Quantitative storytelling and sociology of quantification

Andrea Saltelli

Presentation at EUROFOUND Dublin,
September 22, 2025

Andrea Saltelli

HOME ABOUT ME PUBLICATIONS NEWS & VIDEOS RESOURCES

Latest papers

Models and the common good

A short analysis of norms and counter-norms in modelling, discussing how models may misuse their epistemic authority for reasons of occasion, opportunity and interest.

Outline:
Narratives and counter-narratives,
State of exception,
Seeking Cinderella,
Reformation

Ranking the Rankers

Ranking the Rankers? We investigate using global sensitivity analysis the properties of the science-wide author databases' standardised citation indicators produced since 2015 by a team of researchers led by John P. A. Ioannidis.

Digital twins

We reflect on the development of digital twins of

Where to find this talk:

www.andreasaltelli.eu

Eurofound

Living and working in Europe – Celebrating the past, shaping the future

European Foundation for the Improvement of Living and Working Conditions (Eurofound) … to provide knowledge to assist in the development of better social, employment and work-related policies

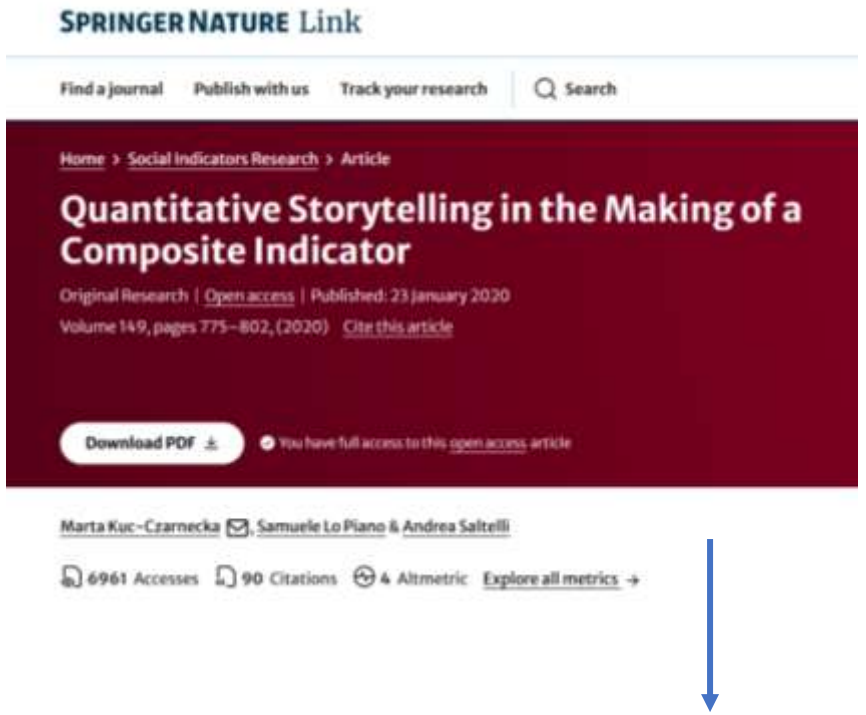
Hans Mattis-Teutsch, 'Coalface (Abataj)', 1950s, oil on canvas, courtesy of Muzeul de Artă Brașov, https://blokmagazine.com/when-the-images-looked-at-the-workers/

DIEGO RIVERADETROIT INDUSTRY, SOUTH WALL, PHARMACEUTICS, 1932-1933, Shop diashop.org, https://customprints.dia.org/detail/492146/rivera-detroit-industry-south-wall-pharmaceutics-1932-1933?

- What is quantitative storytelling?
- Sociology of quantification
- Statactivism
- Numbers and trust
- Multiverse and social policies

What is quantitative storytelling?

- Testing stories
- Checking for better stories



- Measures used in convergence analysis in the field of cohesion policies
- World Bank's Doing Business Index

Measures used in convergence analysis in the field of cohesion policies

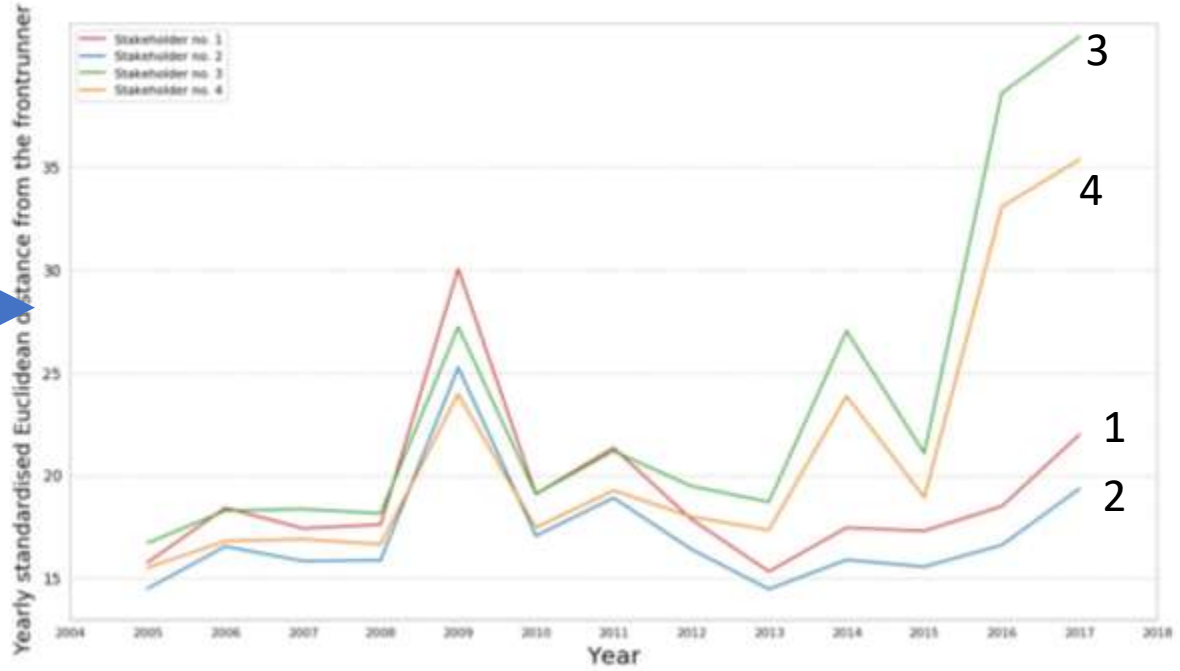
Stakeholder 1 = European Pillar of Social Rights:

1. Opportunities and access to the labour market;
2. Dynamic labour market and fair working conditions;
3. Public support/Social protection and inclusion

Stakeholder 2 = 1-3 above plus measures of governance and fairness

Stakeholder 3 = minus governance plus health care

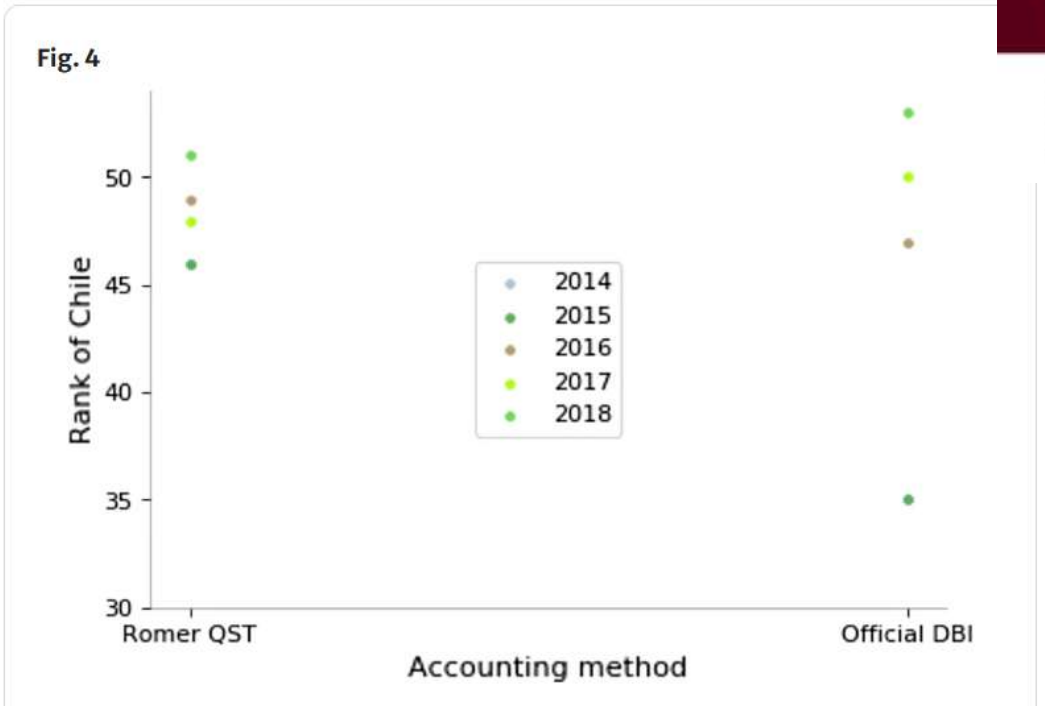
Stakeholder 4 = All of the above



World Bank's Doing Business Index

2021

Paul Romer



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

What is quantitative storytelling?

Highlights

- There is a crisis of science's governance forcing to reconsider evidence based policy as it is being practiced at present.
- The closure of any issue in a pre-established frame used for quantification may correspond to normative and political stances.
- The use of mathematical modelling and indicators conveys a spurious impression of precision, prediction and control.
- Better styles of evidence based policy should flag the existence of 'uncomfortable knowledge' usually avoided in policy discussions.
- We suggest a strategy – Quantitative storytelling – to opening the space of possible narratives and control their quality .

ELSEVIER

Futures

Volume 91, August 2017, Pages 62-71

Original research article

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

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

What is quantitative storytelling?

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

ELSEVIER

Futures

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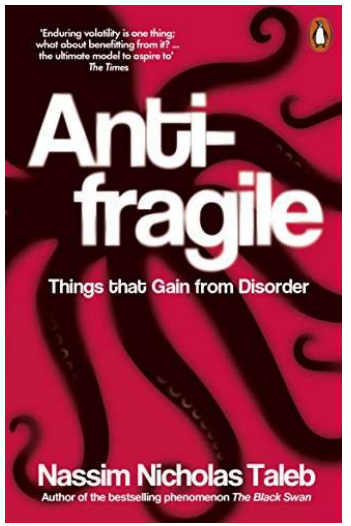
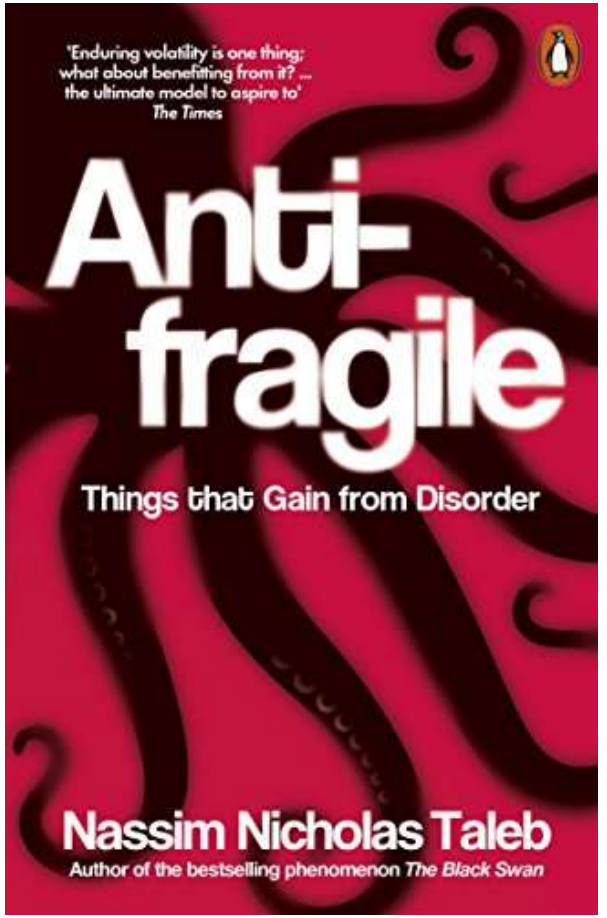
via negativa



