Technology Dynamics & Sustainable Development

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Delft University of Technology

Universities in the Netherlands
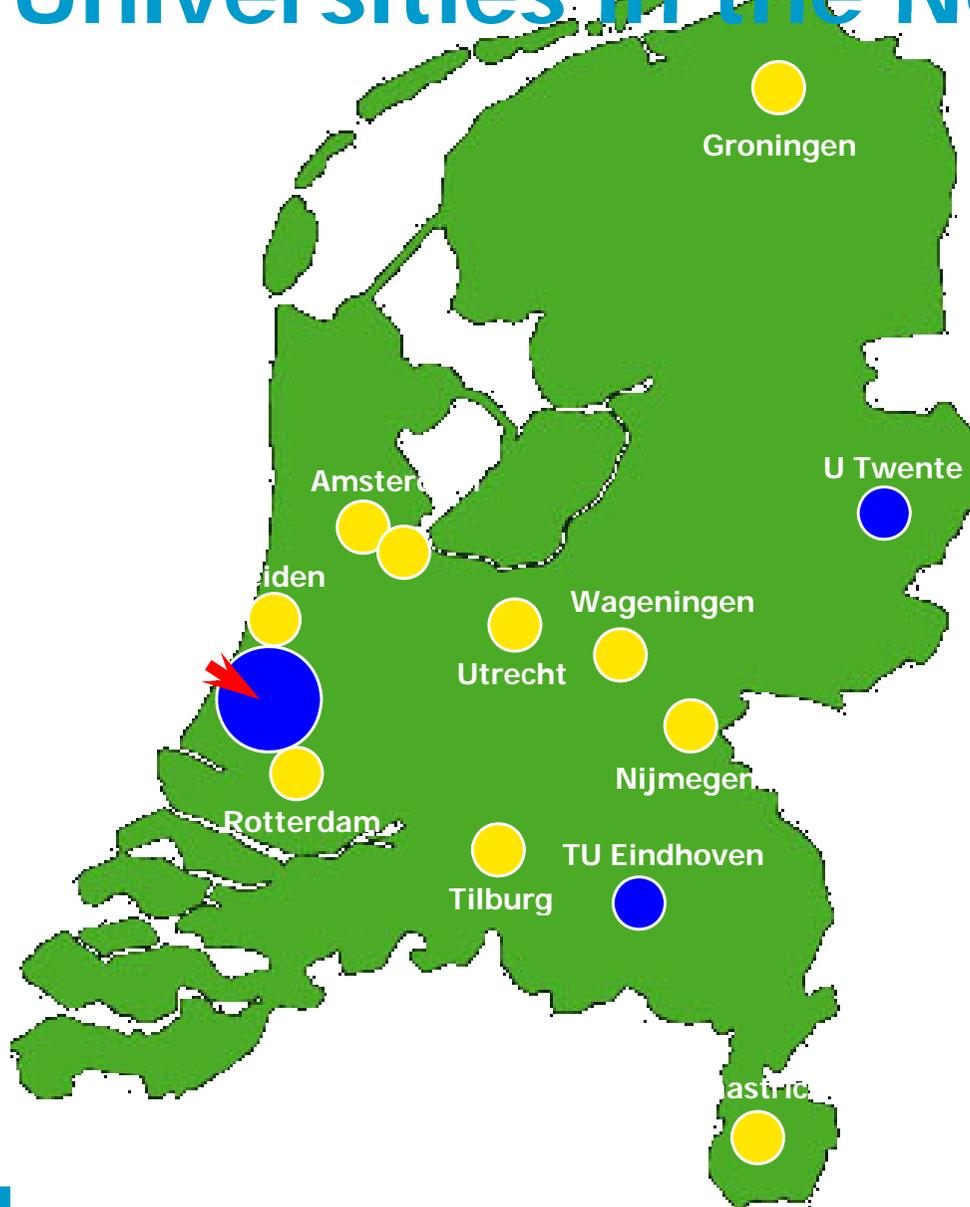
University	Students (±)
Utrecht University	23.000
Universiteit van Amsterdam	22.000
University of Groningen	20.000
Erasmus University Rotterdam	16.000
Vrije Universiteit Amsterdam	16.000
University of Nijmegen	15.000
Leiden University	15.000
Delft University of Technology	**13.000**
Universiteit Maastricht	11.000
Tilburg University	10.000
Technische Universiteit Eindhoven	7.000
University of Twente	7.000
Wageningen University	4.000

