

# The new Geography of Science

*China's rise to scientific excellence*

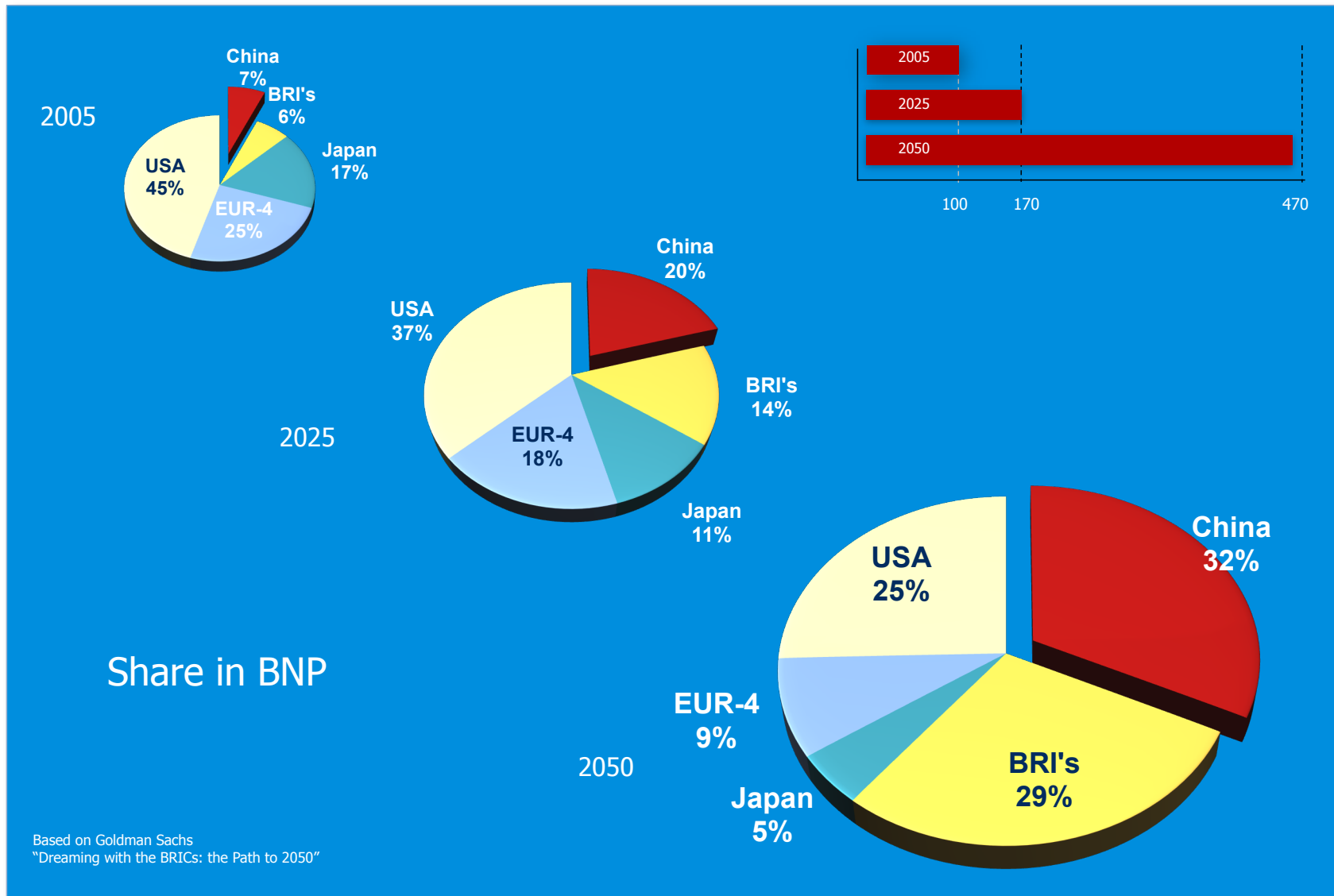
Dirk Jan van den Berg  
Delft University of Technology

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The Netherlands

# Structure of Talk

- **The Asian context** - the new geography of science
- **China's ambitions in Science** - the sky is the limit
- **Why the hurry?** - make the Chinese happy
- **State of play** - do the numbers add up?
- **Role of Regions** - a thousand flowers bloom
- **Culture and Creativity** - can Chinese do research?
- **Trends, pro's and con's** - can we really predict?
- **Models for Cooperation** - can we work together?
- **Policy recommendations** - time for action