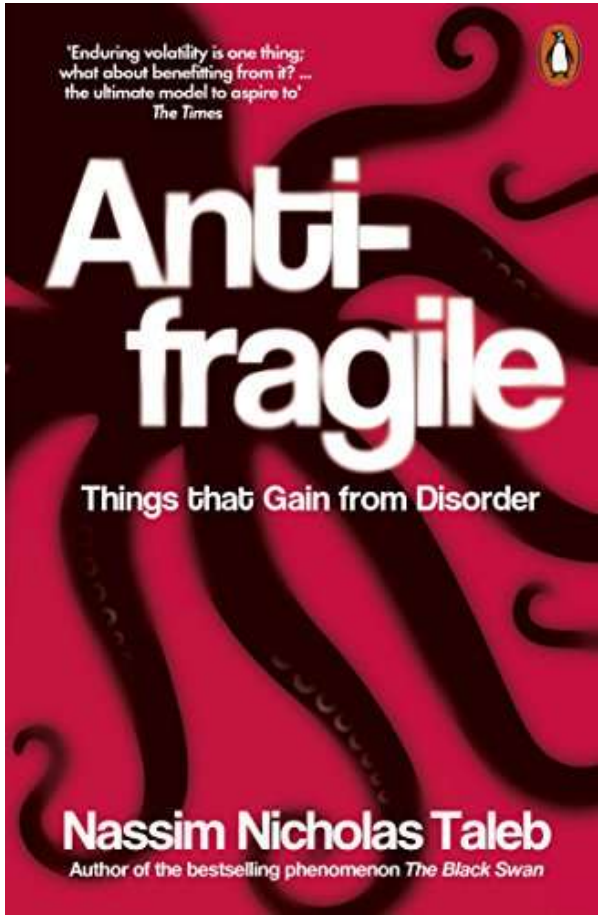
Responsible use of quantitative information; try via negativa (N. Taleb); instead of proving policy options, try to falsify them



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

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

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

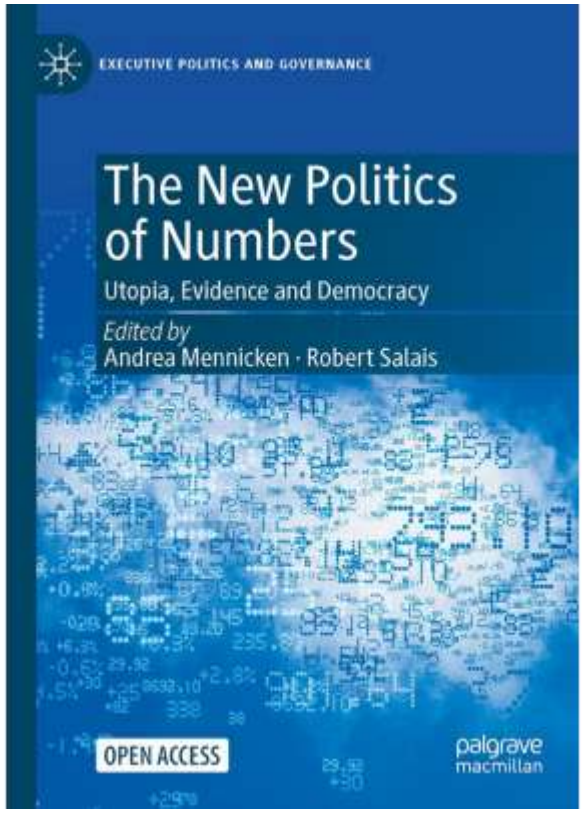


Since the technique is never neutral a technical proof of quality is illusory without a parallel investigation of normative quality

Technical Quality

Normative quality

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



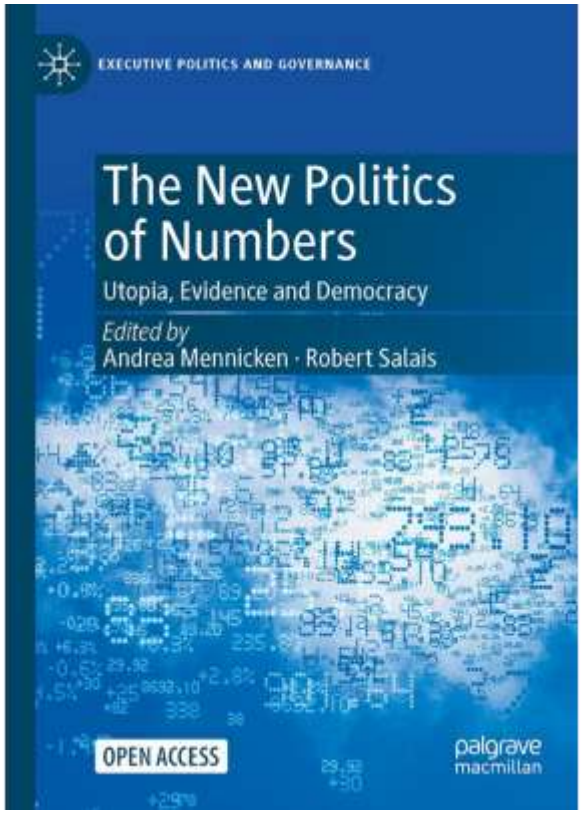
Salais, R. (2022). "La donnée n'est pas un donné": Statistics, Quantification and Democratic Choice. In *The New Politics of Numbers: Utopia, Evidence and Democracy*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 379–415.

Examples

The invention of unemployment as a statistical category in France

Female homeworkers and craft workers in France who were excluded from unemployment statistics until the 1950s

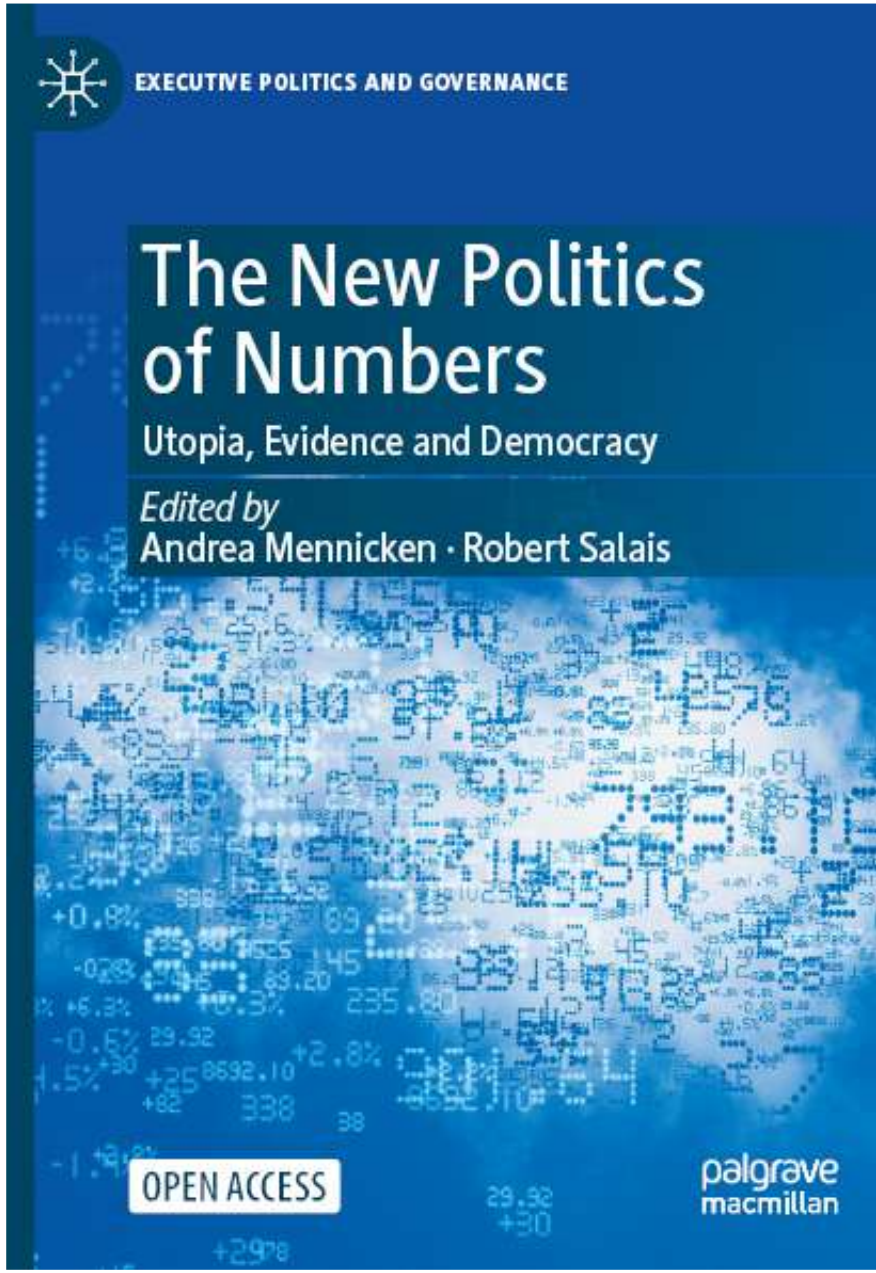
The European Employment Strategy and employment/unemployment indicators

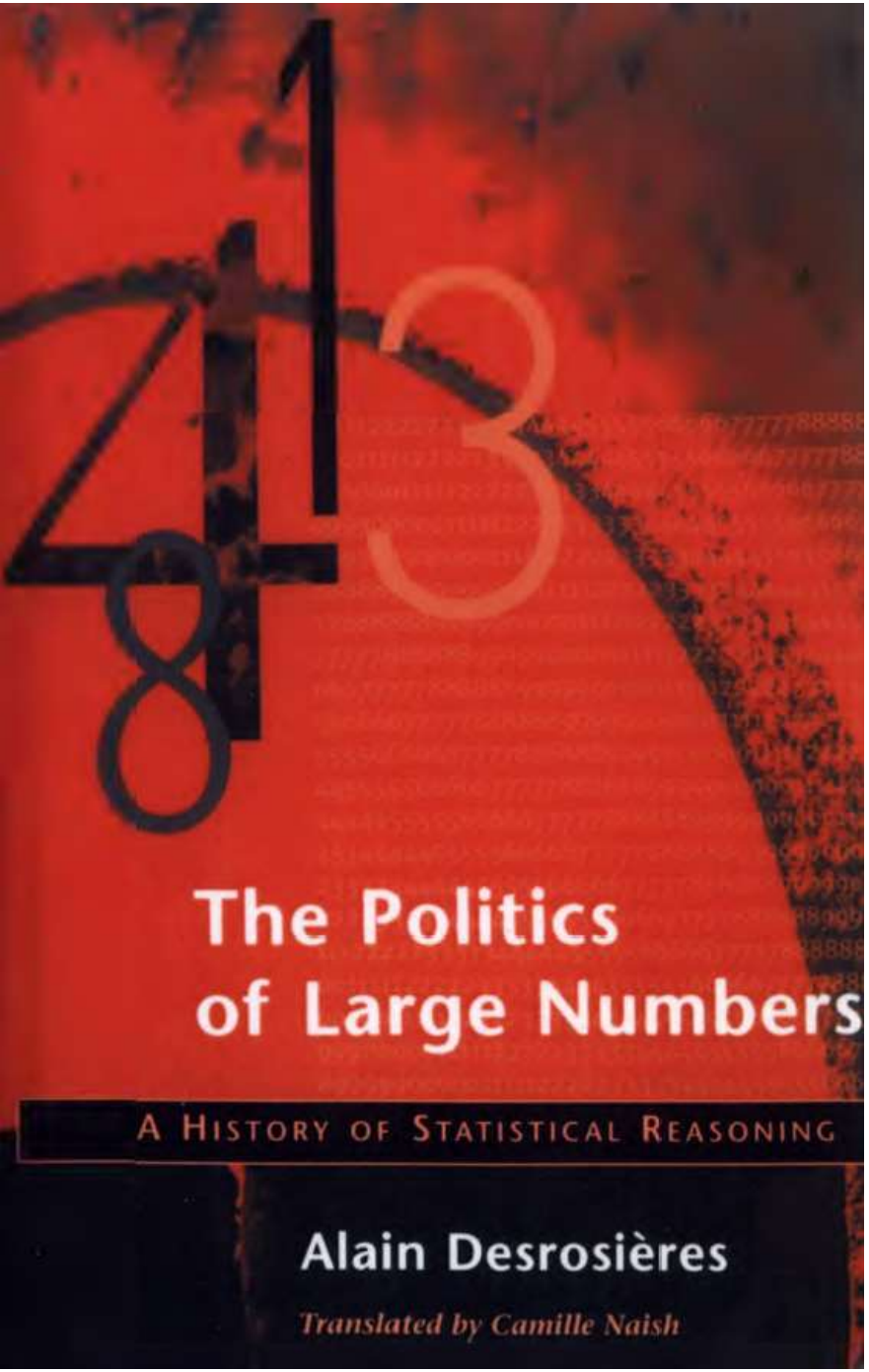


Salais, R. (2022). "La donnée n'est pas un donné": Statistics, Quantification and Democratic Choice. In *The New Politics of Numbers: Utopia, Evidence and Democracy*, Andrea Mennicken and Robert Salais, Palgrave Macmillan, pp. 379–415. **OPEN ACCESS**

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

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





Alain Desrosières: “Making things that hold”

