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Technology and Innovation Policies in OECD Countries: Perspectives for Energy Technology R&D

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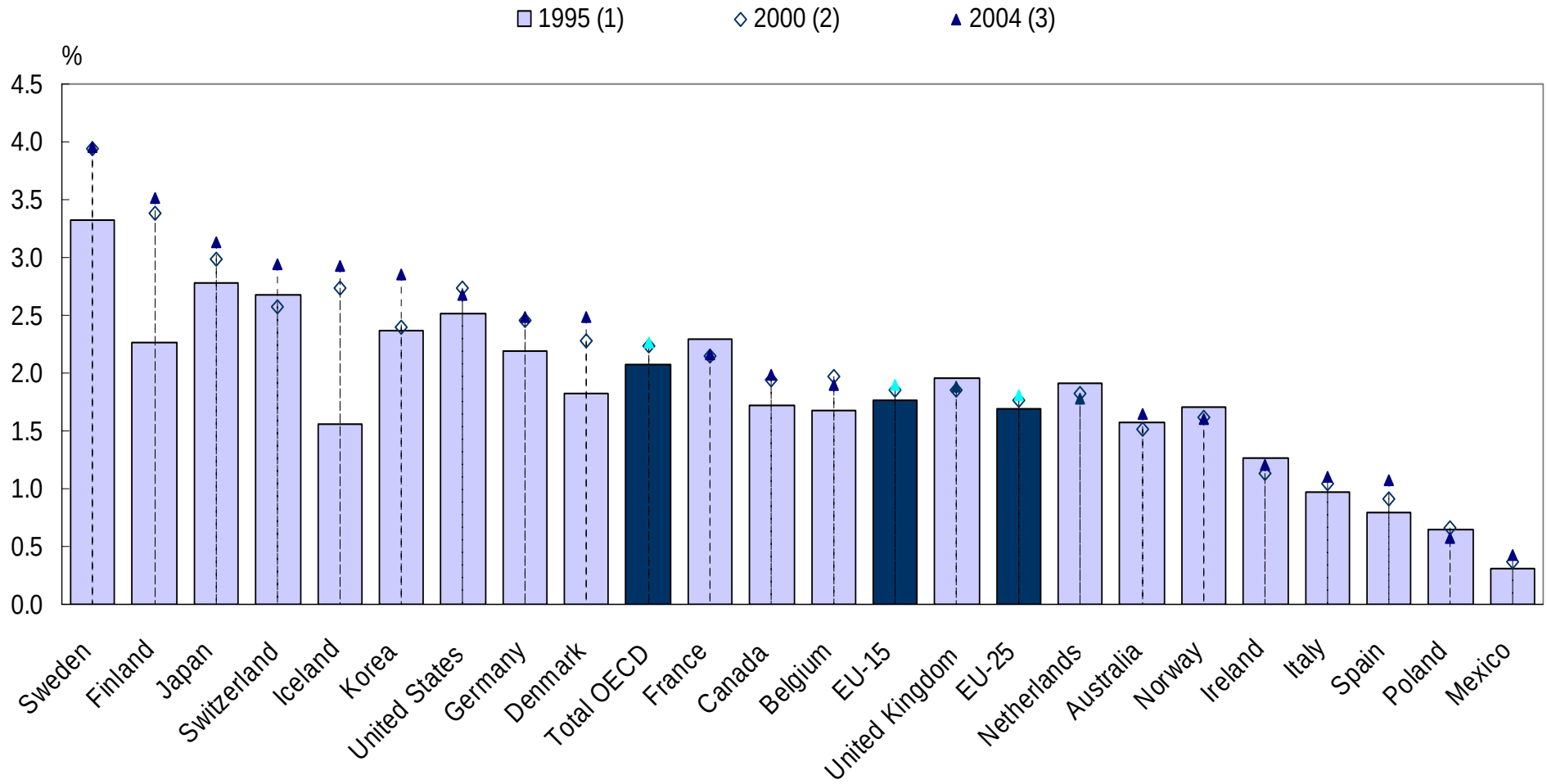
Outline

- OECD work on science and innovation
- Some trends in R&D spending
- Recent OECD work on energy innovation.
- Key trends in technology and innovation policy
- Conclusions

OECD work on science and innovation

- OECD work on science and innovation is carried out by the Committee for Scientific and Technological Policy.
- Covers science (research) and innovation policy.
- The output of the work includes:
  - **Analytical reports**, *e.g.* on Public-Private Partnerships, Science-Industry Links or Innovation in Energy/Pharmaceuticals.
  - **Policy reports**, *e.g.* country reviews of science and innovation policy.
  - **Policy guidelines**, *e.g.* on access to data from publicly-funded research.
  - **Statistics, indicators and benchmarking reports**, *e.g.* OECD's bi-annual Science, Technology and Industry Scoreboard.
- In practice, a platform for exchange, analysis and discussion on good policy practices.

