



**Categorizing a field:
The use of the nanotechnology label across communities**

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Field Emergence

- A field is “those organizations that, in aggregate, constitute a recognized area of institutional life: key suppliers, resources, and product consumers, regulatory agencies, and other organizations that produce similar services or products” (DiMaggio and Powell, 1983)
- Recent research emphasize the role external audiences play in constructing organizational form (Hsu and Hannan 2005)
- Fields breed new fields (Davis 2006)
- Multiple communities interact in the construction of new fields (Rao 1994; Bijker et al. 1987)
- Communities are “a set of individuals and organizations that have the same or identical political, economic and social interests” (Arensberg 1954)
- An important aspect of field emergence is the construction of a category that identifies the field (Hannan, Polos and Carroll 2007)

Labels and Field Emergence

- Some studies have addressed the role of language in field categorization processes
- Ruef (2000) shows how linguistic categories influences the emergence of new organizational forms
- Rao et al (2003) investigates how categorization processes influenced the emergence of the nouvelle cuisine
- Hsu and Podolny (2005) examine how belief processes influence categorization processes
- Studies do not address the genealogy of a label

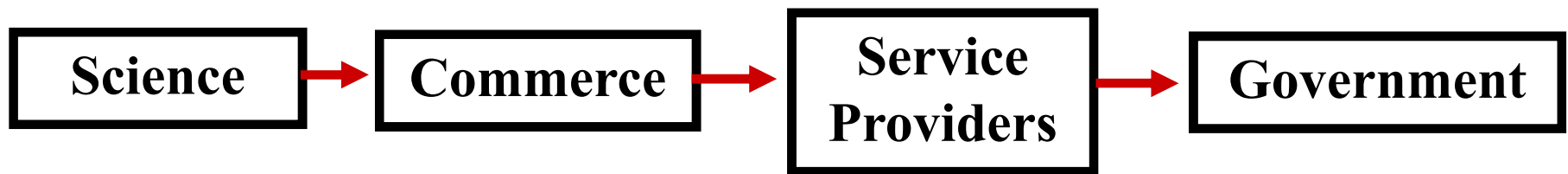
Language

- Language plays a central role in categorization processes (Vygotsky 1987)
- Categorization is socially negotiated (Berger and Luckman 1966)
- Categories emerge and exist in language communities (Becker 1982)
- Labels are a crucial element in the categorization process (Vygotsky 1987; Hsu and Hannan 2005)

Labels

- A label is “a term for categorizing a person, group, or organization on the basis of actual or perceived similarities” (OED 2006)
- One of the earliest events in meaning creation (Hannan et al. 2006)
- Enables categorization (Vygotsky 1987)
- The transfer of information (Glynn and Abzug 2002)
- Disparate groups to organize (Galison 1997)
- Foundation of a category (Hsu and Hannan 2005)

Linear Model of Commercialization



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Research questions

- **What are the mechanisms that drive the use of labels across communities in emerging fields?**

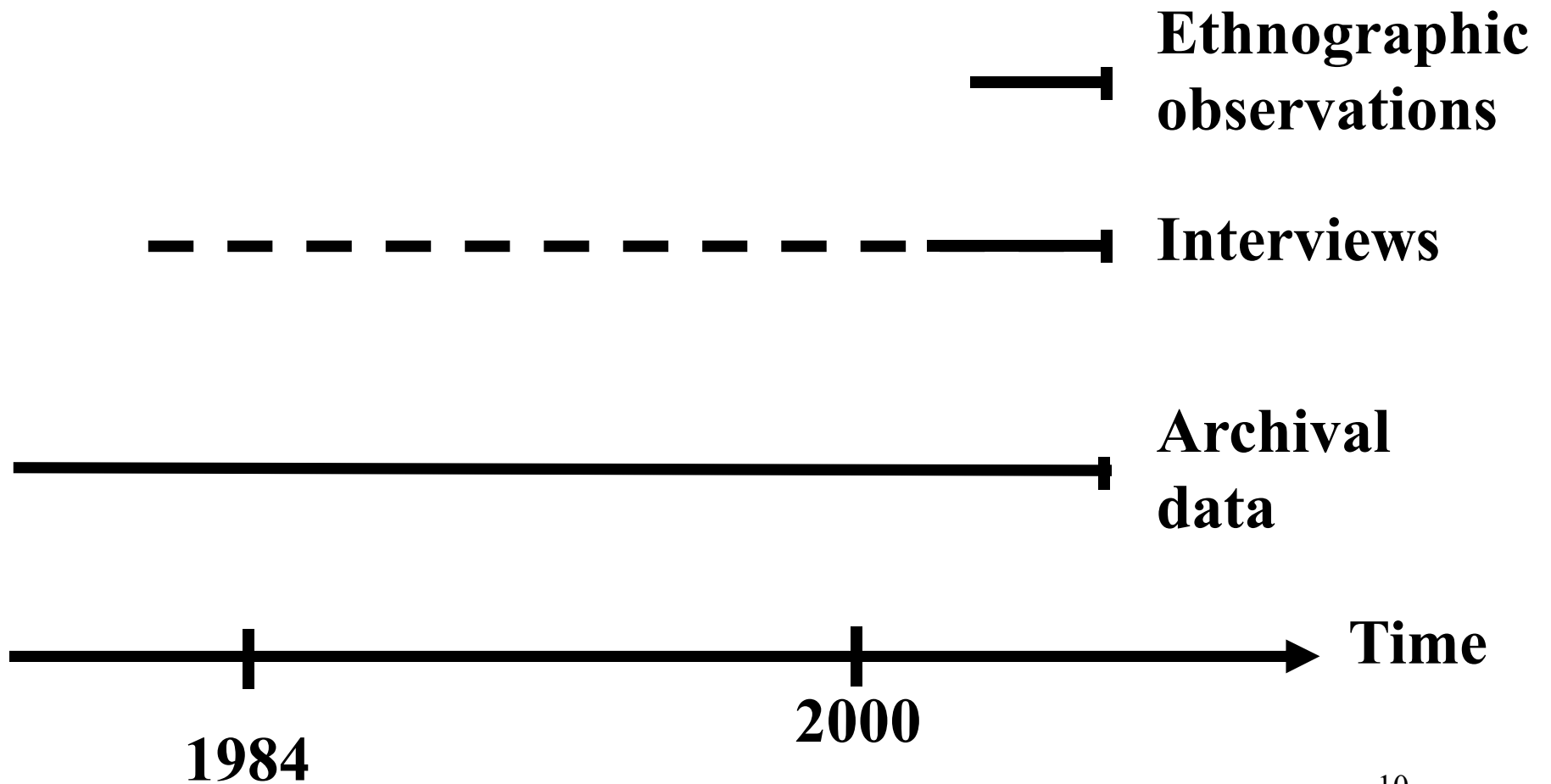
Nanotechnology

- Nanotechnology was still emerging at the time of data collection which enabled real time data collection
- Nanotechnology label was novel and genealogy could be studied and traced
- Current definition of nanotechnology:
Technological capability between 1 and 100 nm.