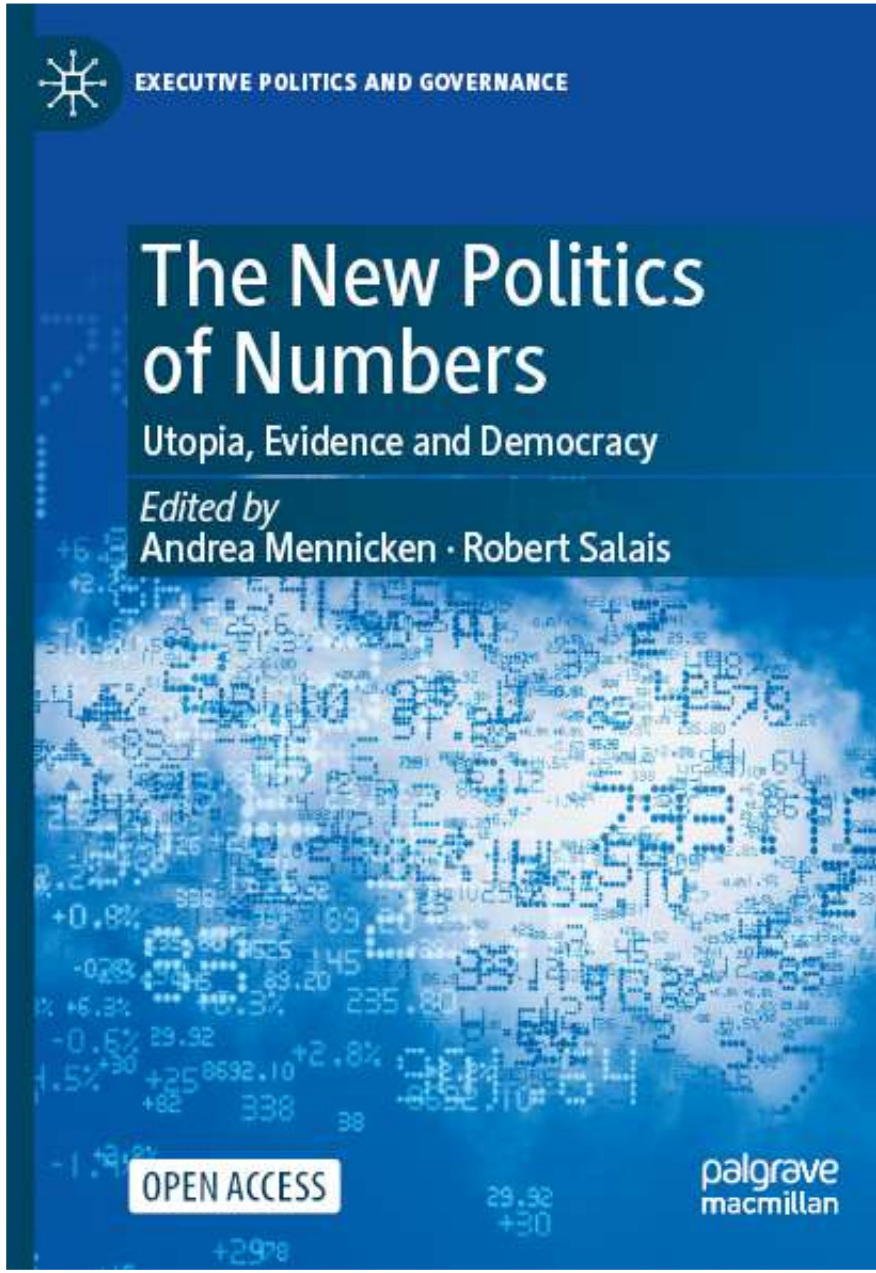
The construction of statistical concepts and categories that can serve for action

BUT

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

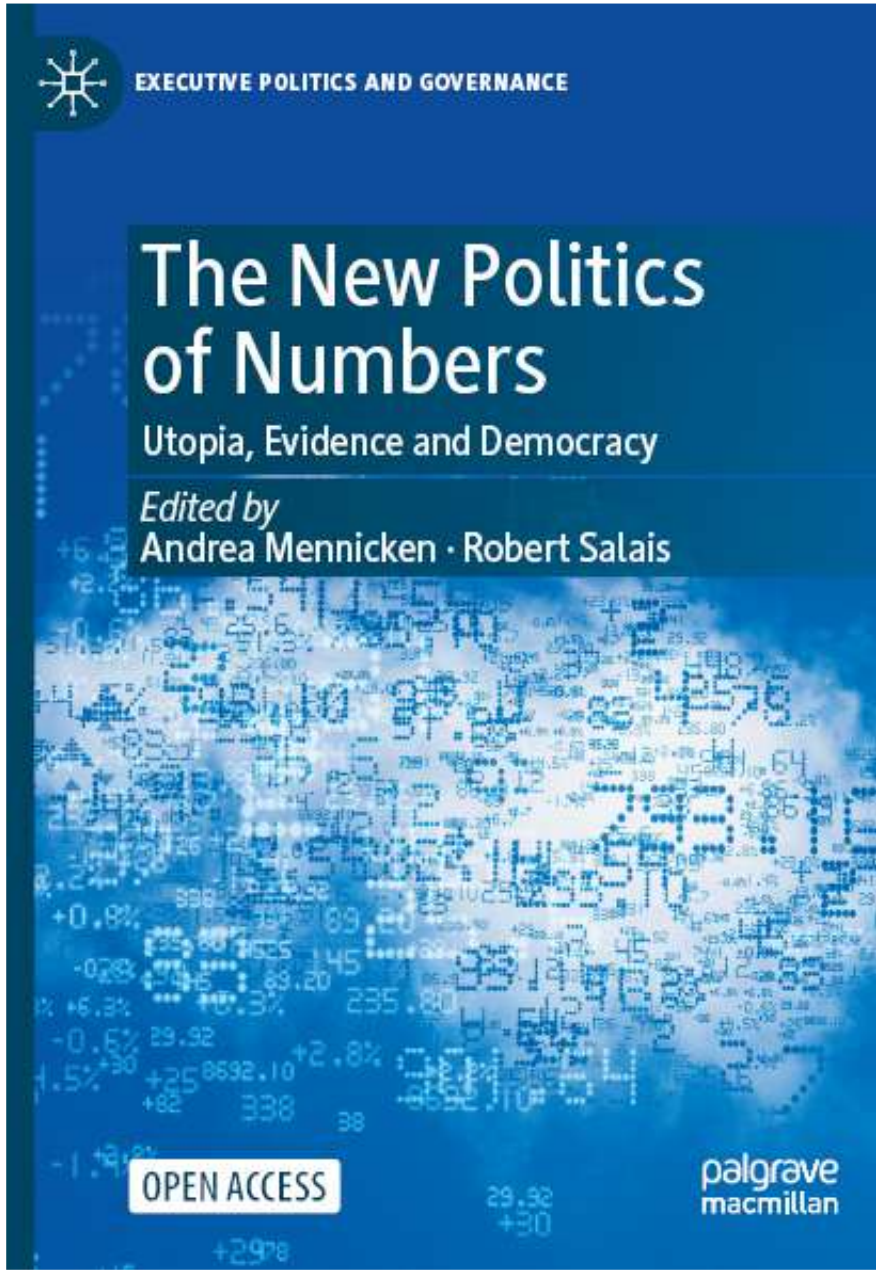
Governance driven quantification is based on pretended objectivity (neutrality), reductionism and justificationism that contribute to a loss of democratic agency (a-democracy)

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

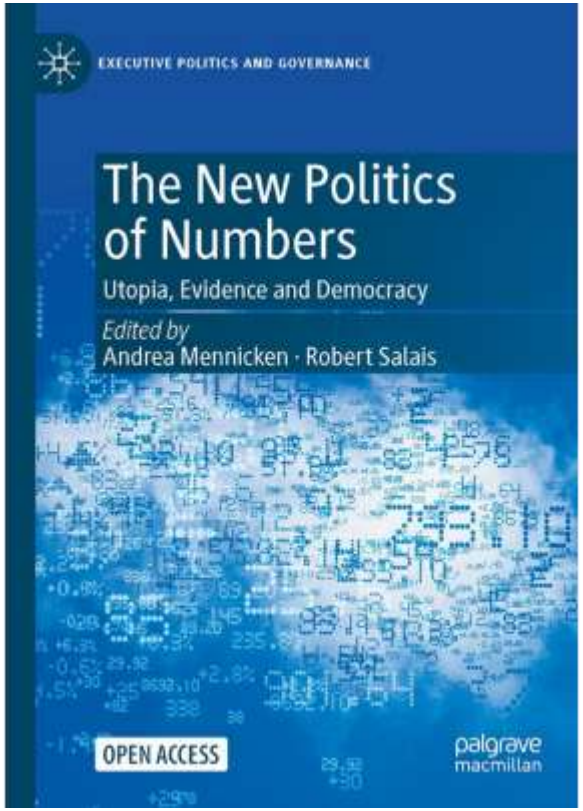


Contesting unjust/unfair governance arrangement is impossible without producing alternative constructions of evidence – that requires muscles not easily available to the lay citizen

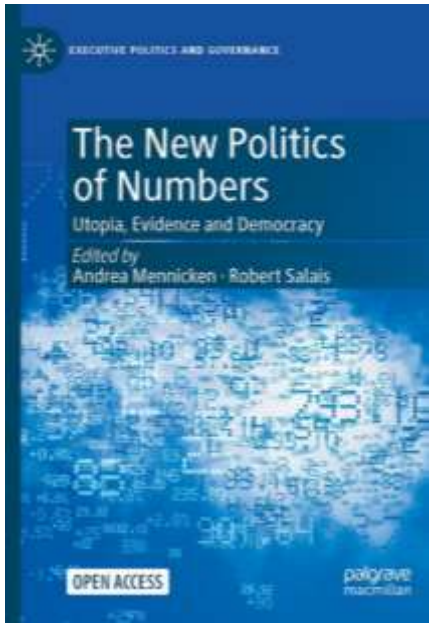
CHAPTER 12, “La donnée n’est pas un donné”: Statistics, Quantification and Democratic Choice, *Robert Salais*

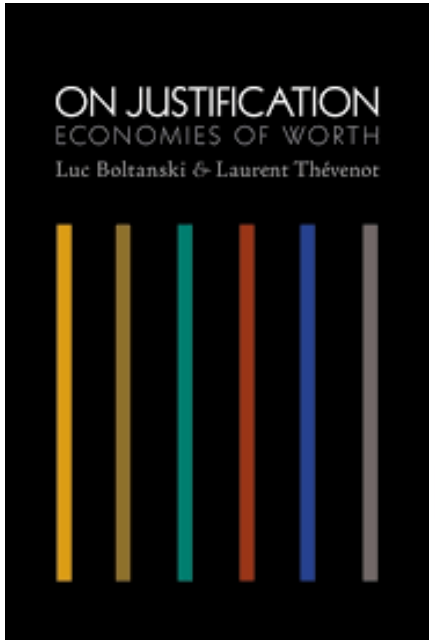


Normative quality … yes but which norms?



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**

- collective solidarity social justice
- *Civic* worth
- environmental concern
- *Green* worth
- tradition
- *Domestic* worth

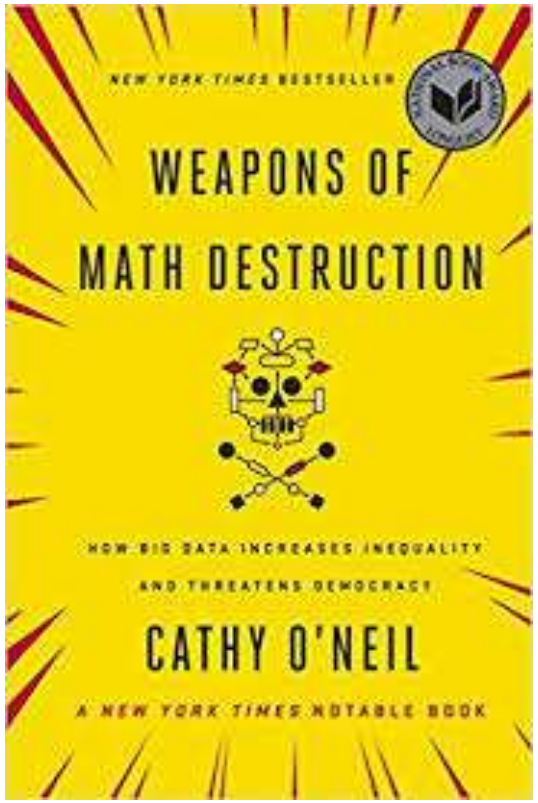
individual consumers' choices between certified **market goods**

market coordination [*market* worth] through certified products & services

- 'Fair-trade'
- 'Organic'
- 'Protected Geographic Indication' (PGI)

Alarm for Weapons of Math Destruction

Cathy O'Neil

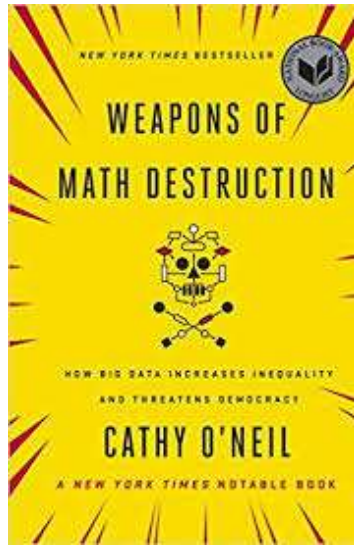


O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

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…

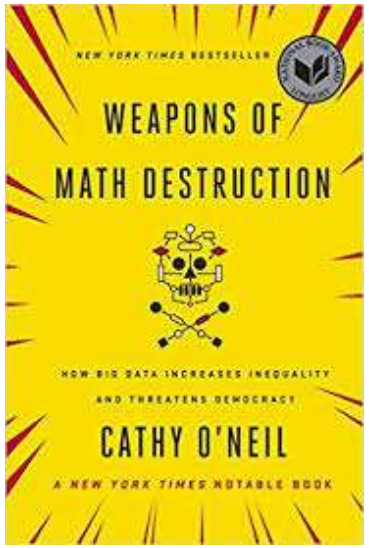
O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. Random House Publishing Group.