Recent trends – Growing R&D intensity in some OECD countries (R&D as % of GDP)

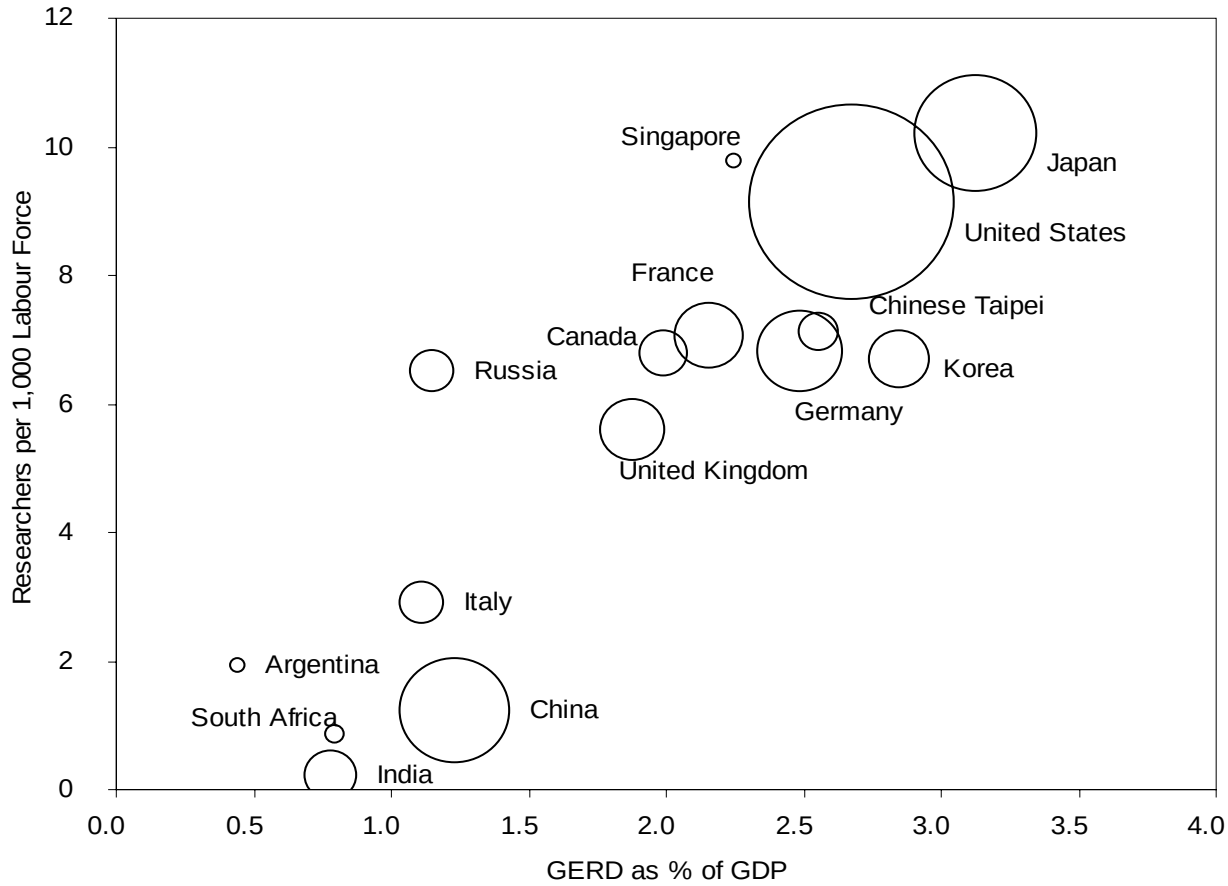


Source: OECD, Science, Technology and Industry Outlook 2006, December 2006.

A growing importance of some non-OECD countries in science and innovation

- Growing importance of non-OECD countries in science and innovation.
- Growing competition for scarce talent – important role for international mobility.
- Some non-OECD countries are trying to leapfrog.

