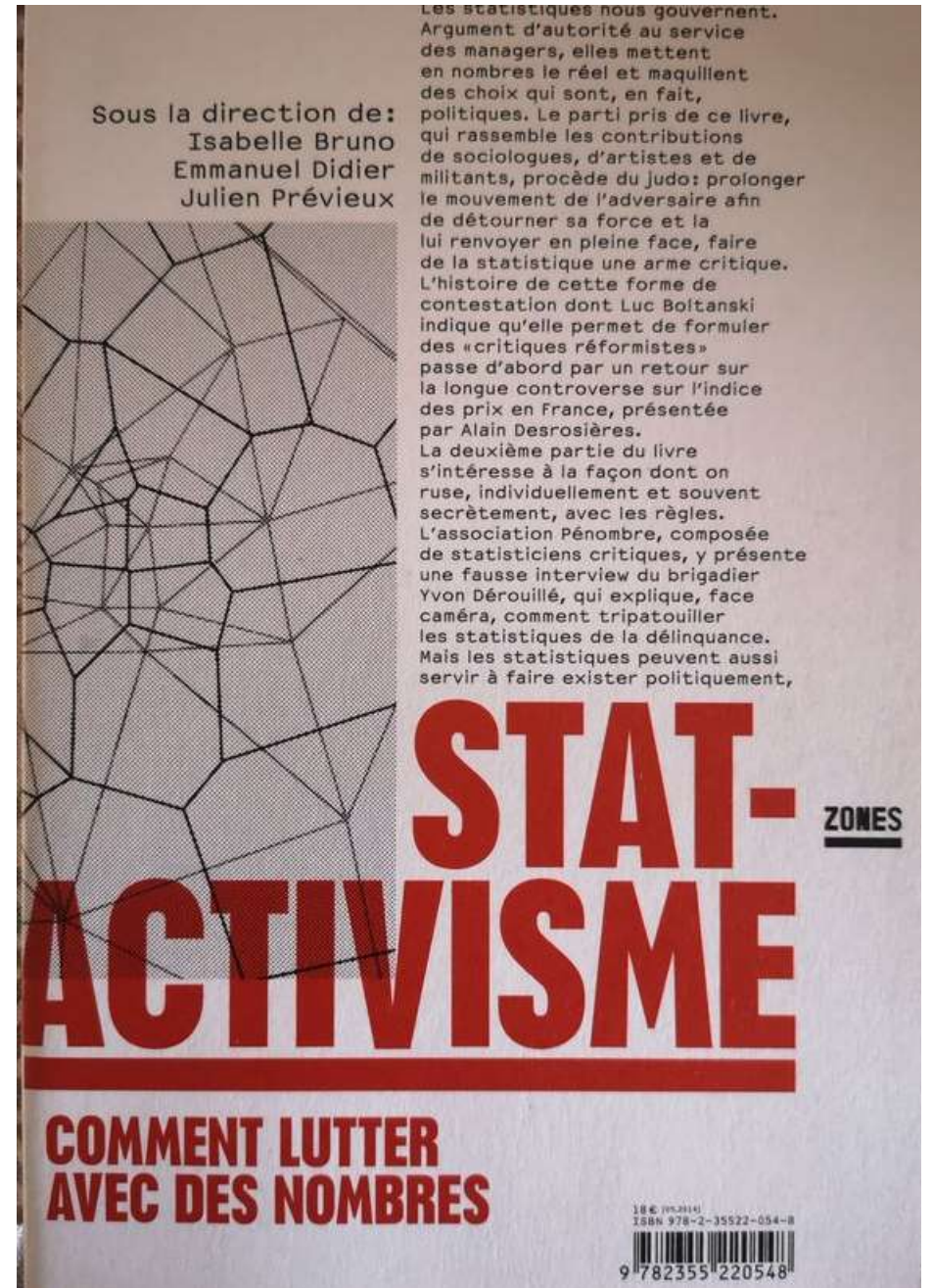
A concluding remark of Muller

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?

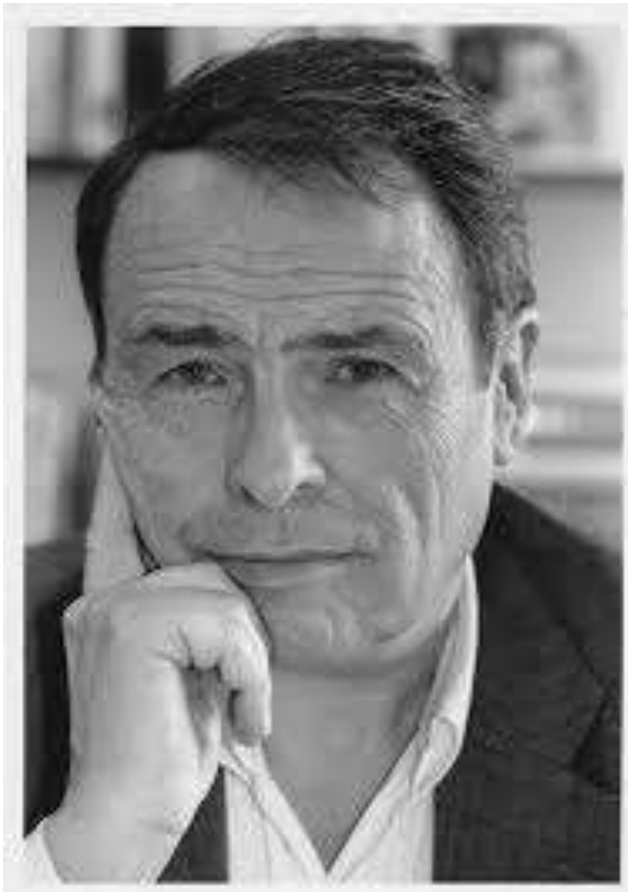
I. Bruno, E. Didier, and J. Prévieux, Stat-activisme. Comment lutter avec des nombres. Paris: Zones, La Découverte, 2014





# 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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[nature](#) > [nature communications](#) > [comment](#) > [article](#)

[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

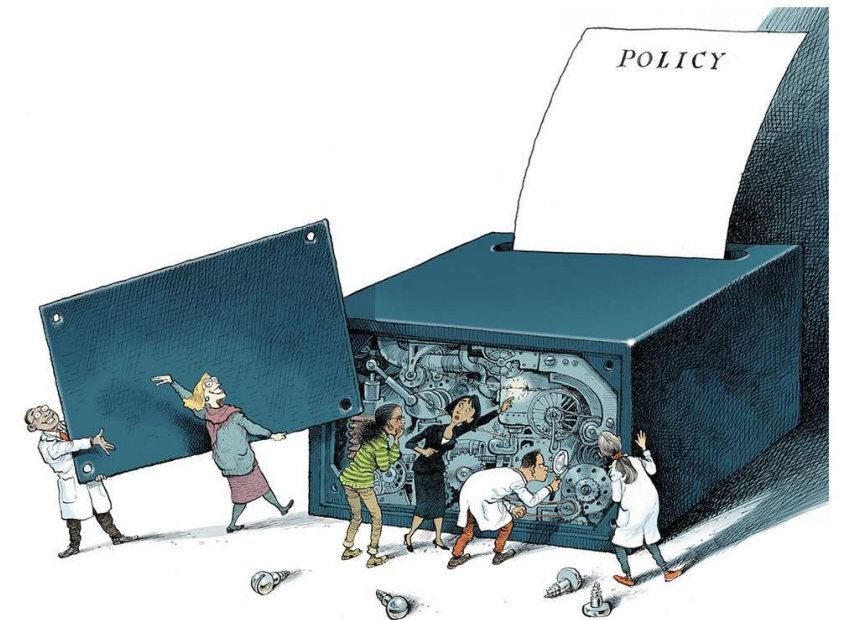
**3 STS scholars** Bammer, Sarewitz, Stirling

**1 philosopher** Ravetz

**1 historian** Charters

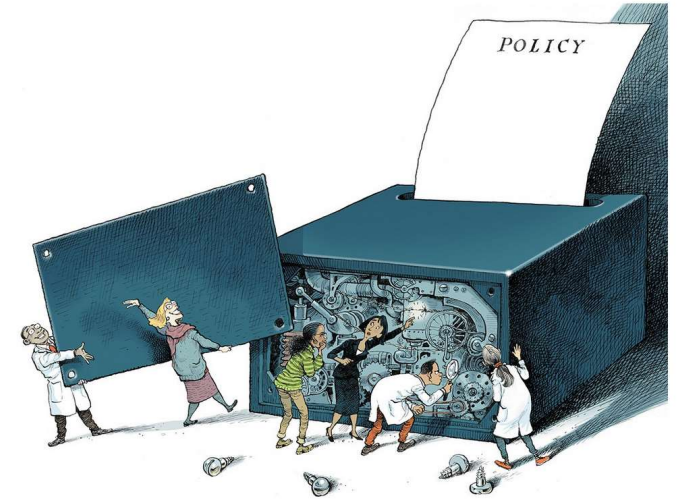
**1 political scientists** Di Fiore

**1 expert RRI - Open Science** Rafols



COVID has put mathematical models in the limelight

→ Power & controversy





# Power

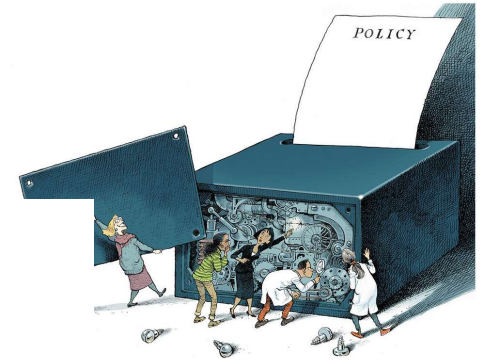
The New York Times

## *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



**THE TIMES**



## **New modelling army is leading us astray**

Be it policy for lockdown, net zero or immigration, it must be ministers and not scientists or analysts who lead the way

Juliet Samuel

Wednesday November 08 2023, 9.00pm, The Times

<https://www.thetimes.co.uk/article/new-modelling-army-is-leading-us-astray-0b7pm8662>

# Mind the assumptions

Assess uncertainty and sensitivity



# Mind the hubris

Complexity can be the enemy of relevance

# Mind the framing

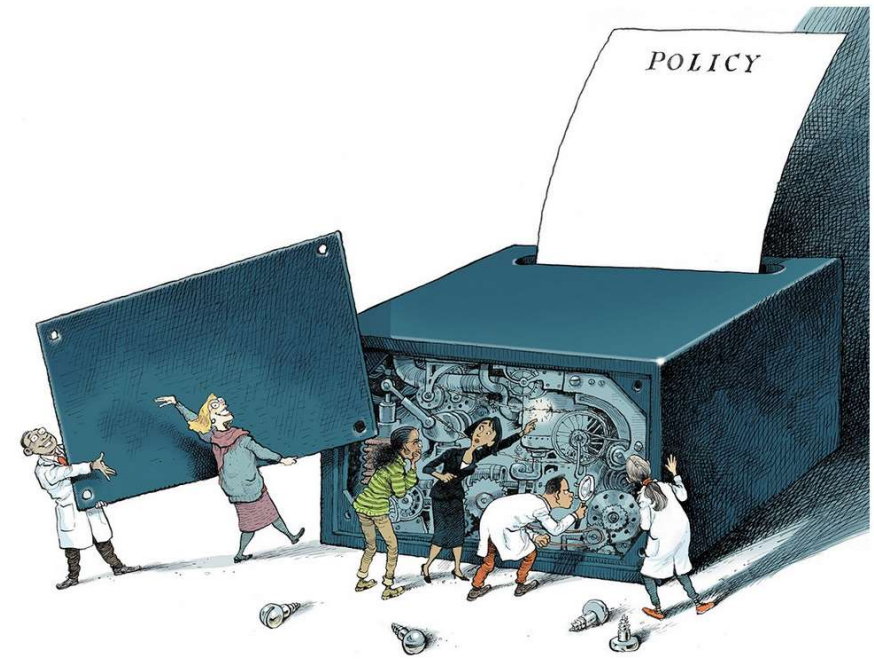
Match purpose and context

# Mind the consequences

Quantification can backfire.