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



NYT running the story of one worker working difficult hours

The New York Times

Working Anything but 9 to 5

Scheduling Technology Leaves Low-Income Parents With Hours of Chaos

By **JODI KANTOR**, Photographs by **SAM HODGSON**

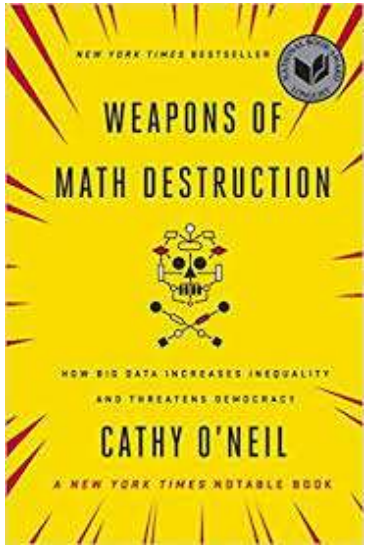
AUGUST 13, 2014

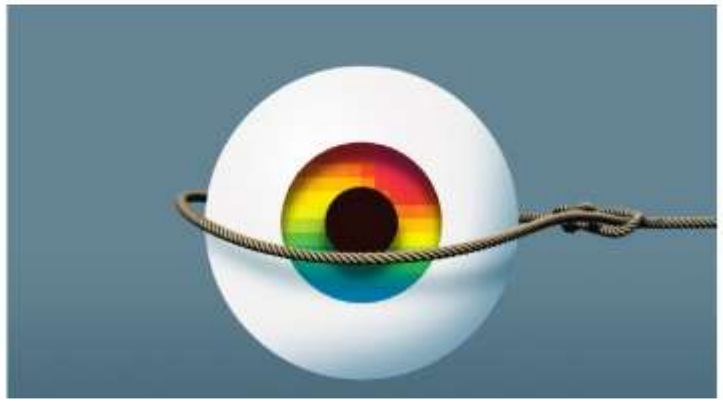
https://www.nytimes.com/interactive/2014/08/13/us/starbucks-workers-scheduling-hours.html

“managers’ pay is contingent upon the efficiency of their staff measured by revenue for employee hour” p. 126

“I consider scheduling software one of the more appalling WMD [Weapon of Math Destruction]” p. 128

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





Some reading

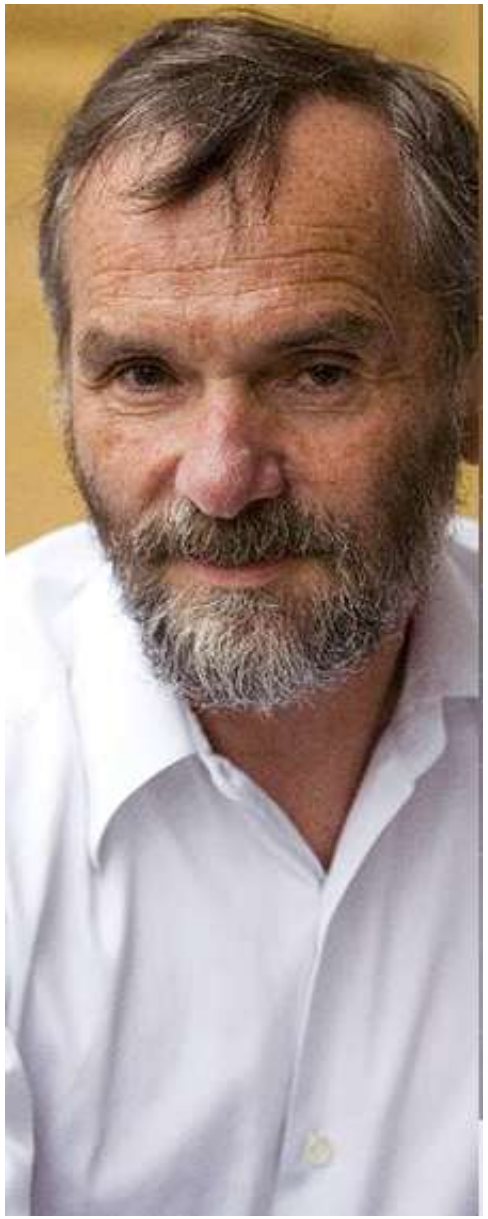
https://www.andreasaltelli.eu/file/repository/Working_Anything_but_9_to_5_.pdf

https://www.andreasaltelli.eu/file/repository/The_Boss_Will_See_You_Now_Zephyr_Teachout_The_New_York_Review_of_Books.pdf

https://www.andreasaltelli.eu/file/repository/The_Coming_Tech_Autocracy_Sue_Halpern_The_New_York_Review_of_Books.pdf

The New York Review of Books

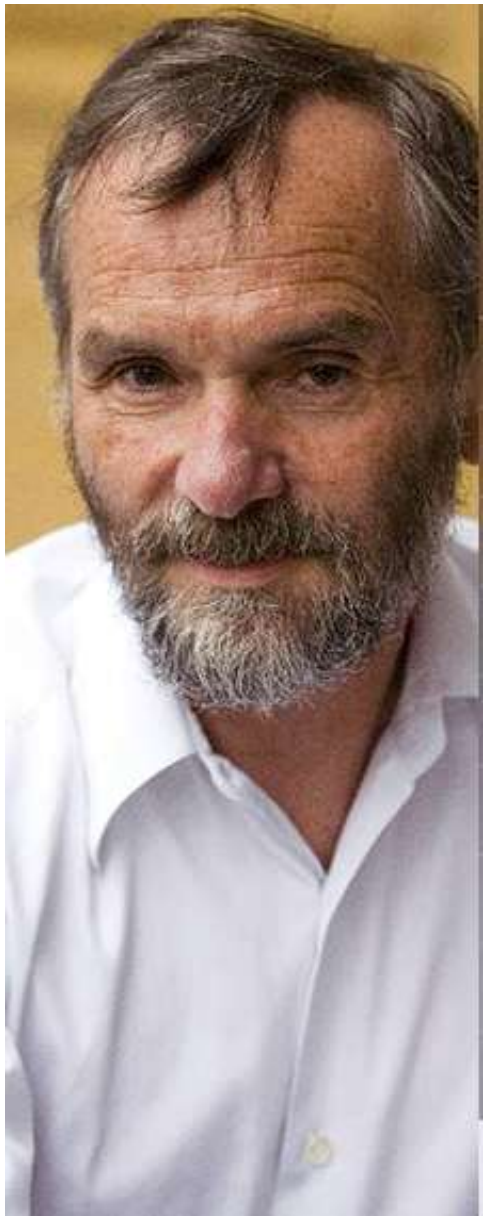
Alain Supiot



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

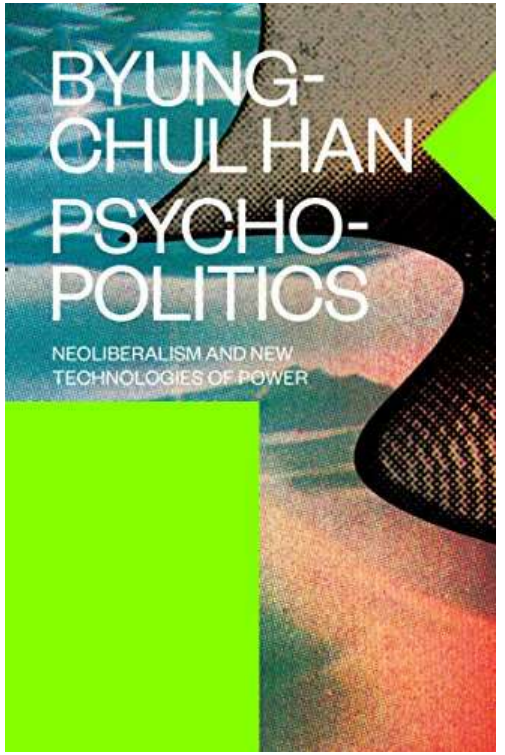
https://www.college-de-france.fr/site/en-alain-supiot/Governance-by-Numbers-Introduction.htm

Alain Supiot



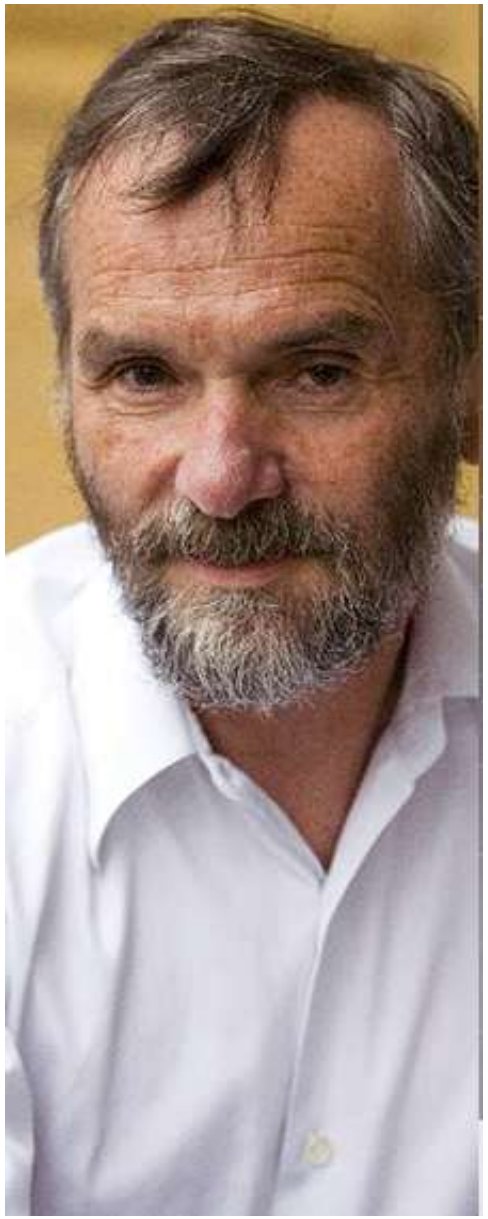
…we have entered the era of the cybernetic imaginary, which revives the West's age-old dream of grounding social harmony in calculations.

Same diagnosis about the neoliberal ‘exploitation of freedom’ from Byung Chul Han …



Slave of ourselves

Alain Supiot

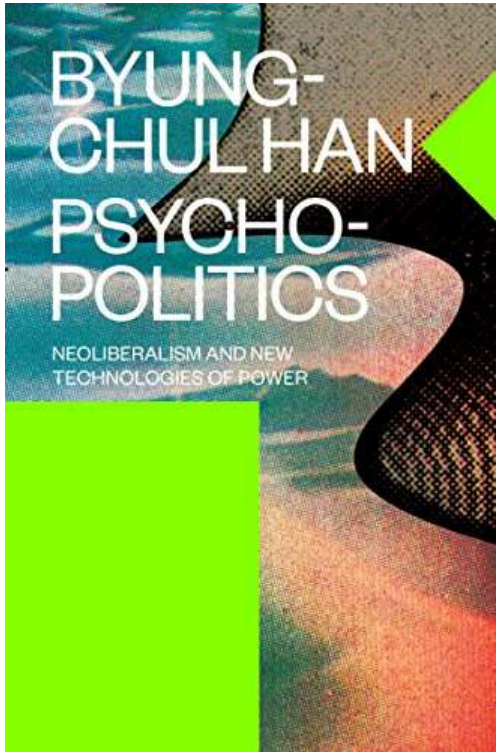


The rise of governance through metrics, performance indicators, and audit cultures undermines modern legal and political frameworks, returning society to hierarchical and personalized forms of domination

➔ re-feudalization

… an indictment of new public management theories

… corporations, financial rating agencies = new "lords," setting rules and obligations overriding state sovereignty

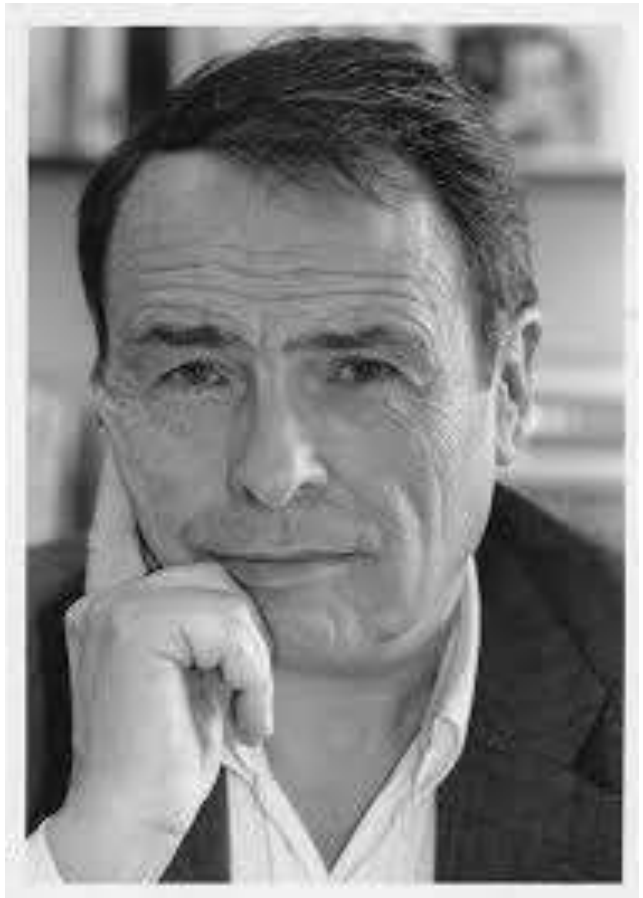


Do we need a movement of resistance?