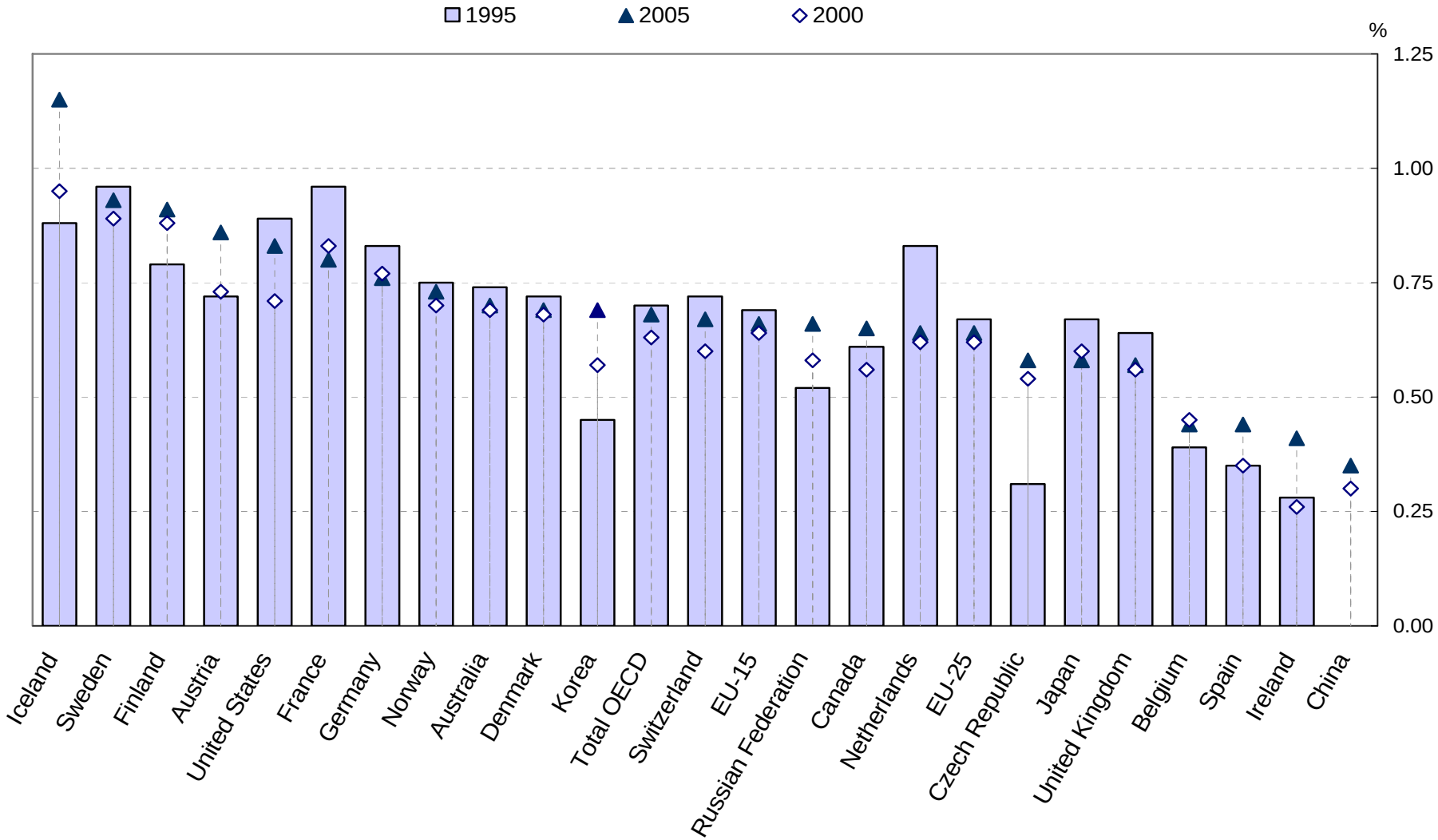
R&D expenditure in 2004
(circles reflect size of spending in billion USD)



Source: OECD, Science, Technology and Industry Outlook 2006, December 2006.