# Mind the unknowns

Acknowledge ignorance





# Mind the assumptions

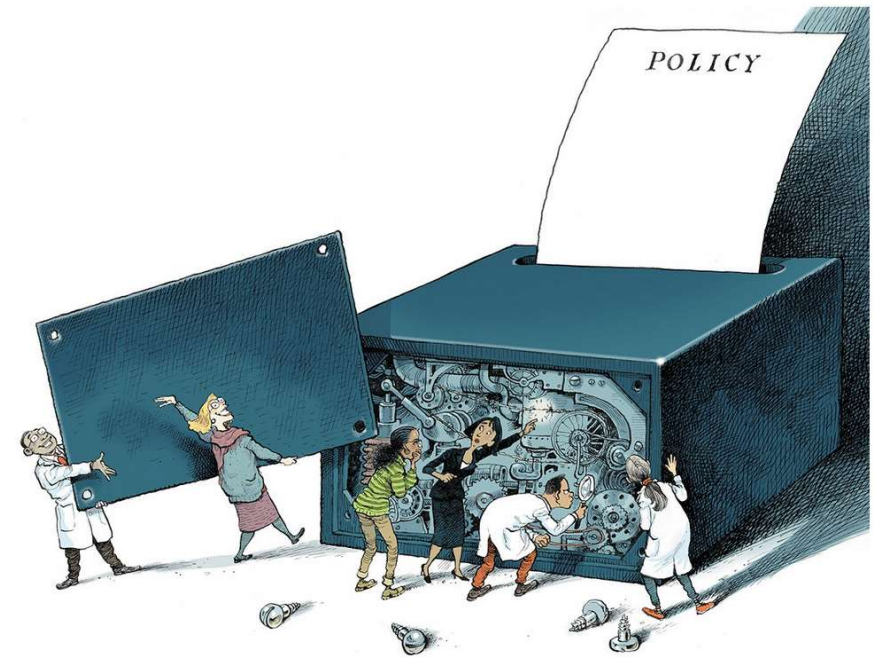
Assess uncertainty and sensitivity



... 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

...

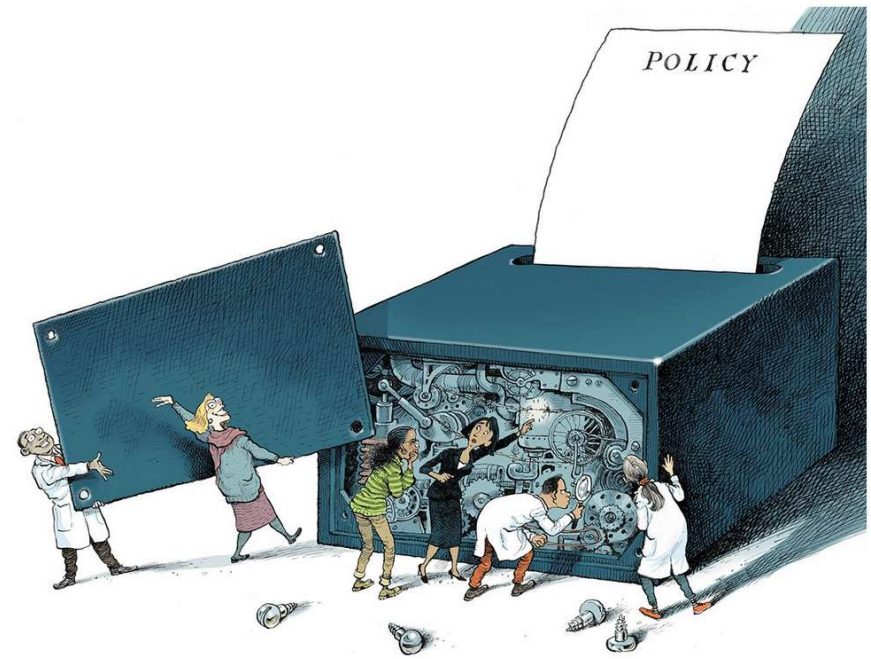


# Mind the assumptions

Assess uncertainty and sensitivity



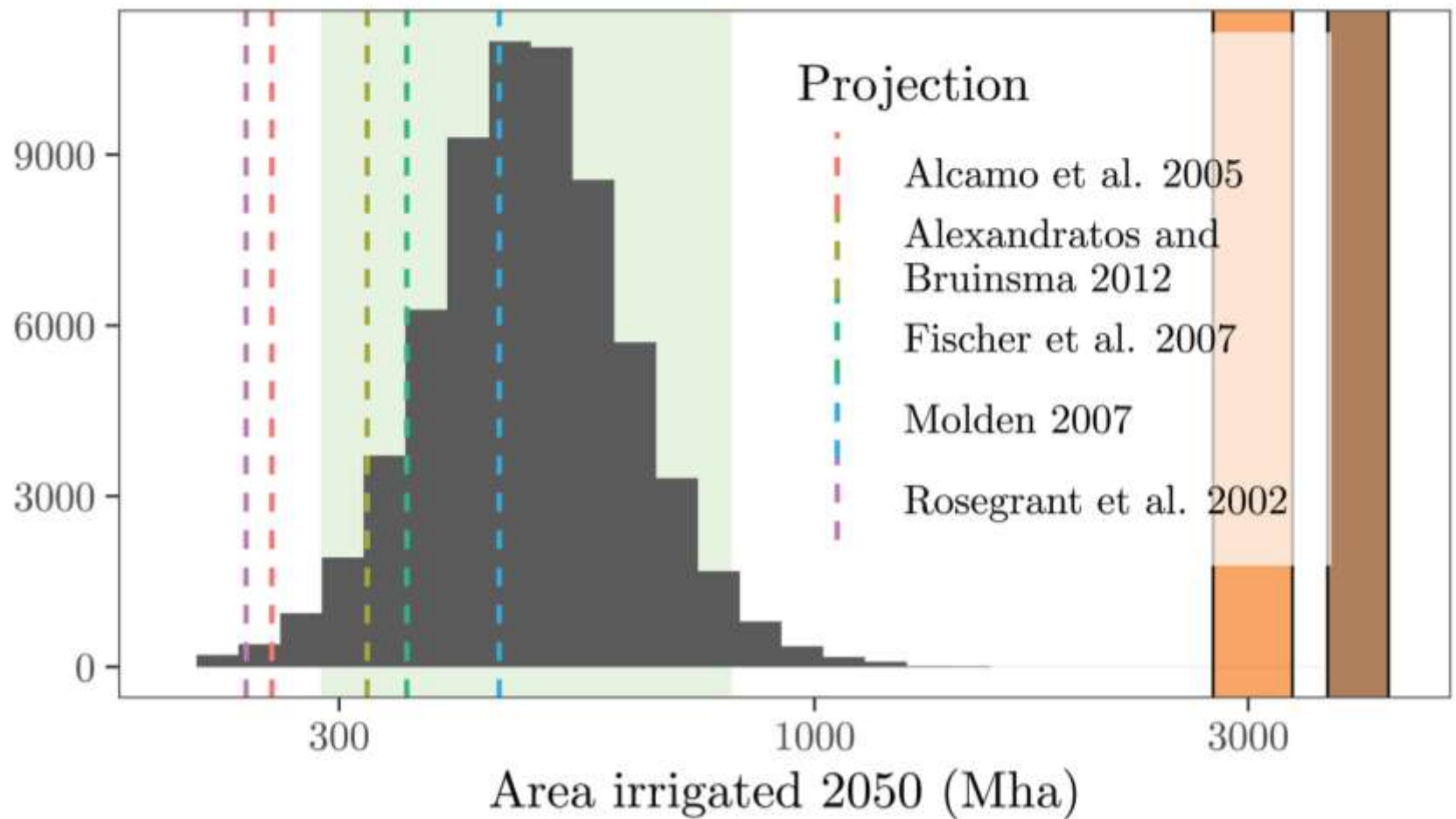
... this may lead to interesting discoveries ...



# 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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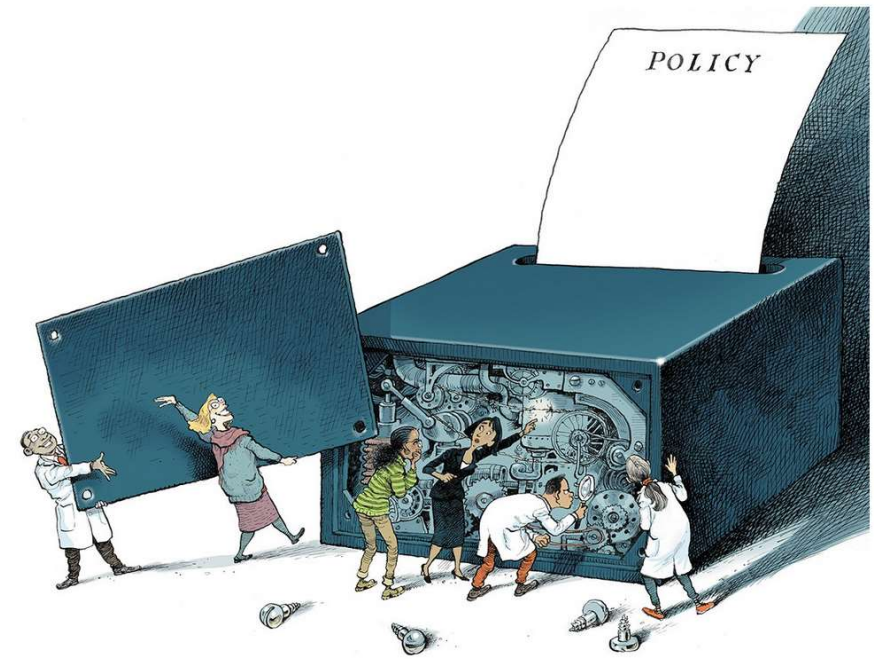
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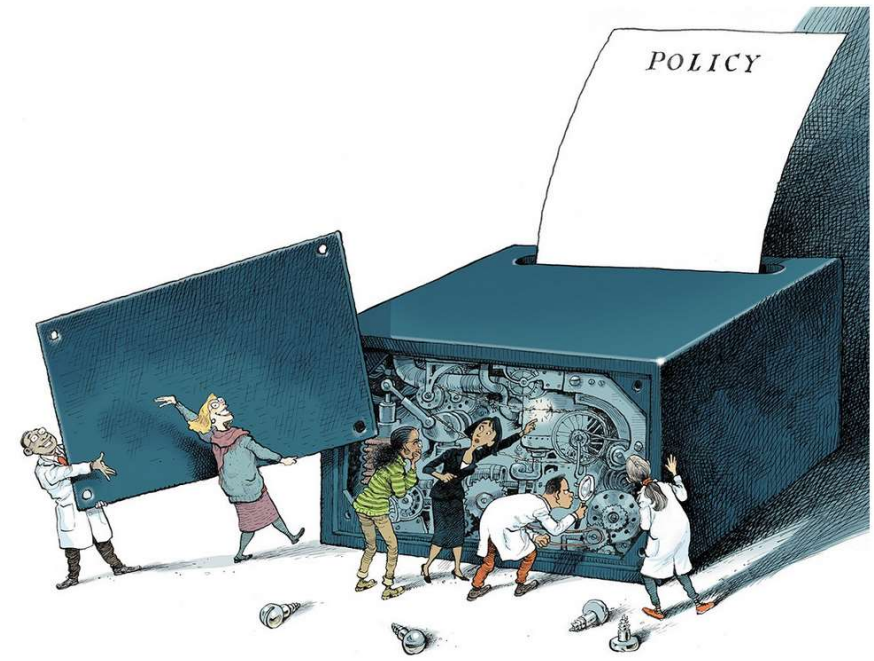
# Mind the unknowns