TU Delft

Architecture

Electrical
Engineering,
Mathematics and
Computer Science

Applied
Sciences

Civil Engineering
and Geosciences

Aerospace
Engineering

Technology, Policy
and Management

Industrial
Design En-
gineering

Mechanical Engi-
neering & Marine
Technology

THE FACULTIES OF

TU Delft

Scientific and support staff (2004)

Scientific staff: fte 2343

Assistant staff: fte 2128

Total staff: fte 4471

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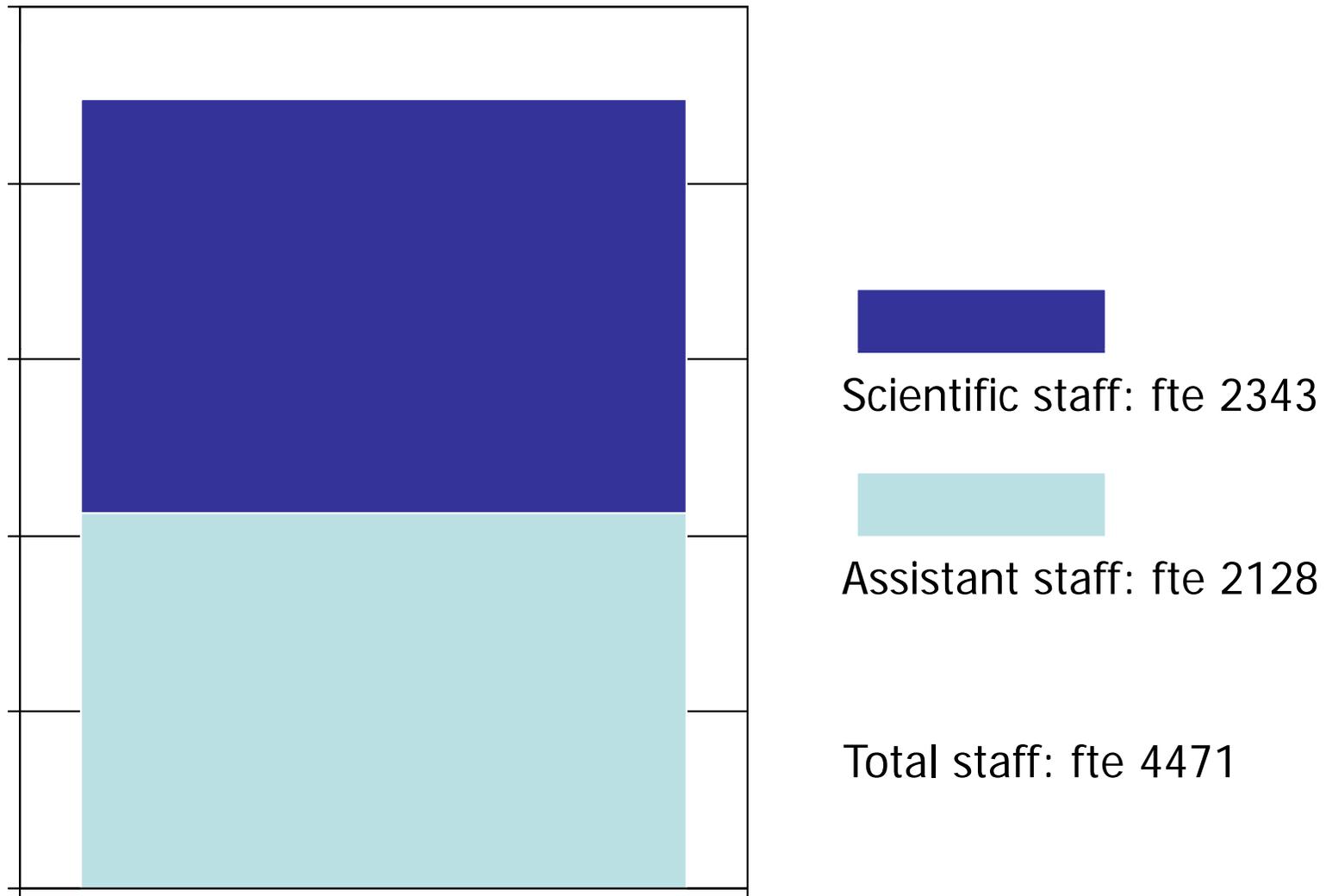
Disciplines

