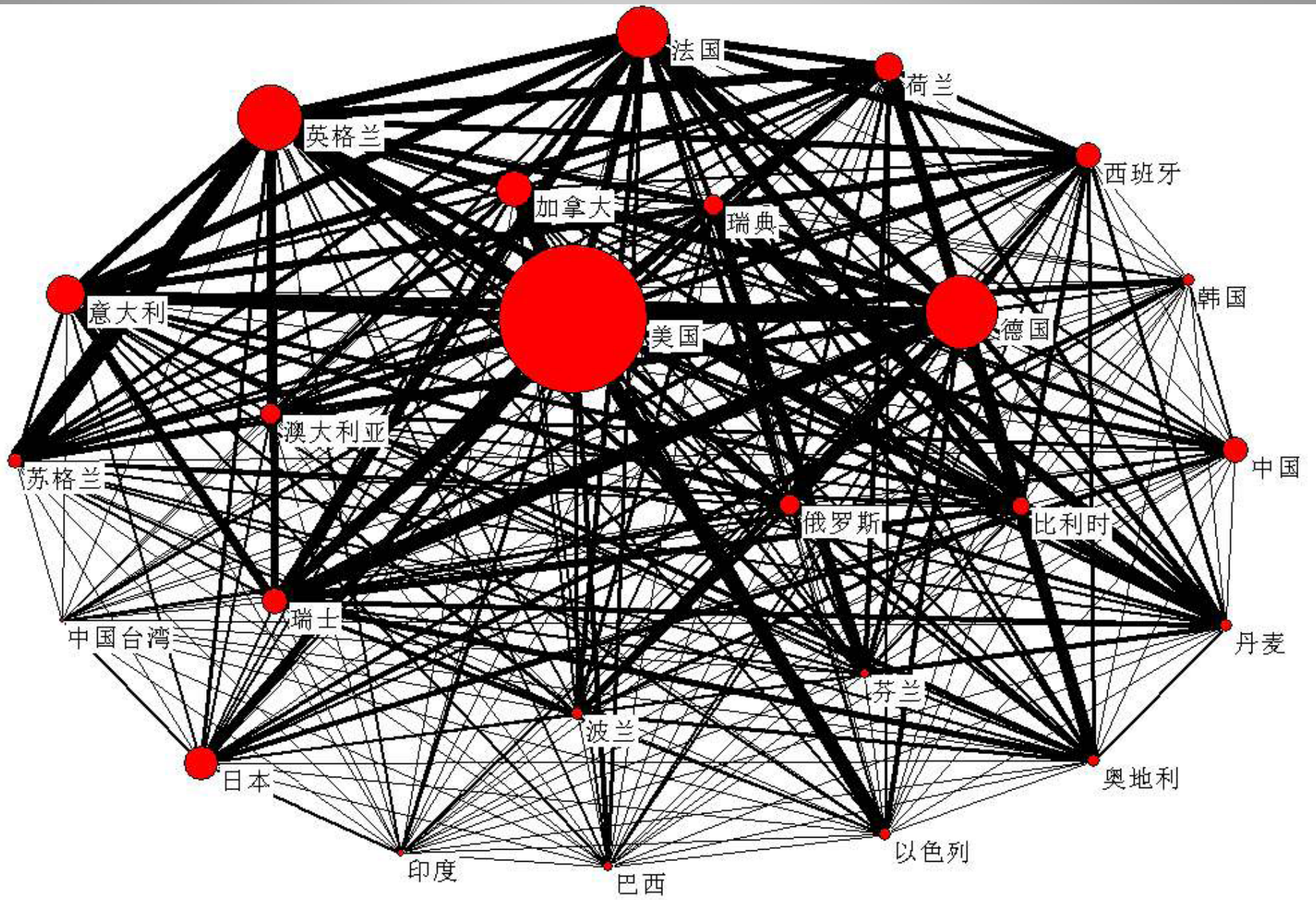


CHINA AS EMERGING  
“SUPERNODE” IN RESEARCH  
AND INNOVATION?  
IMPLICATIONS FOR THE US

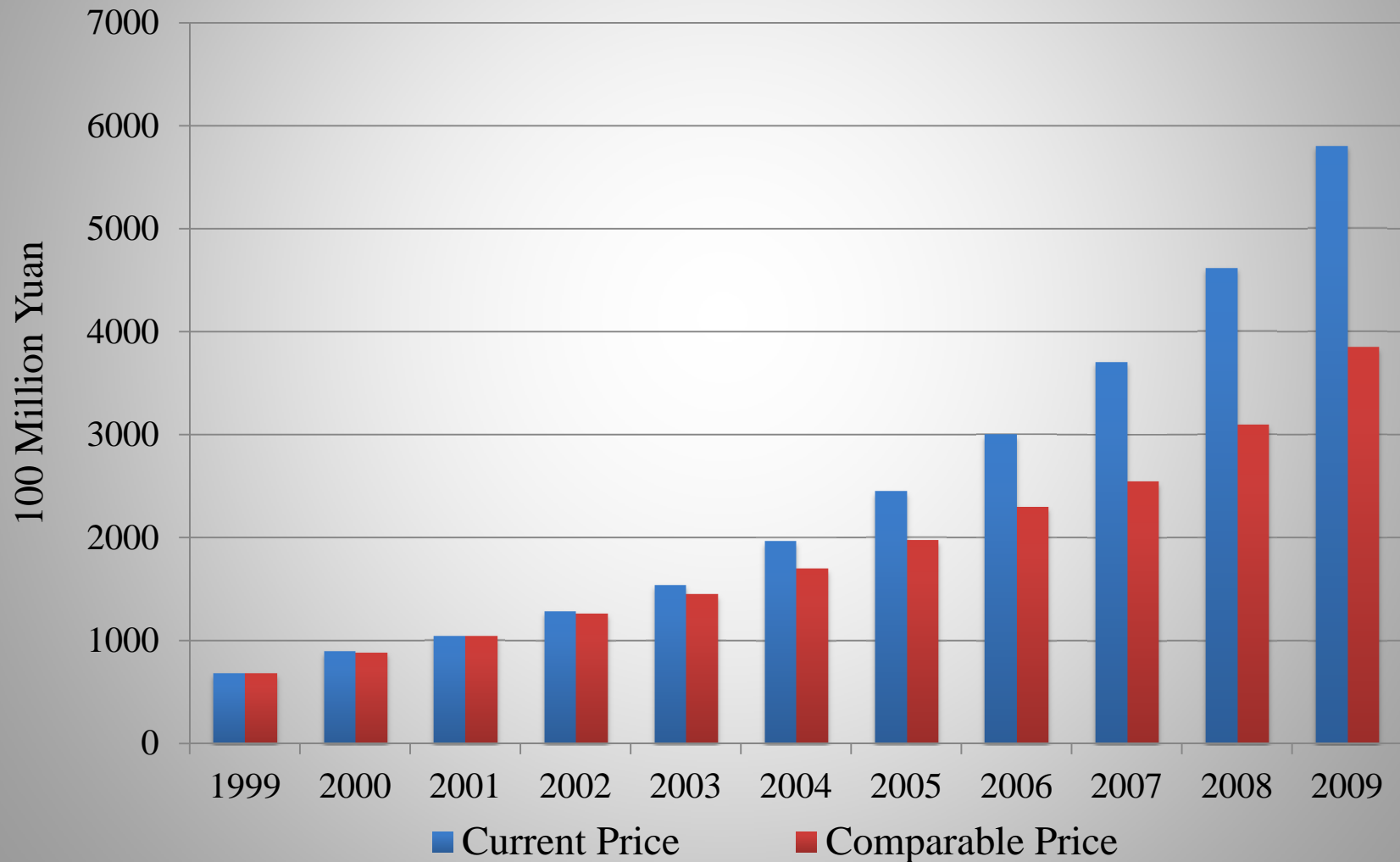
RICHARD P. SUTTMEIER  
UNIVERSITY OF OREGON  
[petesutt@uoregon.edu](mailto:petesutt@uoregon.edu)



