# R&D in China

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# A Definition of R&D

"Research and development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."

Source: OECD

# A Definition of R&D (2)

Three activities:

- Basic Research
- Applied Research
- Experimental Development

Source: OECD

# A Definition of R&D (3)

"Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view."

Source: OECD

# A Definition of R&D (4)

"Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective."

Source: OECD

# A Definition of R&D (5)

"Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed."

Source: OECD

# B R&D in China

B1 Framework
B2 PRC view
B3 Overview of China's R&D policy
B4 Evaluation methods for S&T
B5 Current situation: typical for PRC
B6 Foreign firms
B7 Outward investment and exports

# B1 Framework

- Focus on R&D, you can cope with general economic indicators

- The role of the government
  - Create a framework that stimulates innovation
  - Creating specific policies stimulating innovation
- Economic reforms and open door policy (~FDI)
  - unprecedented growth in GDP. China = workshop of the world.
  - Competition --> innovation
  - FDI in GDP = small, FDI in exports = big
- FDI ~ technology transfer, but less than the Chinese expected

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# B2 PRC view

- Sustainable growth:
  - high-added value products
  - knowledge economy by 2020

    ⇒ R&D = means to enhance the technological level of the economy
- Excel in certain S&T areas

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# B3 Overview of China's R&D policy

Foundation for present S&T policy:

1. 1978
2. 1985
3. 1995
4. 1999
5. 2006

# B3 Overview of China's R&D policy

- 1950's until reforms: USSR based S&T system
  - Centrally planned
  - No competition
- 1975: Deng Xiaoping wanted to improve
  1. the economy
  2. S&T
  3. the education system

⇒ three policy papers on
1. economic modernisation
2. industrialisation
3. development of S&T

- Not in the spirit of Cultural Revolution

⇒ banned

# B3 Overview of China's R&D policy

- 1976: no resistance anymore, docs were the basis for R&D reform (same basis as the eco reforms).
- 1978: National Science Conference.
  - New idea: S&T key to modernising economy and national defence (S&T=productive force, intellectuals=working class).
- 1985: CCPCC "Decision on Reforming the S&T System". Principles:
  - economic development must rely on S&T
  - S&T oriented to economic development
  - official reform began

# B3 Overview of China's R&D policy

Consolidation

- 1995: Decision on Accelerating Scientific and Technological Progress
  - China needed to make world-level contributions to basic scientific research.
- 1999: Decision on Strengthening Technological Innovation and Developing High Technology and Realising Its Industrialisation
  - promotion of R&D in the public sector/SOE's.
    - increasing investments in R&D
    - prioritisation and concentration of resources on major programmes
    - incorporating PRI's
    - growth of corporate R&D (encouraging co. to establish R&D facilities)

# B3 Overview of China's R&D policy

2006: the Medium- and Long-term Strategic Plan for the Development of Science and Technology (2006-2020)

- Innovation capability
- S&T capability:
  1. Economic development
  2. Social development
  3. Safeguard national security

⇒ Comprehensive wealthy society

# B3 Overview of China's R&D policy

2006: (2)

- Strengthen significantly basic science and frontier technology research
- S&T results with significant global impact
- Become a world S&T power by mid 21st century
  - Raising investment
  - Tax incentives
  - Gov. procurement
  - Technical standards
  - HRST

# Policy Translation into Programmes

- Framework is given by policies.
- Five-year plans give specific targets and create programmes
- +/- 15 different programmes
- E.g. Spark (1986), Torch (1988) etc. in 7th five-year plan

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# B4 Evaluation methods for S&T

- By input
  - GERD (= Gross Domestic Expenditure on R&D)
  - BERD (=business)
  - Researchers
  - ...
- By output
  - Research performance
    - Articles/Citations
    - Patents
  - High Technology Exports
  - ...