Total number of students: 13.382 (2004, excluding Ph.D. students)

Discipline	Number
Aerospace Engineering	1655
Applied Earth Sciences	246
Applied Physics	509
Architecture, Urban Planning and Housing	2998
Chemical and Biochemical Engineering	315
Materials Science	51
Civil Engineering	1420
Electrical Engineering	552
Geodetic Engineering	43
Industrial Design Engineering	1648
Life Science and Technology	184
Mechanical Engineering	1311
Marine Technology	316
Systems Engineering and Policy Analyses	920
Technical Mathematics	212
Technical Informatics	1002

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Technology Dynamics and Sustainable Development

- Technology Strategy
- Impact of new Technology
- Innovation Policy
- //For Sustainable Development
- Education of Engineers

Supporting societal actors in developing a sustainable technology policy

Supporting engineers in determining their strategy

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To teach engineers how to innovate within a societal context

"We've put the exhaust pipe on the inside!"

Engineers know as little of technology development as fish know of hydrodynamics

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How to involve society in innovation for Sustainability

Innovation in Modern day Society

trends in technological innovation

- Challenge of Sustainable Development± the need for leaps in efficiency

- Trends:
  - Complexity
  - Globalization
  - Emancipation
  - Knowledge economy

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Increasing Complexity

- Increasing complexity, less design redundancies => barriers for change

- Increasing number of expertise fields involved± cars

- Innovation only manageable by modularity and involving suppliers,

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Complexity: a plethora of information