# WHAT DEFINES A “SUPERNODE?”

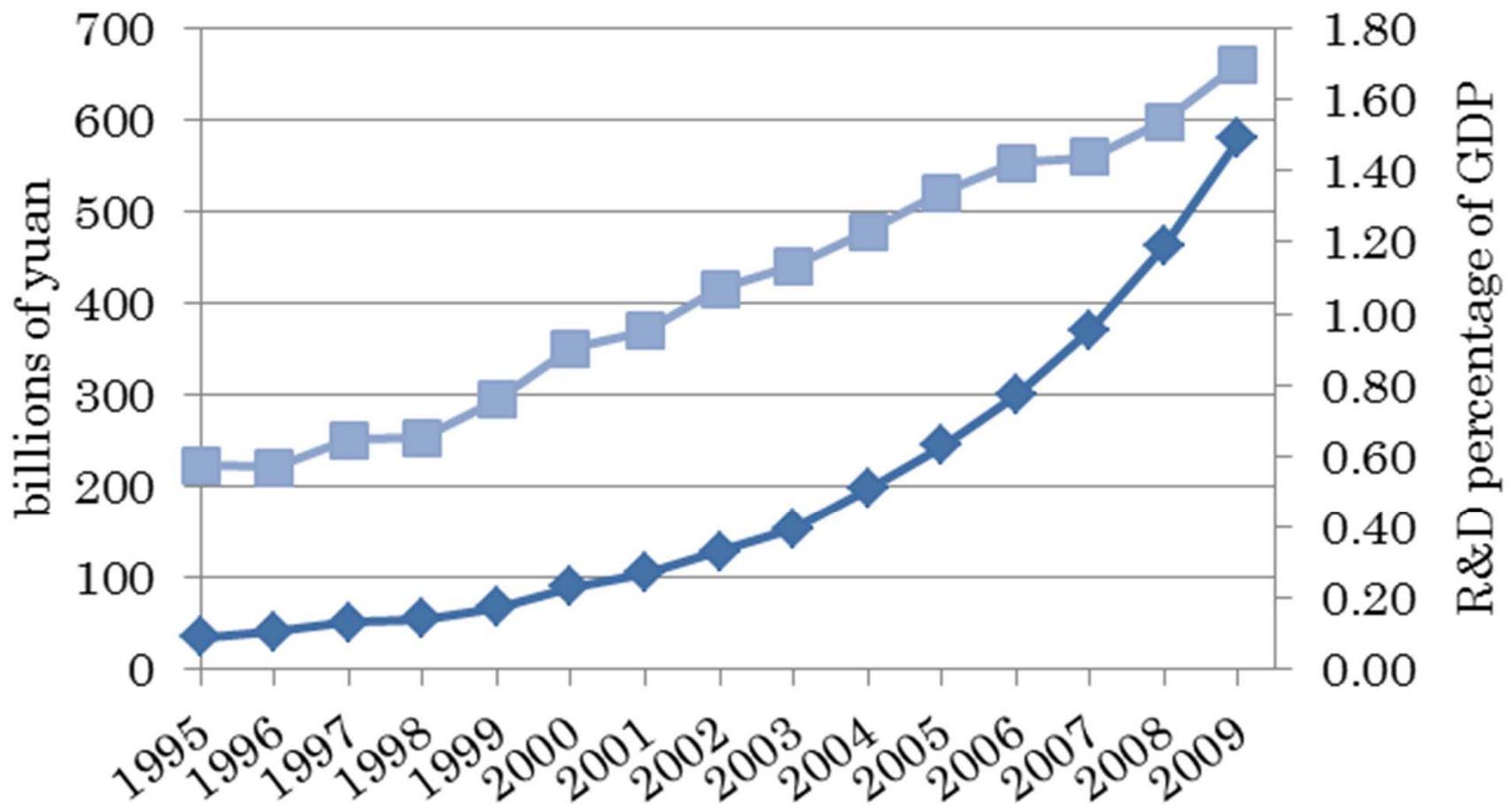
- STATISTICAL INDICATORS
- QUALITY MEASURES – NOBELs?
- CAPABILITIES FOR COMPLEX PROJECTS
- COMPREHENSIVE CAPABILITIES
- “VERTICAL” DEPTH
- MAGNETISM – STUDENTS, “STARS,” MNCs
- SETS NETWORK DEFAULTS
- “NETWORK POWER”