# The Asian context - 1/3



# The Asian context - 2/3

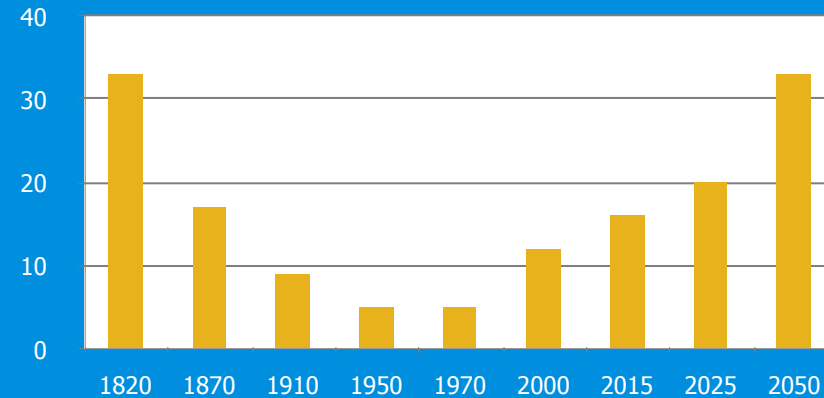
## What we see / What they think



What we see

1980

Share in World Economy



What they think

China's  
RE-emergence on  
the world stage



What we see

2005

# The Asian context - 3/3

- Two poles: China/Japan/Korea and India
- Giant domestic markets (potentially)
- People and Skills
- Computer power, (accessible) prime tool of Science
- Emergence of new sciences
- Ethics of Research
- Active Government policies



Huge investments in R&D (infrastructure)

- Results driven approach to ethics
- Ethical risks
- Human trials

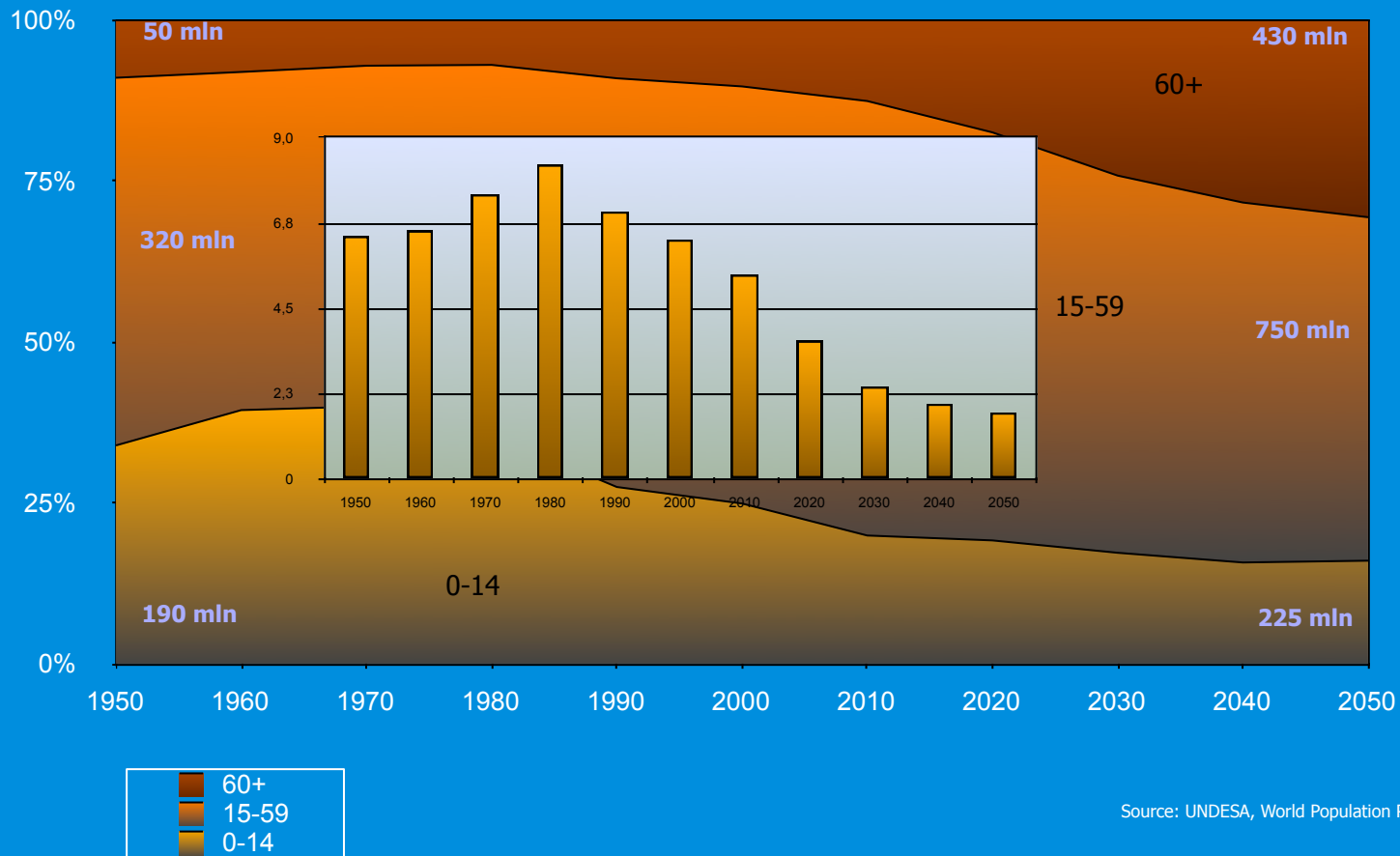
India and China – 2.5 bln. people  
China: urban middle class emerging  
India: 75% population under 25 yrs.