Analysis

- Hsu and Hannan (2005) call for “analyzing the perceptions and beliefs of actors through semantic analysis of archival documents”.
- Grounded theory (Glaser and Strauss 1967)
- Semantic analysis (Nasir 2005; Kennedy 2005, 2008)
- A goal of the analysis was to identify social mechanisms that facilitated community use of a label (Hedström and Swedberg 1996a; 1996b)

Nanotechnology: Data Structure



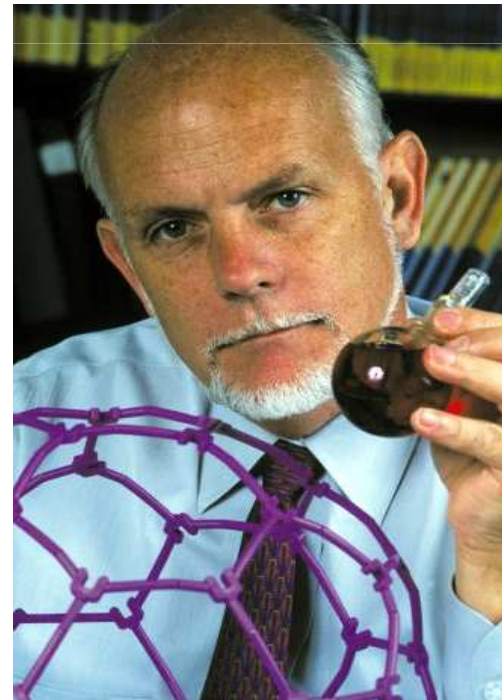
Ethnography

- 25 conferences and networking events
- Took notes, recorded and transcribed presentations
- Identified speech communities (Labov 1972)

- **Scientists**

- Concrete vision:**

- Nanotech focused on chemistry, materials science, biotech, buckyballs and nanotubes



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– **Companies**

Concrete vision:

Creating commercial
products



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- **Futurists**

Grand vision:

Microscopic nanobots



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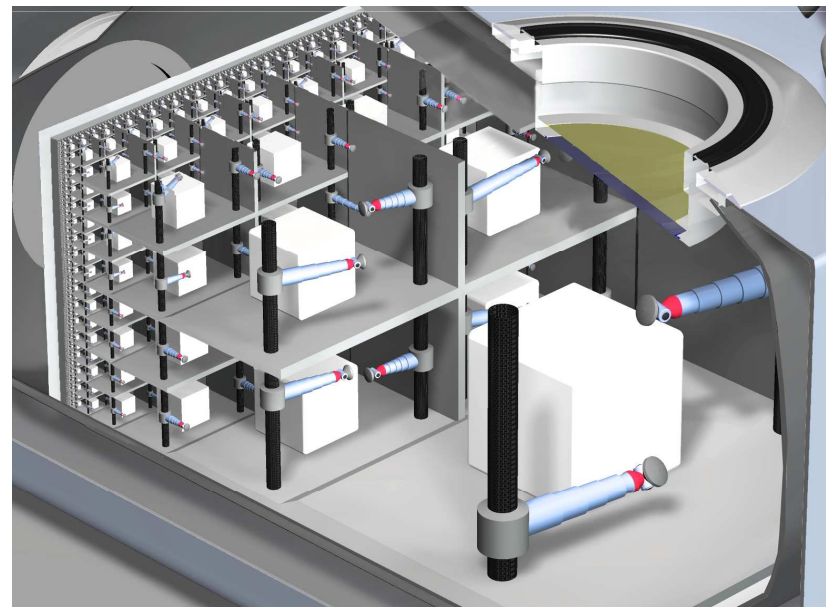
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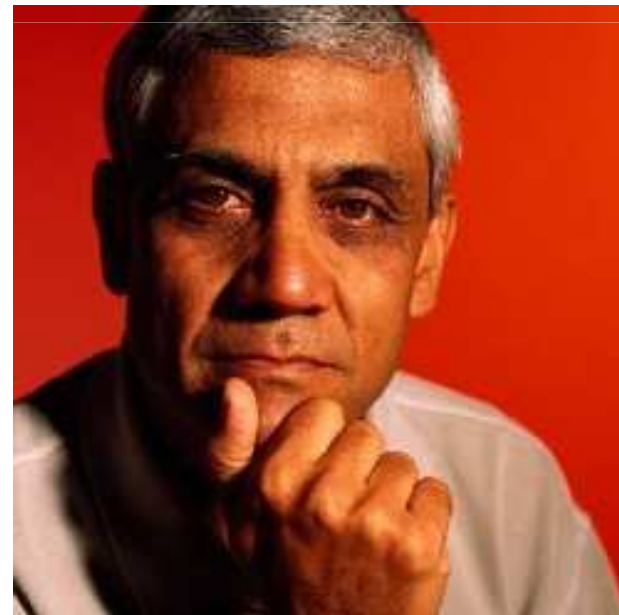
– **Companies**

– **Futurists**

– **Service Providers**

Mixed vision:

Change the world +
make money



Ethnography

- 25 conferences and networking events
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- Identified speech communities (Labov 1972)