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*).



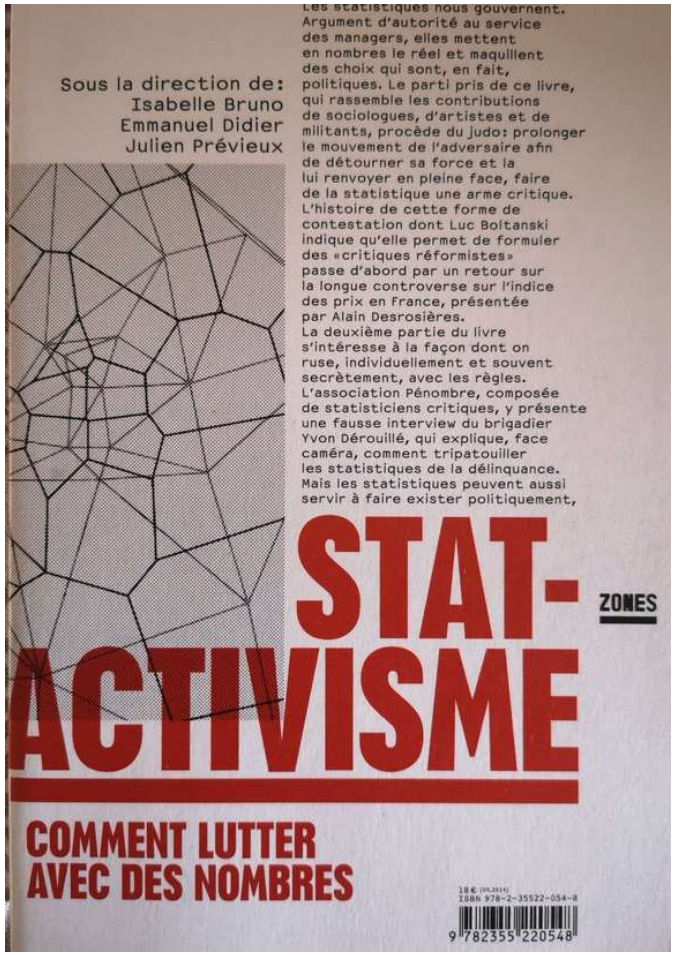
La sociologie, ça doit être rigolo

(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



Charles Goodhart

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

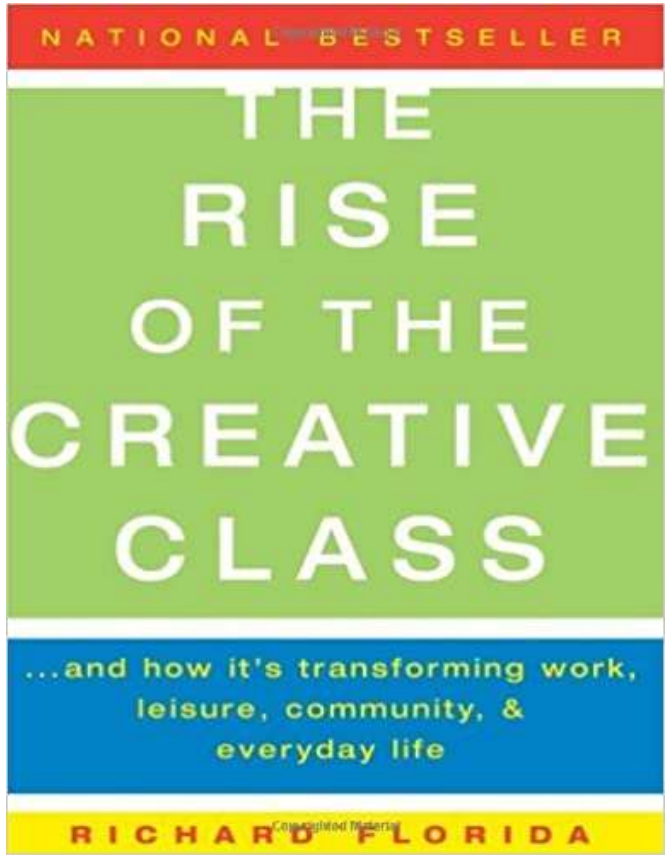
This is what we normally call Goodhart’s law, from Charles Goodhart. "When a measure becomes a target, it ceases to be a good measure."

Also known as Campbell's law (1976);
https://en.wikipedia.org/wiki/Goodhart%27s_law

How to be a "statactiviste"?

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

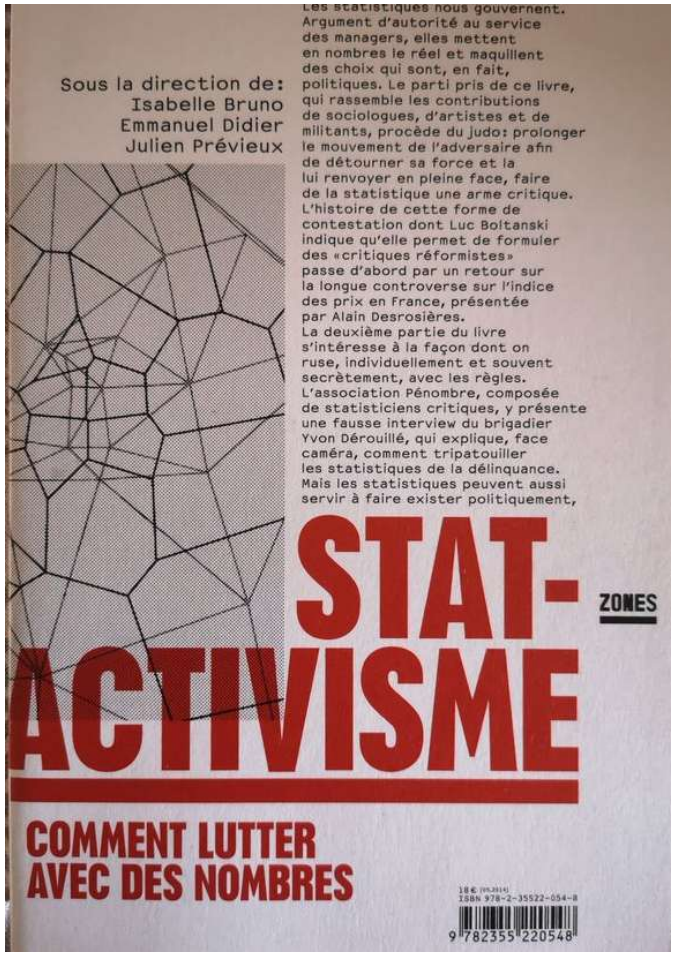
- 'Creative class' or 'precarious intellectuals'?



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"

Numbers

… 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.

IIPP 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 …

… numbers are so deeply entrenched in our existence that we barely reflect on them critically 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.

IIPP UCL Institute for Innovation and Public Purpose

WORKING PAPER
WP 2021/05

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., **47**(3) 257-266, 2017.

Numbers, visible and invisible…

Andrea Mennicken

ANNUAL REVIEWS

Publications A-Z Journal Information

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ANNUAL REVIEW OF SOCIOLOGY Volume 45, 2019

Review Article | Open Access

What's New with Numbers? Sociological Approaches to the Study of Quantification

Andrea Mennicken[1], and Wendy Nelson Espeland[2]

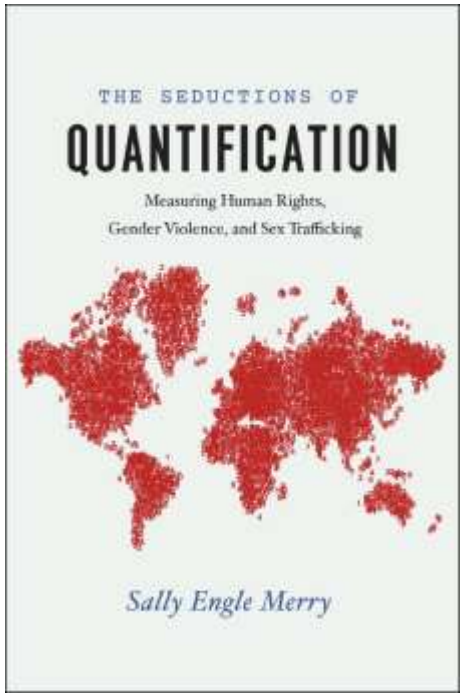
View Affiliations

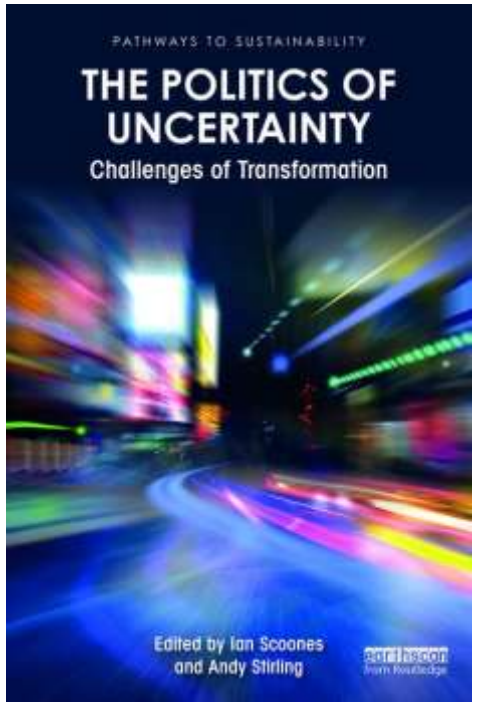
Vol. 45:223-245 (Volume publication date July 2019) | https://doi.org/10.1146/annurev-soc-073117-041343

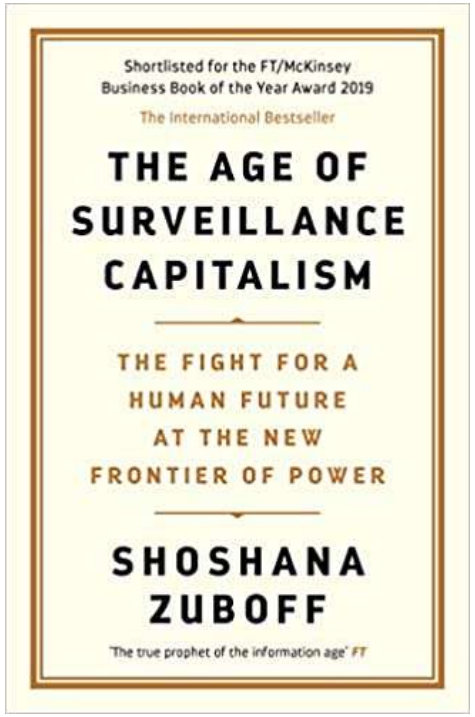
First published as a Review in Advance on May 13, 2019