Acknowledge ignorance



# Mind the hubris

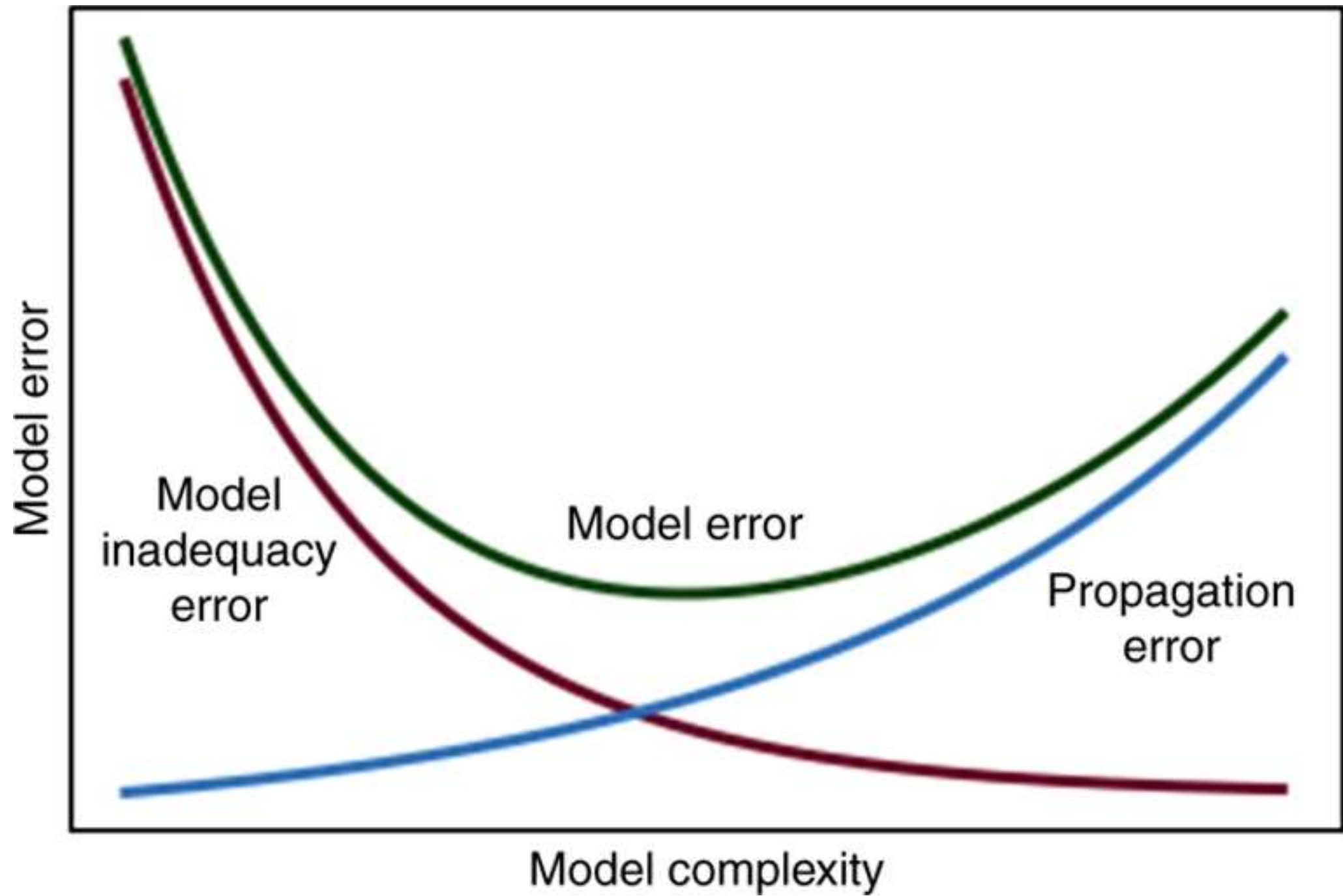
Complexity can be the enemy of relevance



... 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



 | RESEARCH ARTICLE | MATHEMATICS

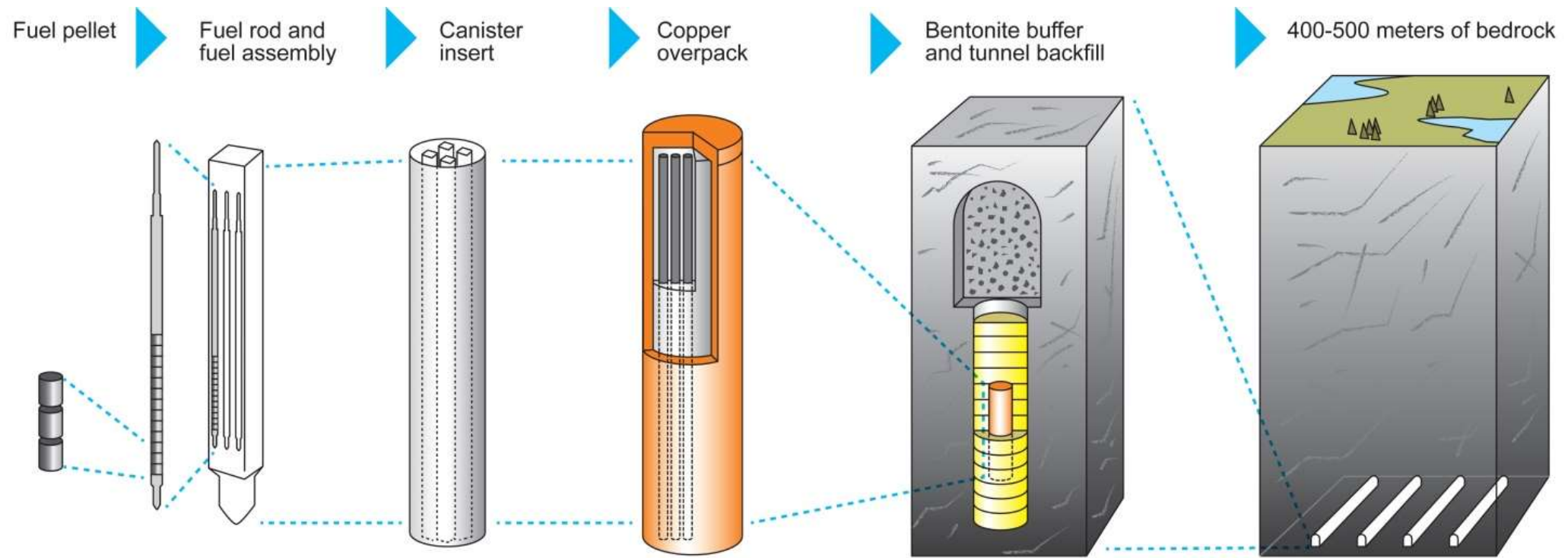


## Models with higher effective dimensions tend to produce more uncertain estimates

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

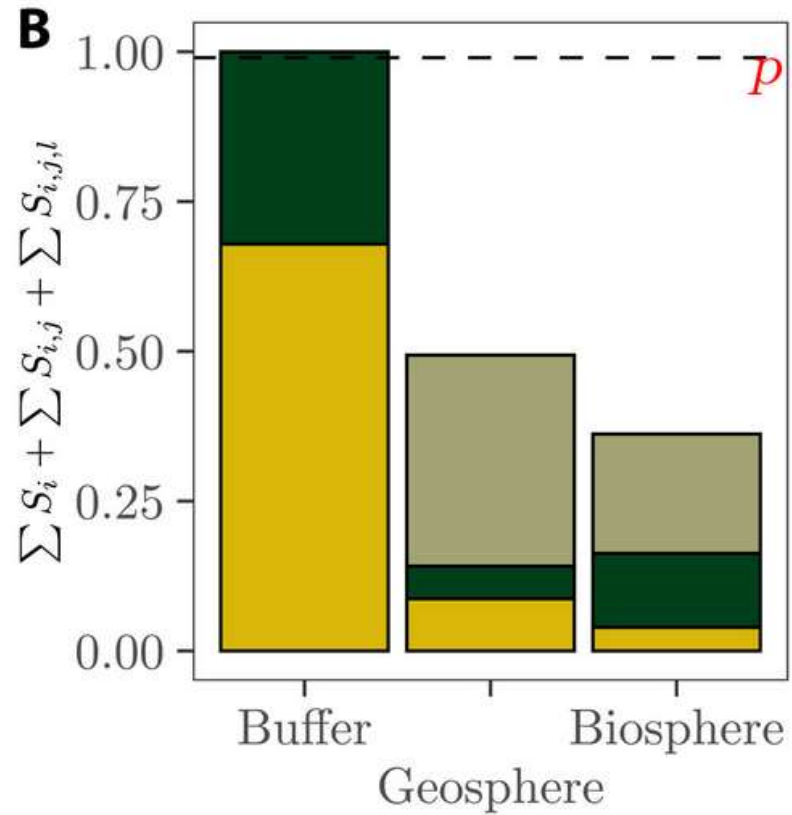
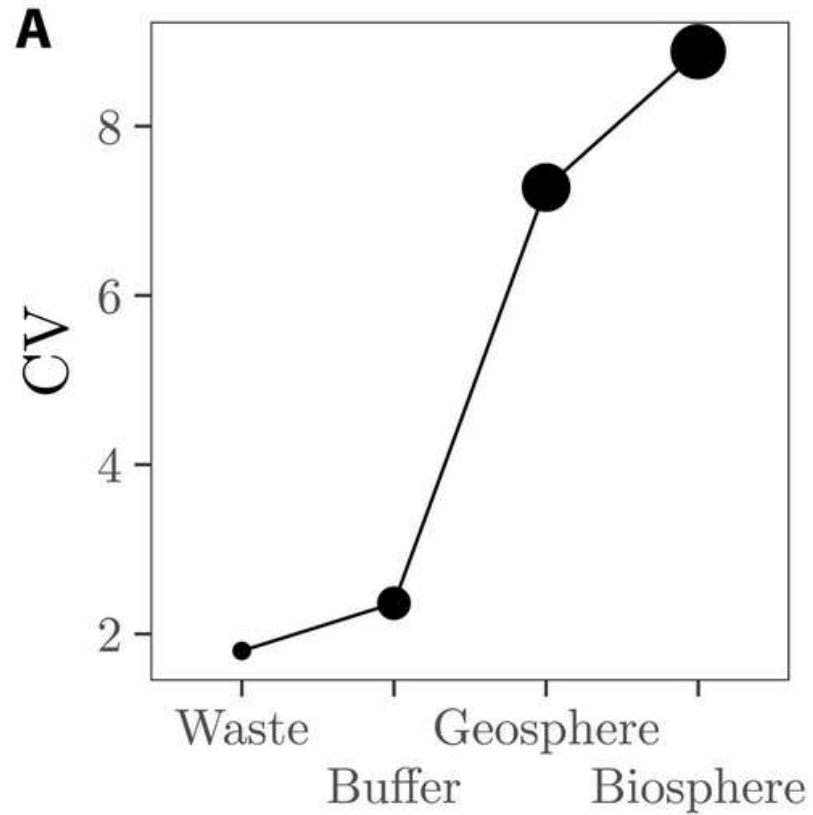
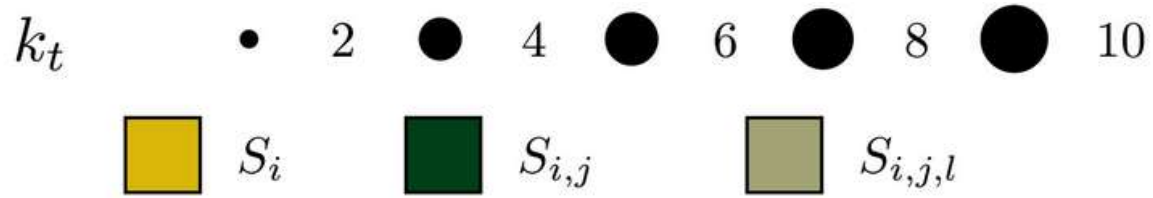
[Affiliations](#)





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

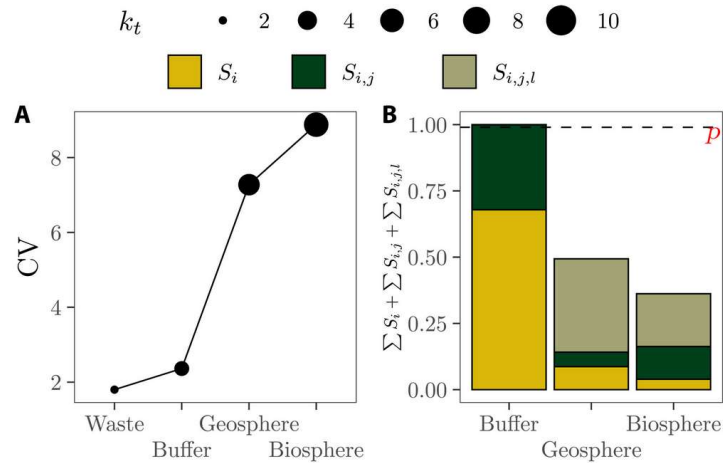
Source: World Nuclear Organization, <https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste.aspx>