Total US Patent Applications
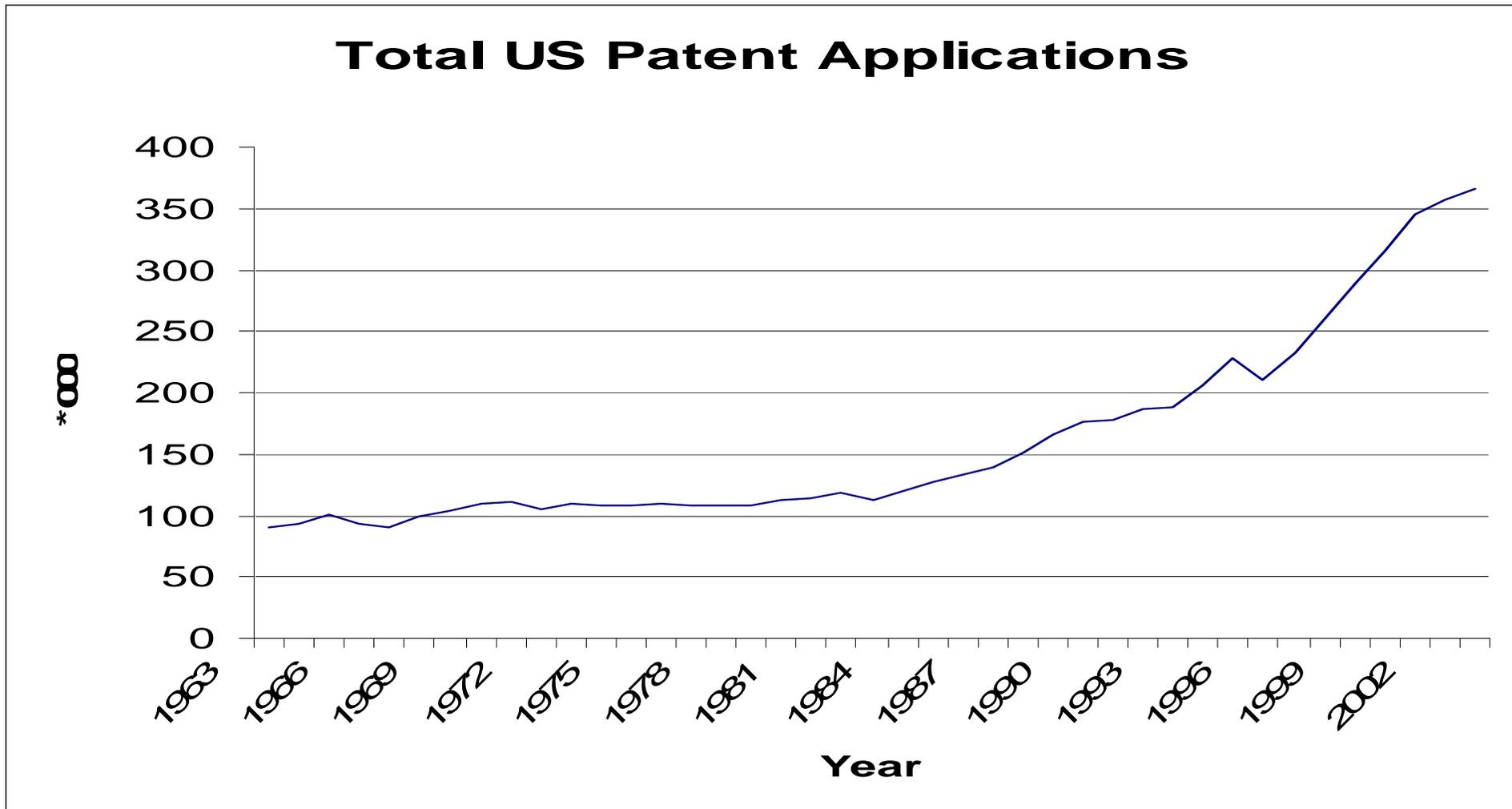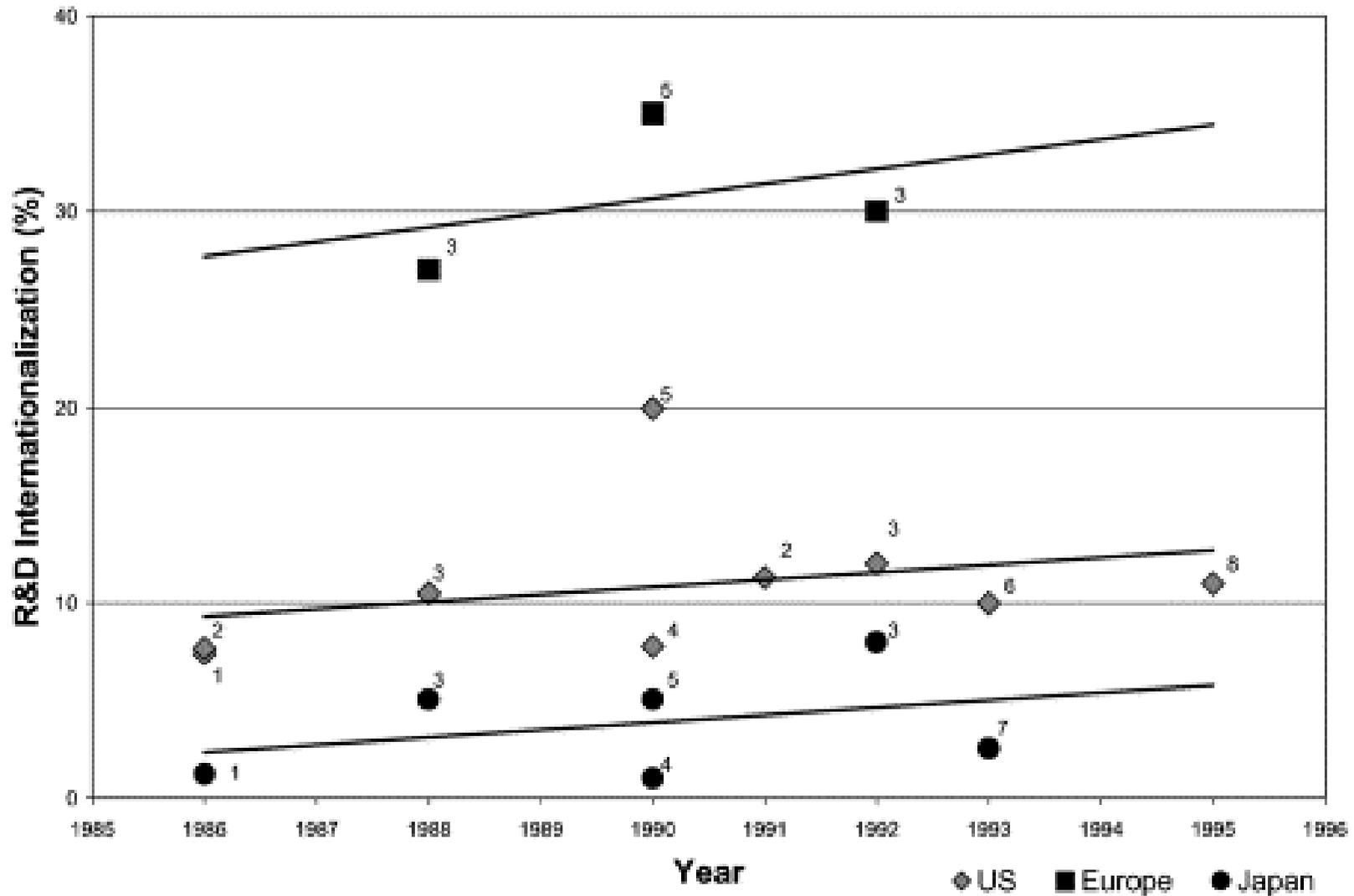
Globalization R&D