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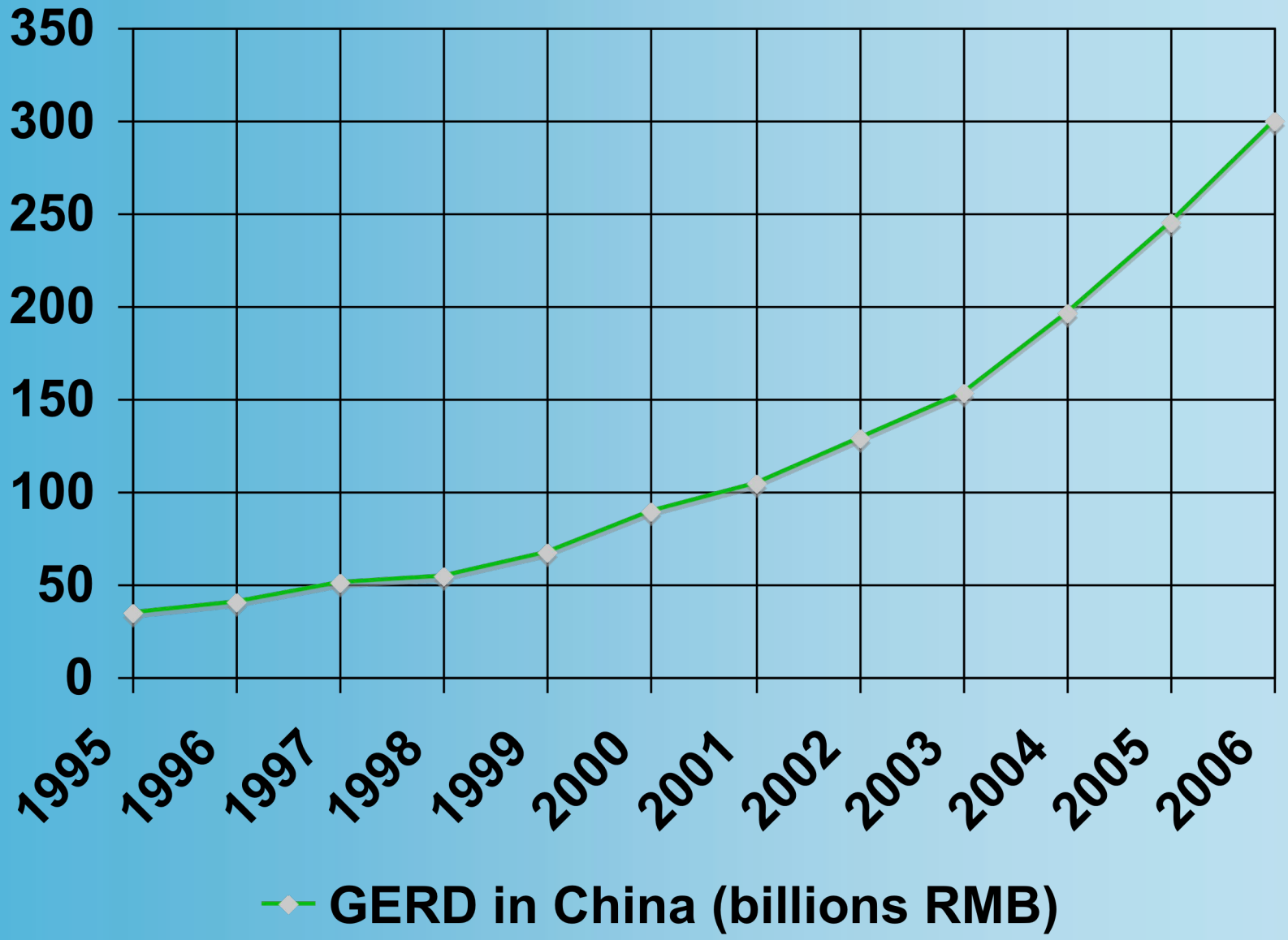
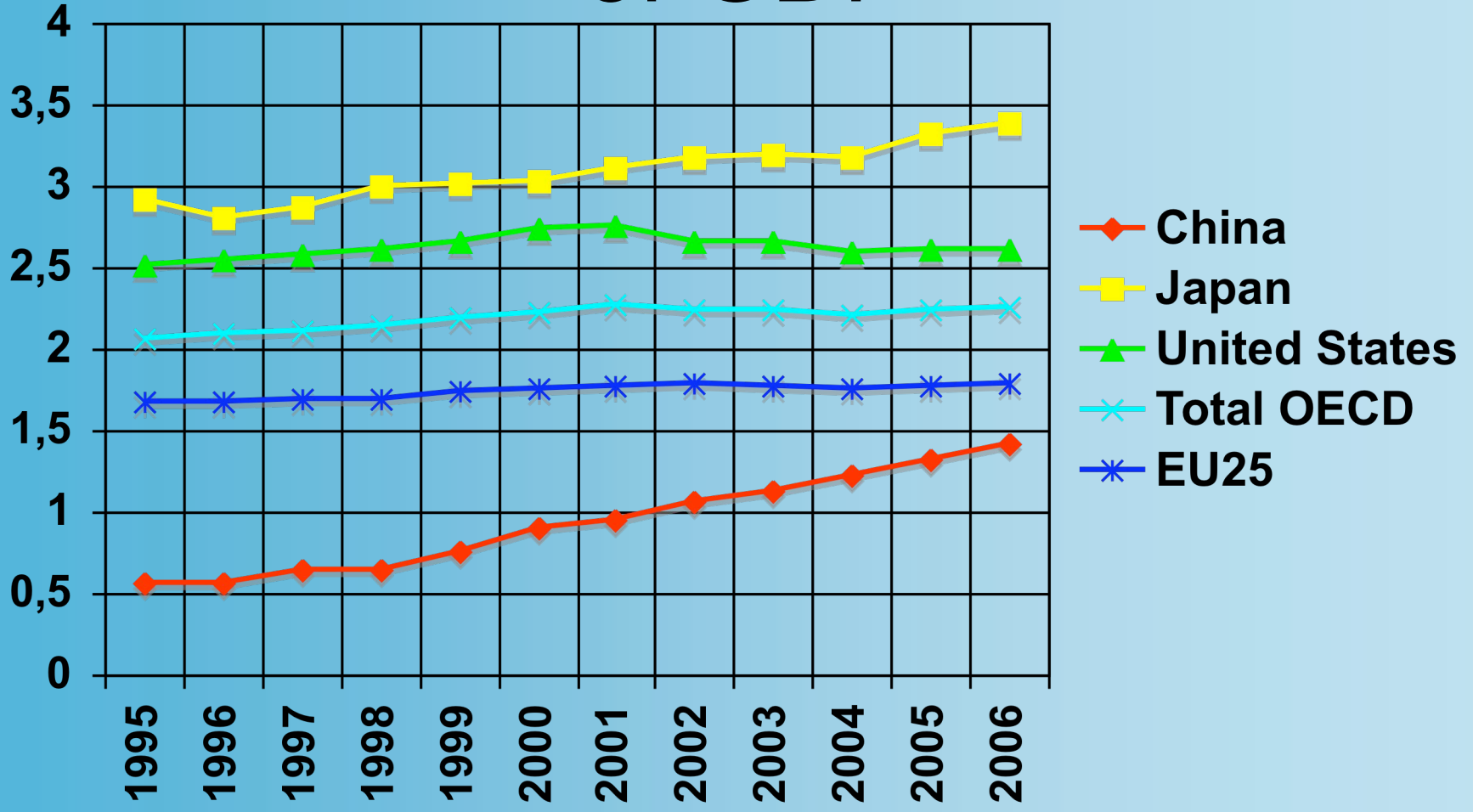
# GERD in China