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

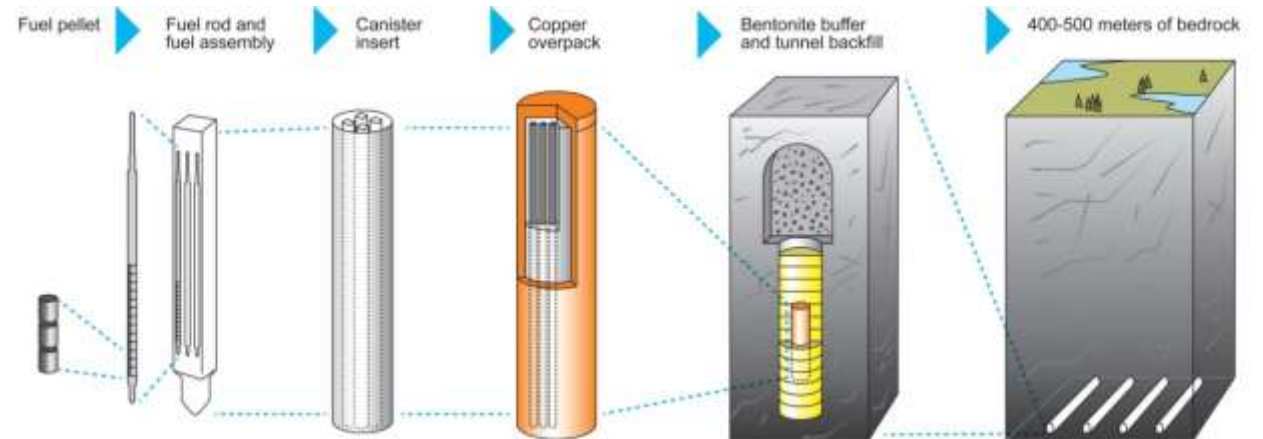
A more realistic and defensible safety standard could be set as a maximum level of radioactivity leaving the buffer



## 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 SALTELLI

Affiliations



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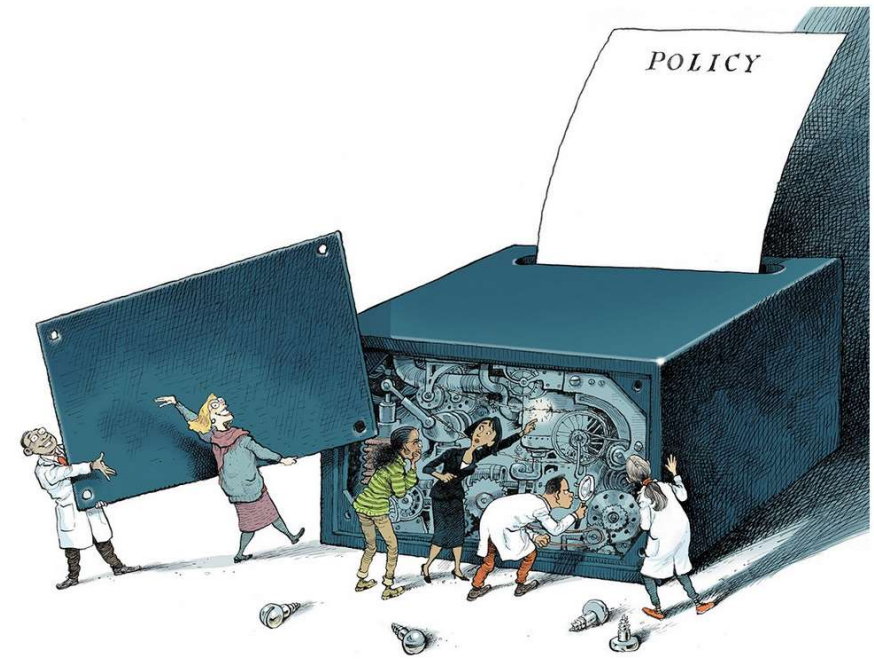
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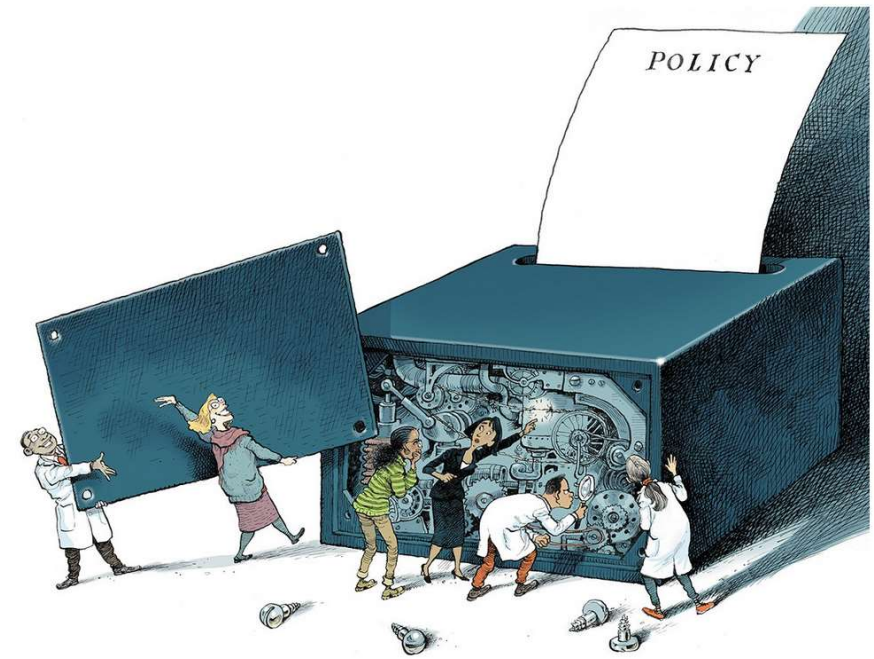
Acknowledge ignorance





# Mind the framing

Match purpose and context



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

## SUPPLEMENTARY INFORMATION

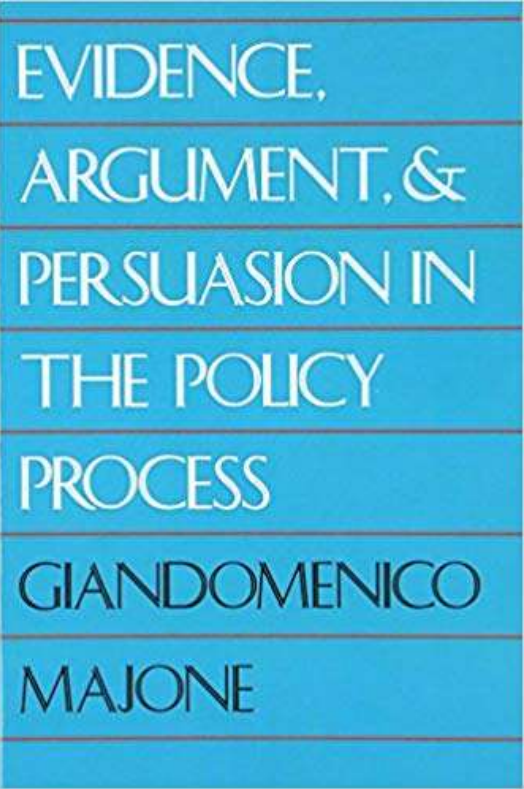
1. Additional information and references

>260 references

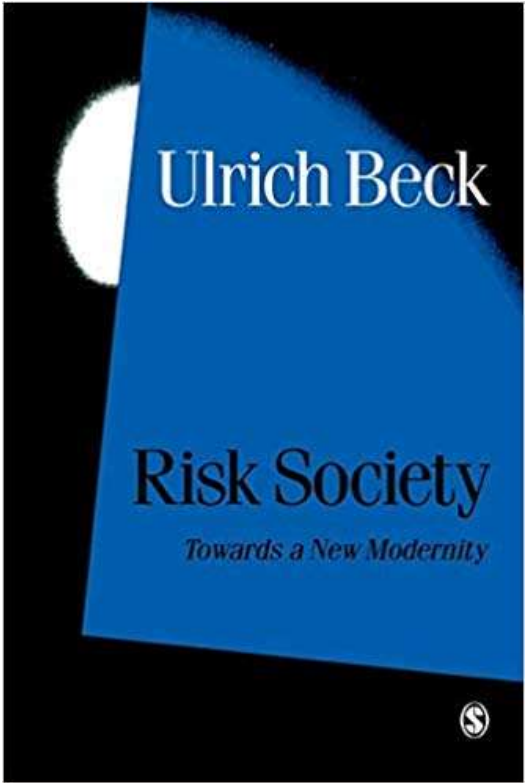
# From Ulrich Beck to Giandomenico Majone: the technique is never neutral



Ulrich Beck  
(1944 –2015)



1989



1992 (1986)



Environmental Science & Policy

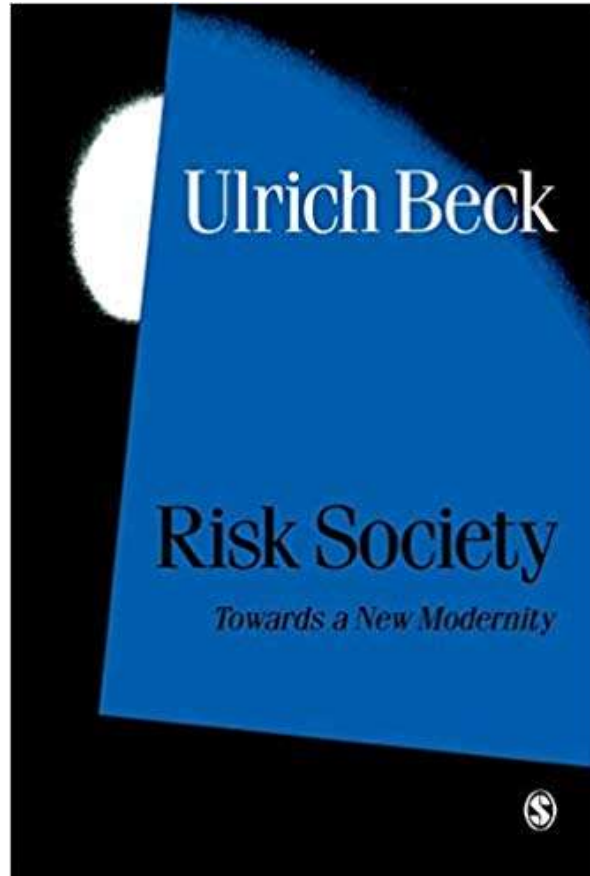
Volume 106, April 2020, Pages 87-98



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

Andrea Saltelli <sup>a, b</sup> ✉, Lorenzo Benini <sup>c</sup>, Silvio Funtowicz <sup>a</sup>, Mario Giampietro <sup>d, e</sup>, Matthias Kaiser <sup>a</sup>, Erik Reinert <sup>a, f</sup>, Jeroen P. van der Sluijs <sup>a, g, h</sup>

“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)



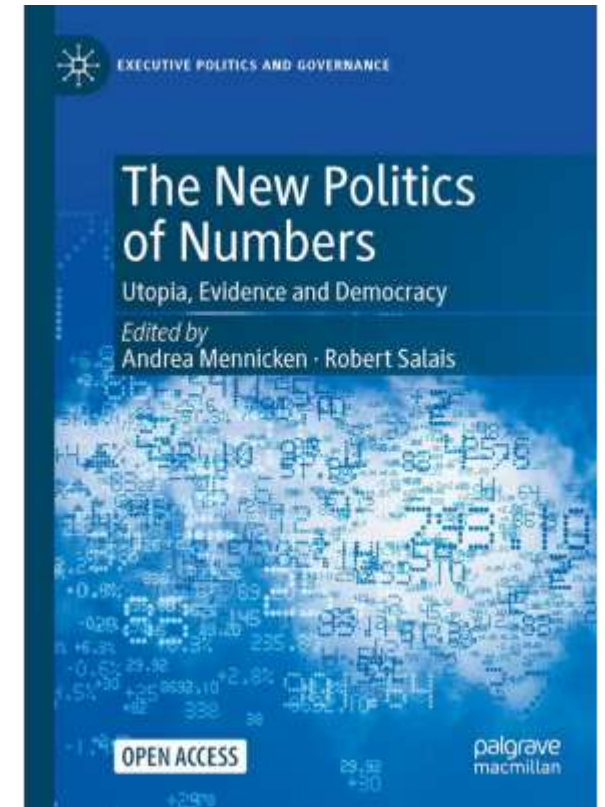
Ulrich Beck  
(1944 –2015)