India: 2.5 mln. graduates per year  
6000 PhD's per year  
China: 8 mln. graduates per year  
25.000 PhD's per year

- All sciences depend on computer power
- Bio / nano / ict relatively new fields with tremendous potential

# China's ambitions, why?

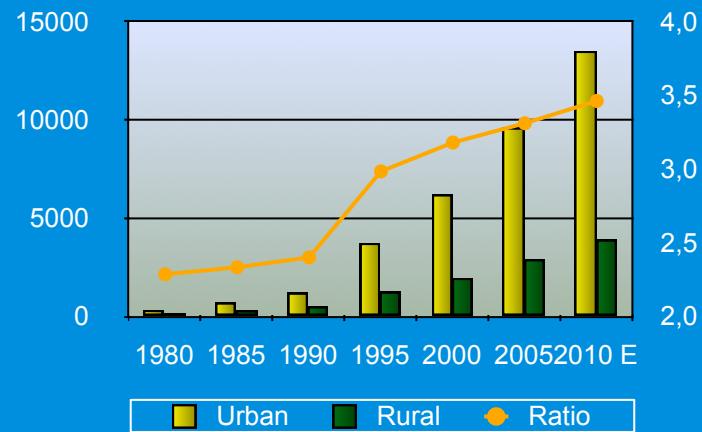
## Age composition of China's population



# China's ambitions, why?

## Income distribution in China

Disposable net household income urban / rural



# China's ambition in Science

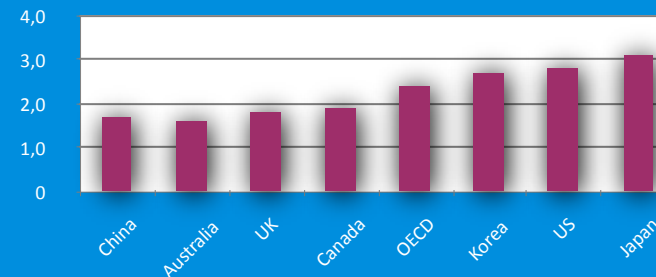
## Policy Goals

- By 2010 R&D-expenditure will be set at 2% (360 bln. RMB)
- By 2020 R&D-expenditure will be set at 2,5% (900 bln. RMB)
- By 2020 reliance on foreign technology will fall below 30%
- By 2020 the number of Chinese generated patents will be annually among the top 5 in the world
- By 2020 the number of citations in the international research journals will be annually among the top 5 in the world