- Scientists
- Companies
- Futurists
- Service Providers
- **Government**



Mixed vision: Create economic growth

Interviews

Interviews

Futurists 13

Government 11

Service providers 18

Companies 24

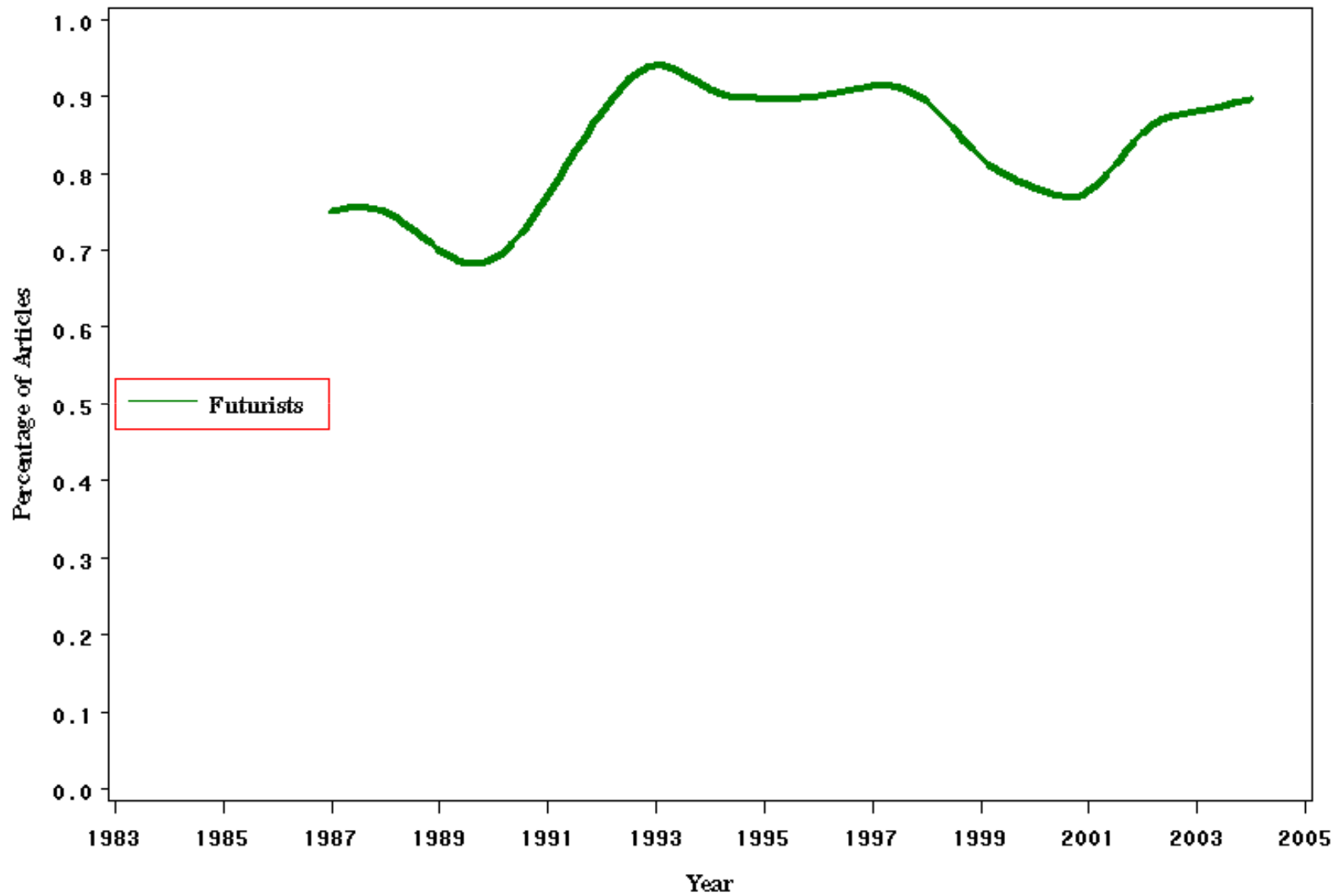
Scientists 11

Total 77

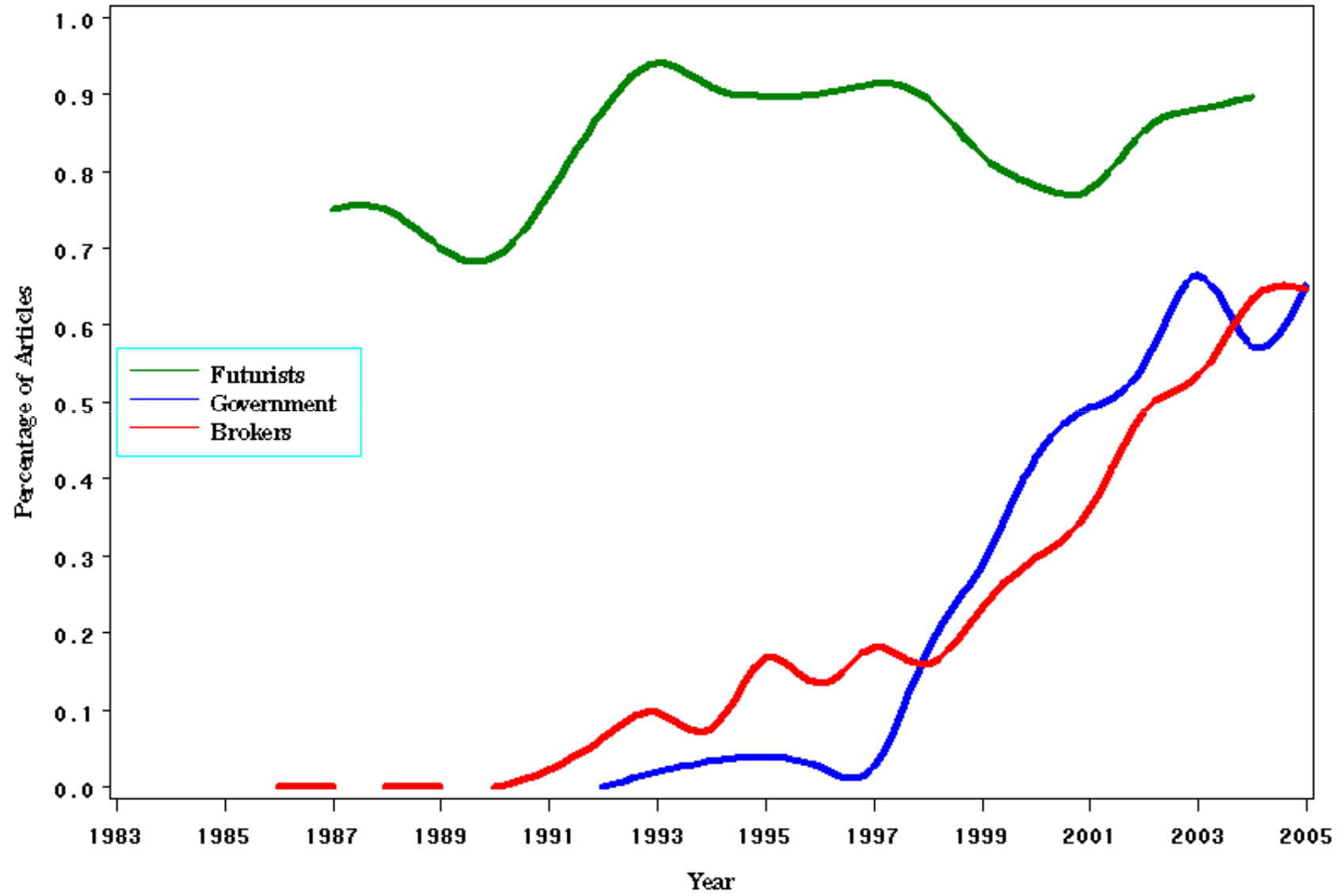
Archival data

Community	Source	Years	Nr. of articles
Futurists	Newsletter	1987-2004	926
Government	Congressional hearings	1991-2005	925
Service providers	Business press	1984-2005	494
Companies	Press releases	1988-2005	4,085
Science	Journal "Science"	1956-2005	2,509
Newspapers	Top 50 US newspapers	1984-2005	3,763
Total			12,774

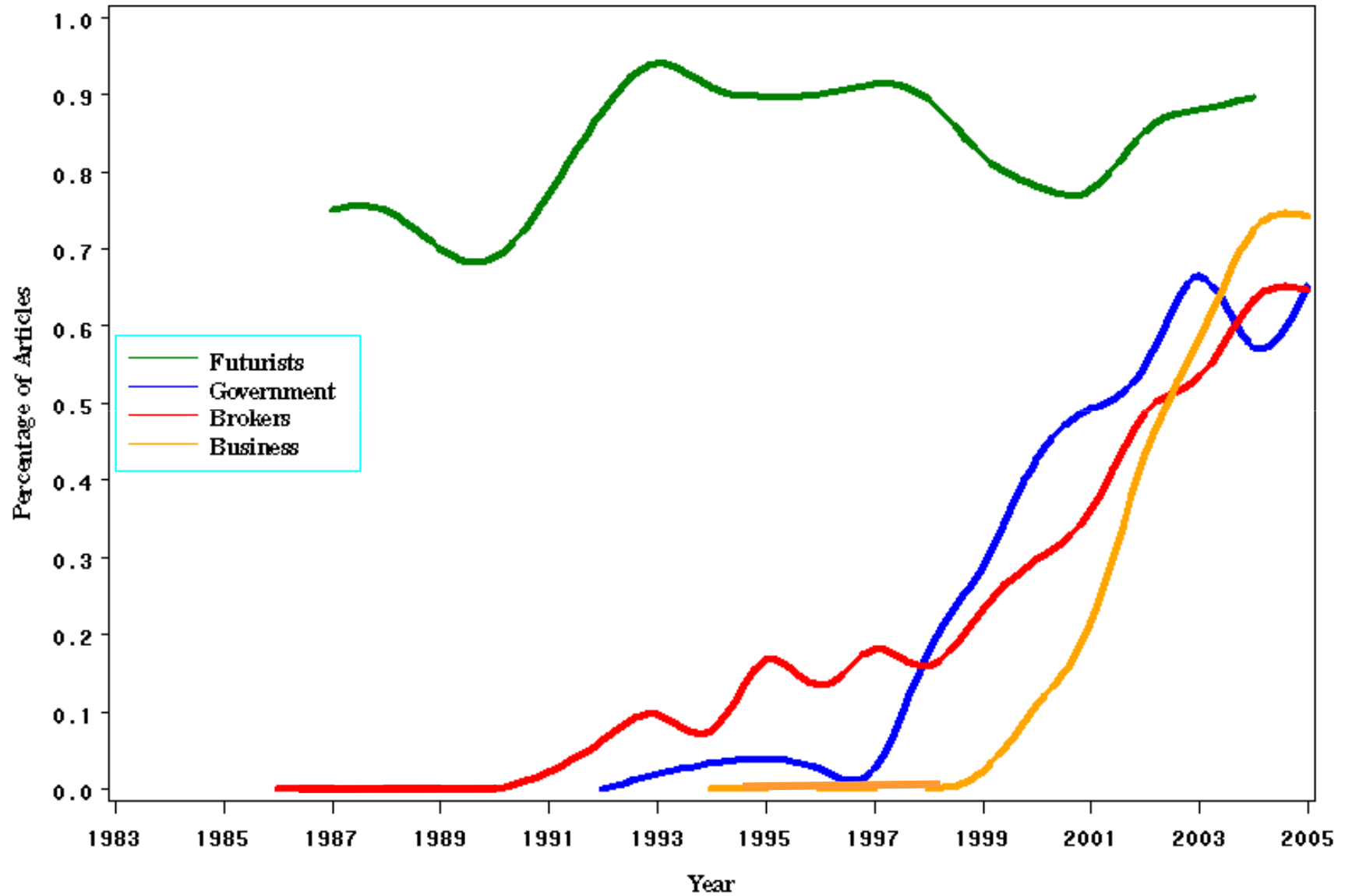
Articles referring to “nanotechnology”



