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RISKS AS A POINT OF VIEW

Scientists' social representations of nanotechnology

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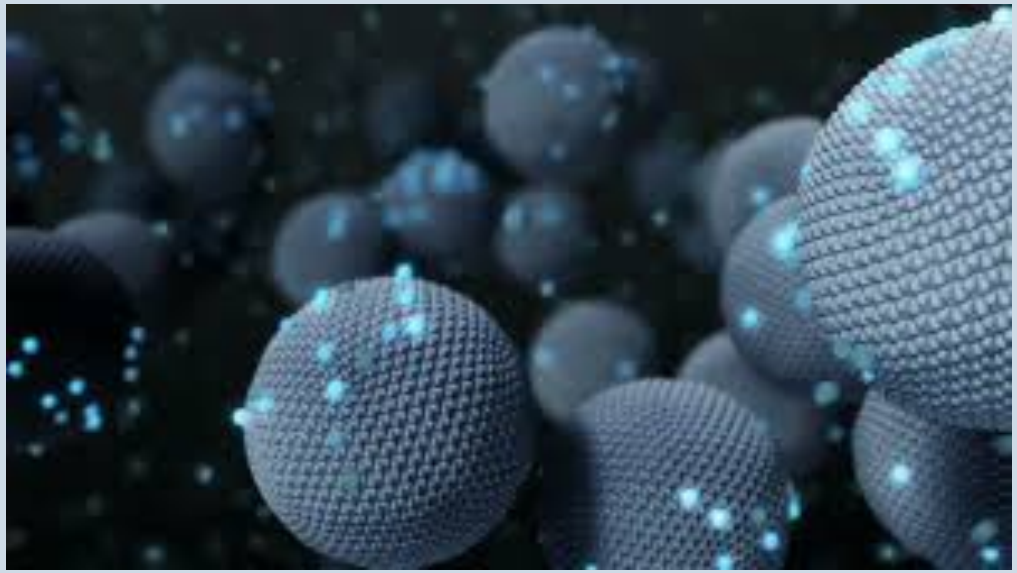
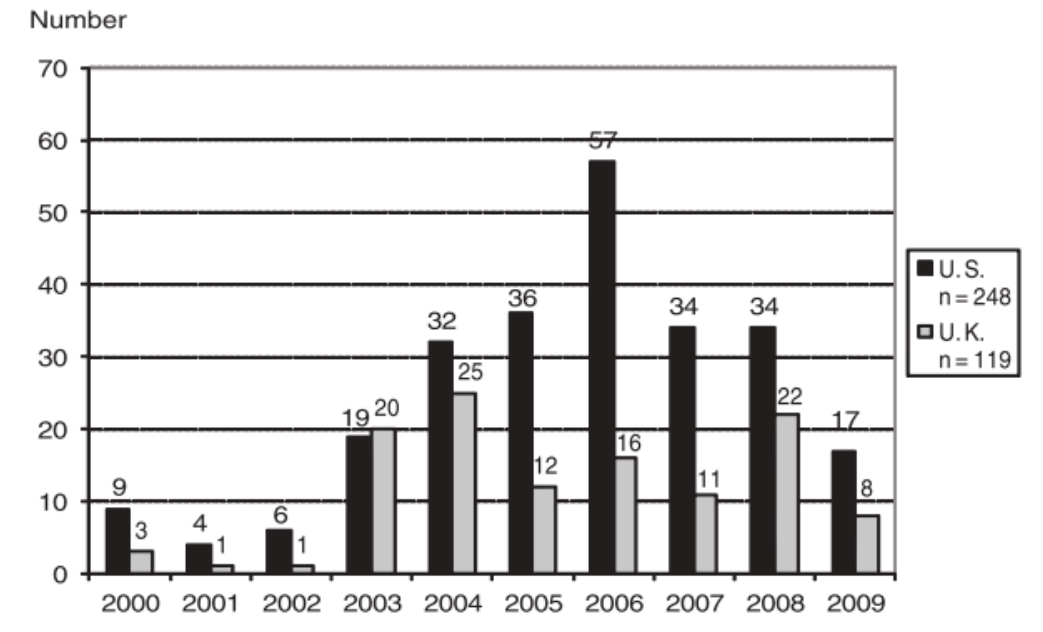
Nanotechnologies and the public