## Ambitious Programs

- **16 special research projects** (core electronic devices, wide band mobile wireless communications, breed new transgenic biological varieties, prevention of infectious diseases, manned space flights, etc.)
- **8 top technology areas** (biotech, IT, new materials, adv. manufacturing, adv. energy, marine technologies, lasers and aerospace.)
- **8 science challenges** (deep structure of matter, mathematics, earth systems science, cognitive science)
- **4 major research programs** (protein research, nanoscience, growth and reproduction and quantum modulation research)

R&D pct BNP

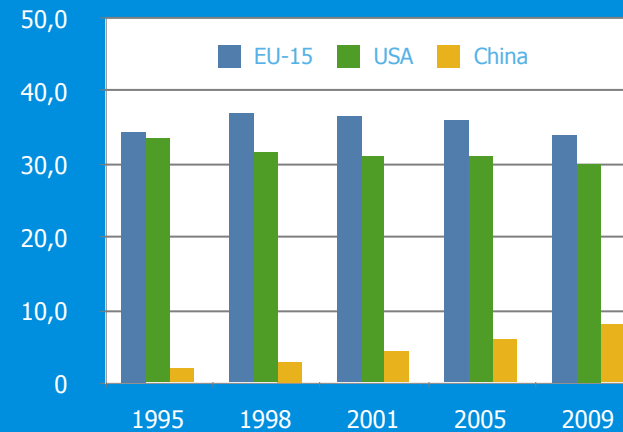




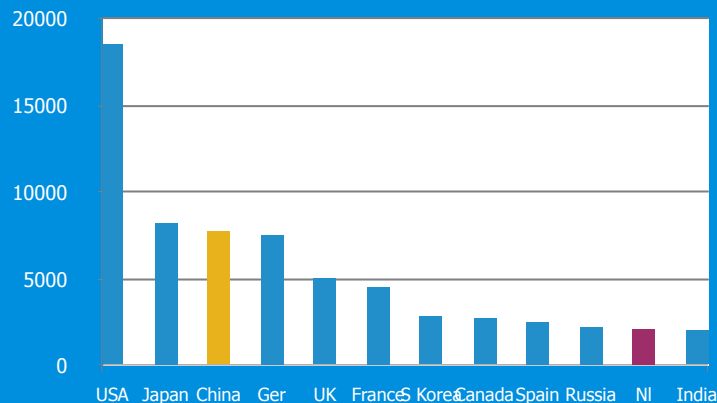
# State of Play

- Home grown enterprises: low spending on R&D; 0,5% of sales; little sign of high-tech start up culture;
- Less than 0,1% of Chinese companies own the technology they produce;