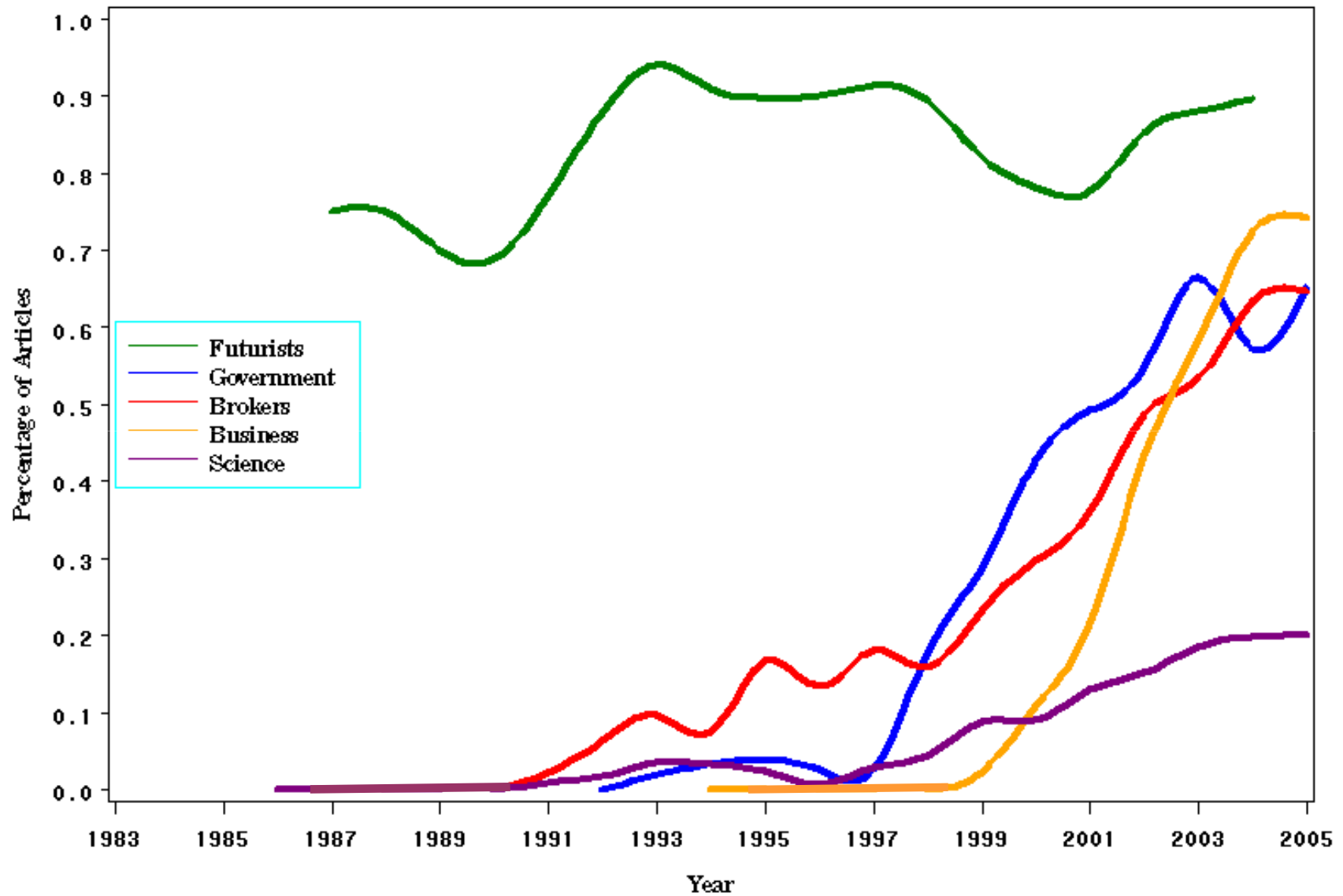
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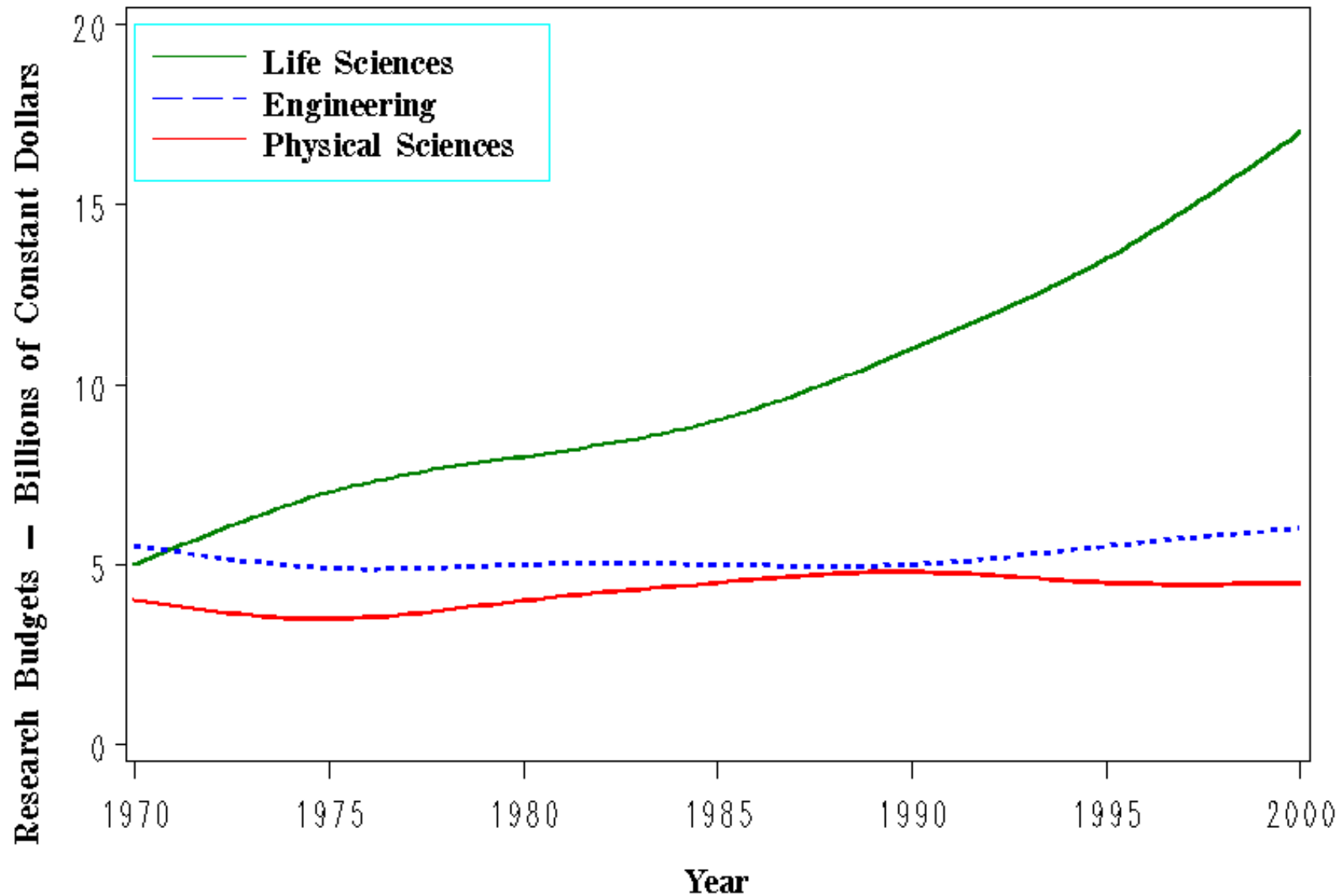
Overview of Findings

Year	1984 - 2000	2000 - 2005
Phase	Mobilization	Institutionalization
Communities	Futurists Government Service providers	Government Service providers Companies Scientists
Mechanism	Symbolic capital	Symbolic capital Economic capital Boundary pressure
Label use	Vision creation	Concretization

Mechanisms: Mobilization

- Symbolic capital facilitated label use
 - Symbolic capital is interpretative and defined by the community in which it is valued (Bourdieu 1991)
 - The five communities attached different symbolic capital to the label depending on the perceived alignment between the label's symbolic structure and the communities language practices
 - The variance of symbolic capital across communities influenced their use of the label