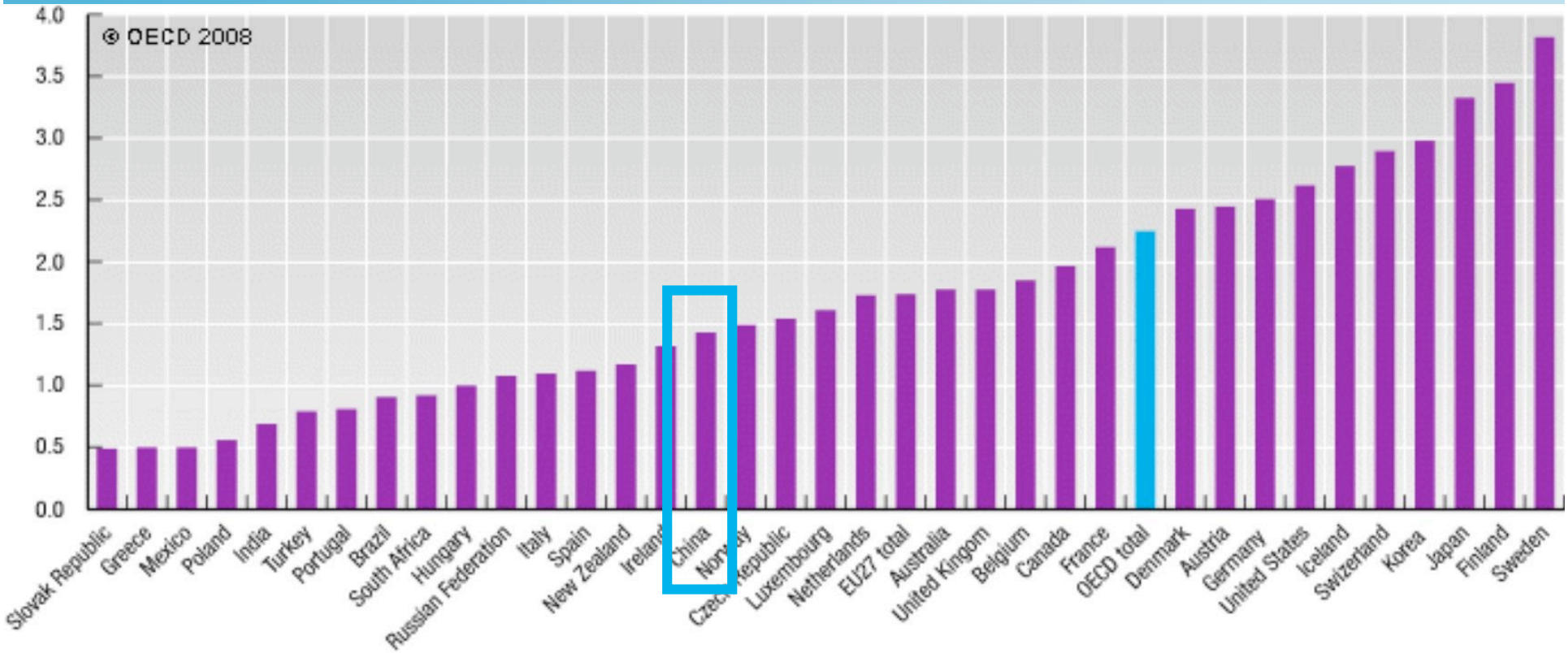

Data: China Statistical Yearbook 2007

# Evolution GERD as percentage of GDP



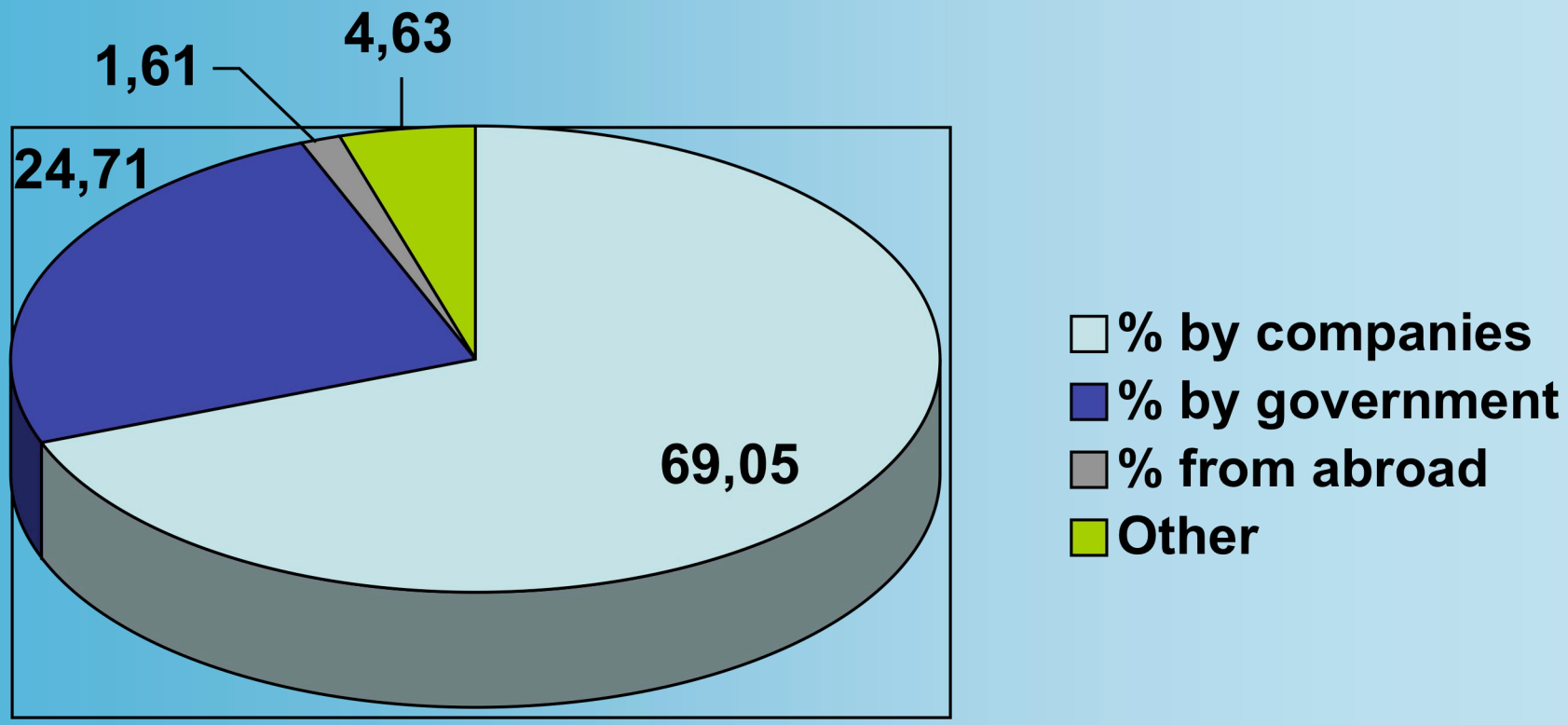

Data: OECD, MSTI Database, p. 496.