Government-financed R&D has been relatively stable compared to GDP in most OECD countries

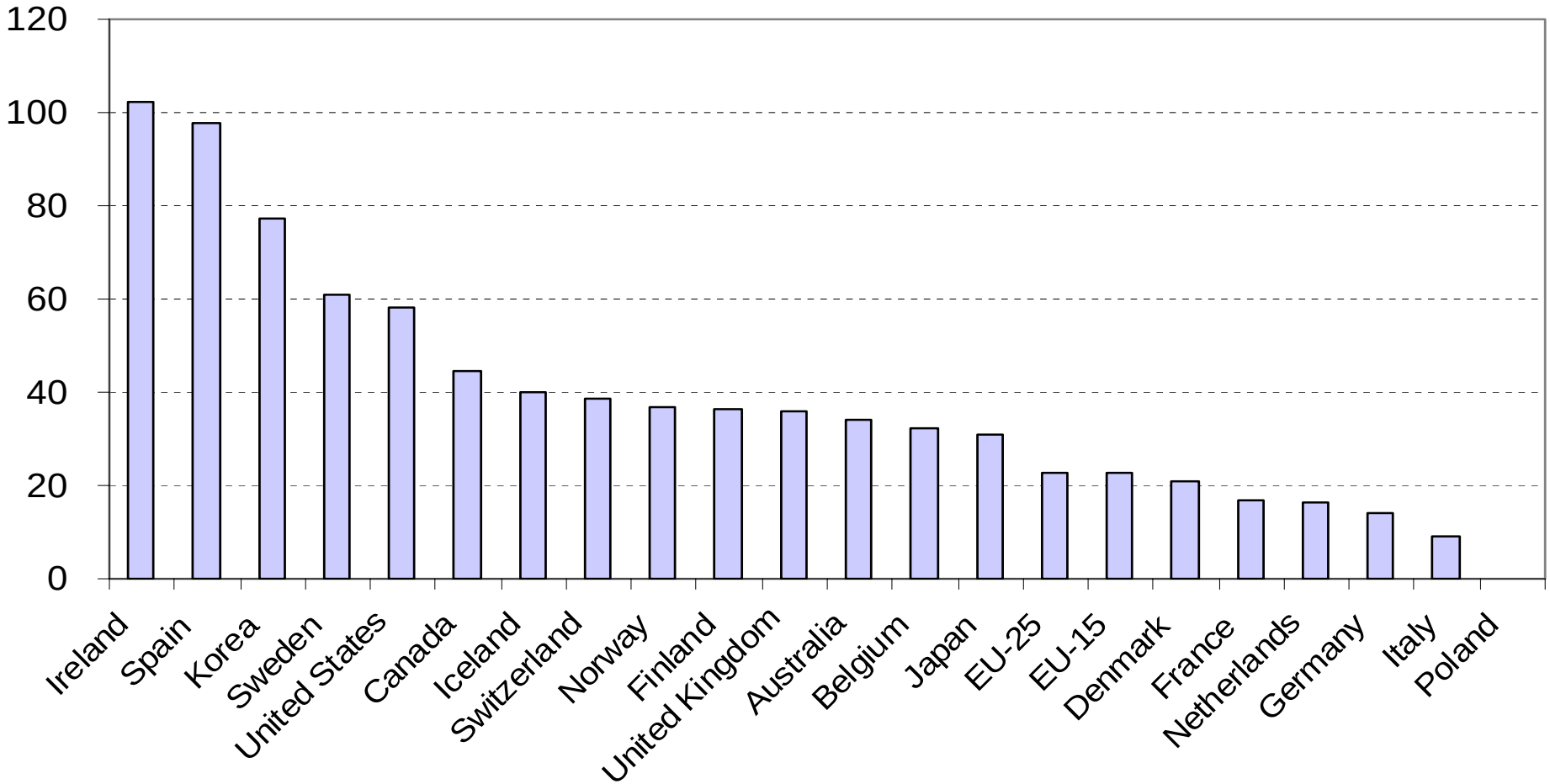
(government-financed R&D as % of GDP)



Source: OECD, Main Science and Technology Indicators, 2006-II, December 2006.

Government budgets for R&D have grown substantially in some countries

(growth in government budgets for R&D, 2000-2006, current prices, in %)