Globalization of US Industrial R&D
1989-1998
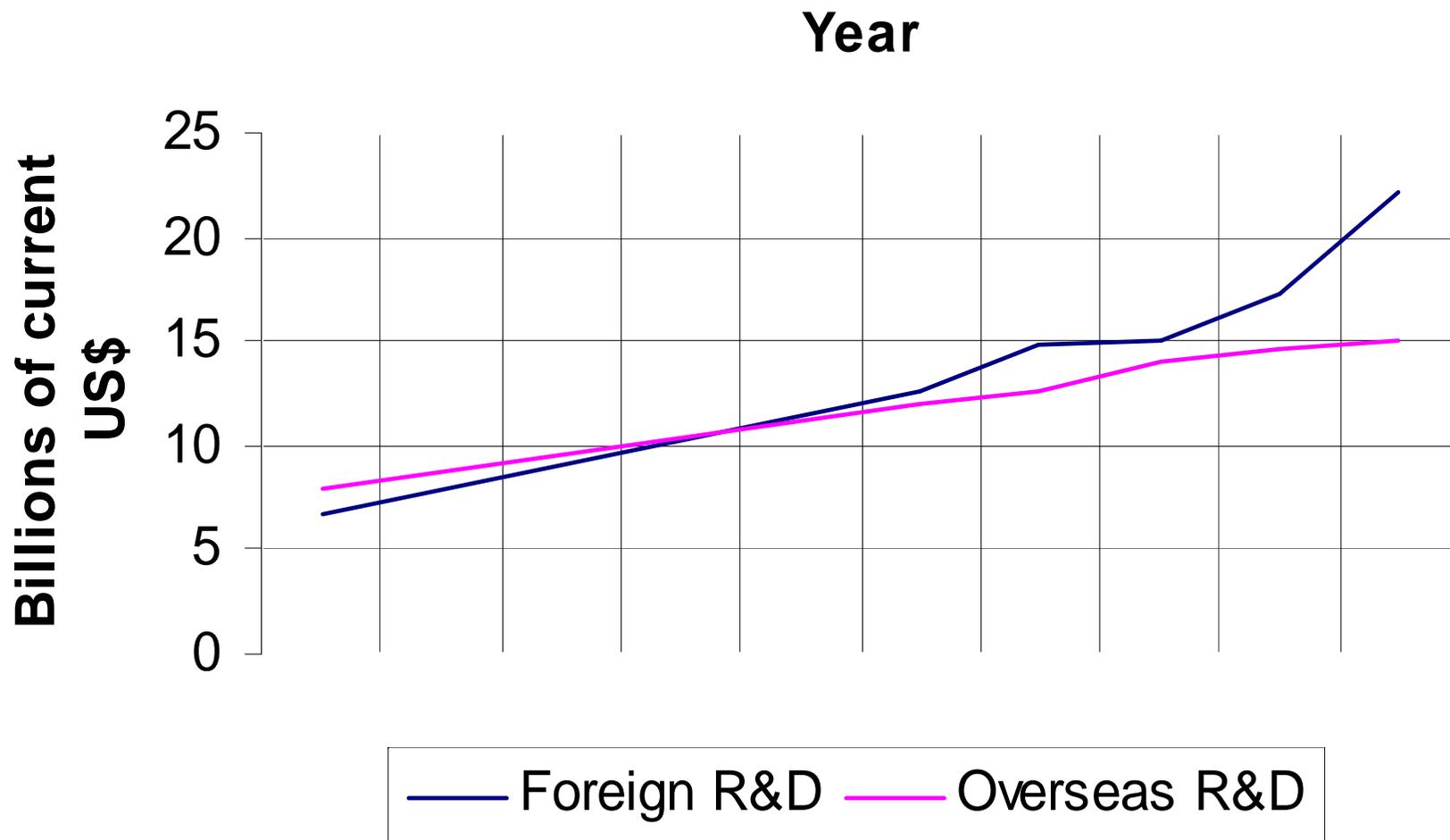
Emancipation & Civil society