# GERD in 2006 as a percentage of GDP in comparison with OECD



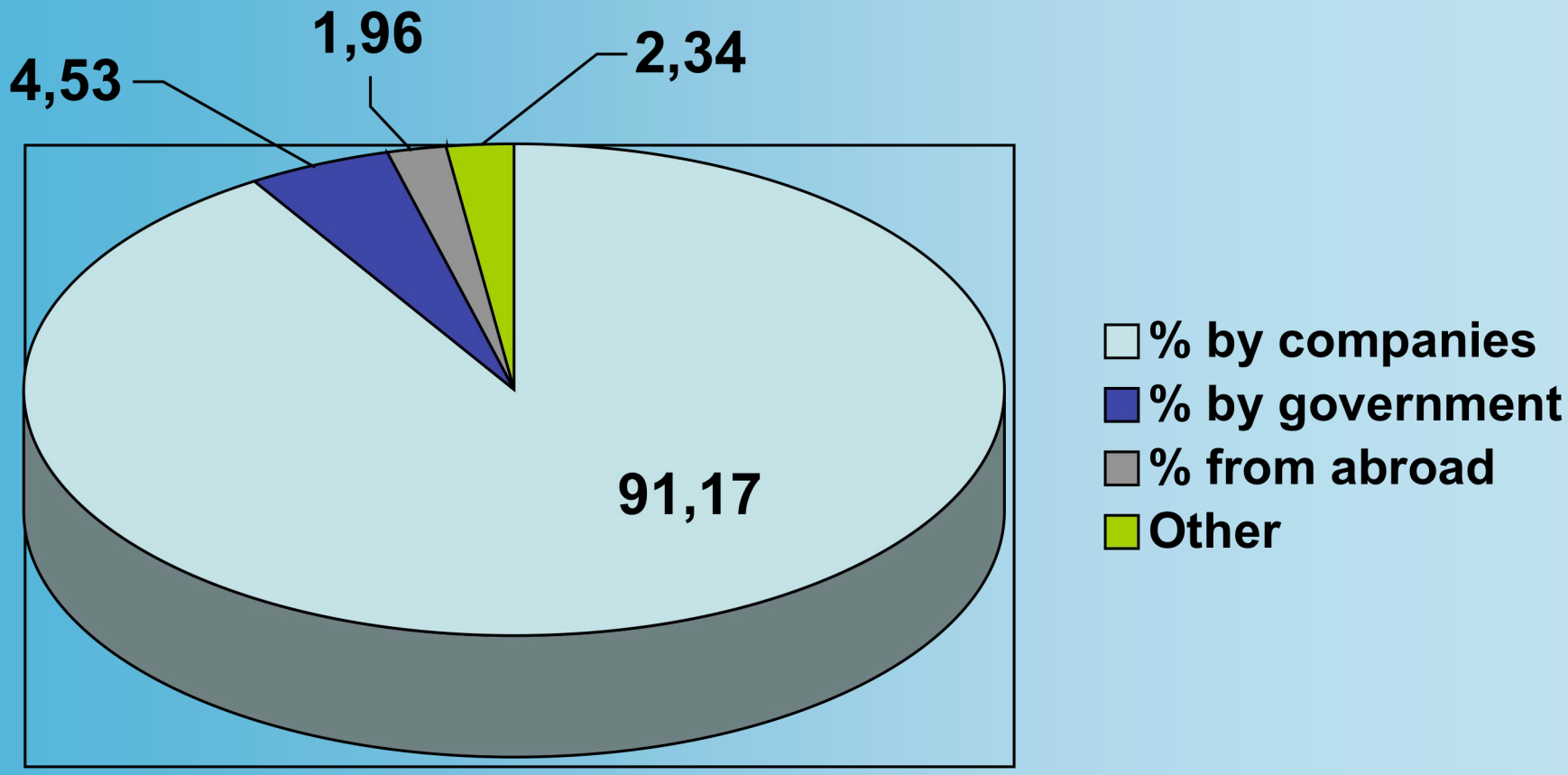