# Gross Domestic Expenditures on R&D (GERD)

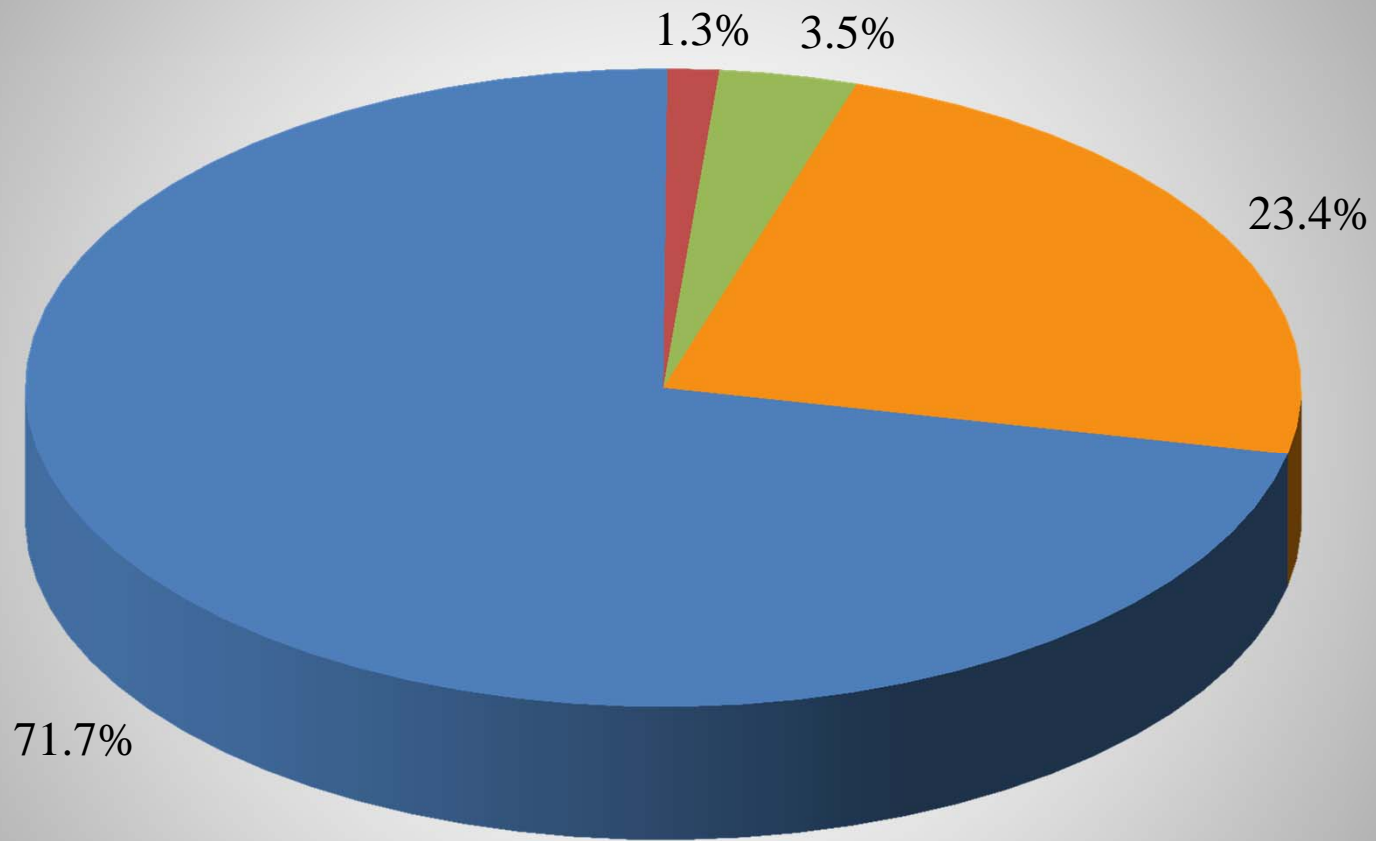


# R&D/GDP

◆ Total Expenditures on R&D (billions RMB)    ■ R&D % of GDP

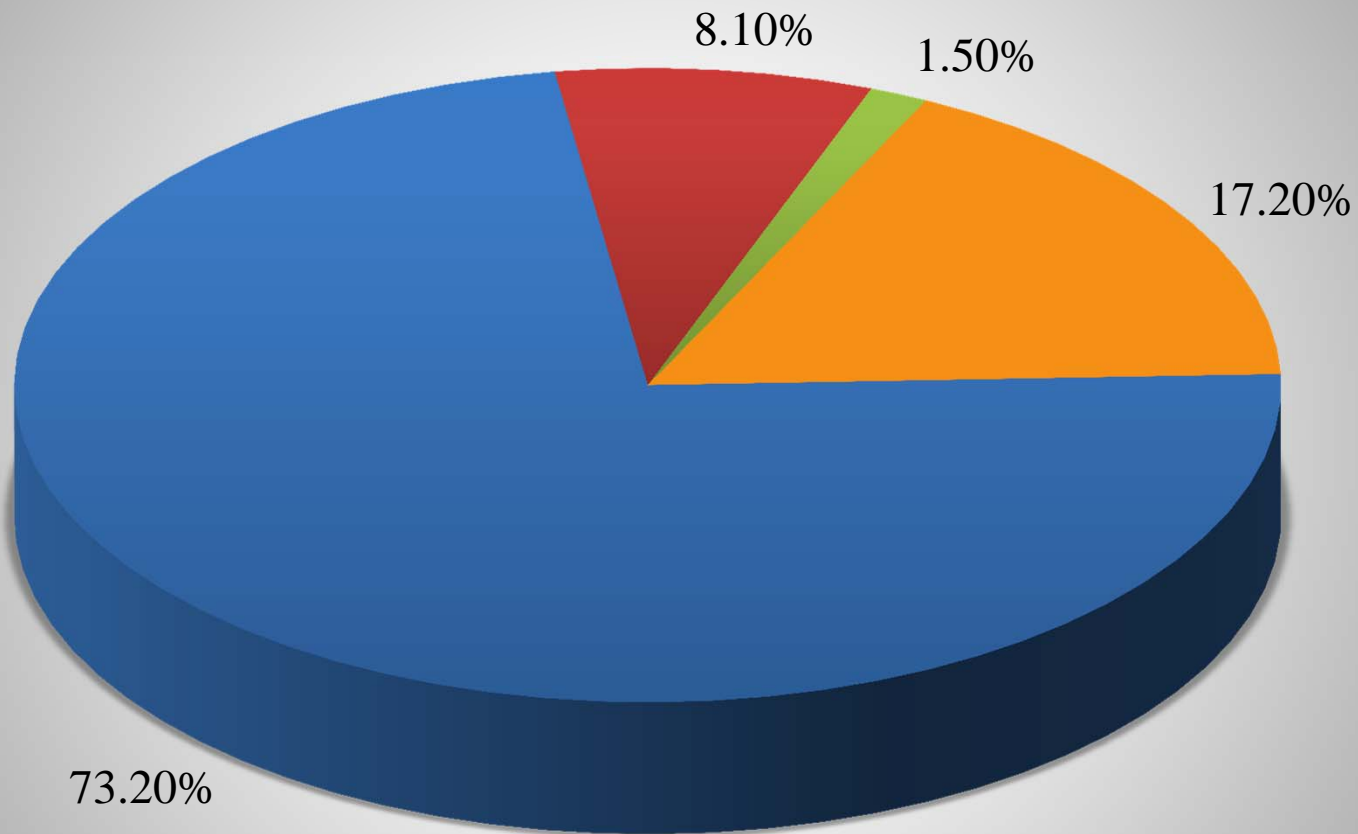


# GERD by Source of Funds



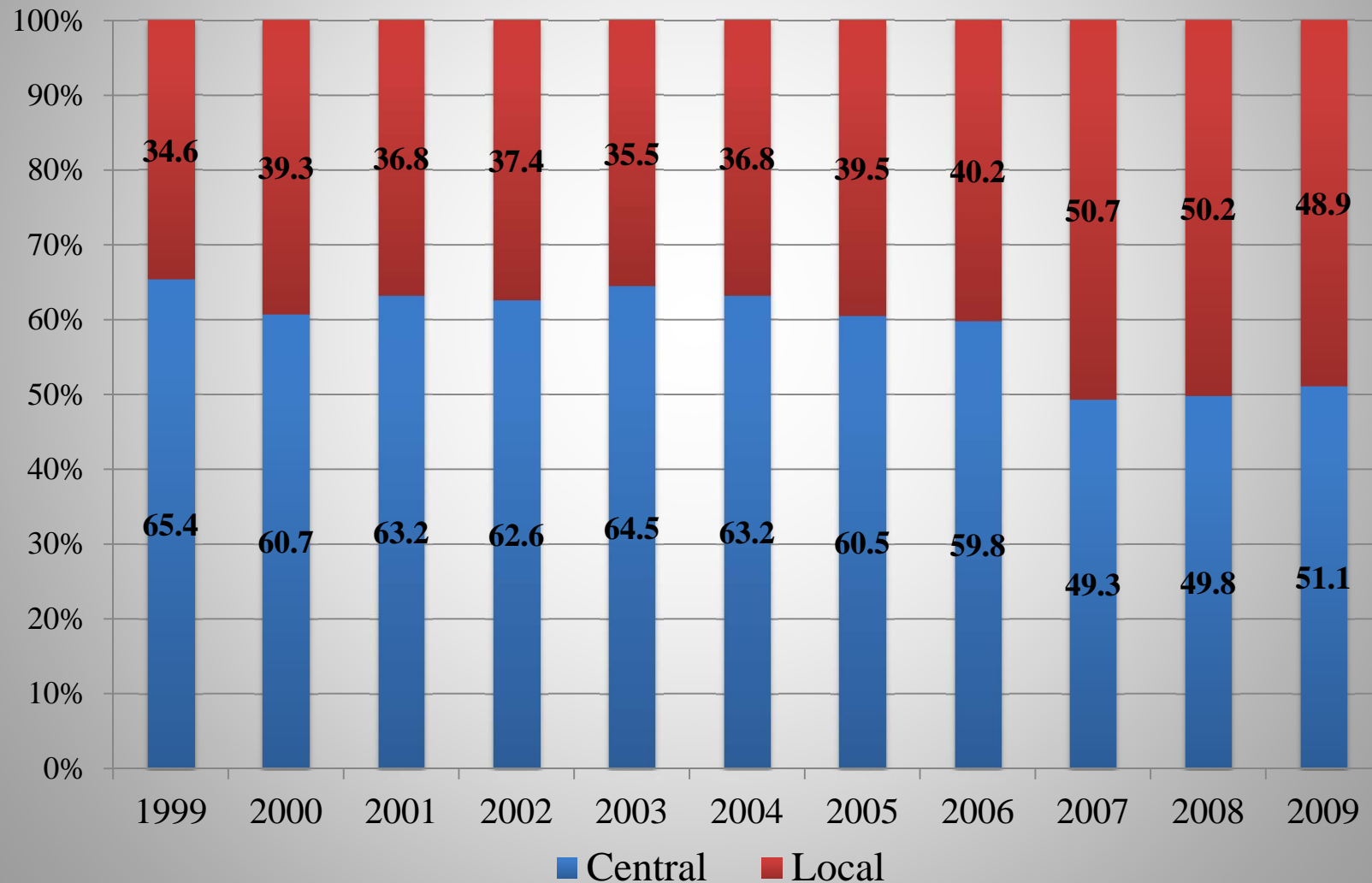
■ Business ■ Abroad ■ Others ■ Government