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



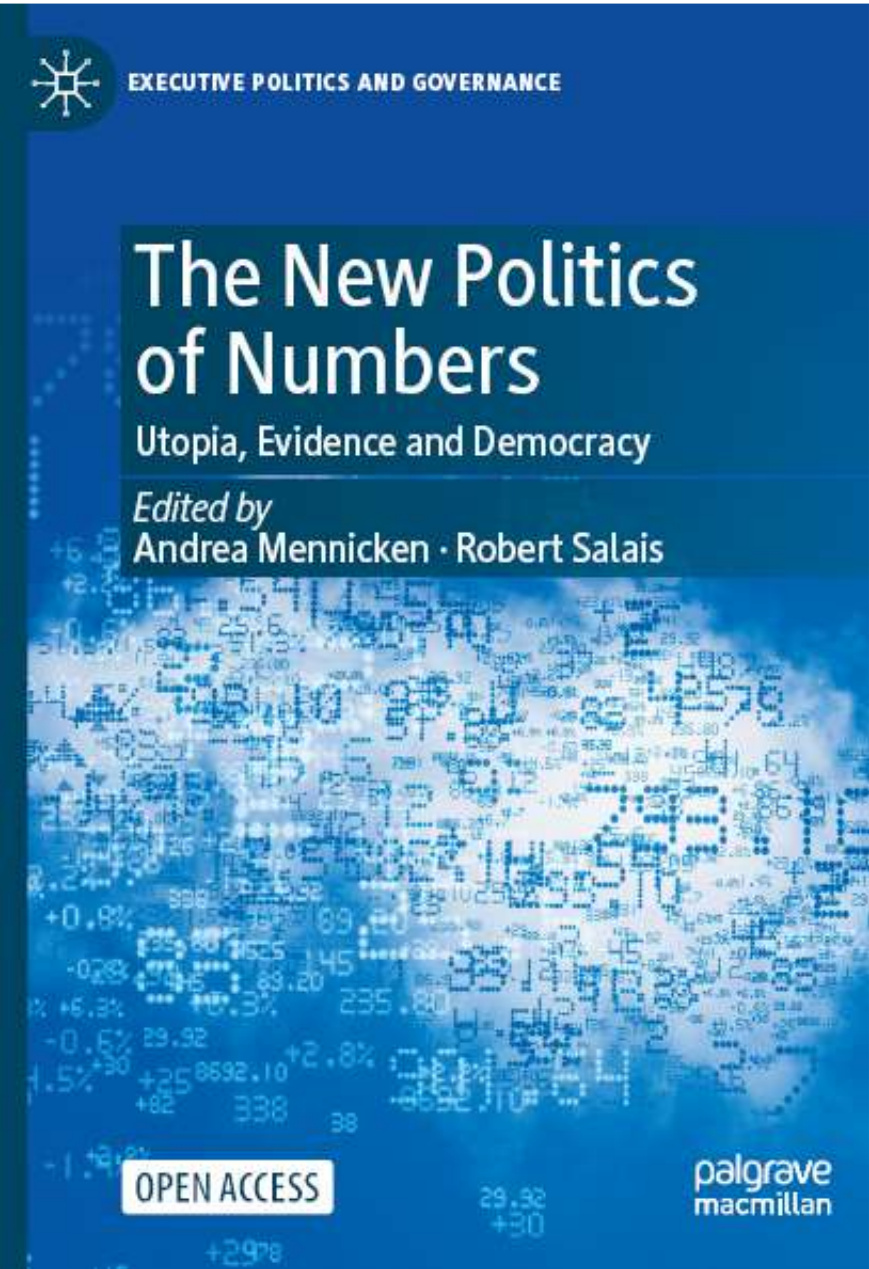
Salais, R. (2022). “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice. In *The New Politics of Numbers: Utopia, Evidence and Democracy*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 379–415.

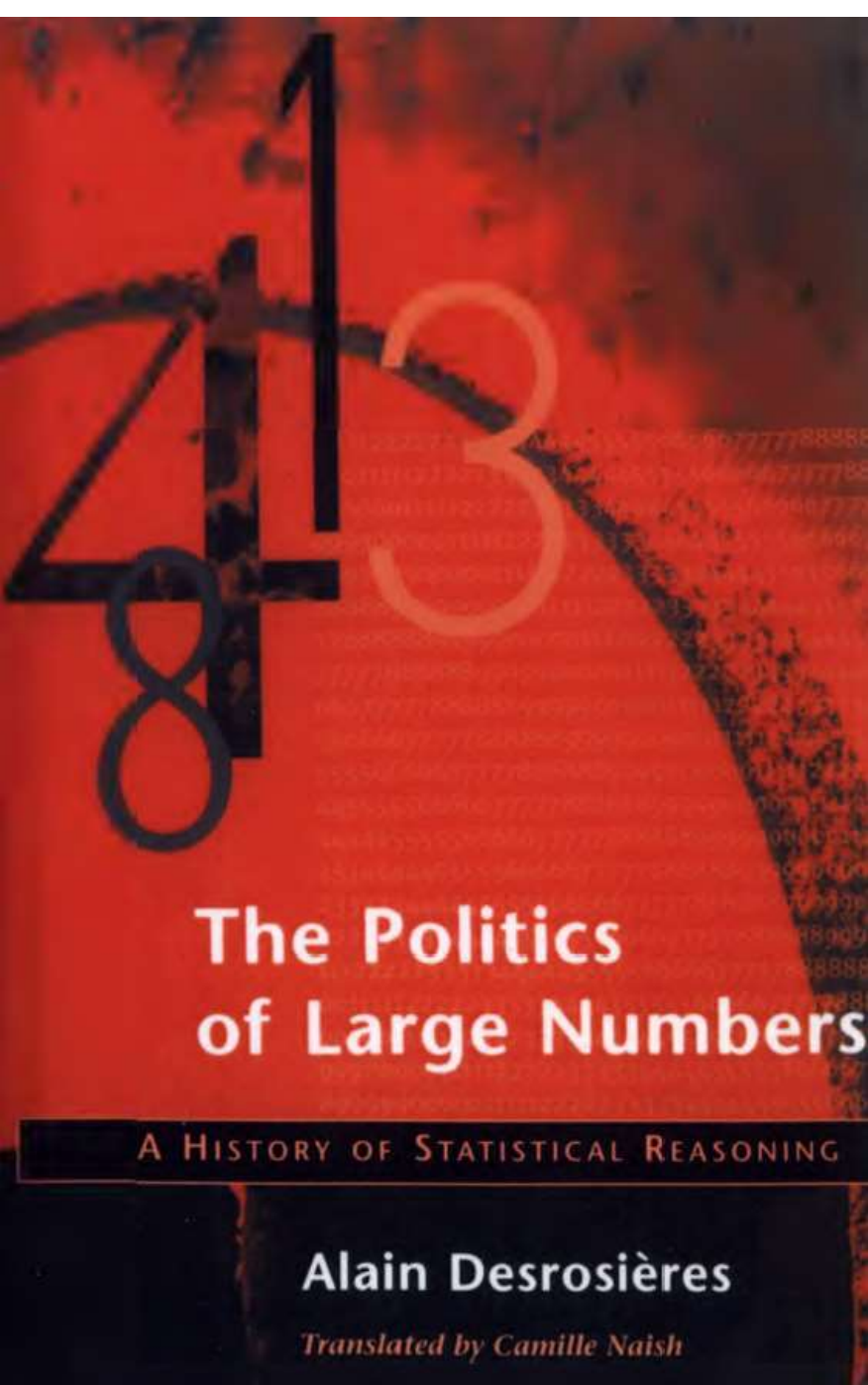




<p><b>Evidence based policy</b></p>	<p><b>Statistics (creating things that hold together for the solution of practical problems)</b></p>
<p><b>Policy based evidence</b></p>	<p>Governance driven quantification (a reversal of the statistical pyramid)</p>

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





Alain Desrosières: “Making things that hold”

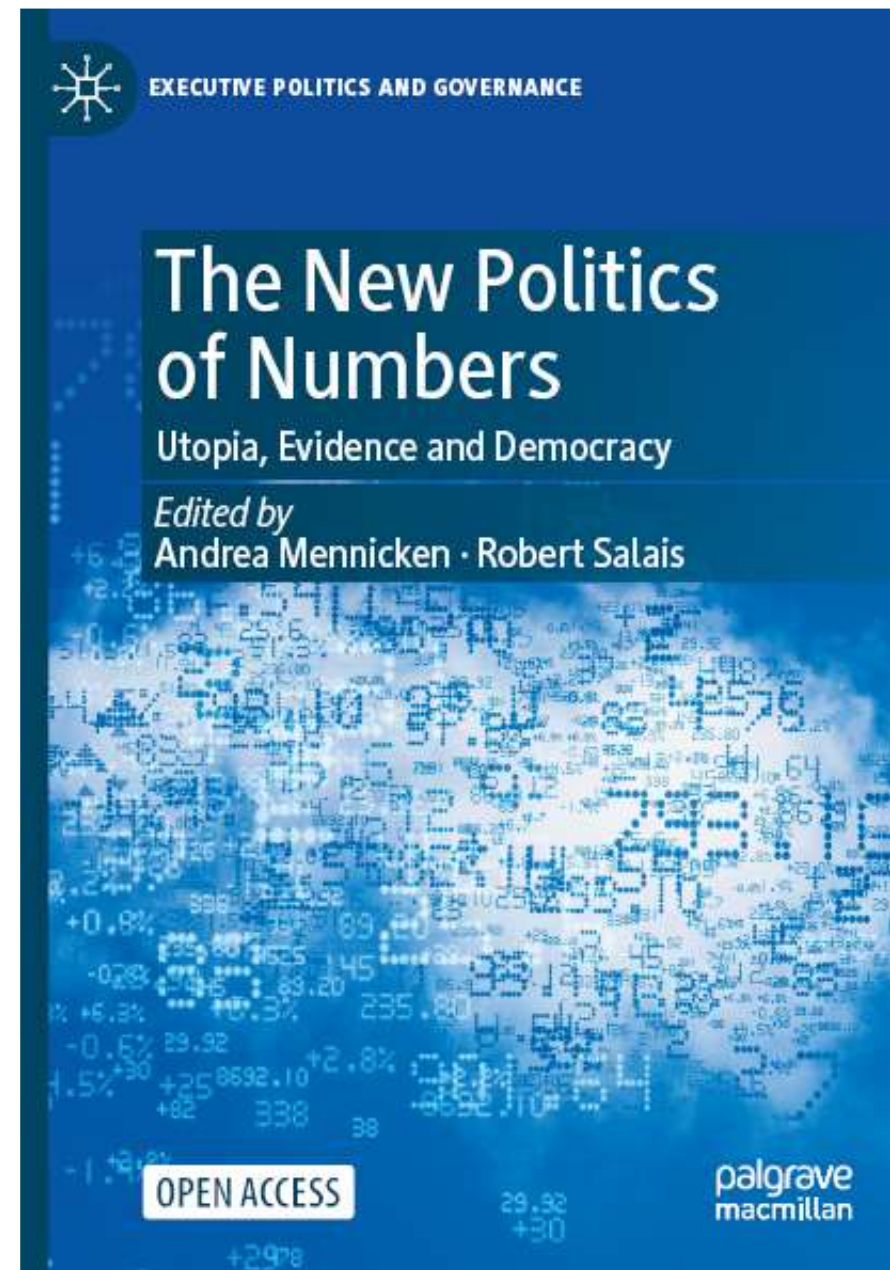
The construction of statistical concepts and categories that can serve for action