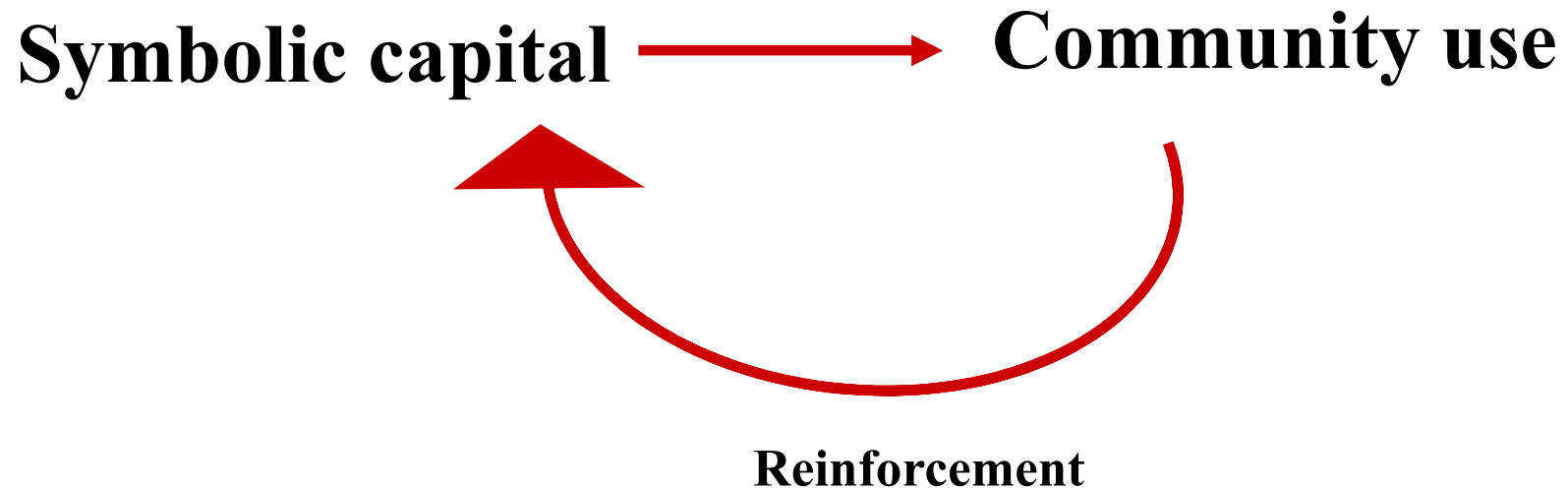
Trends in Federal Research for Selected Disciplines



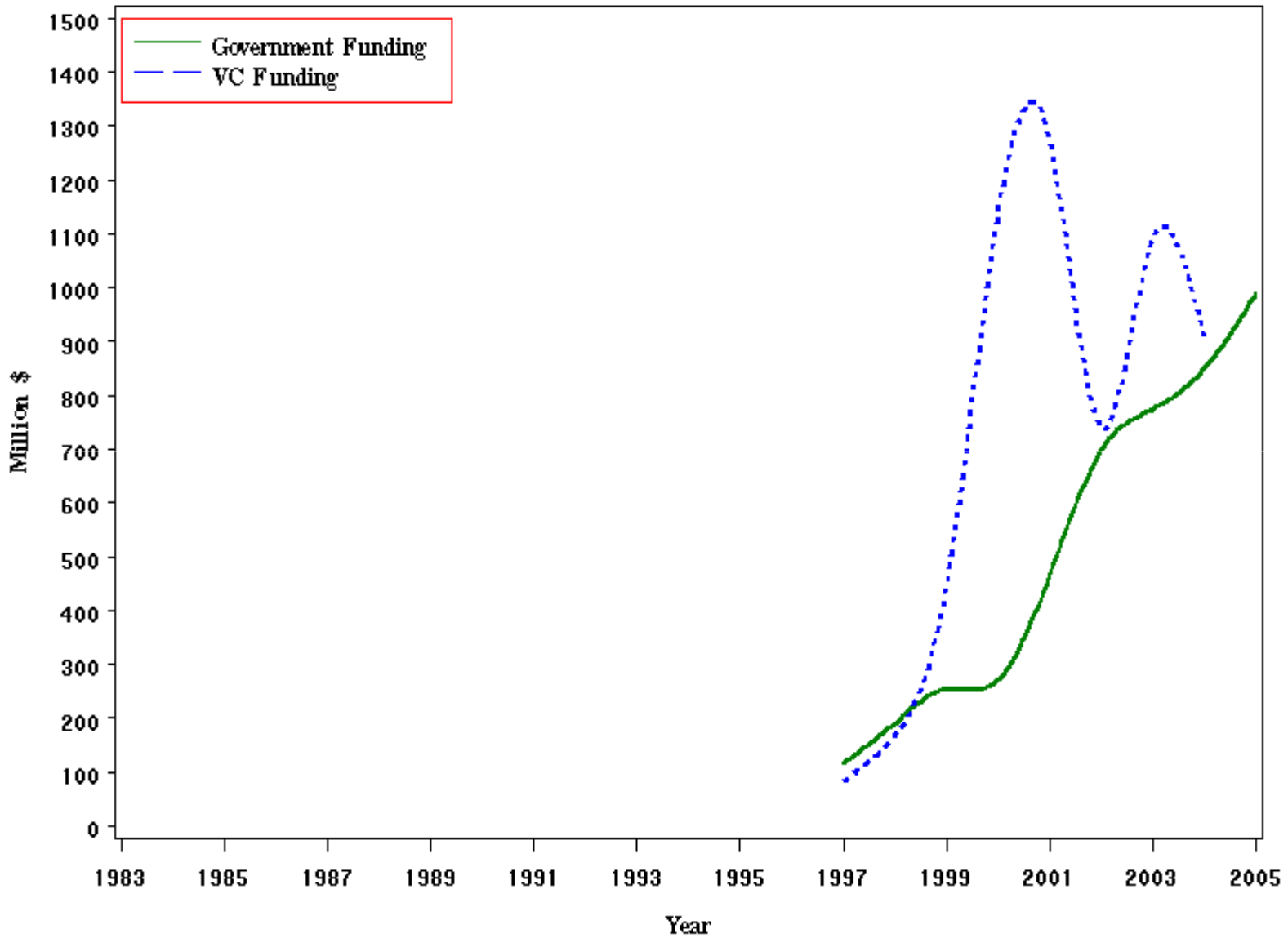
Mechanism: Symbolic Capital

Community	Symbolic alignment w. label	Label use: Vision creation
Futurists	Created label. Strong alignment with linguistic norms of constructing future visions	Yes
Government	Symbolic alignment with political discourse. Creation of political vision	Yes
Service providers	Alignment with their expert position, and visionary discourse	Yes
Companies	Discrepancy with focus on technological accuracy	No
Scientists	Discrepancy with scientific norms of purity in the language of science	No

Symbolic Reinforcement



Government and VC Funding



Institutionalization – Economic Capital

Community	Economic capital	Label use: Concretization
Futurists	Futurist tried to obtain funding but failed	Yes
Government	Influenced use within the agencies	Yes
Service providers	Service providers increasingly used the nanotechnology label to attract attention	Yes
Companies	Companies renamed their activities in order to secure funding	Yes
Scientists	Scientists renamed their activities in order to secure funding	Yes