# GERD by Sector of Performance



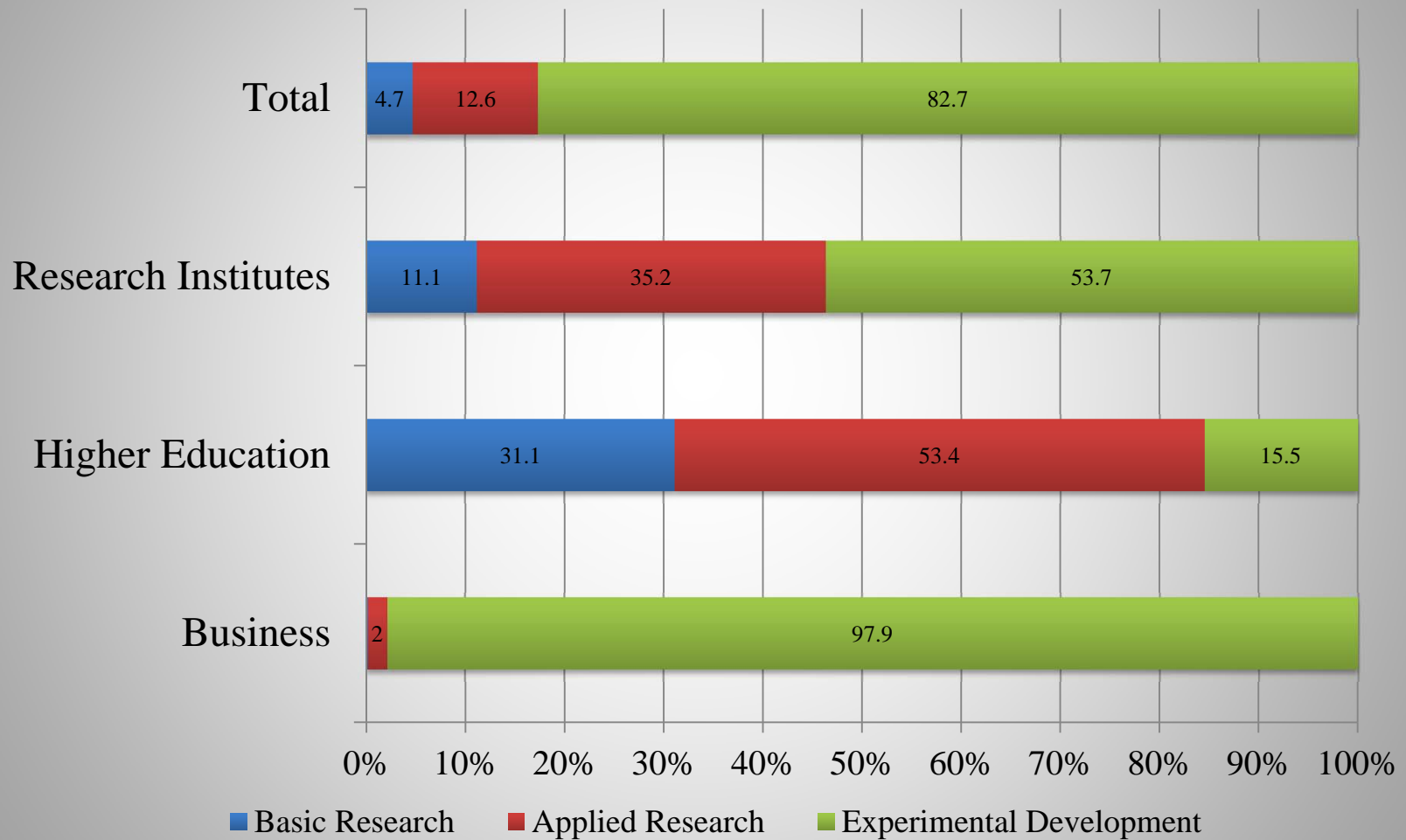
■ Business   ■ Higher Education   ■ Others   ■ Research Institutes