**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)

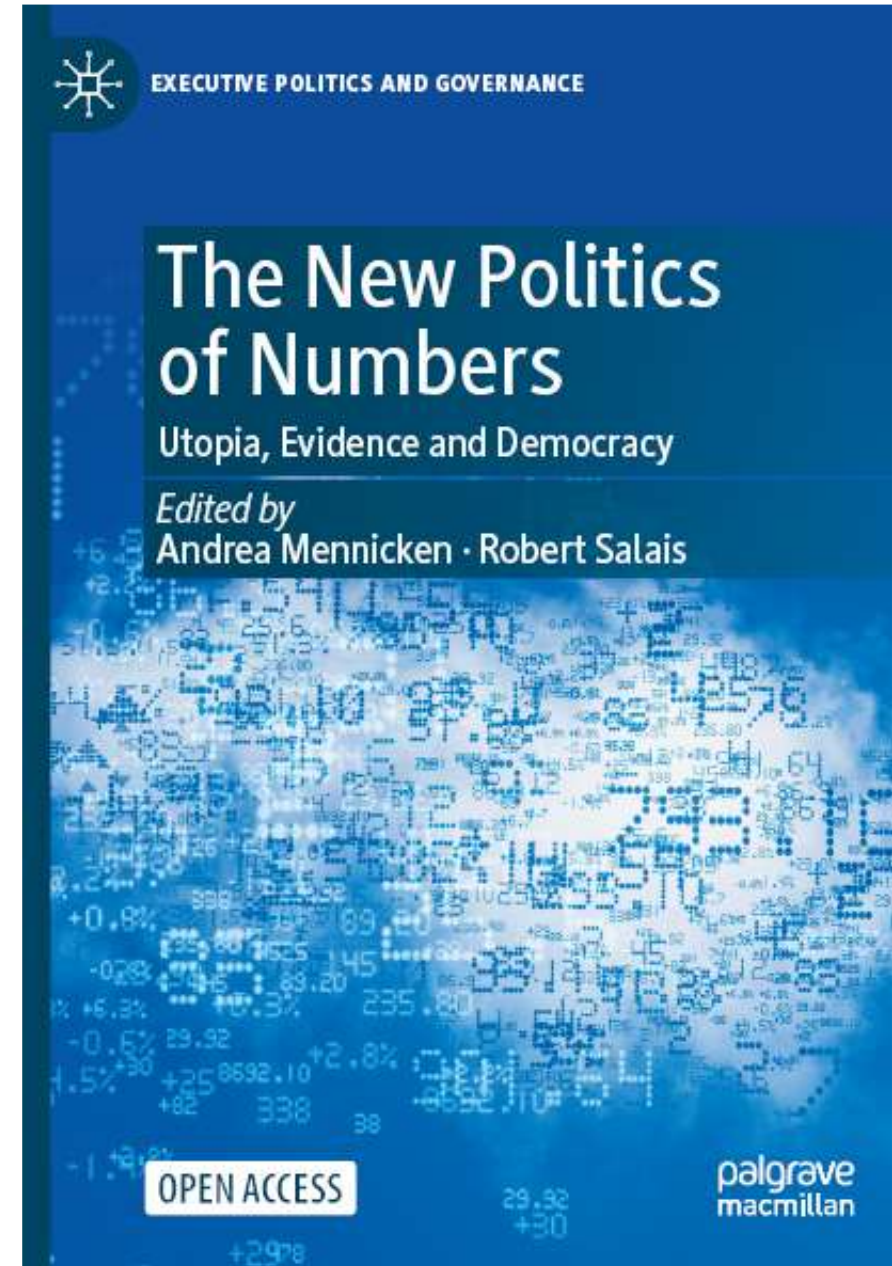
CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*





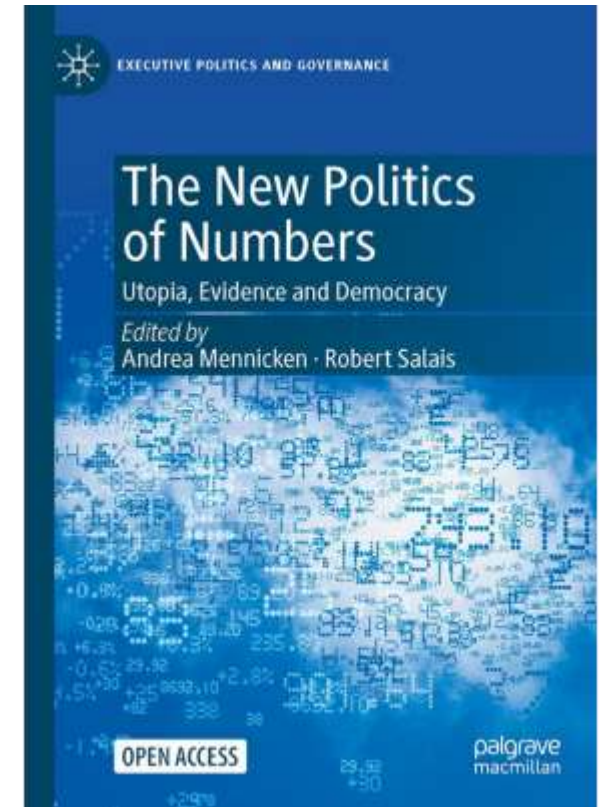
Contesting unjust/unfair governance arrangement is impossible without producing alternative constructions of evidence – that requires muscles not easily available to the lay citizen

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

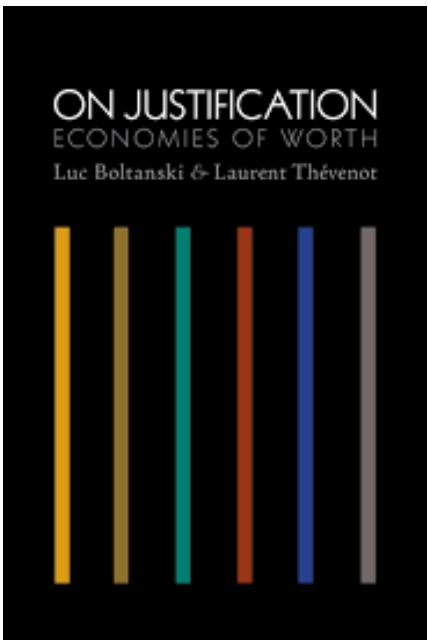
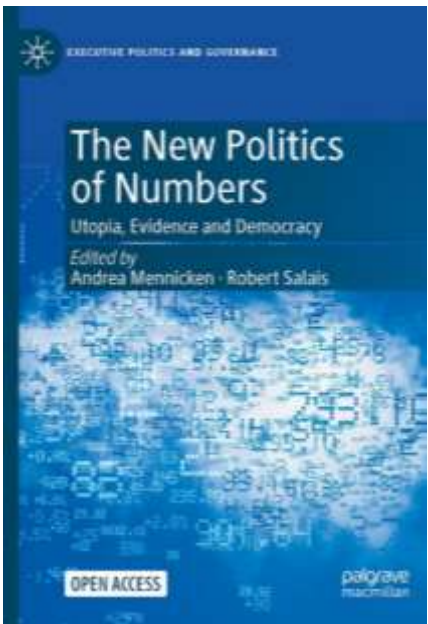




Normative quality ... yes but which norms?



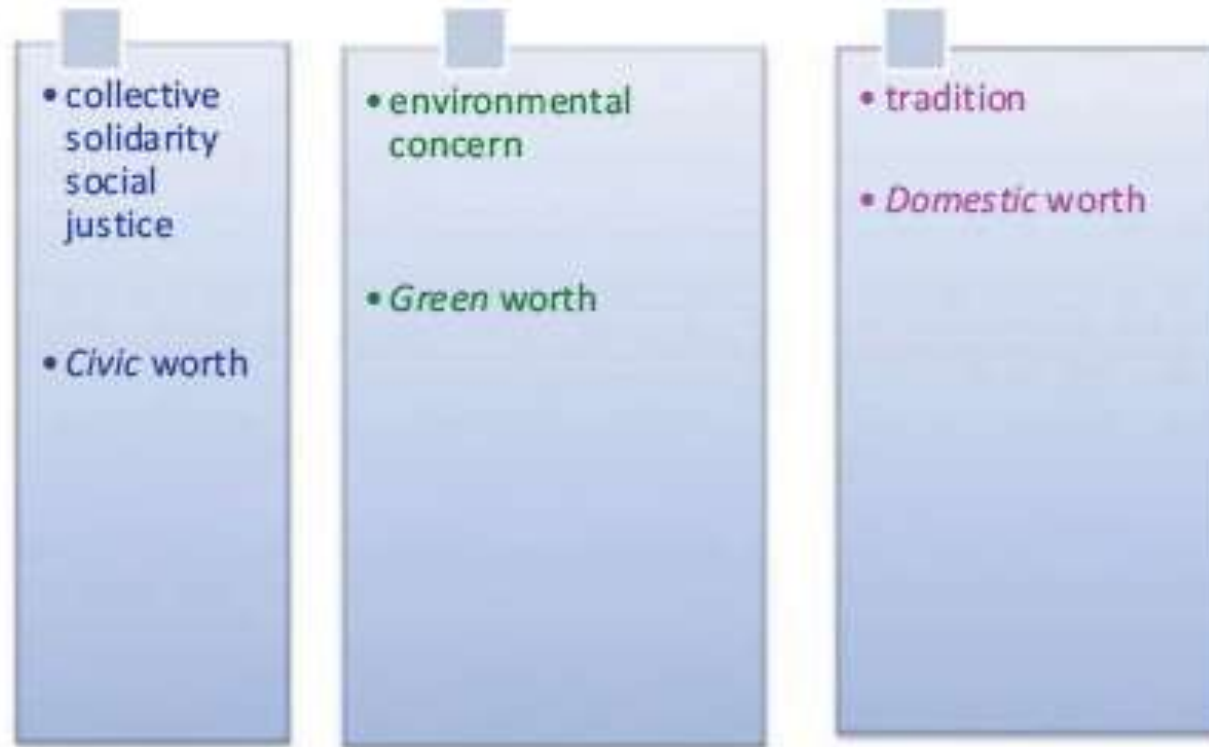
Thévenot, L. (2022). A New Calculable Global World in the Making: Governing Through Transnational Certification Standards. In *The new politics of numbers*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 197–252.