- Nanoscience and its major impacts on electronics, telecommunication, construction, food technology, drug development, etc.
- Between 1993 and 2003, worldwide investments in nanotechnology research grew from $430 million to about $3 billion (Roco, 2003)



Nanotechnologies and the public

- About 51-54% of the participants reported knowing ‘nothing at all’ about nanotechnology (Eurobarometer, 2010; Satterfield et al., 2009)



Issue-attention cycle (Downs, 1972)
Decline of intense public interest

post-problem stage

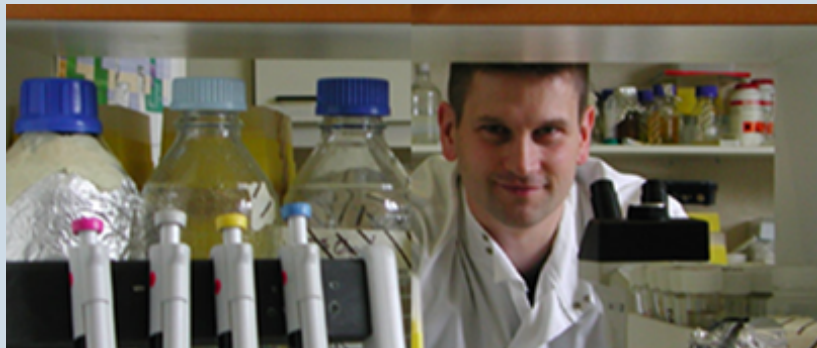
Uncontroversial media reporting
Larger volume of articles about nanotechnology *benefits* in both United States and United Kingdom (Friedman & Egolf, 2011)

Friedman, S. M., & Egolf, B. P. (2011). A longitudinal study of newspaper and wire service coverage of nanotechnology risks. *Risk Analysis*, *31*(11), 1701–17.

Social representations, nanotechnologies and the public

- **Social representations**
  - *how scientific ideas are integrated by society at large and become shared social knowledge (Moscovici 1961, 2001).*
  - *The public proceeds thus to a reconstruction of the scientific object on its own terms*
- Example of biotechnology

- it would be unlikely that we could talk about "social representations" of nanotechnologies in a broader sense. The public does not seem to have sufficiently become sufficiently familiarized with the issue
  - *This is not the case of **nanoscientists!***



Study 1 - Exploring scientists' representations of nanotechnology

- As socially shared beliefs, the "logic" of social representations can be identified as arguments that contain pairs of oppositions

GOALS

1. *What is the **content** that scientists from different fields associate with nanotechnology*
2. *How is this content "**organised**" - i.e. which ideas that are seen as opposed*

Method

- 39 participants (researchers involved in a multidisciplinary European project)
- Free-association task 'When you think of NANOTECHNOLOGY, what are the five words or notions that first come to your mind?'
- Answers were content-analysed and submitted to a multiple correspondence analysis (MCA)

Study 1 - Exploring scientists' representations of nanotechnology

Results

- Main ideas associated with nanotechnology by scientists
  - *new products' (n = 27), 'small' (26), 'risk' (23), 'new' (11), 'nanoparticles' (10), 'opportunity' (9), 'uncertainties' (9)*

- **Multiple Correspondence Analysis (MCA)**

1. *Benefit vs. Risk (α = .68, 14.1% of variance)*
2. *Opportunity vs. Toxicity (α = .63, 12.5% of variance)*