Source: OECD

# Sources of GERD in 2006



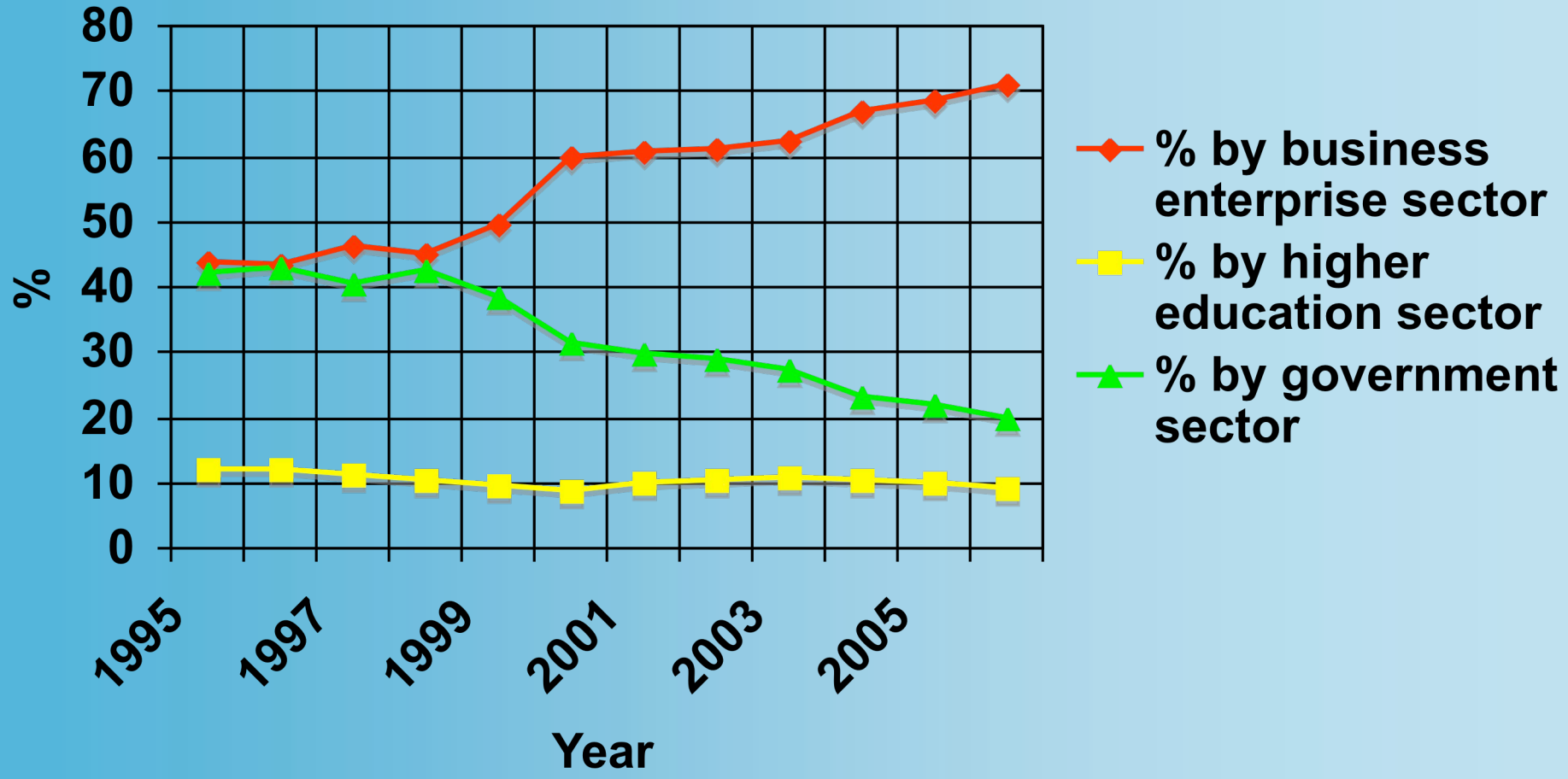

Data: OECD p. 498, MSTI Database.