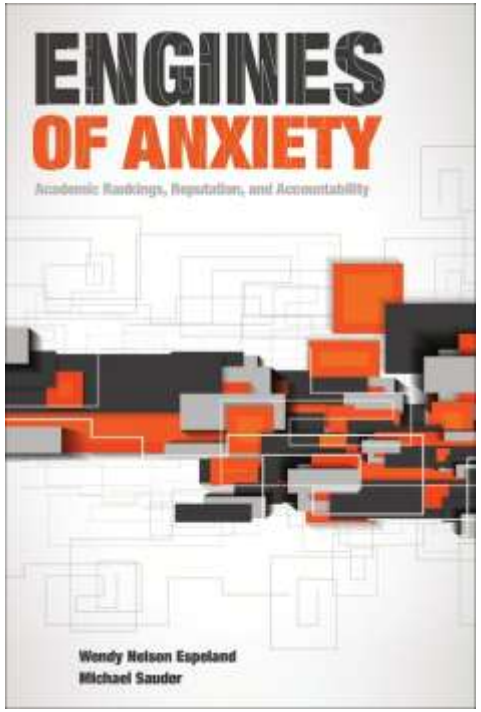
Wendy N. Espeland

Algorithms, models, metrics, statistics…



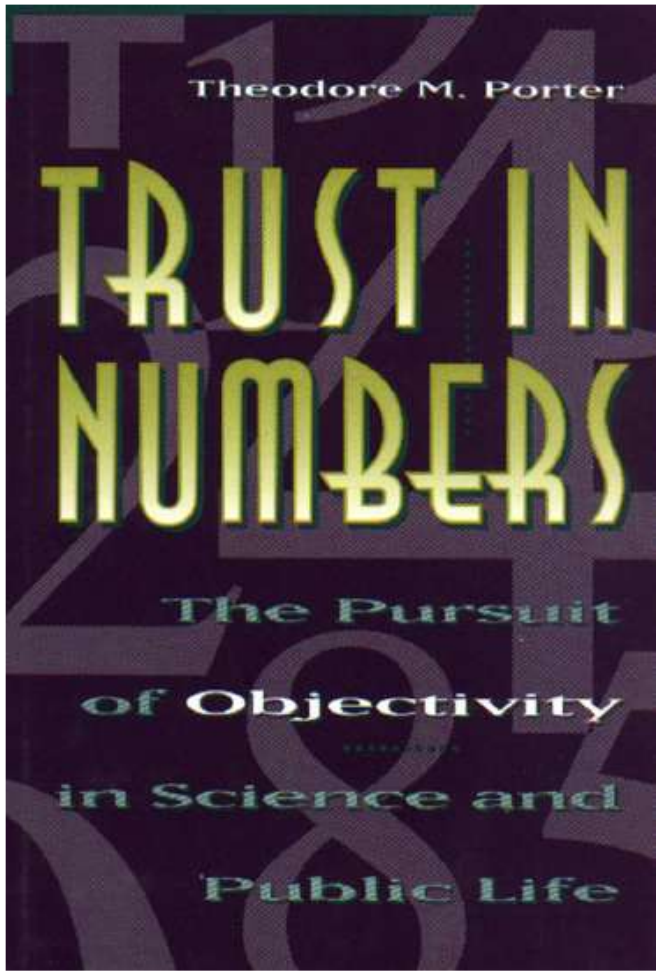






Numbers and trust

Theodor
M. Porter



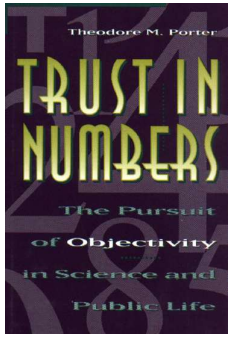
Theodore M. Porter, Trust in Numbers,
The Pursuit of Objectivity in Science and Public Life, Princeton 1995

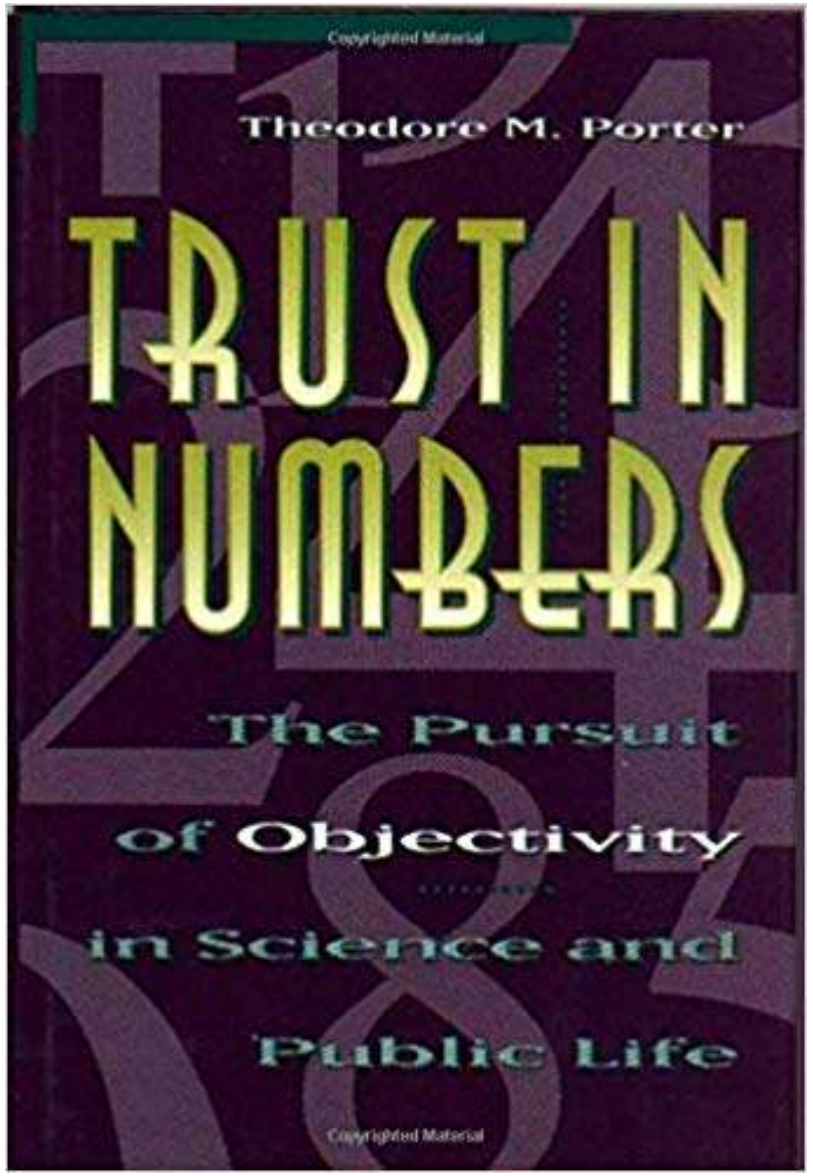
Porter's story: Quantification needs judgment which in turn needs trust …without trust quantification becomes mechanical, a system, and 'systems can be played'.

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





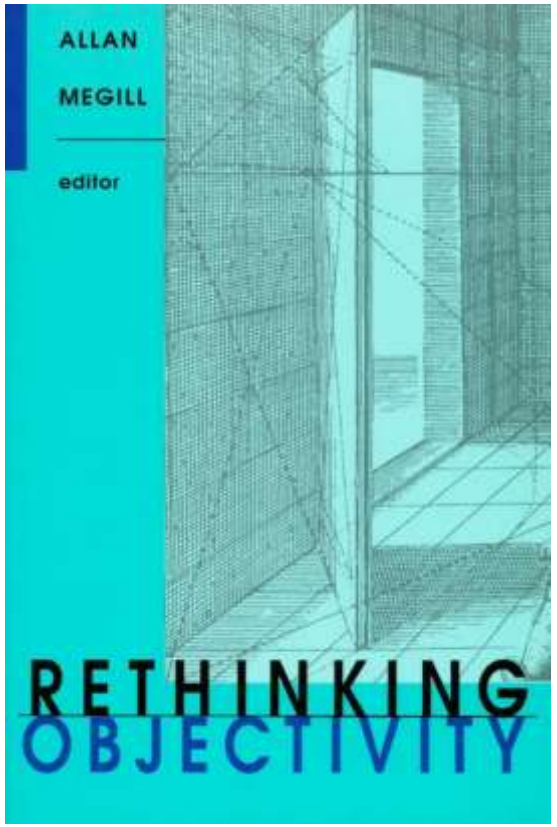
Numbers are not neutral but their purported neutrality is a large part of their appeal: being performative without appearing to be so

http://ereserve.library.utah.edu/Annual/WRTG/3705/Mathison/objectivity.pdf in

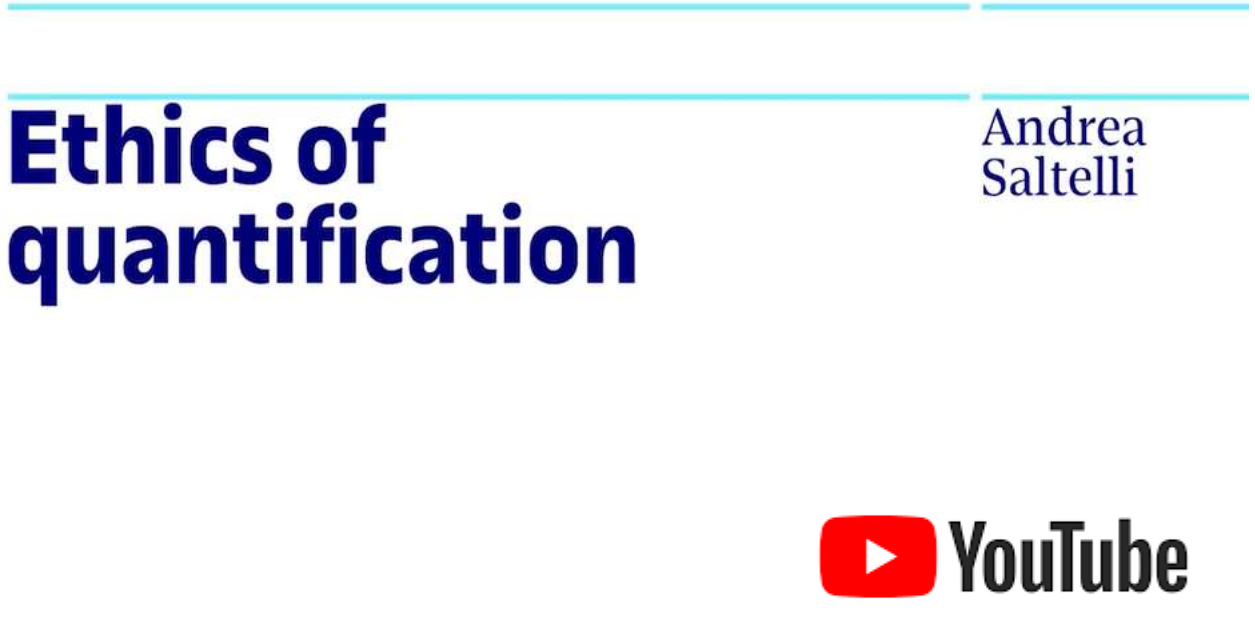
Objectivity as Standardization: The Rhetoric of Impersonality in Measurement, Statistics, and Cost-Benefit Analysis

THEODORE M. PORTER

1. Quantification makes knowledge impersonal, hence objective.



Video recorded by UOC:
https://www.youtube.com/watch?v=eHtJUSxoioI&t=921s



On reductionism

4

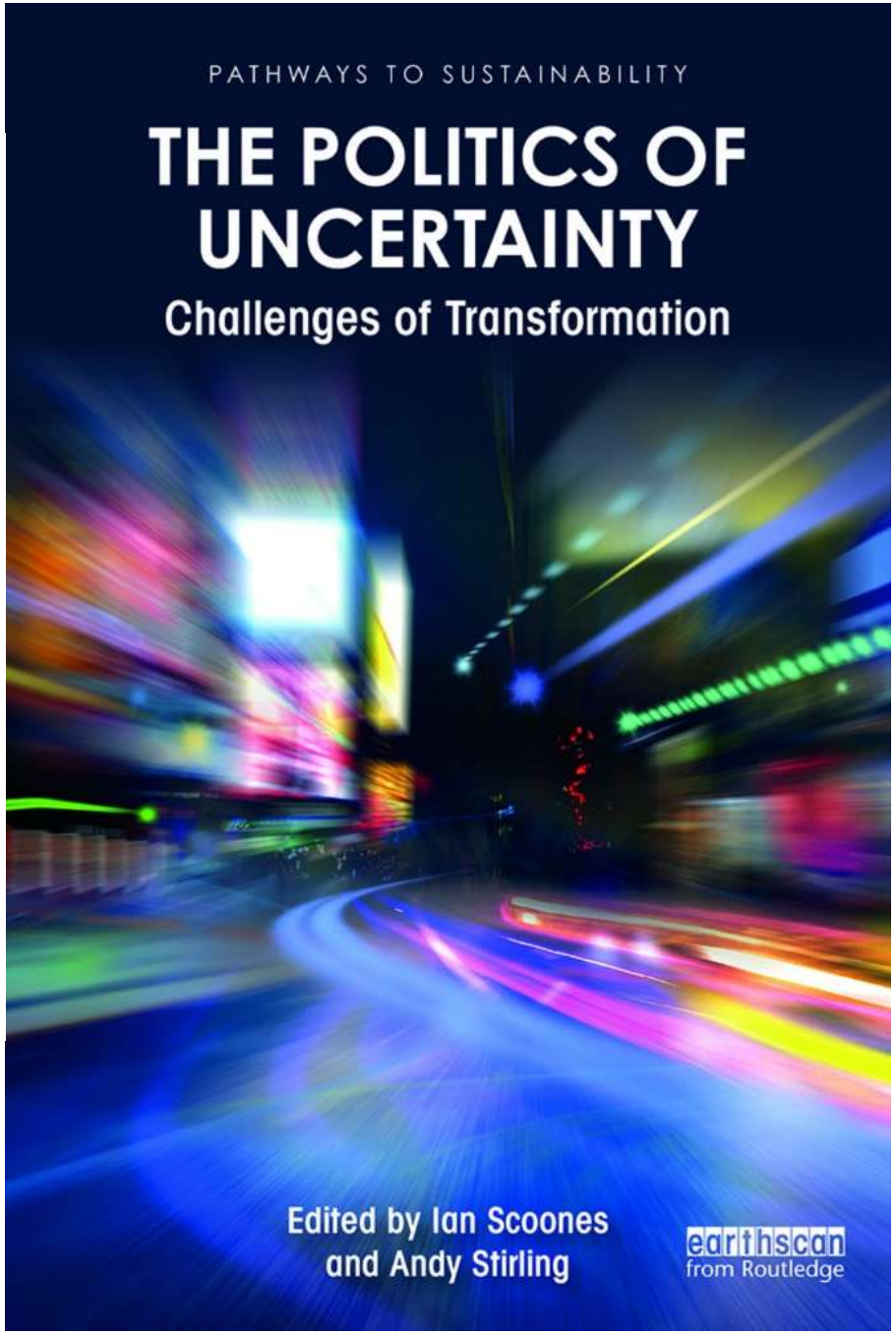
THE UNRAVELLING OF TECHNOCRATIC ORTHODOXY?