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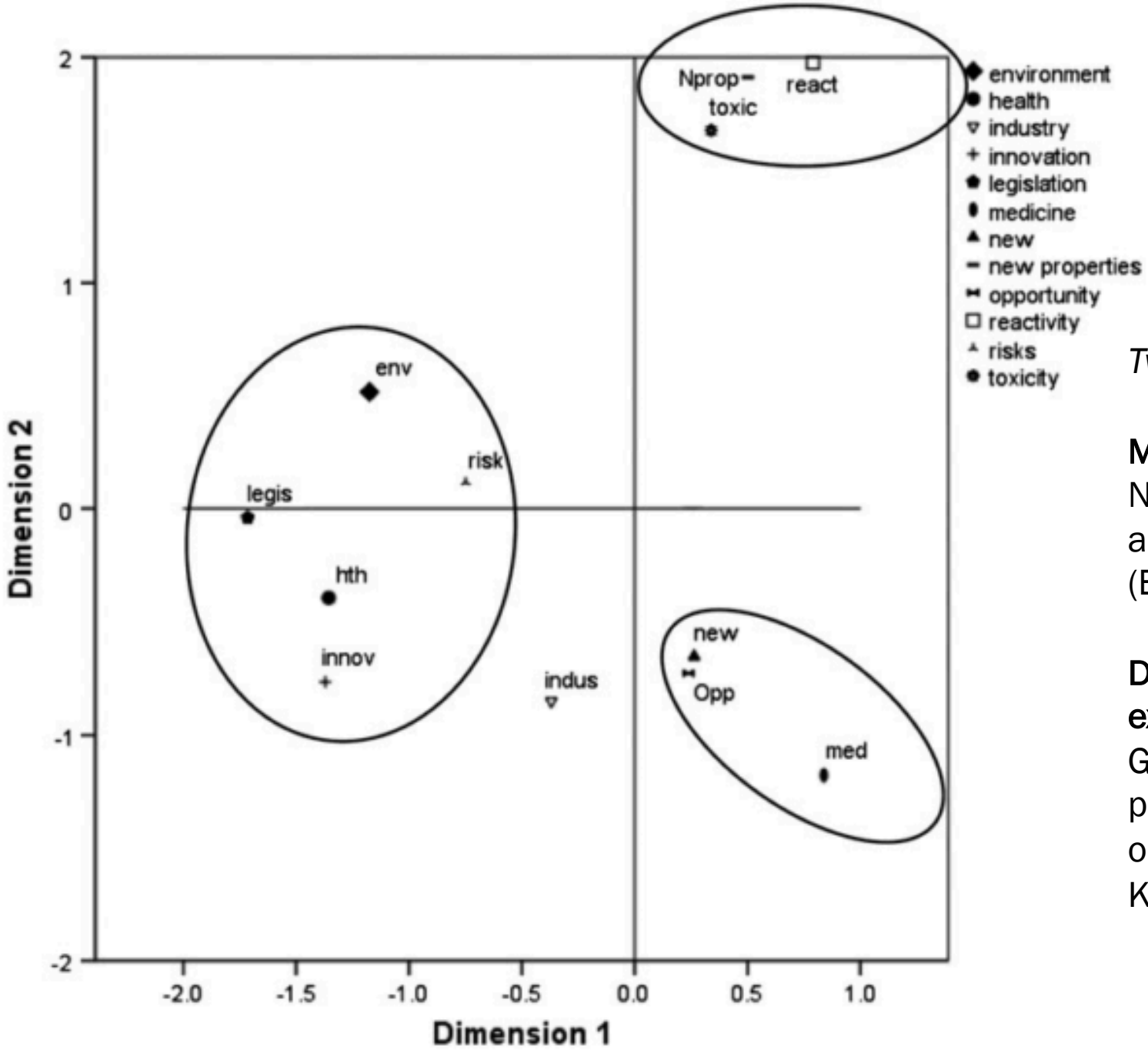

1. Benefit vs. Risk
2. Opportunity vs. Toxicity

Two possible interpretations

Meaning-making as a dilemma

Nanoscientists (in general) also think and argue about nanotechnology in a polarized manner (Billig et al., 1988)

Different representations of nanotechnology exist among scientists

Groups adopting different paradigms would possibly 'cluster' at either end of the overall risk-opportunity field (Babbage & Ronan, 2000; Kuhn, 1995)

Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

GOALS

1. Test the the **polarized** risk-opportunity nature of nanotechnology's social representations – through an instrument
2. Use this instrument to identify whether experts with **different backgrounds** are more (or less) inclined to represent nanotechnology as **risk** or as **opportunity**