# Central and Local Government S&T Expenditures

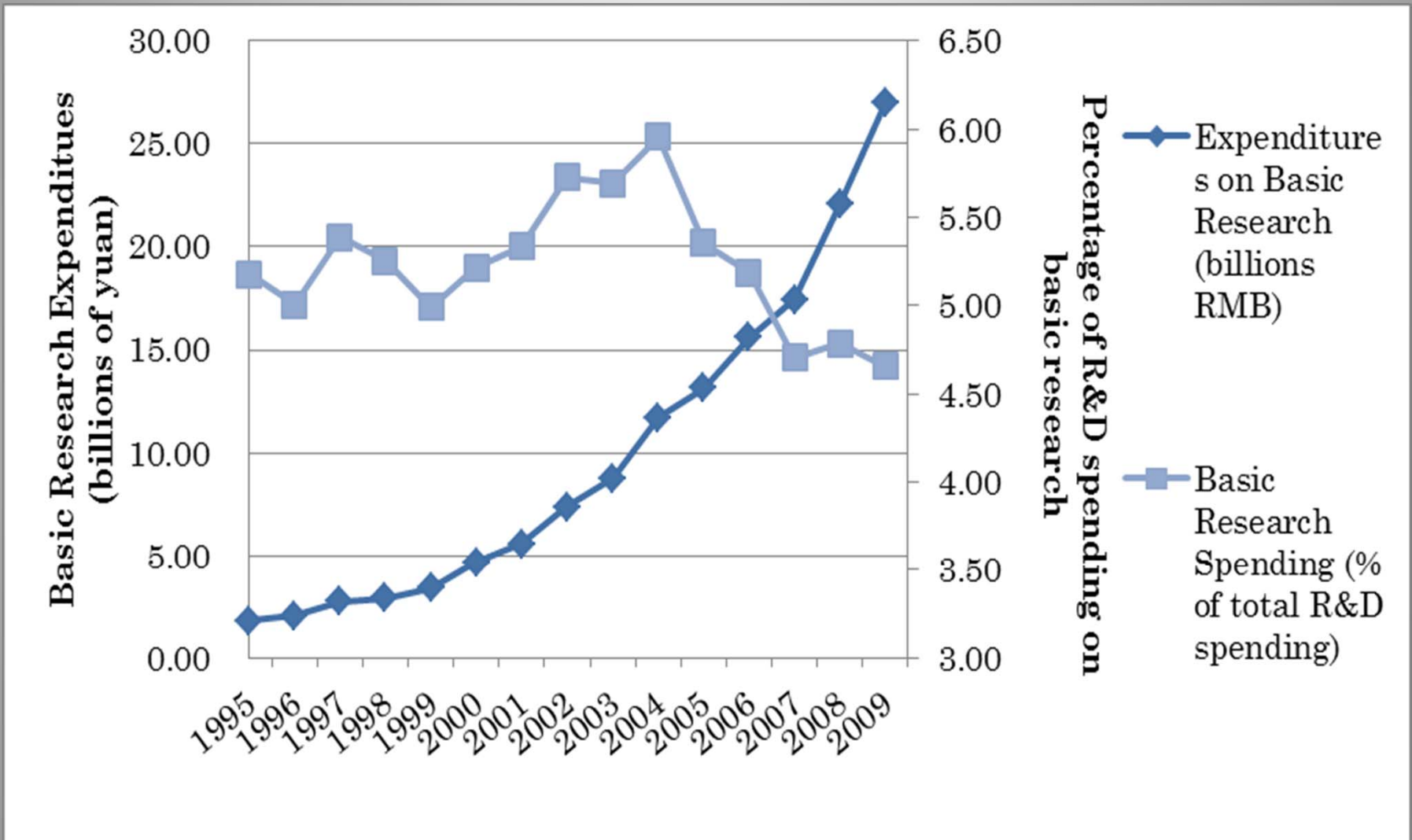




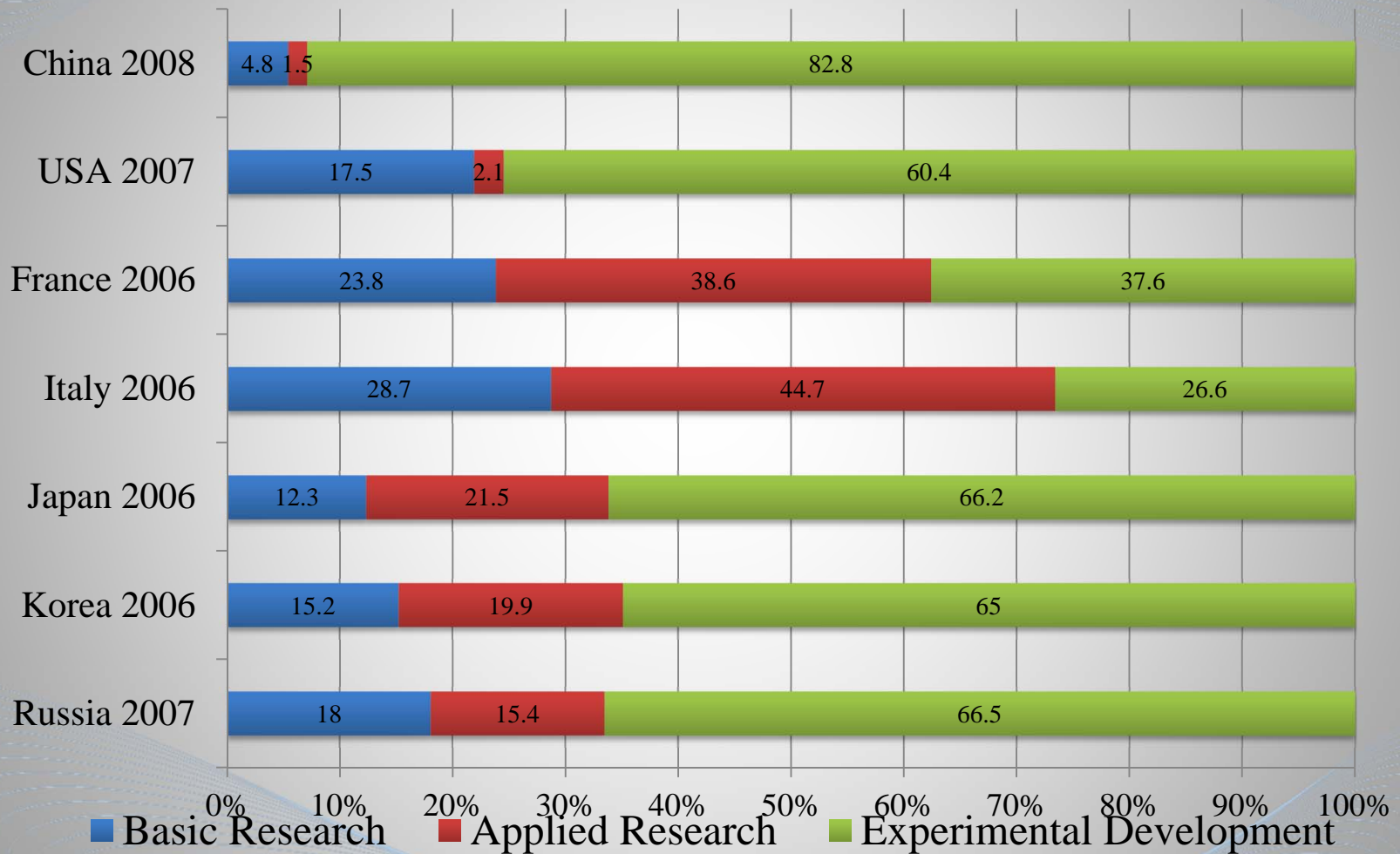
# GERD by Type of Activity



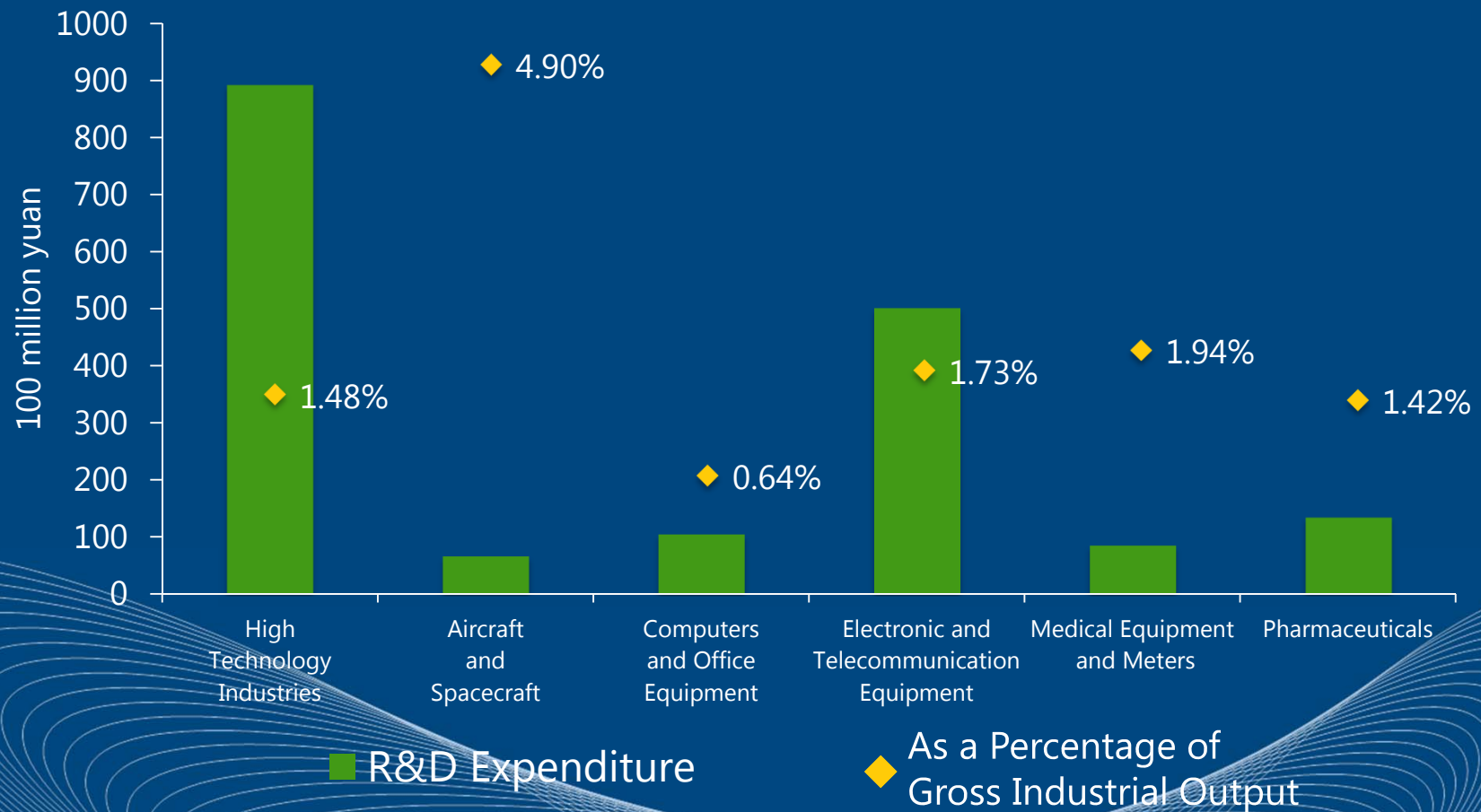