Contemporary knowledge politics in technology regulation

Patrick van Zwanenberg

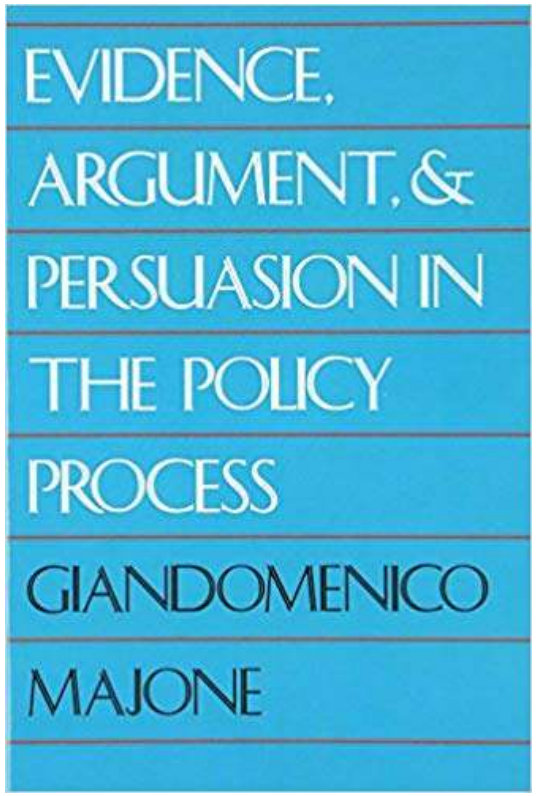
→ Crisp numbers help standardisation
Faith in the neutrality of science

OPEN ACCESS

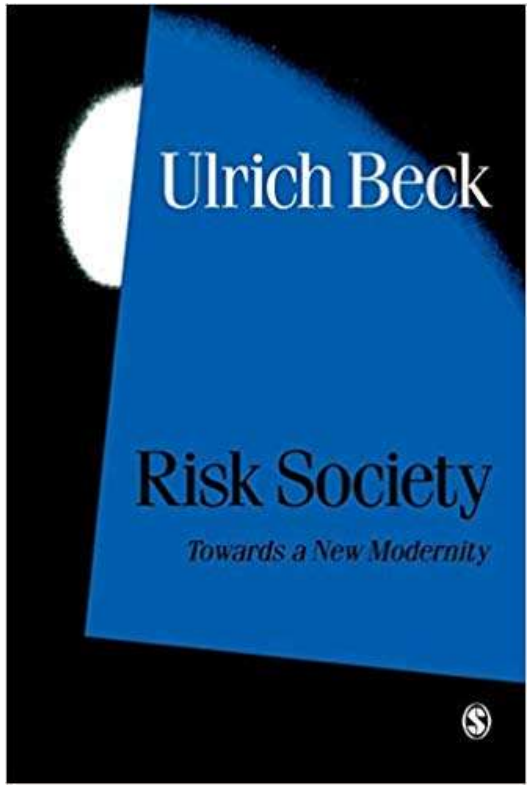


From Ulrich Beck to Giandomenico Majone: the technique is never neutral

Ulrich Beck
(1944 –2015)



1989



1992 (1986)

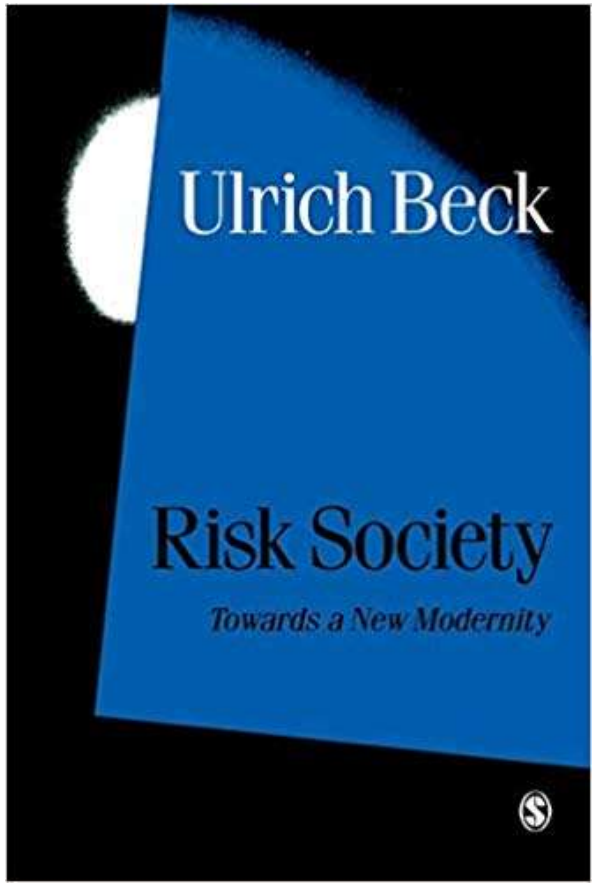
ELSEVIER

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

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

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

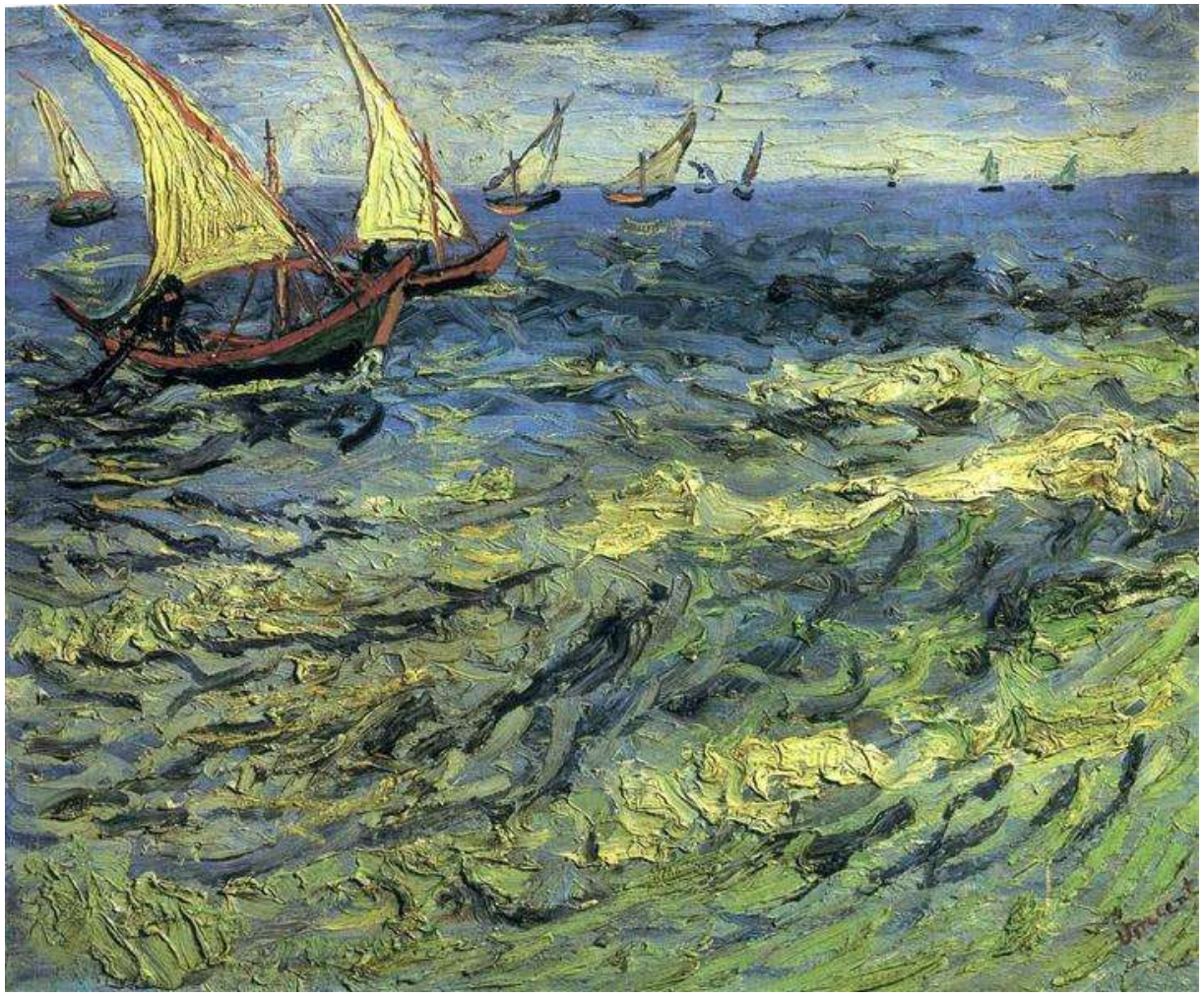
“It is not uncommon for political programs to be decided in advance simply by the choice of what expert representatives are included in the circle of advisers.”



1992 (1986)

Ulrich Beck
(1944 –2015)

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

Many multi-analyst studies ongoing, e.g.:

"Are soccer players with dark skin tone more likely to receive red cards from referees?", Silberzahn et al. 2018

"Is there an impact of compulsory schooling on teenage pregnancy rates?", Huntington-Klein et al. (2021)

Source: BBC https://www.bbc.com/sport/football/68435064

"There are at least twenty multi-analyst experiments brewing"

… some large! 343 authors of Menkveld et al. (2024)"

HUNTINGTON-KLEIN, N., ARENAS, A., BEAM, E., BERTONI, M., BLOEM, J. R., BURLI, P., CHEN, N., GRIECO, P., EKPE, G., PUGATCH, T. et al. (2021). The influence of hidden researcher decisions in applied microeconomics. Economic Inquiry 59 944–960.
MENKVELD, A. J., (2024). Nonstandard Errors. The Journal of Finance 79 2339–2390. https://doi.org/10.1111/jofi.13337.
SILBERZAHN, R., UHLMANN, E. L., MARTIN, D. P., ANSELMI, P., AUST, F., AWTREY, E., BAHNÍK, Š., BAI, F., BANNARD, C., BONNIER, E. et al. (2018). Many analysts, one data set: Making transparent how variations in analytic choices affect results. Advances in Methods and Practices in Psychological Science 1, 337–356.