Renaming of science

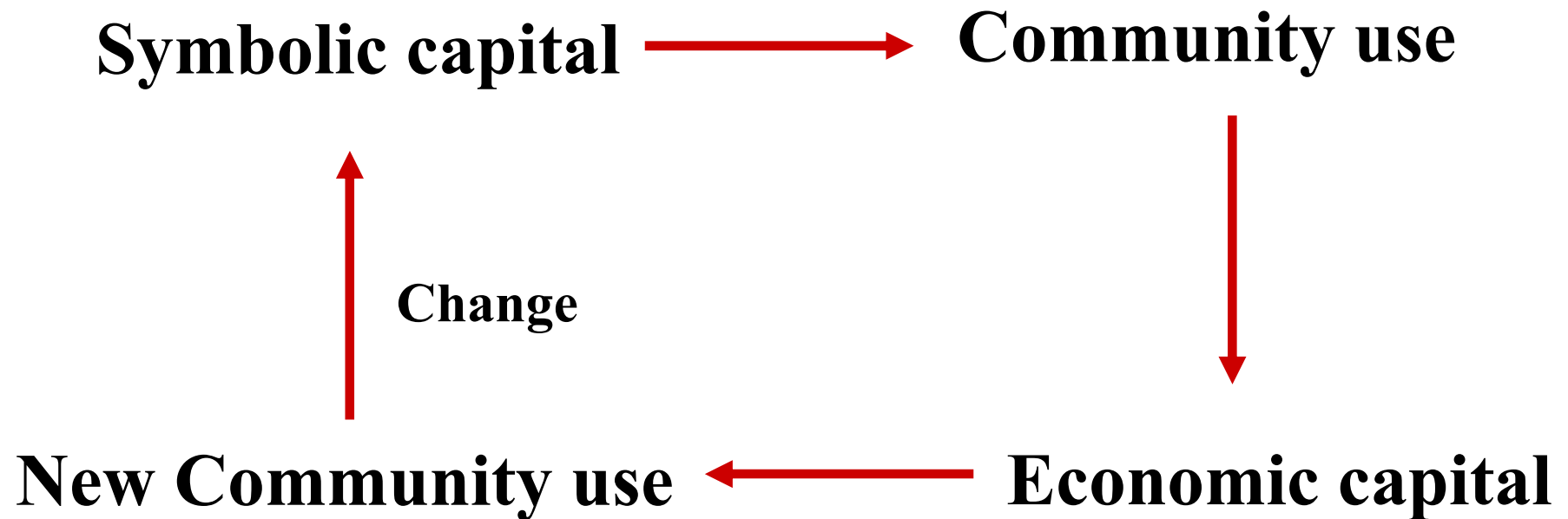
I think [government funding] has just changed what people call it. I think we saw a lot of people change the name of what they are working on. Now they say that they work on nanotechnology and all that really happened is the scale that we pattern accurately decreased and people changed names around to get funding.....Instead of people getting a normal NSF grant they got an NSF grant that had nanotechnology in the title.