Method

- **Construction of the risk-opportunity instrument**: content of the first study, a focus group with nanoscientists, and an internet review (nanotechnology projects and platforms).
  - 13 items
  - "Nanotechnology is an important sector for European economic development and competitiveness"
  - "The development of nanomaterials should be under strict regulatory control"

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Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

- **Administration of the questionnaire**: mailing list of the EU NanoSafety Cluster with 771 addresses). 163 recipients responded (21% response rate)
- **Role**: researchers (66.4%), policy actors (17.1%), administrators (15.1%), and regulators (5.9%)
- **Scientific background**: environmental sciences (38.2%), engineering (27.3%), toxicology (19.7%), biology (19.1%), physics (16.4%), chemistry (15.1%), social sciences (9.2%), medicine (7.2%), and pharmacy (2.6%).

Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

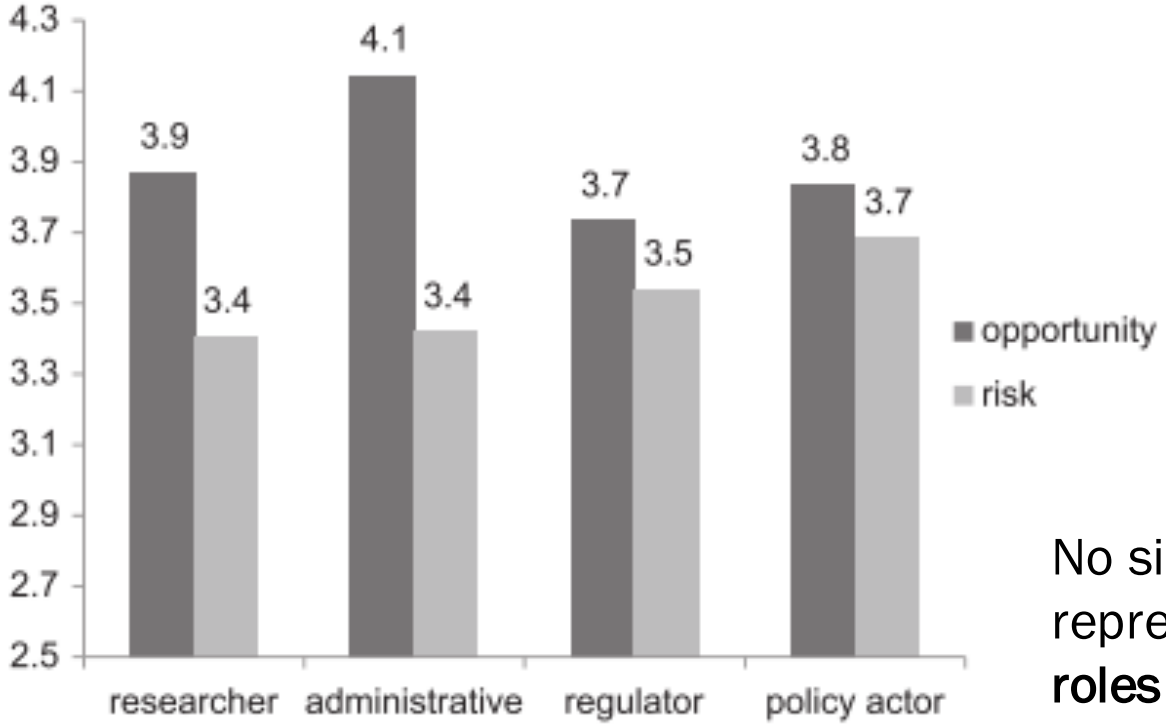
Results

- Instrument submitted to a principal component analysis (PCA), which presented a 2-factor solution
  - *Nanotechnology as **opportunity** (34.05% explained variance)*
  - *Nanotechnology as **risk** (15.45% explained variance)*

$r = -.37^*$

Do experts from different groups have distinct nanotech representations in terms of **opportunity** or **risk**?