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‡

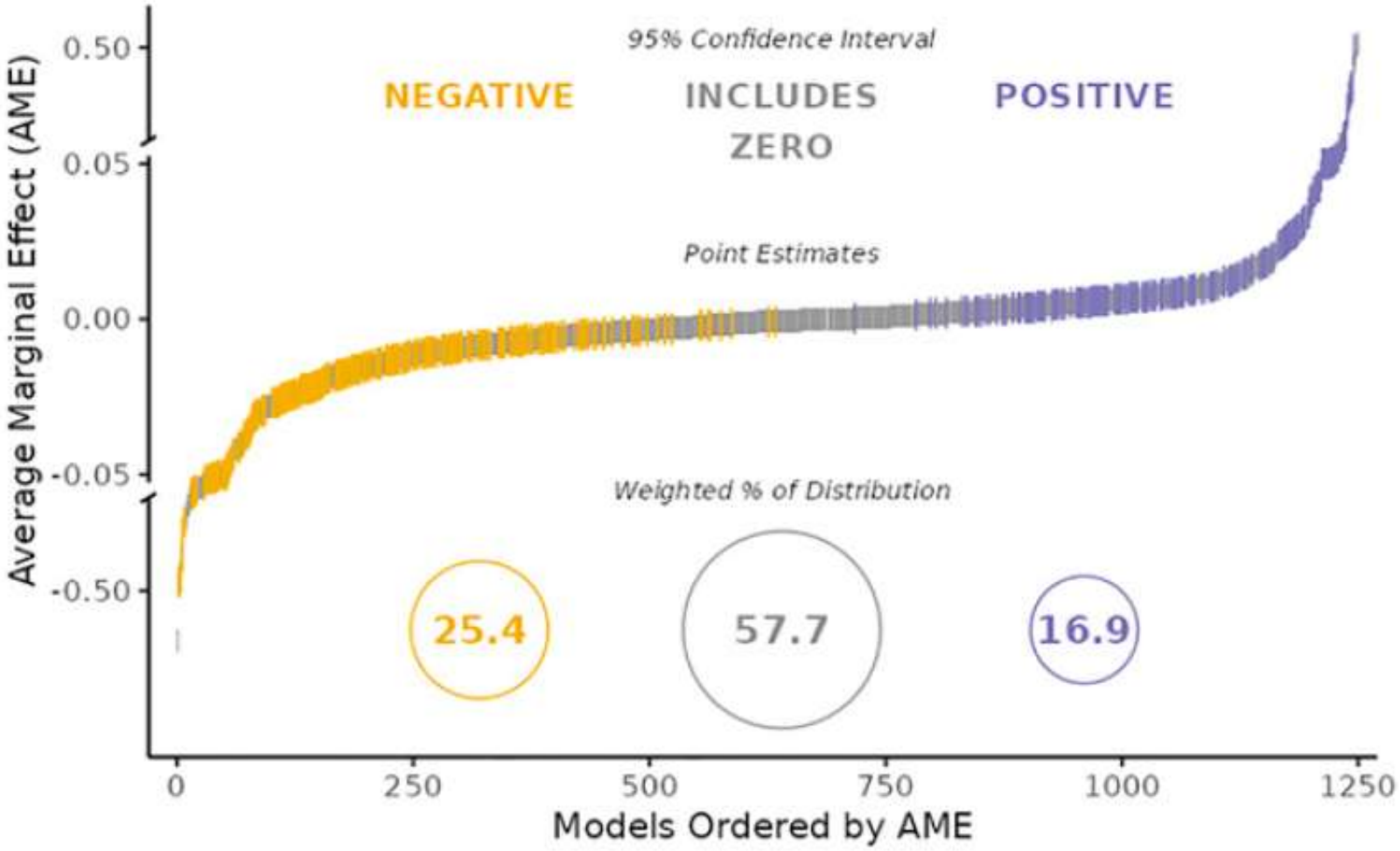
14 Nov 2013

Why this matters?

PNAS RESEARCH ARTICLE | SOCIAL SCIENCES OPEN

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)

In the original multi-analyst study the normative (political) orientation of the analysts was found **not** to explain the variance

The modelling variables were found to explain at most a few percent of the variance of the results … **where does the variance come from?**

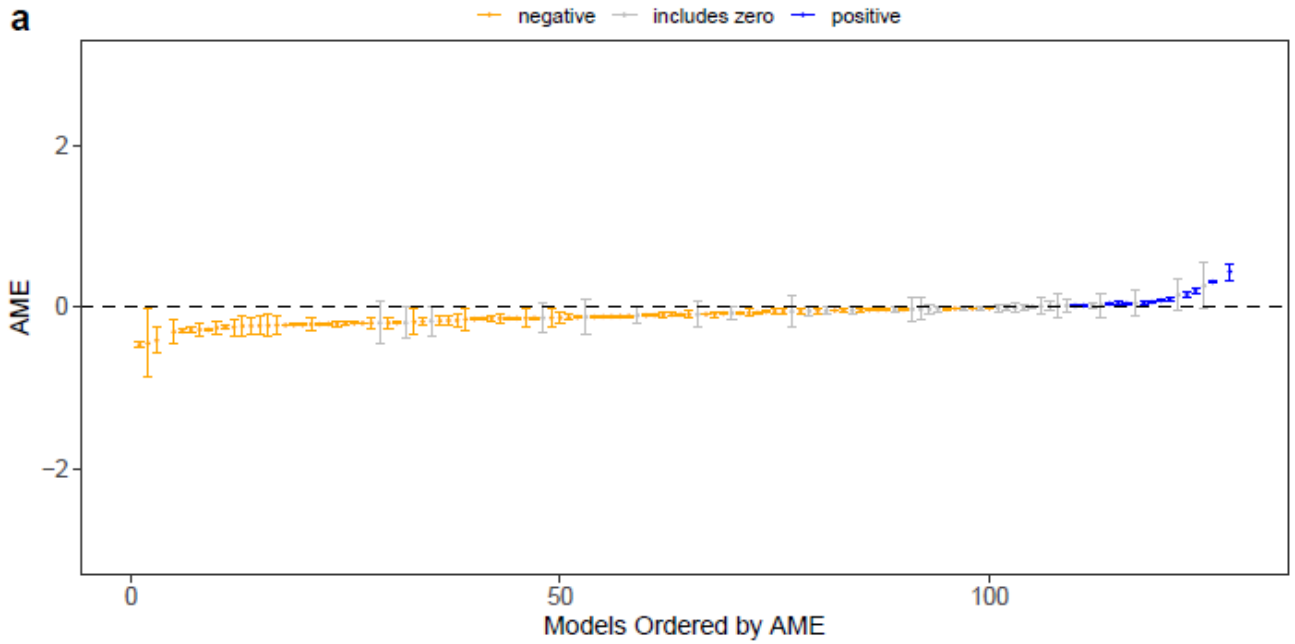
https://www.istockphoto.com/

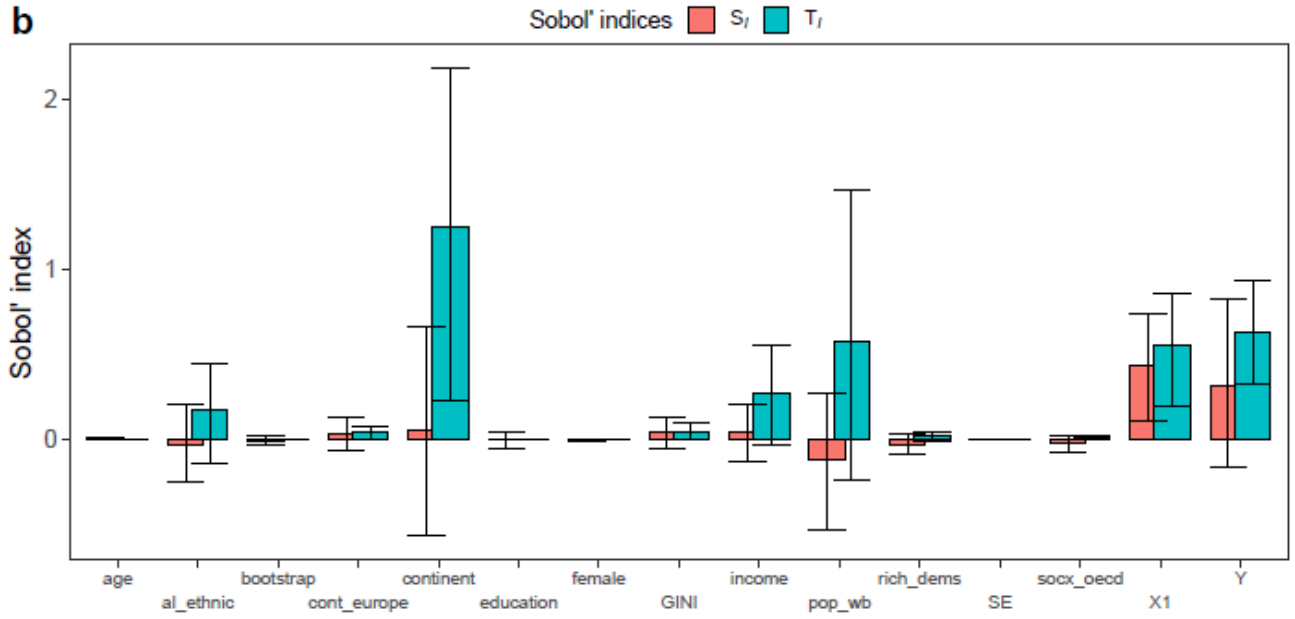
k_i	Variable	Description
1	age	Inclusion or non-inclusion of the covariates age and square age of participants
2	$all - ethnic$	Inclusion or non-inclusion of a covariate that takes into account all ethnic categories
3	$bootstrap$	Inclusion or non-inclusion of the bootstrap procedure
4	$cont - europe$	Inclusion or non-inclusion of continental Europe countries in the analysis
5	$continent$	Inclusion or non-inclusion of different continents in the analysis
6	$education$	Inclusion or non-inclusion of the covariates level of education
7	$female$	Inclusion or non-inclusion of the covariates gender as self-reported by respondents in the survey
8	$GINI$	Inclusion or non-inclusion of the covariates related to the Gini indexes
9	$income$	Inclusion or non-inclusion of the covariate related to the income
10	$pop - wb$	Inclusion or non-inclusion of the covariate related to the information about country-specific numerosity of population
11	$rich - dems$	Inclusion or non-inclusion of rich democracies in the analysis
12	SE	Inclusion or non-inclusion of clustered standard error
13	$socx - oecd$	Inclusion or non-inclusion of the covariate related to social expenditure
14	$X1$	Inclusion or non-inclusion of the covariates related to the migration indexes
15	Y	Choice of policy dependent variable

Table 1. Descriptions of variables included in the analysis.

We simulate different paths using triggers then we do a global sensitivity analysis

https://www.istockphoto.com/





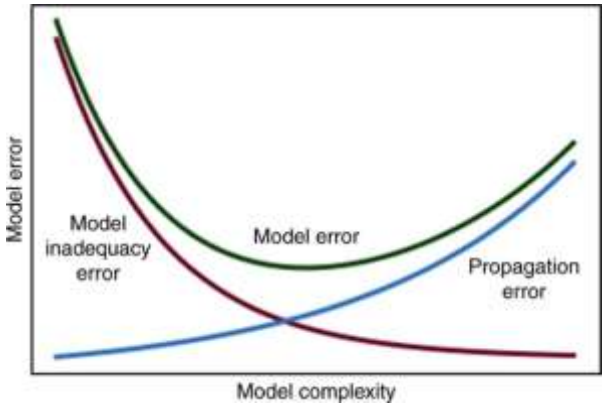
Uncertainty analysis reproduces the results of the multi-analyst experiment

Our sensitivity analysis explains where the missing variance went: **interactions**

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)

Article | Open Access | Published: 06 May 2023

What can mathematical modelling contribute to a sociology of quantification?

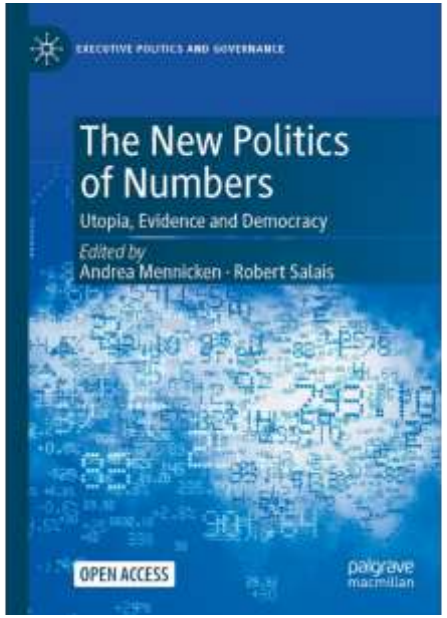
Andrea Saltelli & Arnald Puy

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

448 Accesses | **4** Altmetric | Metrics

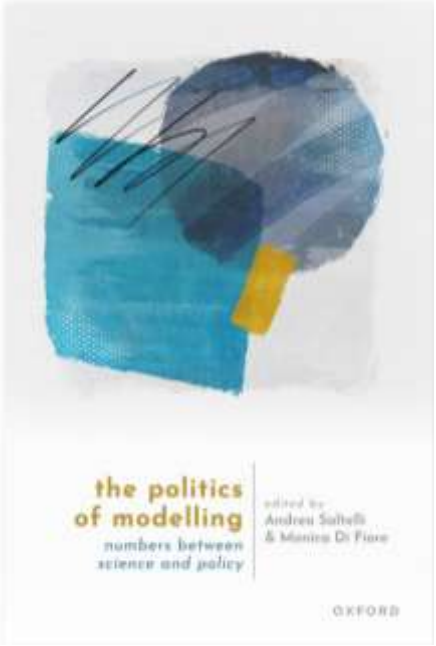
Technical Quality

Normative quality



Sensitivity analysis

Sensitivity auditing



The End

@andreasaltelli