- Far more stakeholders involved in decisions

- Open & transparent process: new stakeholders might emerge

- Government approval not sufficient for public legitimacy

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Emancipation: Participation in Higher Education 1970-1996

	1970	1996	Increase %
Albania	25469	34257	34,5
Austria	59778	293172	390,4
Bulgaria	99596	262757	163,8
Finland	59769	226458	278,9
Iceland	1706	7908	363,5
Italy	687242	1892542	175,4
Netherlands	231167	468970	102,9
Norway	50047	185320	270,3
Romania	151885	411687	171,1
Spain	224904	1684445	649,0
Sweden	144254	275217	90,8
United Kingdom	601300	1891450	214,6

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The knowledge economy

- Knowledge production becomes harder but more important for the economy:
    - *Value increasingly created by knowledge*

- No national protection for research: economies of scale -> concentration

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Clustering

- Research is taking place 'where the action is'
- Researchers like to live in a vivid culture
- Informal exchange of know how
- Rich labor markets

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Research & Development clusters

N=1021

Legitimations of Research

Have shifted:

- Glorifying Gods' creation, Medieaval
- Enlightenment, abandoning superstition,18th century
- Progress, raising society, 19th century
- Utility, Science as production factor, 20th century
- Creating a Sustainable Society, an enterprise for which everybody is invited, ... but that has consequences for doing research

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