# BASIC RESEARCH SPENDING



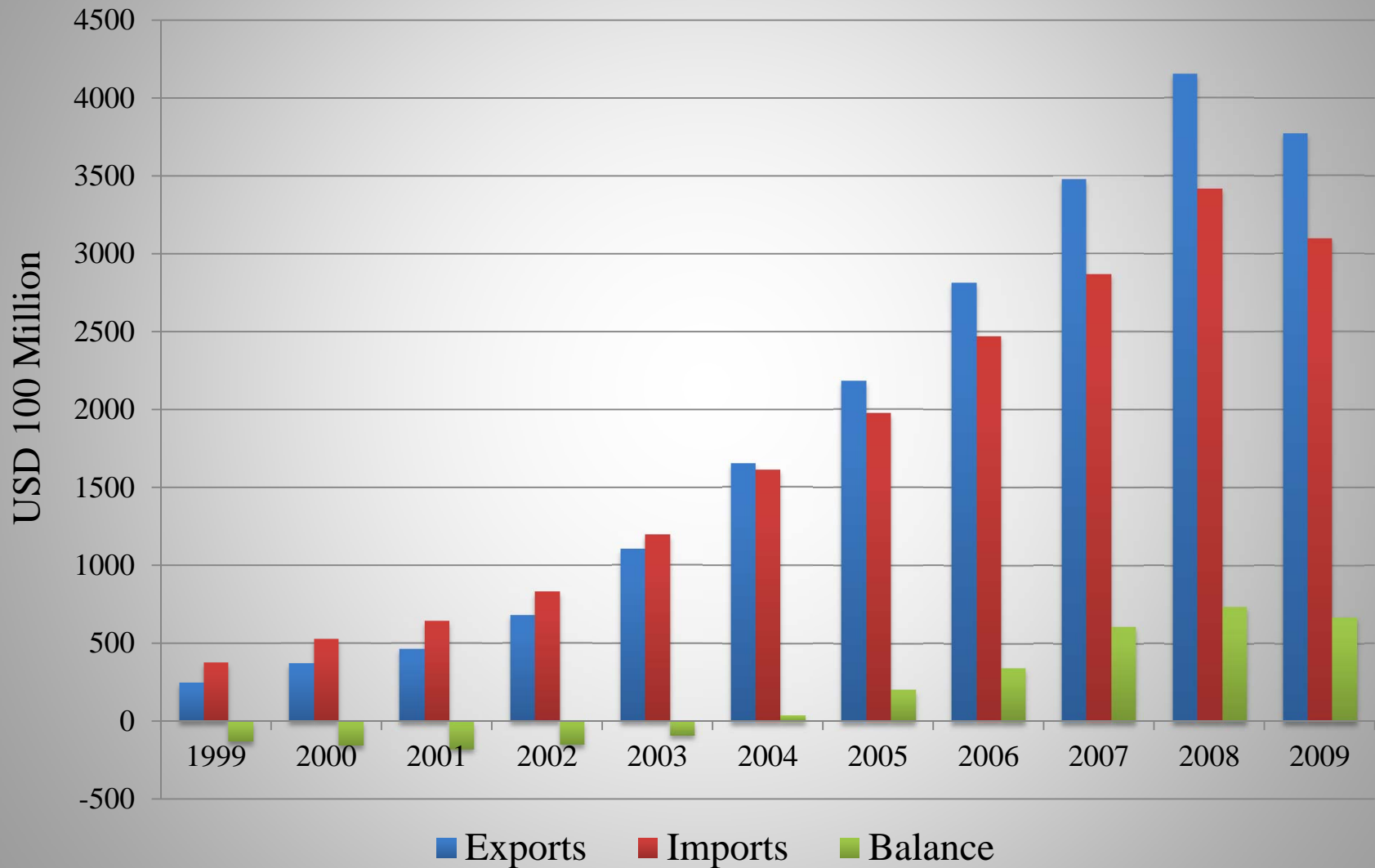
# GERD Activities/Selected Countries



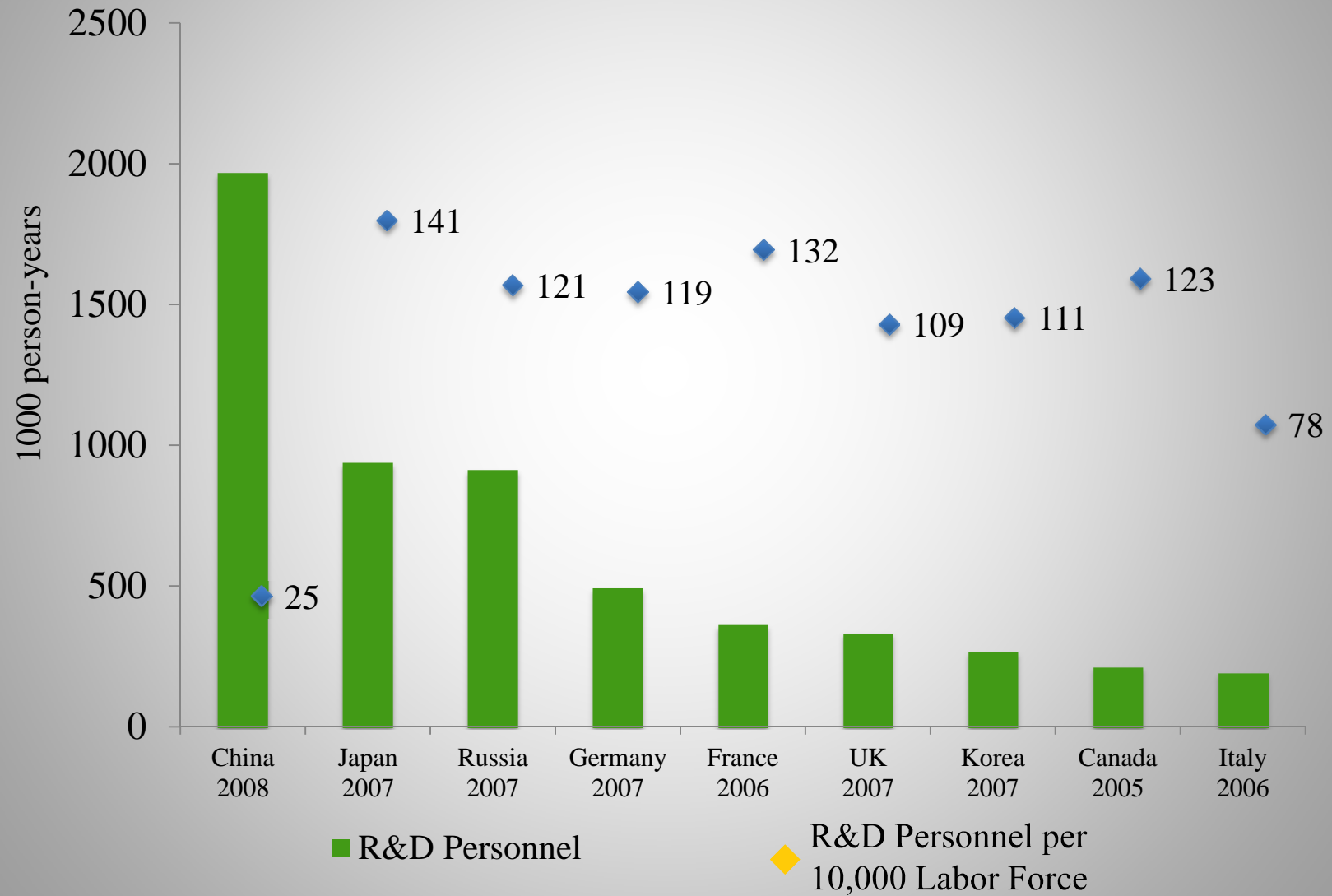
# High-Tech Industry R&D Expenditure and As Percentage of Gross Industrial Output