What's a nine-letter word for Nanotechnology?
CHEMISTRY

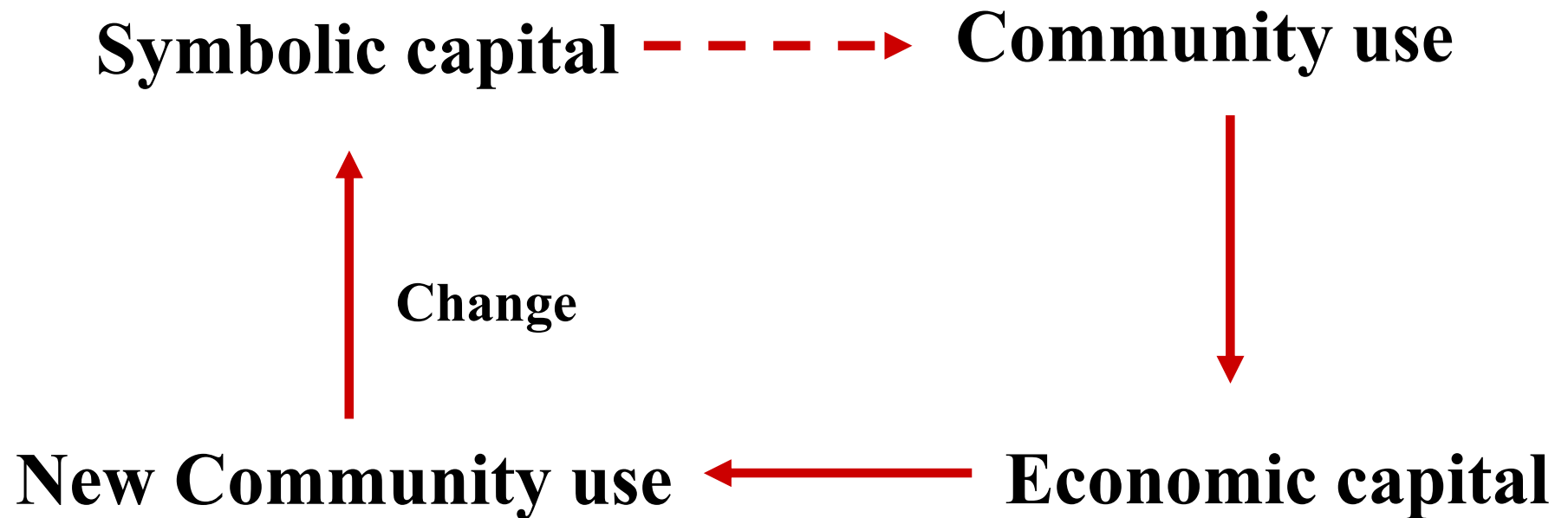


**The American Chemical Society's Spring National Meeting
will feature more than 1,000 presentations on Nanotechnology**

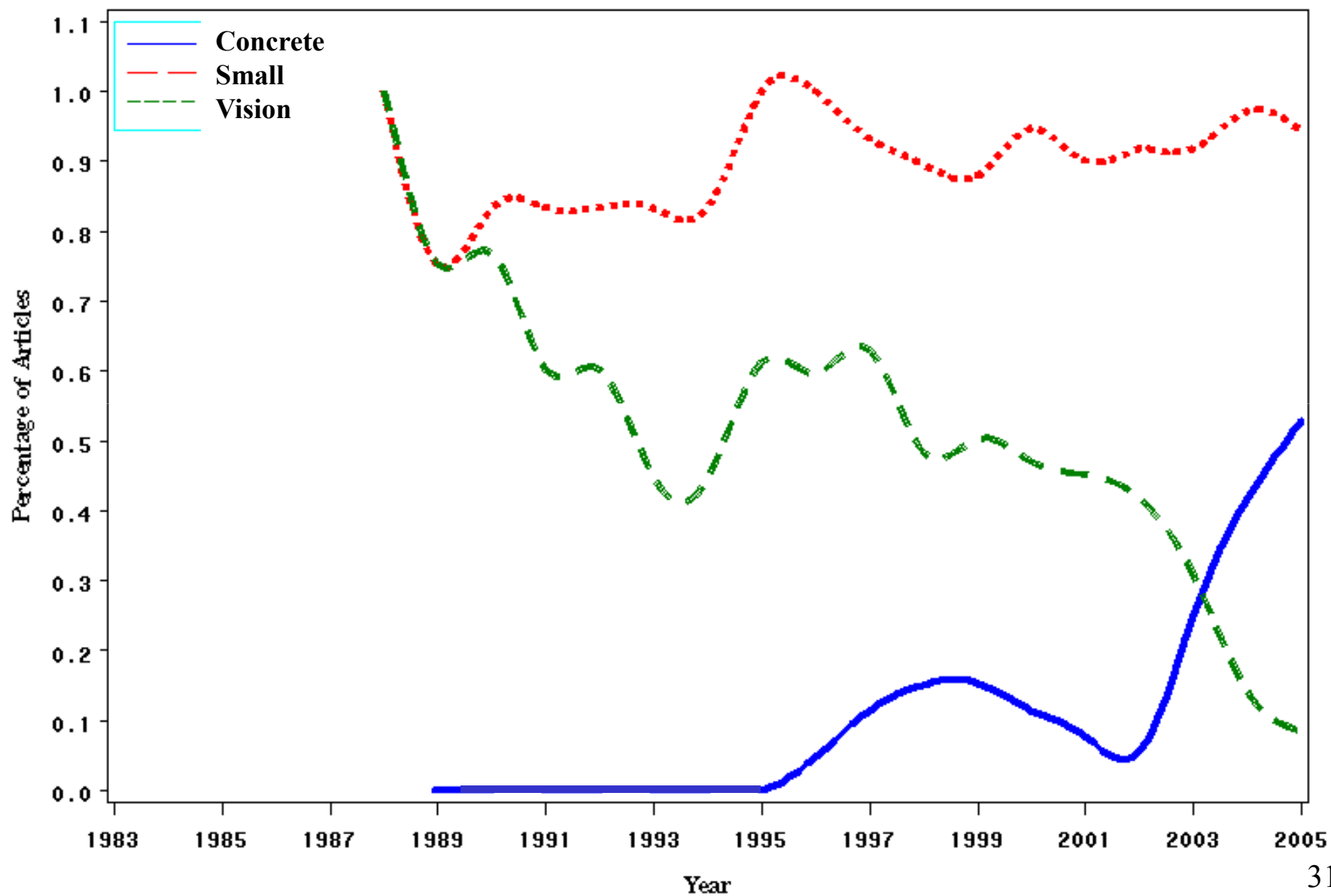
The Economic and Symbolic Dynamic



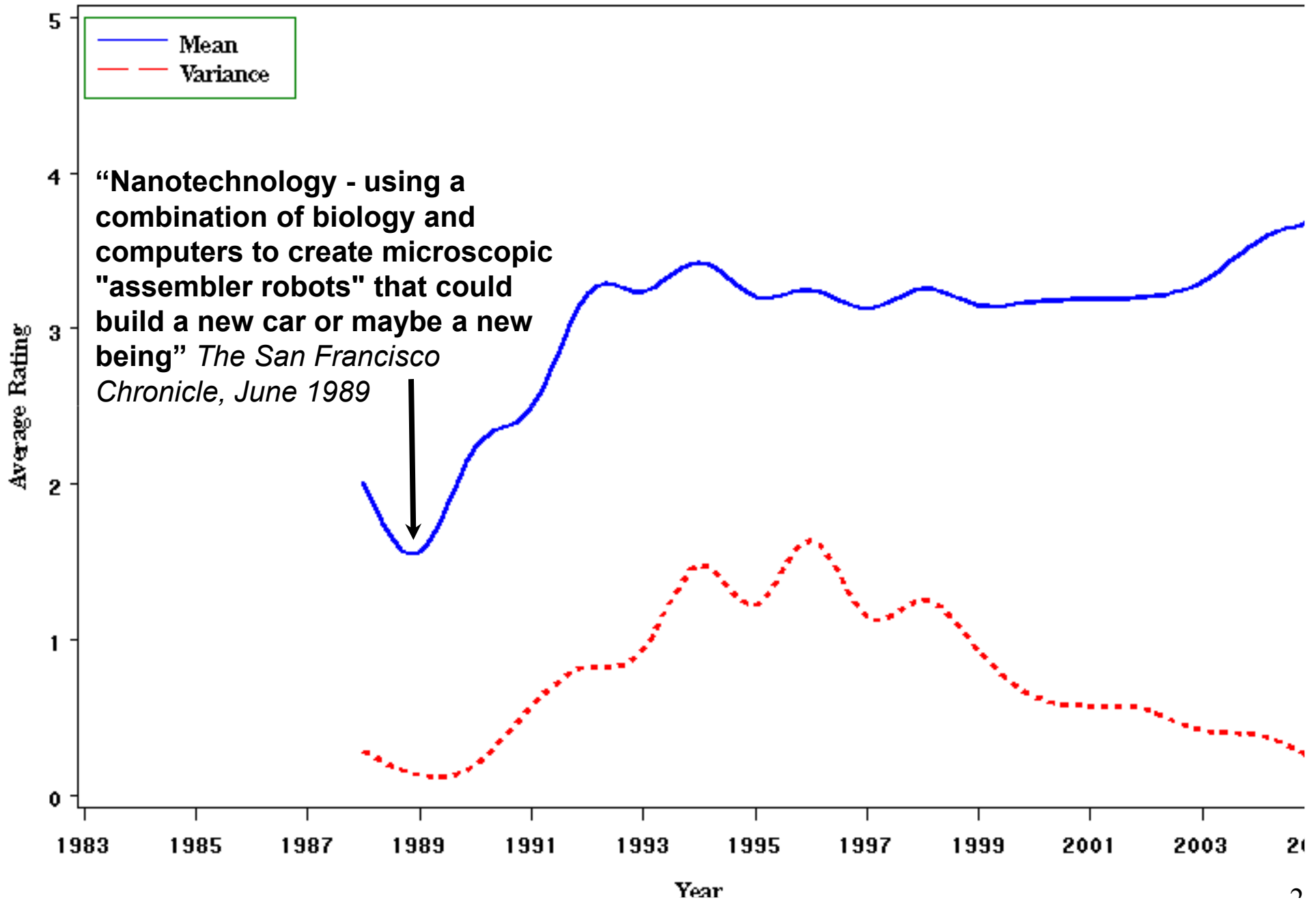
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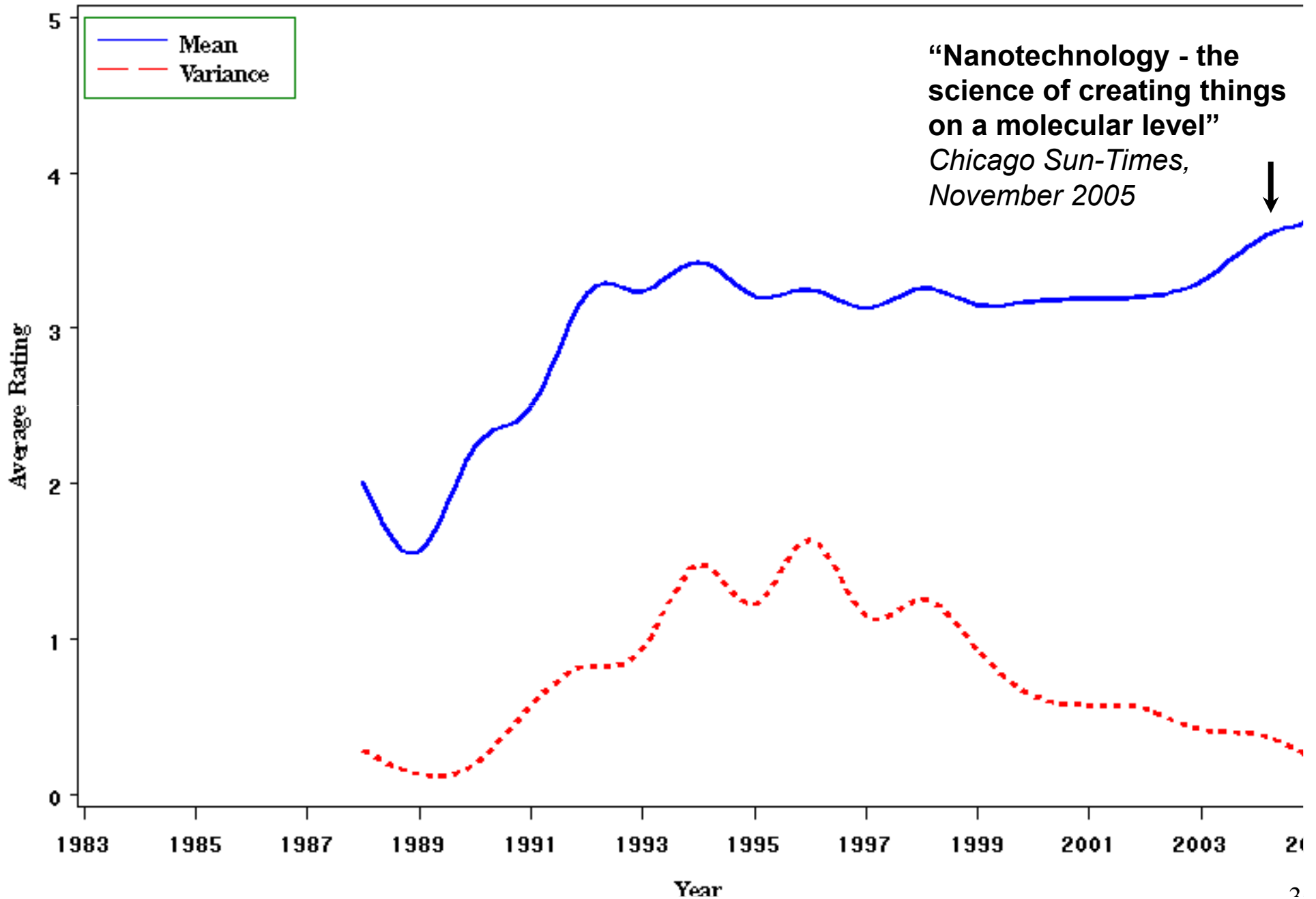
Definitions – Vision and Concrete