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

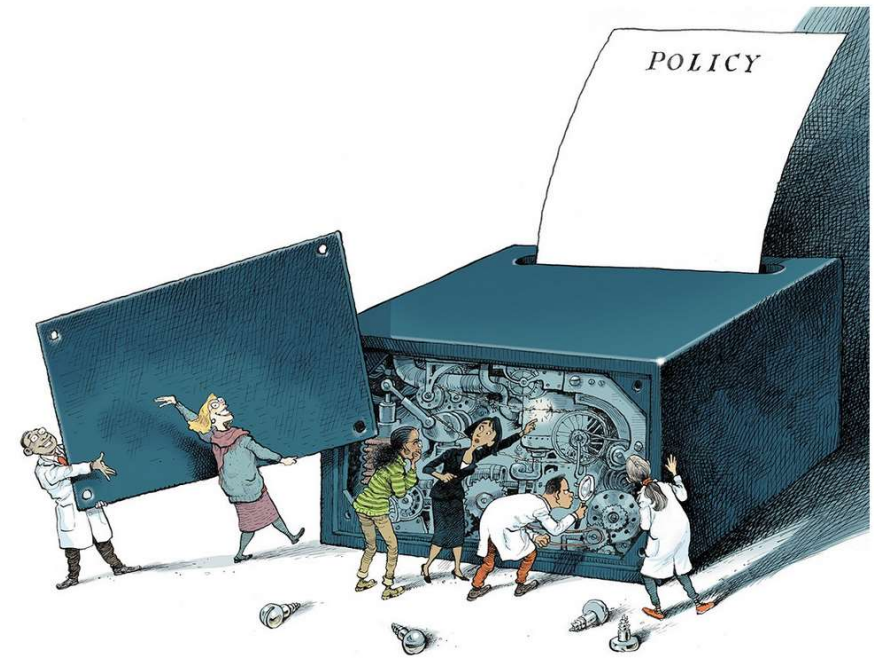


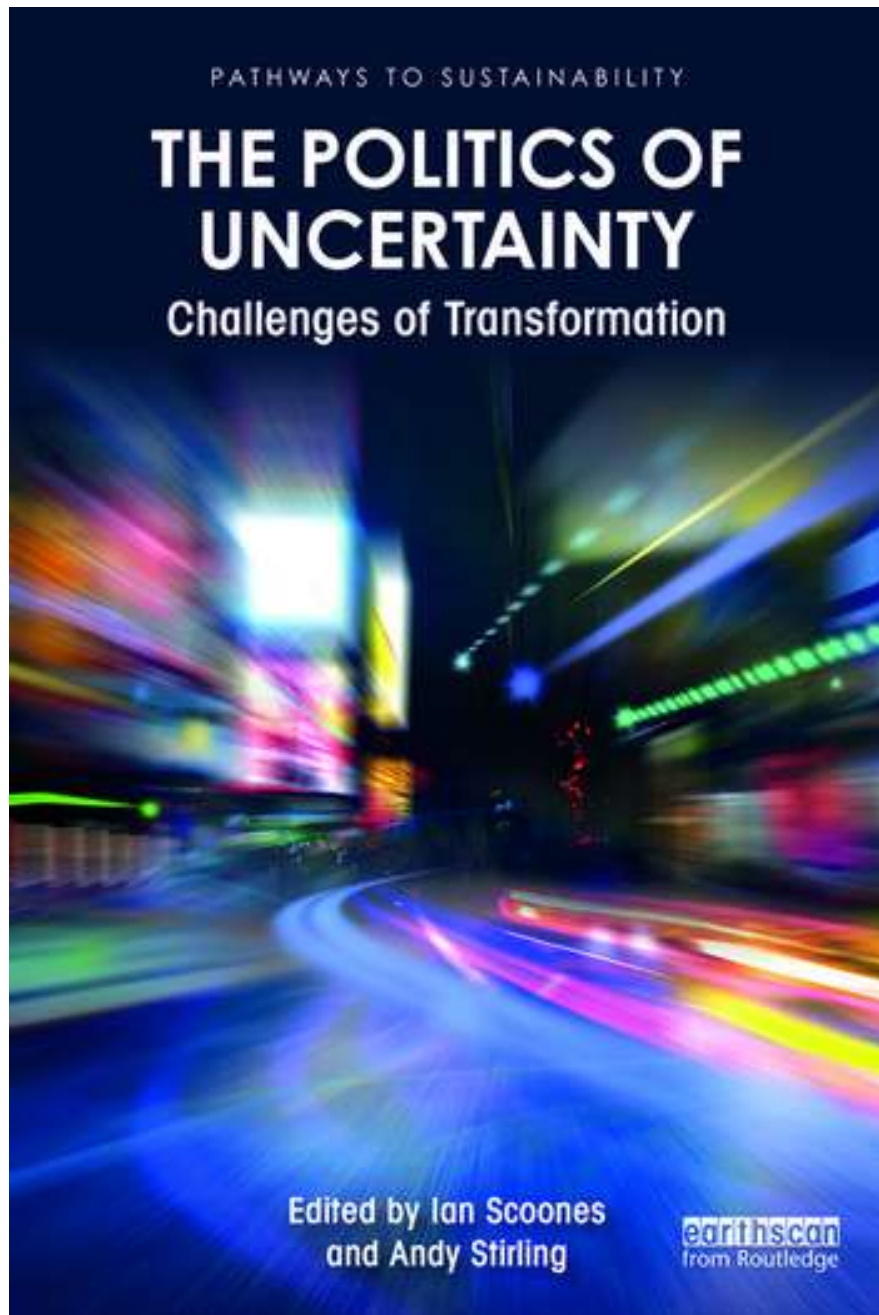
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Quantification can backfire.

# 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 <sup>a, b, c, d, e</sup>, Mario Giampietro <sup>a, c, d</sup>

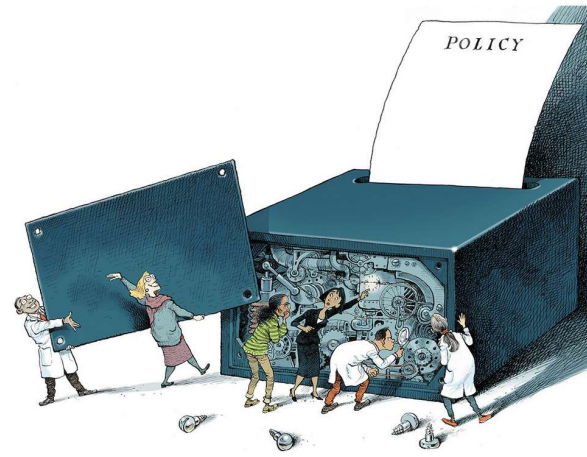
nature

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nature ▸ comment ▸ article

COMMENT | 24 June 2020

## Five ways to ensure that models serve society: a manifesto



2020



2023



➔ 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](#)

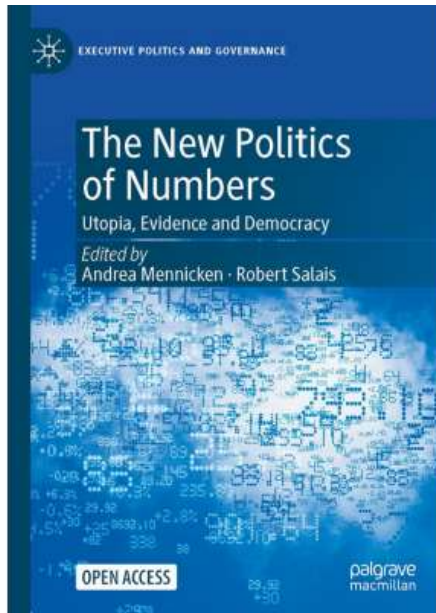
Technical Quality

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<sup>†</sup> and Eric Loken<sup>‡</sup>

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<sup>†</sup> and Eric Loken<sup>‡</sup>

14 Nov 2013

Why this matters?



**PNAS**

RESEARCH ARTICLE

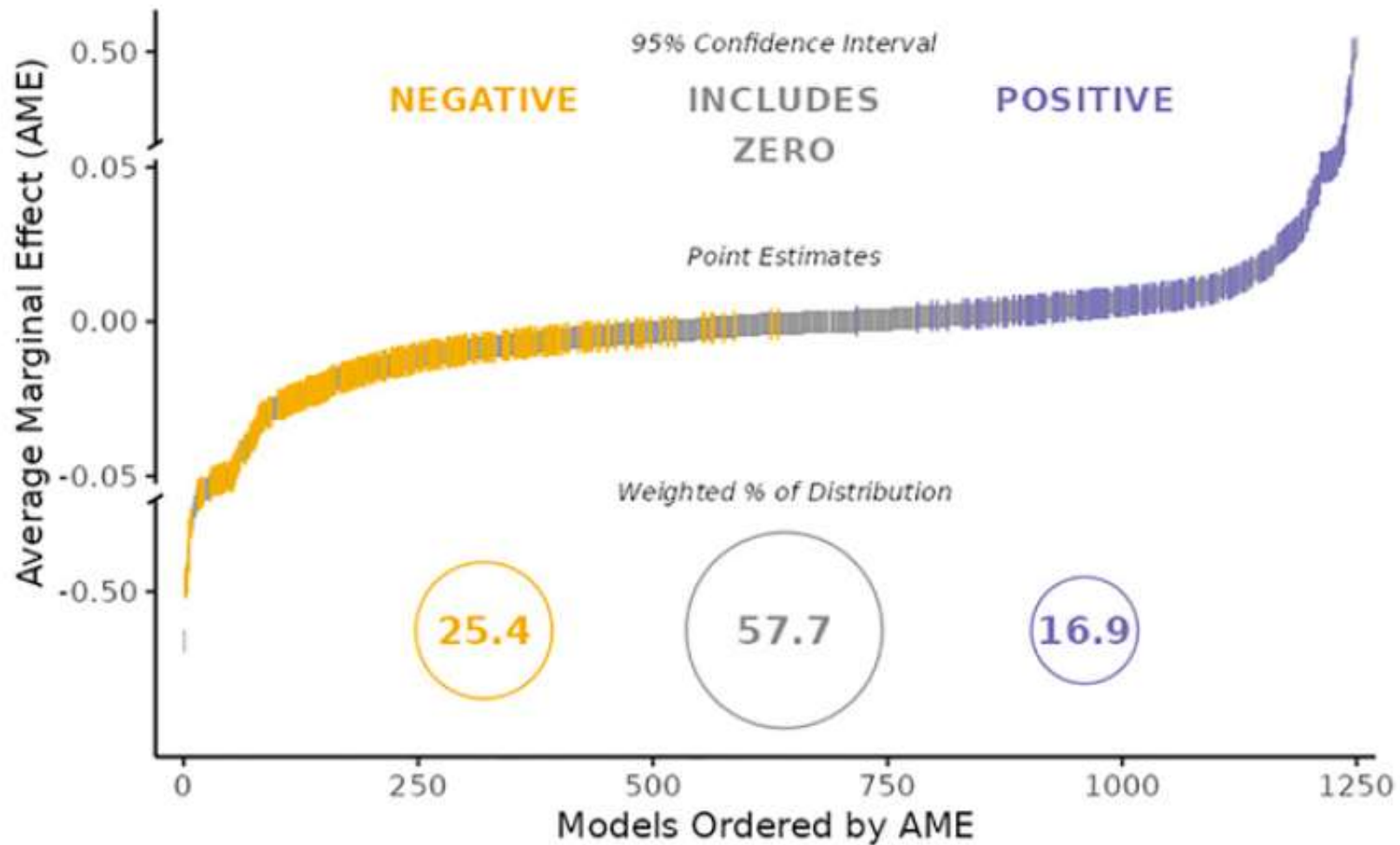
SOCIAL SCIENCES

 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)



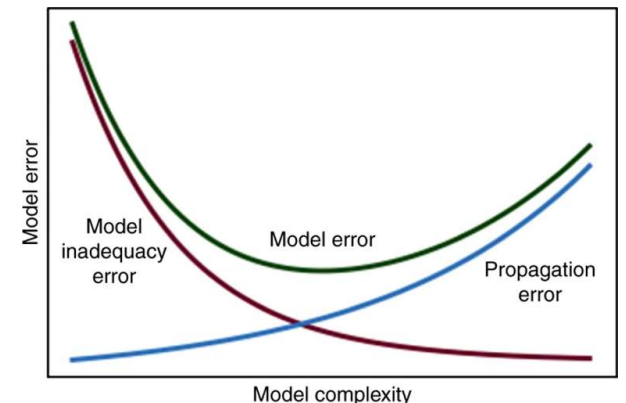
Sensitivity analysis and auditing can assist sociology of quantification in activities of de- and re-construction (e.g. for statactivists)