# Sources of BERD in 2006



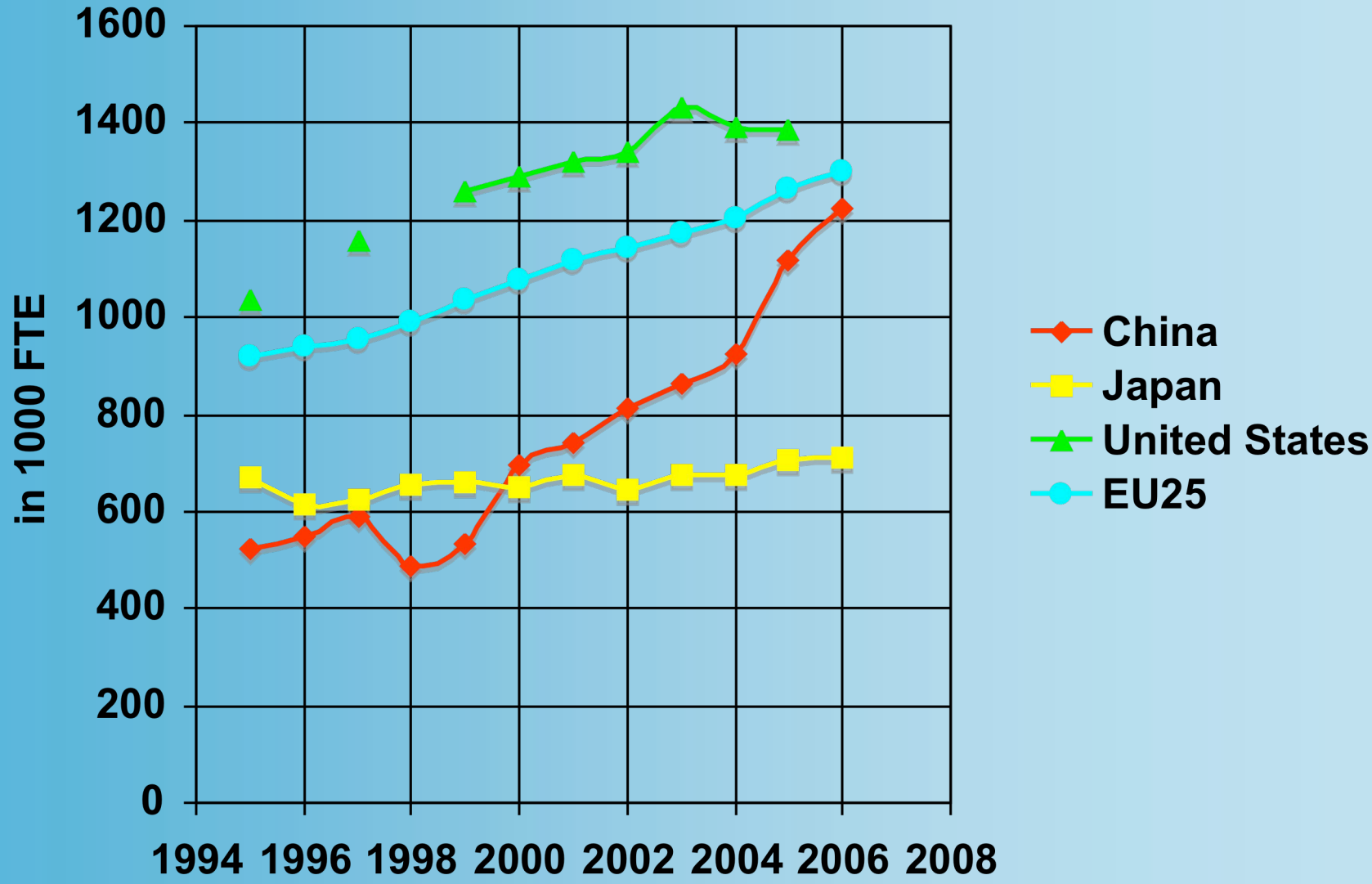

Data: OECD p. 498, MSTI Database.

# GERD by performance sectors in China



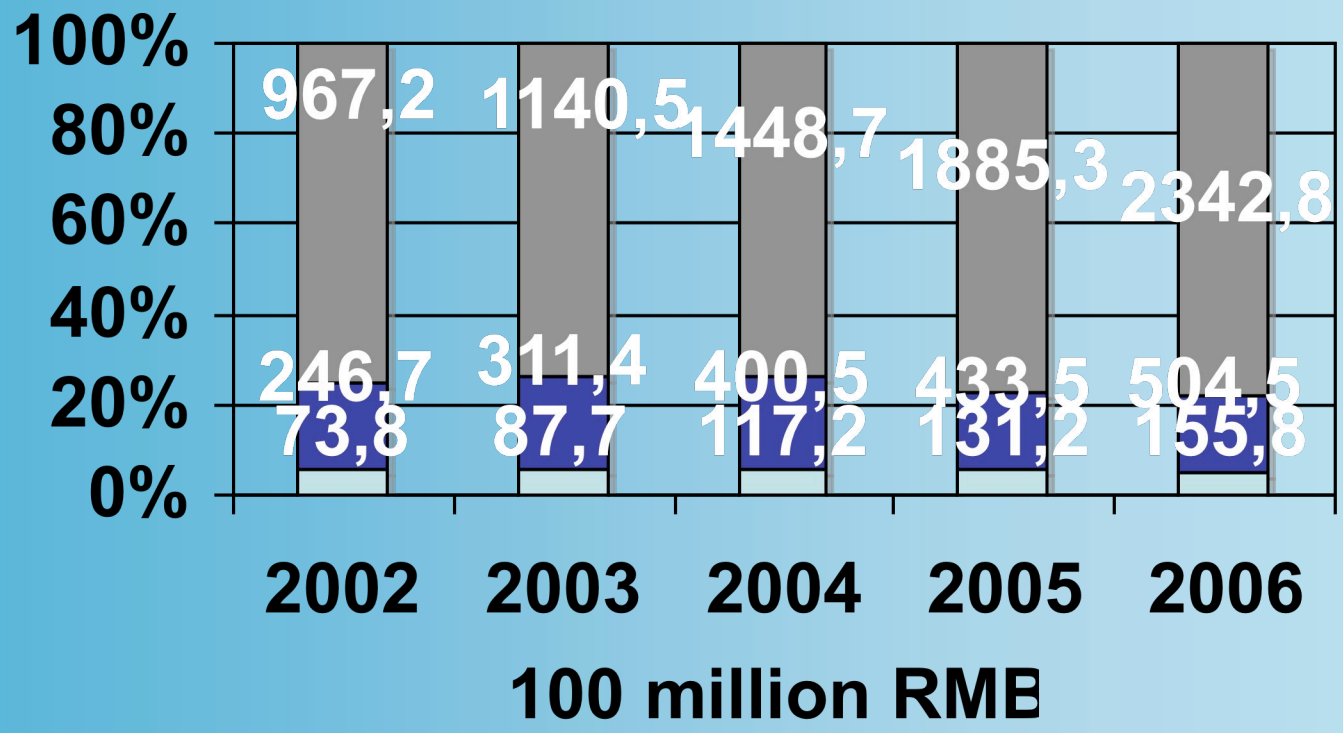

Data: OECD p. 498, MSTI Database.