Definitions in Major US Newspapers



Definitions in Major US Newspapers



Device, material and smallness

Reference to the device, material and small category

	Dependent var: Device	Dependent var: Material	Dependent var: Small
Intercept	373.9	-641.2	-103.8
Years	.83***	1.38***	1.06
N	147	147	147

*** p<.001

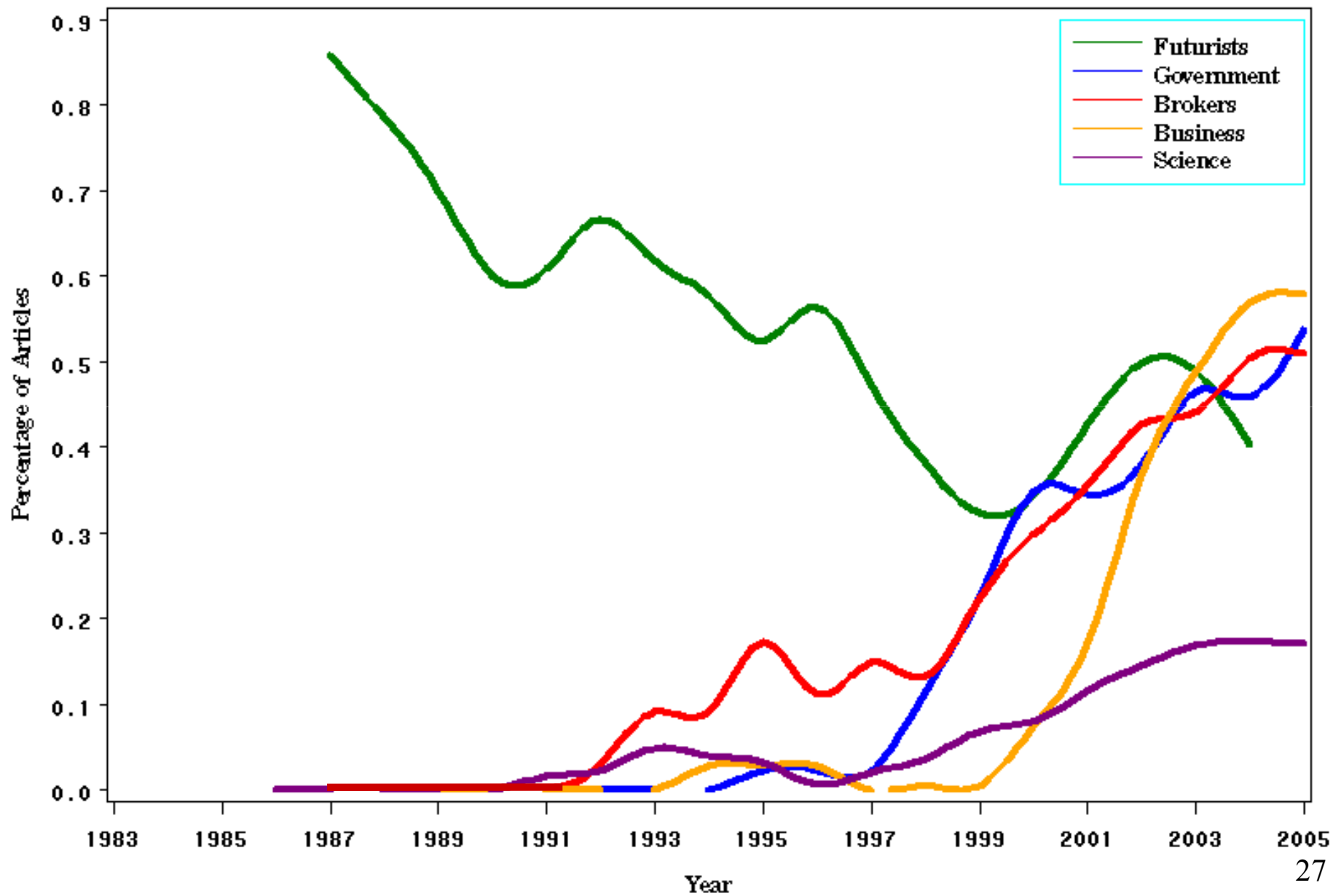
Institutionalization – Symbolic Capital

Community	Symbolic alignment w. label	Label use
Futurists	Change in symbolic structure meant a discrepancy between the label and futurist's discourse.	Diminishing
Government	Symbolic alignment with political discourse. Creation of political vision around concrete science	Yes
Service providers	Alignment with expert position of service providers. Service to companies around concrete vision	Yes
Companies	Change in symbolic structure meant a decrease in discrepancy with technological accuracy	Yes
Scientists	Change in symbolic structure meant a decrease in discrepancy with the language of science	Yes

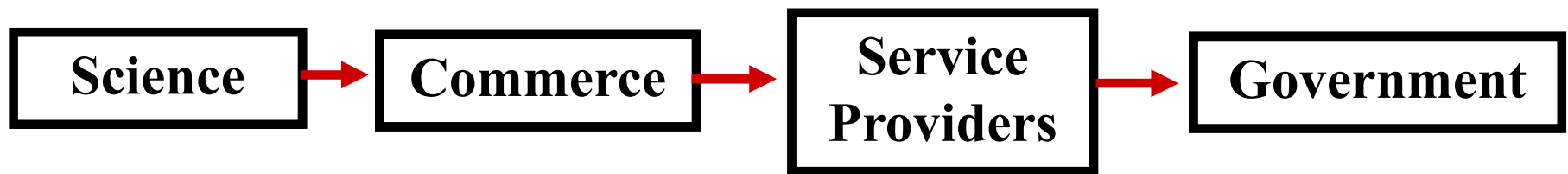
Boundary pressure

Community	Boundary pressure	Label use
Futurists	Felt pressure from government and service providers to terminate label use	Diminishing
Government	Exerted pressure on companies and scientists to join and on futurist to terminate label use	Yes
Service providers	Exerted pressure on companies and scientists to use the label and for futurists to terminate label use	Yes
Companies	Felt pressure from government and service providers to use the label	Yes
Scientists	Felt pressure from government and service providers to use the label	Yes

Articles referring to "Nanotechnology"

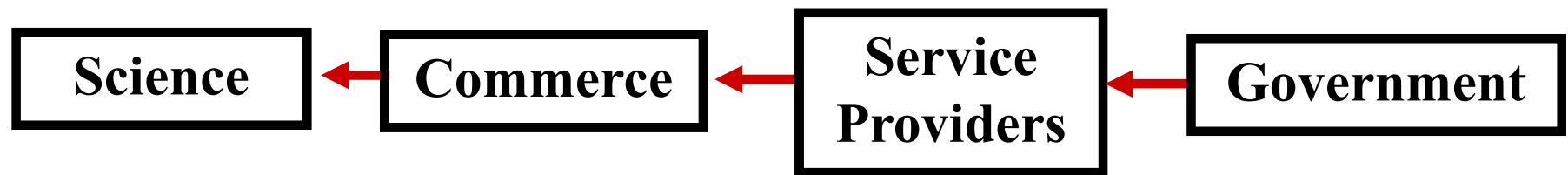


Old Model of Commercialization



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New Model of Field Creation



Conclusion

- Field emergence is characterized by two stages: mobilization and institutionalization
- During mobilization communities use labels due to the labels perceived symbolic capital
- During institutionalization communities use labels due to both boundary pressure, symbolic and economic capital
- The technological development and the linguistic development were initially decoupled. Emergence happened through labeling of technological activities

Theoretical contribution

- External stakeholders began to use the label before commercial enterprises and contributed to the labeling of commercial enterprises
- Commercial enterprises and scientists started to use the label through renaming existing practices
- Field emergence is a *categorization process* fueled by *political contestation*



Questions