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

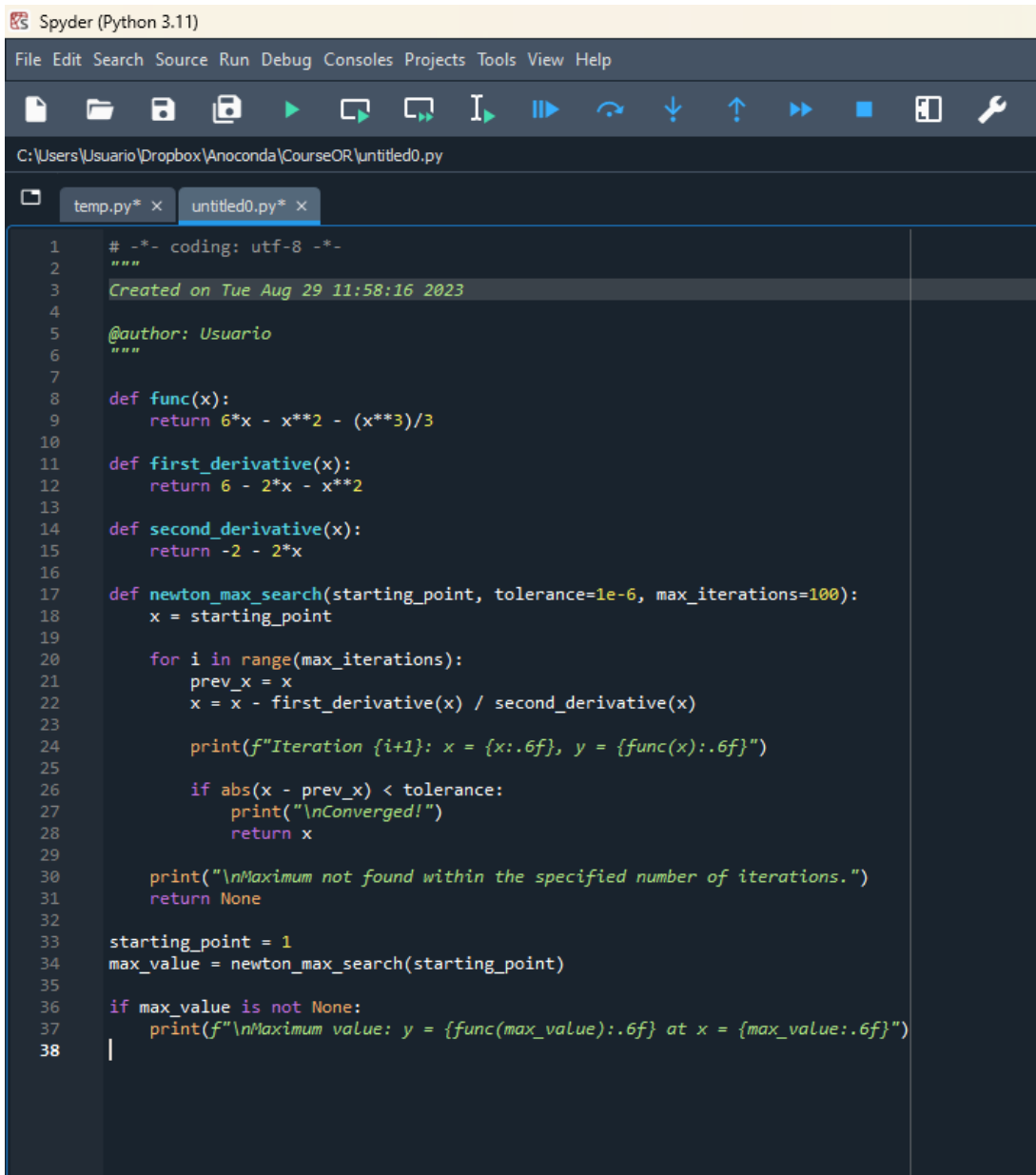
<https://arpi.unipi.it/cris/rp/rp162690>

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





# I use it myself!



```
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 Large Language Models such as ChatGPT or GPT4 artificial intelligence is part of the problem

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 text "cs > arXiv:2303.08774". On the right side of the red bar, there is a search box and links for "Help" and "Ad". Below the red bar is a grey navigation 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**

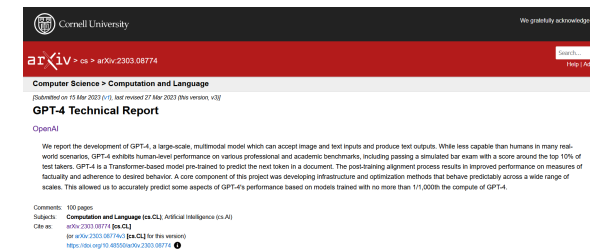
# Still the same developers admit: it may hallucinate

## 2.2 Hallucinations

GPT-4 has the tendency to “hallucinate,”<sup>9</sup> 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]

<sup>9</sup>We 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



Futures

Volume 135, January 2022, 102860



## Science, the endless frontier of regulatory capture

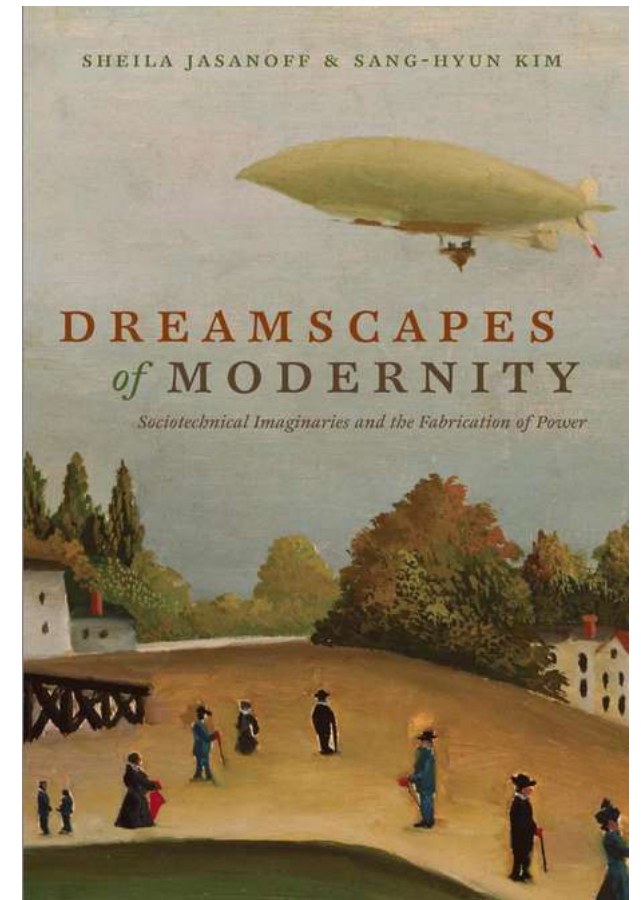
[Andrea Saltelli](#)<sup>a</sup>  , [Dorothy J. Dankel](#)<sup>b c</sup>, [Monica Di Fiore](#)<sup>d</sup>, [Nina Holland](#)<sup>e</sup>, [Martin Pigeon](#)<sup>e</sup>

[Show more](#) 



Sheila Jasanoff

A domination of the sociotechnical imaginary



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)

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- Technological determinism (there is no going back)
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- Legal exceptionalism (New rules are needed for a new technology)



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- Anthropomorphising machines, dehumanizing people (the Human Brain Project)
- 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

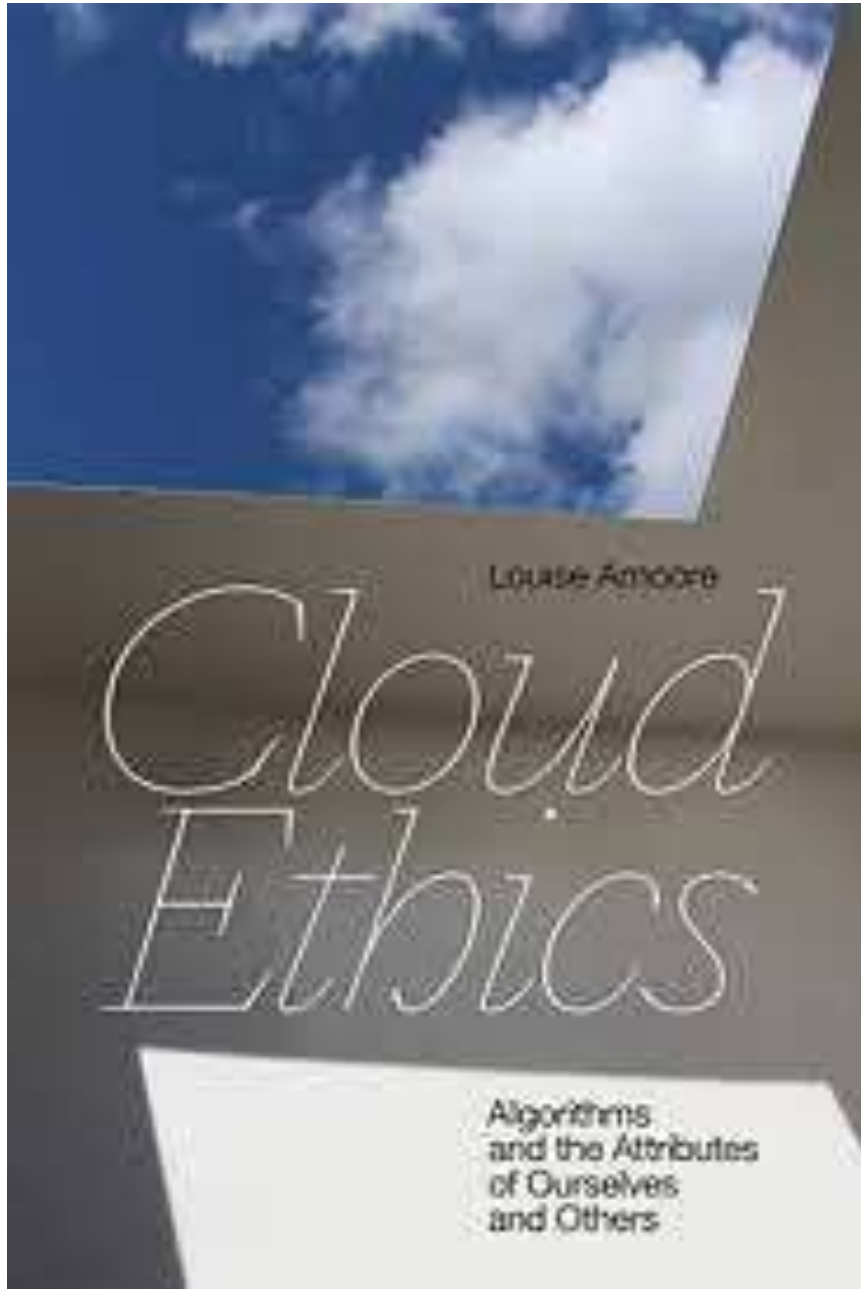
Add your  
signature

Published  
March 22, 2023

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- Legal exceptionalism (New rules are needed for a new technology)
- Crying ‘wolf’ about future challenges to distract from present ones
- Distracting regulators with ‘ethics of algorithms’





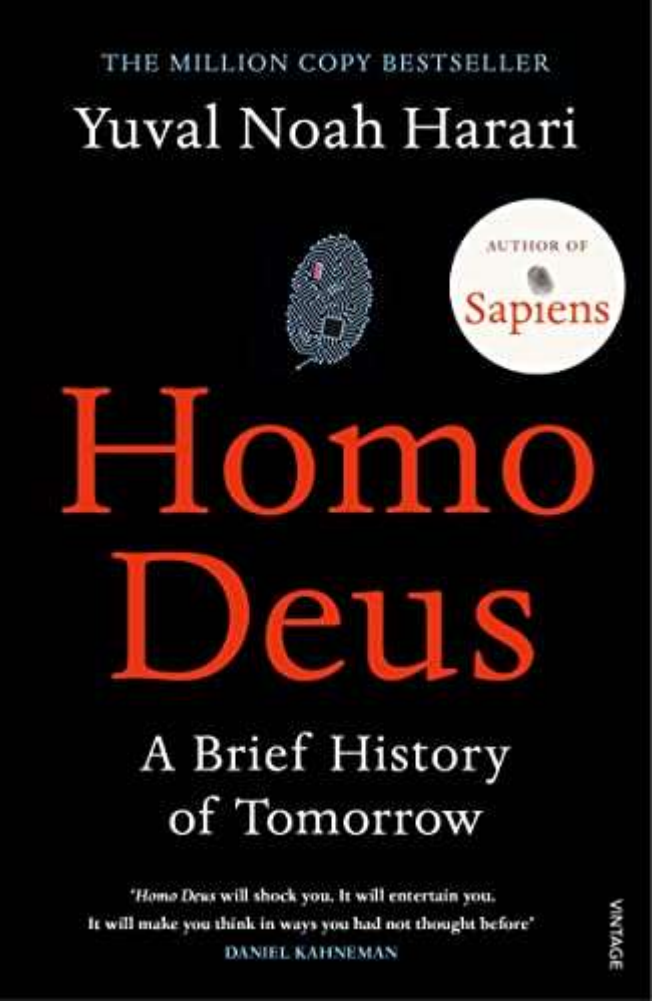
Making algorithms  
'good' or 'transparent'  
is beyond the point.  
Algorithms create new  
norms of good or bad.

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



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

PHOTO CREDIT: Thomas Hawk, RIA Novosti, Cointelegraph



# Some Slides from Sasha Luccioni

You can find me at:

[sasha.luccioni@hf.co](mailto: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

Raising the barrier to entry in AI

Harmful and violent content

Tonnes of carbon emissions

Private information

Huge quantities of energy/water

Copyright infringement

Rare metals for manufacturing hardware



## 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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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](#)



## (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)?

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>

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## Ethics of quantification

Andrea  
Saltelli



# The End



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