# Total Researchers




Source: OECD, MSTI Database

# Composition of R&D in China by activity




Source: China Statistical Yearbook 2007.

R&D personnel and patent applications show the same characteristics.

# Regional Distribution of Patents

| Patent Applications (in %) | |
|---|---|
| Guangdong | 19,32 |
| Jiangsu | 11,33 |
| Zhejiang | 11,26 |
| Shandong | 8,14 |
| Shanghai | 7,66 |
| Beijing | 5,65 |
| Taiwan | 4,78 |
| Liaoning | 3,63 |
| Hubei | 3,1 |
| Tianjin | 2,83 |
| Sichuan | 2,79 |

| Granted patents (in %) | |
|---|---|
| Guangdong | 19,44 |
| Zhejiang | 13,83 |
| Jiangsu | 8,64 |
| Shanghai | 7,42 |
| Shandong | 7,12 |
| Taiwan | 5,9 |
| Beijing | 5,02 |
| Liaoning | 3,31 |
| Sichuan | 3,19 |
| Fujian | 2,86 |
| Hunan | 2,51 |

| Granted invention patents (in %) | |
|---|---|
| Beijing | 15,41 |
| Taiwan | 10,74 |
| Shanghai | 10,54 |
| Guangdong | 9,73 |
| Jiangsu | 6,5 |
| Zhejiang | 5,68 |
| Shandong | 4,35 |
| Liaoning | 4,24 |
| Tianjin | 3,86 |
| Hubei | 3,41 |
| Sichuan | 2,7 |



Calculated from China Statistical Yearbook 2007.

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# R&D FDI in China

Stimulating:

- Proximity to market and production
- HRST
- FDI-friendly policies
- Requirement of technology transfer
- Adaptation to domestic standard

Discouraging:

- IPR infringements
- Abolishment of preferential policies (e.g. tax incentives)
- HRST

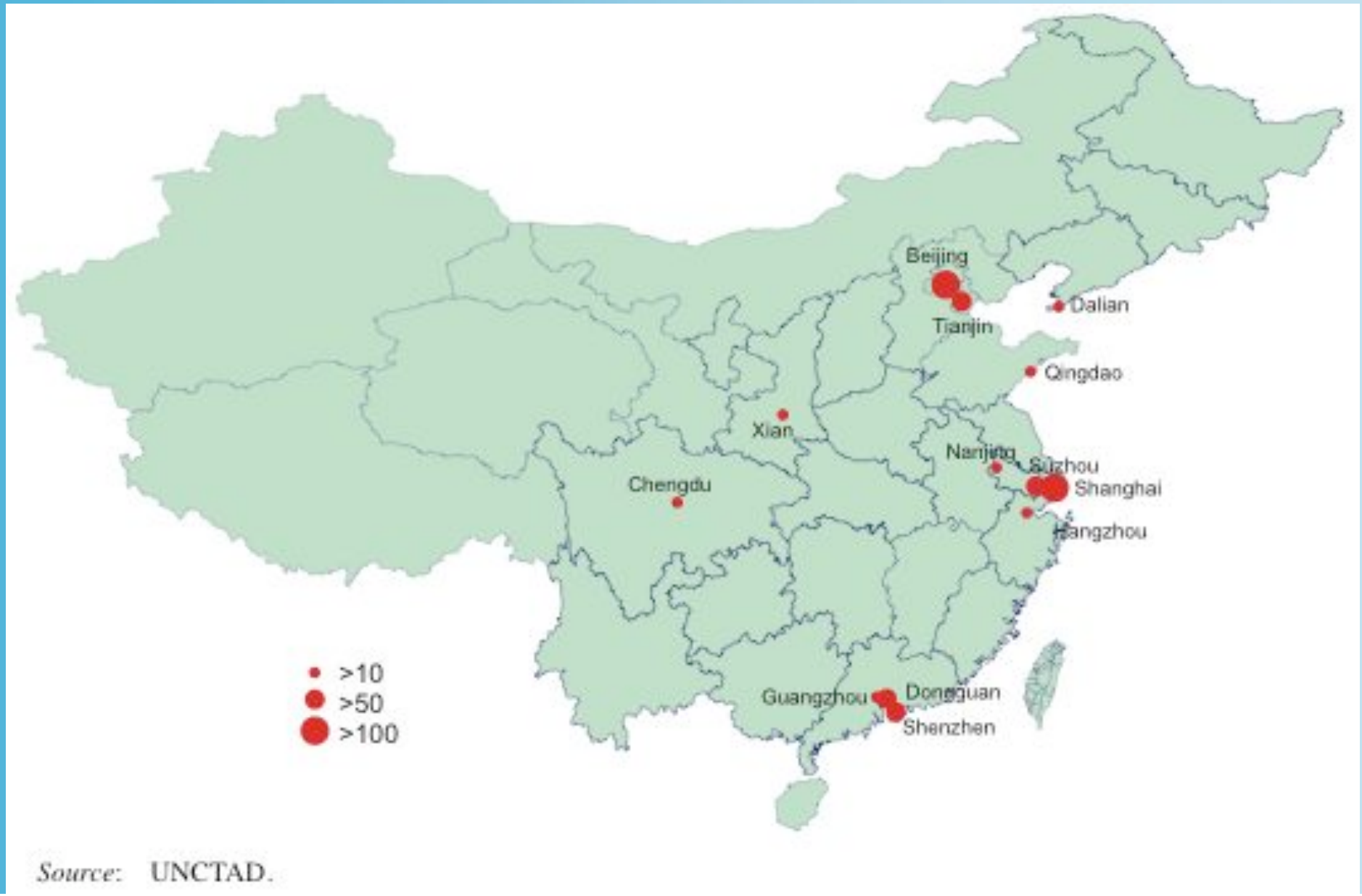
Source: OECD, p. 275-276.