### Share in World Publications

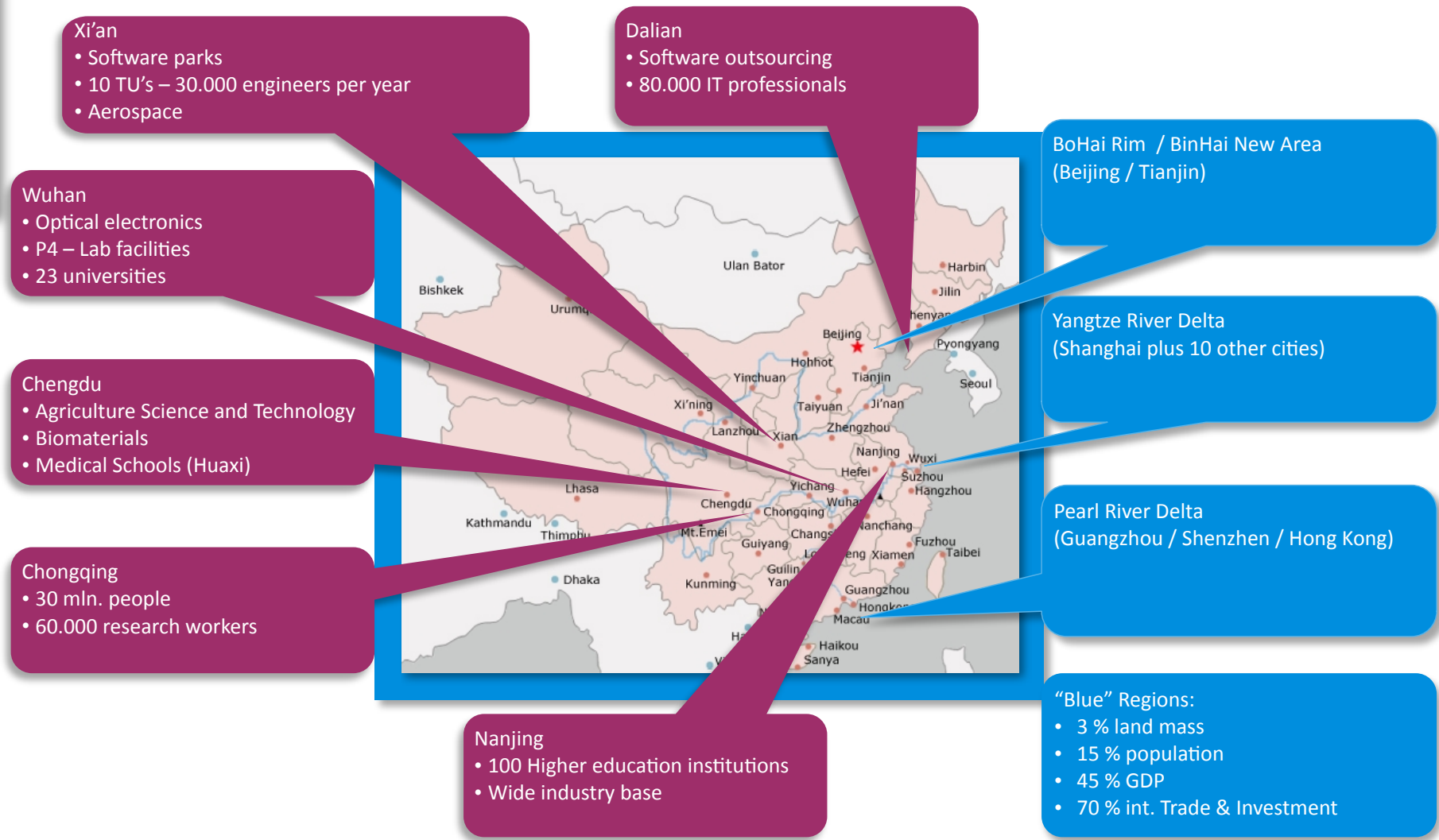


### Publications nanoscience 1999-2004



- More than 400 out of the world's top 500 companies have invested in China;
- Over 700 R&D laboratories have been set up in China since 1993 (Motorola was the first in 1993)
- Economist Intelligence Survey: 39% of the surveyed companies will spend most of their R&D in China in the coming 3 years.

# Role of Regions



# Culture and Creativity

Lucien Pye: "No other political culture relies so much on the pleasure of suspending disbelief".

## Approach

- "Scientific development": Facts will lead to solutions; great reliance on the belief that society can be engineered; technology focused;
- Fact finding relies on information gathering: Elaborate systems and tied disciplines on gathering information and on reporting are in place everywhere;
- Information: Needs to be managed and carefully channeled through;

## Culture

- Confucius: Harmony through revering relationships between members of family, school, village, clan, province, empire; respect for father, teacher, authority; authority should not be put into question.

Individual: Focus on contribution to society; fulfill expectations; no relevance for soul searching

Authority: Is expected to act as a "caring father"; is not necessarily "hands on"; should not be directly challenged;