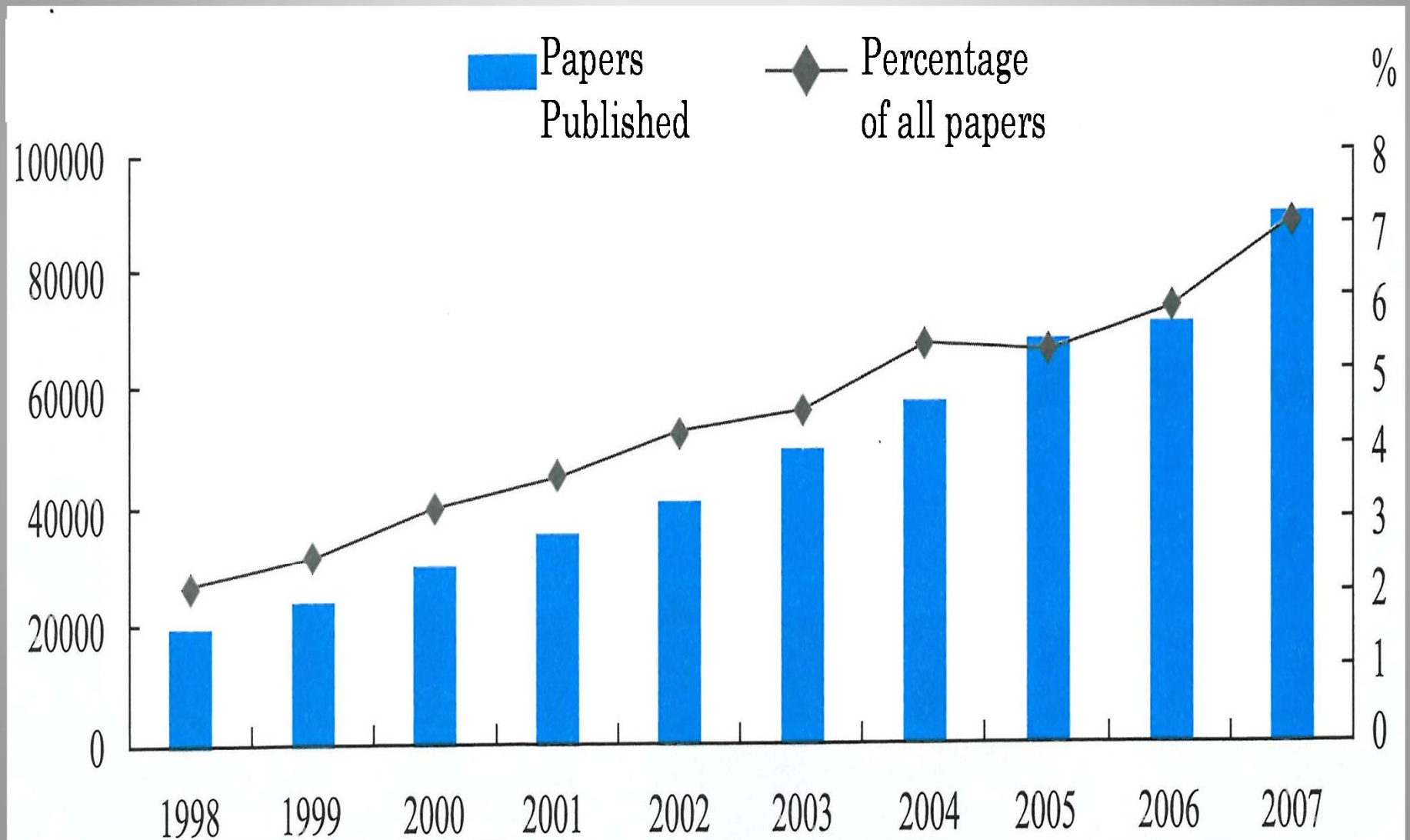
# Trade in High-Tech Products



# R&D Personnel



# S&T PUBLICATIONS

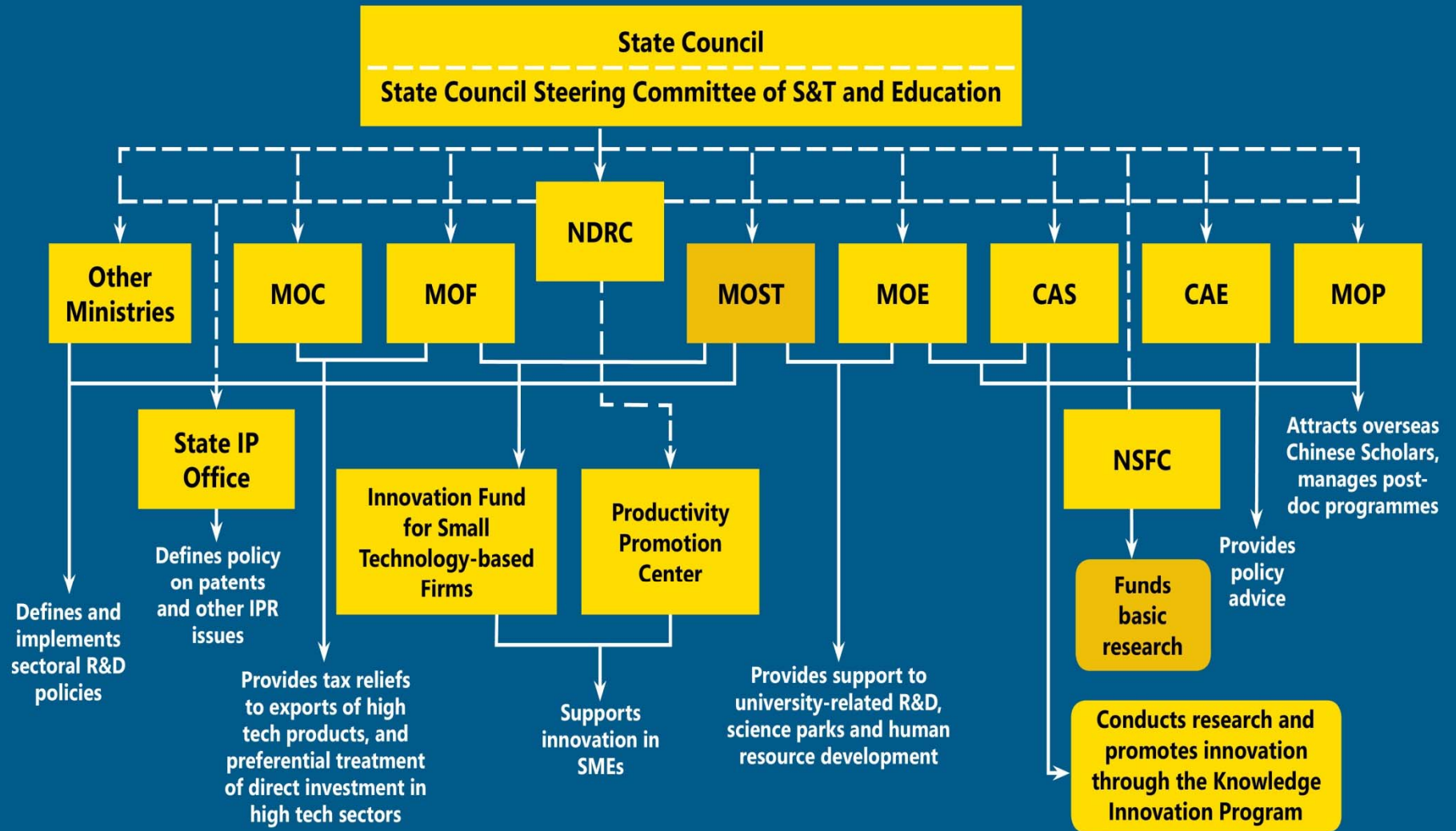


# SOME KEY DRIVERS OF RESEARCH AND INNOVATION

- CONSUMER MARKET
- URBANIZATION AND INFRASTRUCTURE  
– SCALE OF PUBLIC INVESTMENTS
- RESOURCE AND ENVIRONMENTAL  
CHALLENGES
- BOTTOM-UP ENTREPRENEURIAL  
ENERGY
- ELITE COMMITMENT TO AGGRESSIVE  
NATIONAL ACTION PLANS FOR SCIENCE  
AND INNOVATION



# The Governance Structure of Chinese S&T



# A SYSTEM OF GREAT DIVERSITY AND VITALITY

- THE ACADEMIC MODEL
  - CAS
  - UNIVERSITIES
- THE SOE MODEL
- ENTREPRENEURSHIP
  - ZHONGGUANCUN AND OTHER HI TECH ZONES
  - THE “SOUTHERN APPROACH”
    - *SHANZHAI*
    - JIANGSU, ETC.
- NEW “PUBLIC-PRIVATE” EXPERIMENTS
- FDI/MNC MODEL

# KEY INSTRUMENTALITIES – *JUGUO TIZHI* (“NATIONAL MOBILIZATION”)

- MEDIUM TO LONG TERM PLAN (2006-20)
  - “INNOVATIVE SOCIETY” BY 2020
  - MEGA-PROJECTS/NATIONAL R&D PROGRAMS
  - STANDARDS AND IPR
  - “LEAPFROGGING” TO THE FRONTIER AND BEYOND
- IP STRATEGY
- TALENT STRATEGY
- MOBILIZATION OF LOCAL GOVERNMENTS
- “STRATEGIC EMERGING INDUSTRIES” (SEI)

# 16 MEGAPROJECTS

- Advanced numerically-controlled machine tools and basic manufacturing technology
- Control and treatment of AIDS, hepatitis, and other major diseases
- Core electronic components, including high-end chip design and software
- Extra large-scale integrated circuit manufacturing
- Drug innovation and development
- Genetically modified organisms
- High-definition earth observation systems
- Advanced pressurized water nuclear reactors and high-temperature gas cooled reactors
- Large aircraft
- Large-scale oil and gas exploration
- Manned space, including lunar exploration
- Next-generation broadband wireless telecommunications
- Water pollution control and treatment
- Three unannounced projects, thought to be classified

# Strategic Emerging Industries (SEI)



# “SEI” IN GREATER DETAIL

- Energy conservation and environmental conservation, including energy-saving equipment and products, pollution control, clean coal, and utilization of seawater.
- Information technology, including Next-Generation Internet equipment, broadband-based information network infrastructures, the Internet of Things, cloud computing, integrated circuits, and new display devices, software and servers.
- Biotechnology, including pharmaceuticals and agriculture.