# FDI in R&D focused on ICT

- 936 foreign invested R&D centres (2006)
- Mainly active in ICT ind., biomedical ind. and automotive ind.[1]
- 70 % of Western MNE labs is related to ICT[2]

[1]OECD, p. 273, MOFCOM.
[2]Long, Laestadius, p. 10.

# Location of foreign R&D labs in China




*Source*: UNCTAD.

# Gross Industrial Output Value 2006

| | in trillion RMB | percentage |
|---|---|---|
| Total | 32 | 100% |
| Domestic Funded | 22 | 68% |
| Foreign Funded + HK, MC & TW | 10 | 32% |

Calculated from China Statistical Yearbook 2007.

# R&D in Industrial LME's 2006

| | in billion RMB | percentage |
|---|---|---|
| Total | 163 | 100% |
| Domestic Funded | 119 | 73% |
| Foreign Funded + HK, MC & TW | 44 | 27% |

Calculated from China Statistical Yearbook 2007.

# Owning of invention patents in Ind. LME's 2006

| | In nr. of items | percentage |
|---|---|---|
| Total | 29176 | 100% |
| Domestic Funded | 21232 | 73% |
| Foreign Funded + HK, MC & TW | 7944 | 27% |

Calculated from China Statistical Yearbook 2007.

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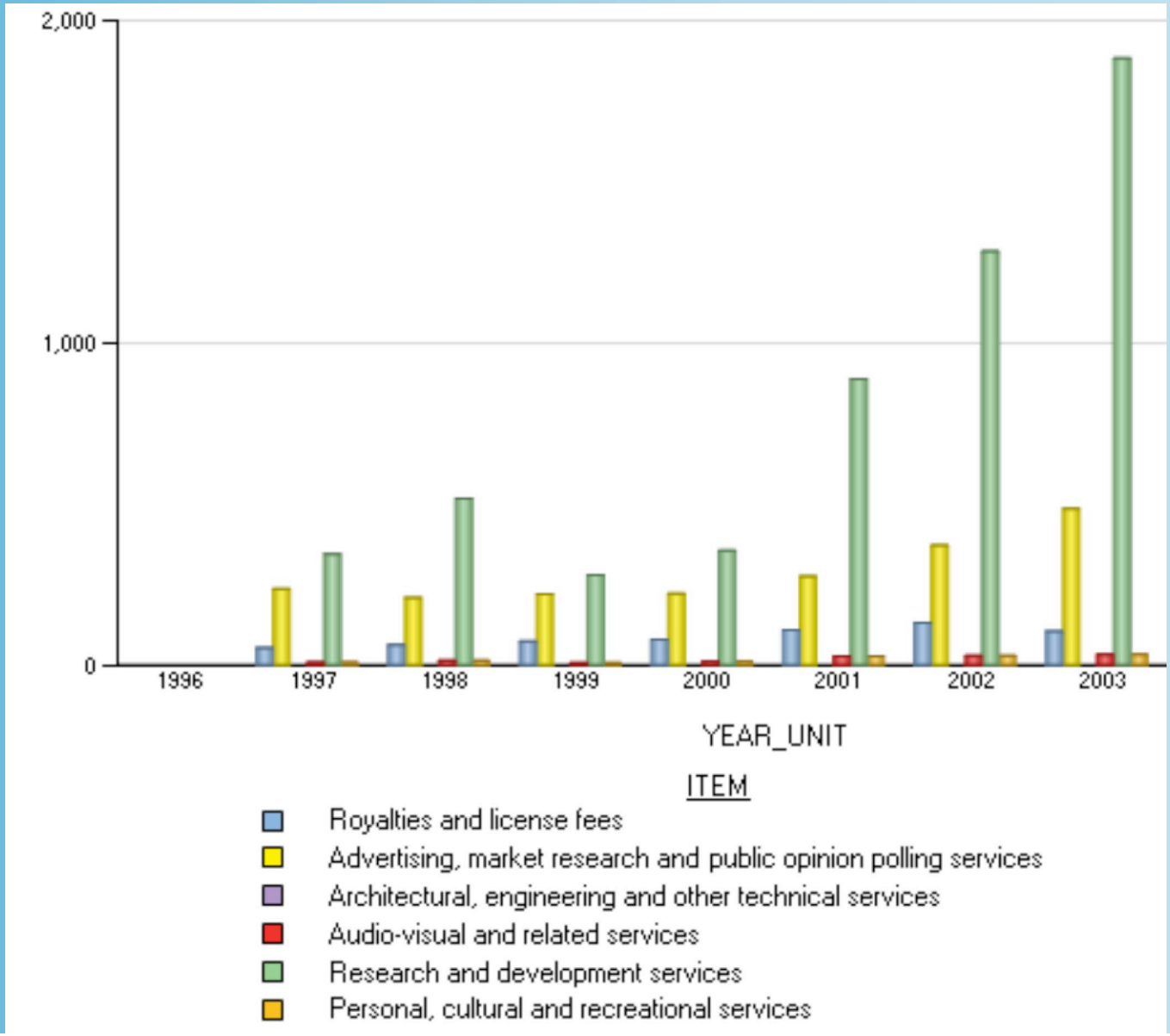
# Outward R&D FDI

- Previous presentations: high rise of outward FDI in recent years to more than USD 20 billion in 2008.[1]
- The Outward Investment Policy Art. 6: encouragement of investment in R&D (to raise domestic levels).
  - By means of subsidies

[1]Freeman, China's outward investments, p. 3.

# Export of Chinese R&D services

(millions of USD)




Source: UNCTAD

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