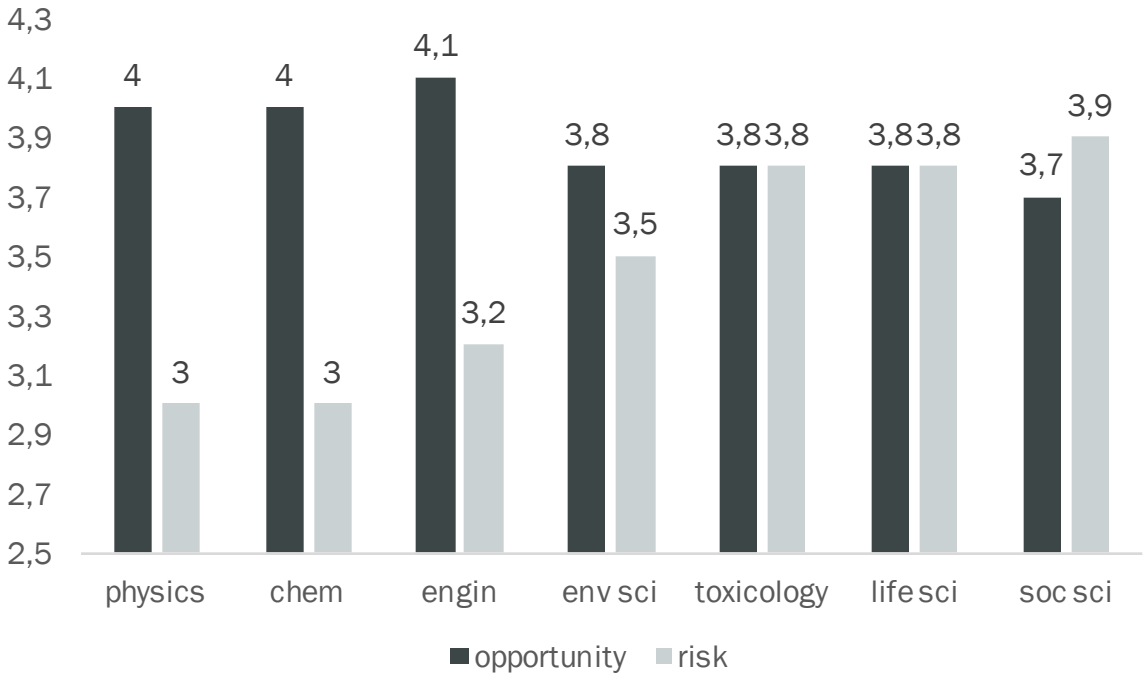
Scores of the opportunity and risk representation scale per role



No significant differences between the representations of participants occupying different **roles**

- Nanotech as **opportunity** ($F(3,122) = 1.26$, *ns*)
- Nanotech as **risk** ($F(3,122) = .95$, *ns*)

Scores of the opportunity and risk representation scale per role



Participants represent nanotechnology "differently" in function of their scientific background

- **No differences** are found in relation to the perception of opportunity ($F(6,136) = .98$, *ns*)
- **Differences** are found in how participants represent nanotech <u>also</u> as risky ($F(6,136) = 5.47^{***}$)

Study 2 - Exploring the opportunity–risk dimension of the nanotechnology representation

- Consensus around the representation of nanotech as **opportunity**
- Lack of agreement in relation to the representation of nanotechnology **also as a risk**
  - **Hard science** experts (physics & chemistry) tend to **downplay the risk dimension**
  - **Life and social science** experts represent nanotechnology both as an opportunity and as a risk – "yes… but" logic (Mouro & Castro, 2010)
  - **Engineers and environmental scientists** agree more than the hard scientists that nanotech also constitutes a risk, yet less than the life and social scientists

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Discussion

- a seemingly **consensual view** by scientists regarding nanotechnology as conveyed by the media (Friedman and Egolf 2011) – open to discussion
- Scientific backgrounds constitute the lens through which experts socially construct risk issues – issues in relation to which they are often requested to intervene
- Behind the "expert" label, a large array of choices (paradigms/scientific practices) are made and taken for granted

– *Importance of describing social contexts and implicit meaning making practices*

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Thank you for your attention!

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