- Large-scale machines, including civilian aircraft, satellite and aerospace technology, intra- and inter-city rail transport, offshore exploration rigs, and intelligent manufacturing facilities.
- Clean energy, including nuclear, solar, wind, and smart grid technologies.
- New materials, including the development of rare earth materials, membrane materials, special glass, functional ceramics, semiconductor materials, LED materials, metal alloys and alloy steels, engineering plastics, carbon fiber, Kevlar fabrics, ultrahigh molecular weight polyethylene (UHMWPE); and research on nanomaterials, superconducting materials, and intelligent materials.
- Electric vehicles, including hybrids cars, pure electric cars and batteries

# EXPLOITING GLOBALIZATION

- TAPPING THE DIASPORA
- OVERSEAS OPPORTUNITIES FOR ADVANCED TRAINING
- ROBUST APPROACH TO INTERNATIONAL COOPERATION AT NATIONAL AND LOCAL LEVELS (E.G., CERC)
- CHINA AS MAGNET.....
  - FOR MNCS -1,300 MNC R&D CENTERS
  - FOR FOREIGN RESEARCHERS
  - FOR THOSE LOST IN THE BRAIN DRAIN
  - FOR FOREIGN GOVERNMENTS (E.G., CERC)

# BUT, SIGNS OF TROUBLE

- CONTROVERSIES OVER ORIGINALITY AND INNOVATION (THE “STEVE JOBS ISSUE”)
- ISSUES OF SCIENTIFIC/COMMERCIAL INTEGRITY
- INSTITUTIONAL ARRANGEMENTS
  - SPENDING OUTPACING GOOD MANAGEMENT
  - NATIONAL COORDINATION ISSUES
  - THE “ENTERPRISE PROBLEM”
    - IN-HOUSE R&D
    - EFFECTIVE LINKS WITH ACADEMIC SECTOR
- WHAT IS *ZIZHU CHUANGXIN* IN AN AGE OF GLOBALIZATION?



# WHY ARE ASPIRATIONS FOR S&T FRUSTRATED?

- CULTURAL EXPLANATIONS
  - EDUCATION – “OUTSIDE THE BOX?”
  - EXCESSIVE RESPECT FOR HIERARCHY
- INSTITUTIONAL
  - IPR/RULE OF LAW
  - FINANCE
  - ENTERPRISE CULTURE
- POLITICAL
  - BELIEF IN STATE-DIRECTED INNOVATION
  - INFORMATION CULTURE

# S&T ENGAGEMENT WITH CHINA

- THE TRADITION
- RISKS HAVE INCREASED, BUT SO HAVE PAYOFFS
- MODALITIES OF ENGAGEMENT
  - GOVERNMENT
  - BUSINESS
  - UNIVERSITIES
  - NGOs
- UNCOORDINATED ENGAGEMENT INCREASES RISKS (?)
- COMPETITIVE CHALLENGES ARE REAL

# SECURING BENEFITS THROUGH ATTENTION TO STRATEGY

- CLARIFY RELATIONSHIPS BETWEEN TRADE/INVESTMENT ISSUES AND S&T COOPERATION
- MORE NATIONAL COORDINATION AMONG PUBLIC AND PRIVATE PLAYERS
  - STAFFING
  - INTELLIGENCE
  - FORUMS
- MORE ATTENTION TO STAFFING AND RESPONSIBILITIES IN CHINA

**THANKS!**

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<http://china-us.uoregon.edu/>