# Trends: pro's and con's

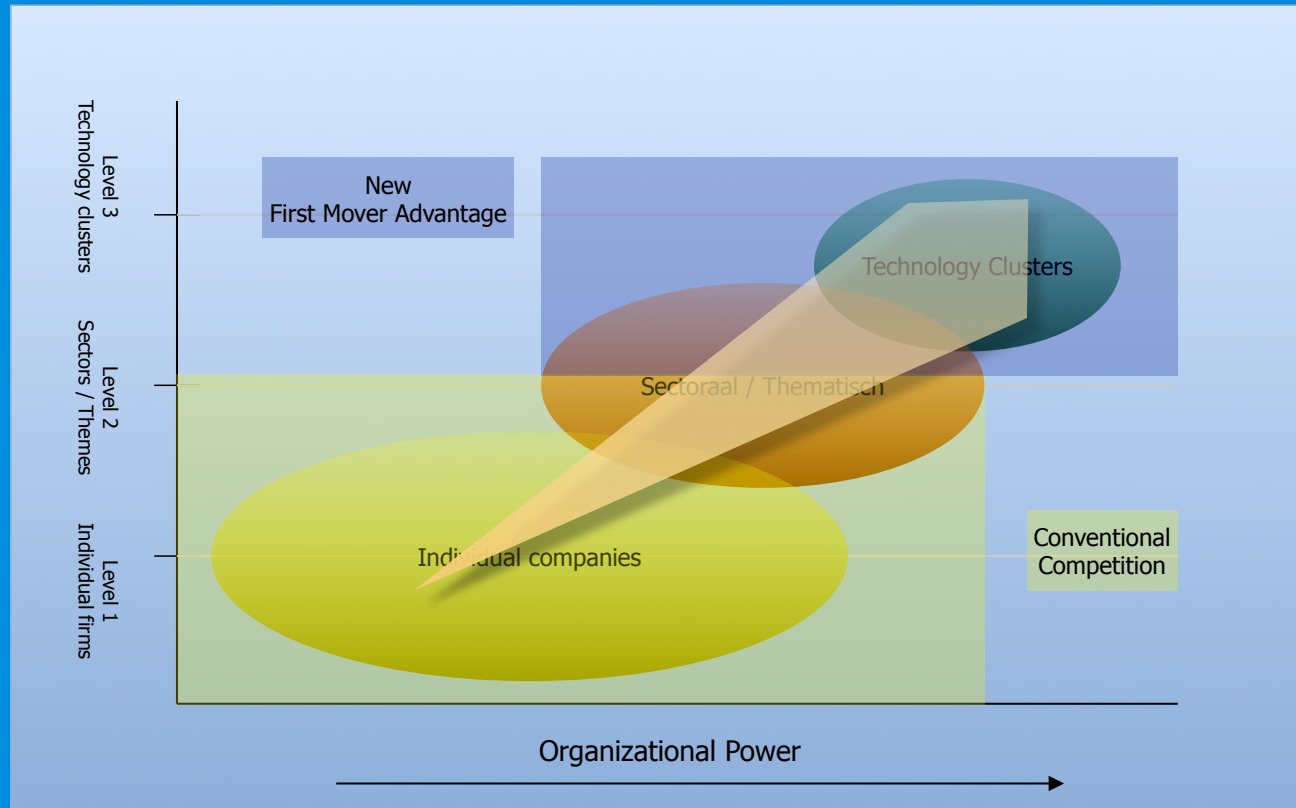
## Pro's

- Manpower: sheer endless capacity to mobilize manpower; China has the world's largest scientific workforce;
- Financial resources: strong government (financial) support in targeted programs
- Awareness importance enterprise sector: innovation and home grown Chinese enterprises; high level of off-shoring;
- Improvement regulatory framework: intellectual property; corporate law;

## Con's

- Lack of system thinking: solutions are the produce of vertical thinking; every problem can be solved by its own little machine; are all the little machines together a viable system?
- Hardware – software wedge: can the creation of a full fletched science infrastructure be matched by an adequate research culture?
- Valorization deficit: will sufficient Chinese enterprises be capable of absorbing academic research;
- Education: will the Chinese educational system sufficiently encourage individual creativity;

# Models for Cooperation



# Four policy recommendations

- **Invest in getting your data right** – we should recognize that our knowledge of China's scientific efforts is still limited; Scientific councilor's system (TWA-systeem) should be seriously expanded in order to map out China's knowledge infrastructure.
- **Prepare interesting value propositions** – cluster approach; bring together universities, knowledge/research institutions, companies in value propositions; food and nutrition, sustainable energy, creative industries
- **Engage China in an open innovation environment thinking** – turn this into a mutual benefit; assess to bring in patent knowledge; open borders for Chinese and Dutch start ups.
- **Encourage bilateral cooperation in research and education** – enable universities to engage in bilateral cooperation; envisage the creation of Dutch campuses in Chinese universities; attract Chinese talent.

# One more policy recommendation



## Wake up call!

Time to brace the Dutch knowledge infrastructure for the global competition in production of top-science, in delivery of top-education and in acquisition of top-talents. Top positions require top-efforts.