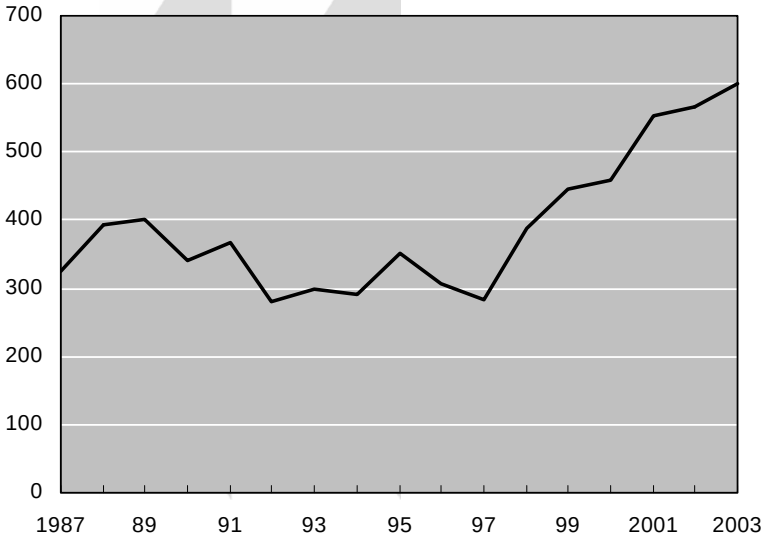


Source: OECD, Main Science and Technology Indicators, 2006-II, December 2006.

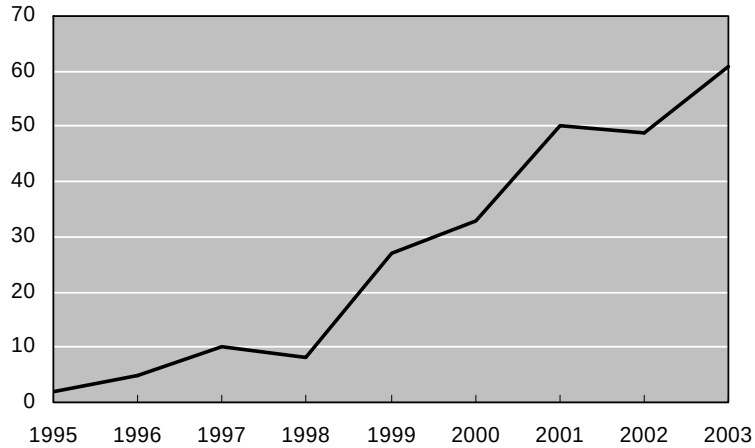
Patent data provide insights in innovation patterns

(patent counts at EPO)

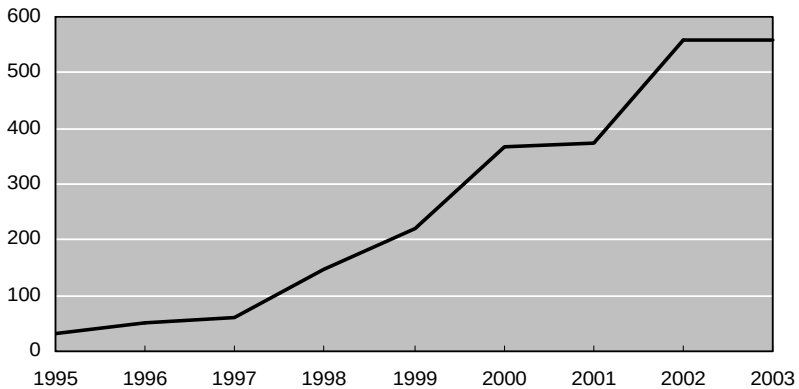
Nuclear energy



Wind energy



Fuel cells



Source: OECD, Patent Statistics Database, based on European Patent Office, December 2006.

Selected OECD work on energy innovation

a) Innovation in Fuel Cells (published in 2006)

- Key findings:
  - Complex technology with most benefits still in the future.
  - Particularly important focus for countries with large car industries or countries heavily dependent on imported oil.
  - Important role for universities and government laboratories.
  - Growing private spending as commercial applications becoming apparent.
  - Public-private partnerships used by nearly all countries to share costs, encourage co-operation and knowledge sharing, and help identify R&D gaps and opportunities.
  - High degree of international cooperation.
  - Focus not only on R&D, but also on market development, e.g. demonstration and deployment, through subsidies, co-financing or tax incentives. Also:
    - Focus on cooperation to develop a shared vision and reduce uncertainty.
    - Development of skilled human resources for the fuel cells industry.
    - International codes and standards to support commercialisation.

Selected OECD work on energy innovation

b) Conference on Scientific Challenges for Energy Research, May 2006 (OECD Global Science Forum)

- Key questions for each area considered:
  - **S&T Maturity** – scientific maturity; timescale to competitive/commercial viability
  - **S&T Challenges** – identifiable S&T challenges and bottlenecks; prospects for breakthroughs
  - **Non-S&T Challenges** – scientific vs. other obstacles
  - **Impacts** – potential impacts on the future energy mix
  - **Current R&D intensity** – what resources have been committed

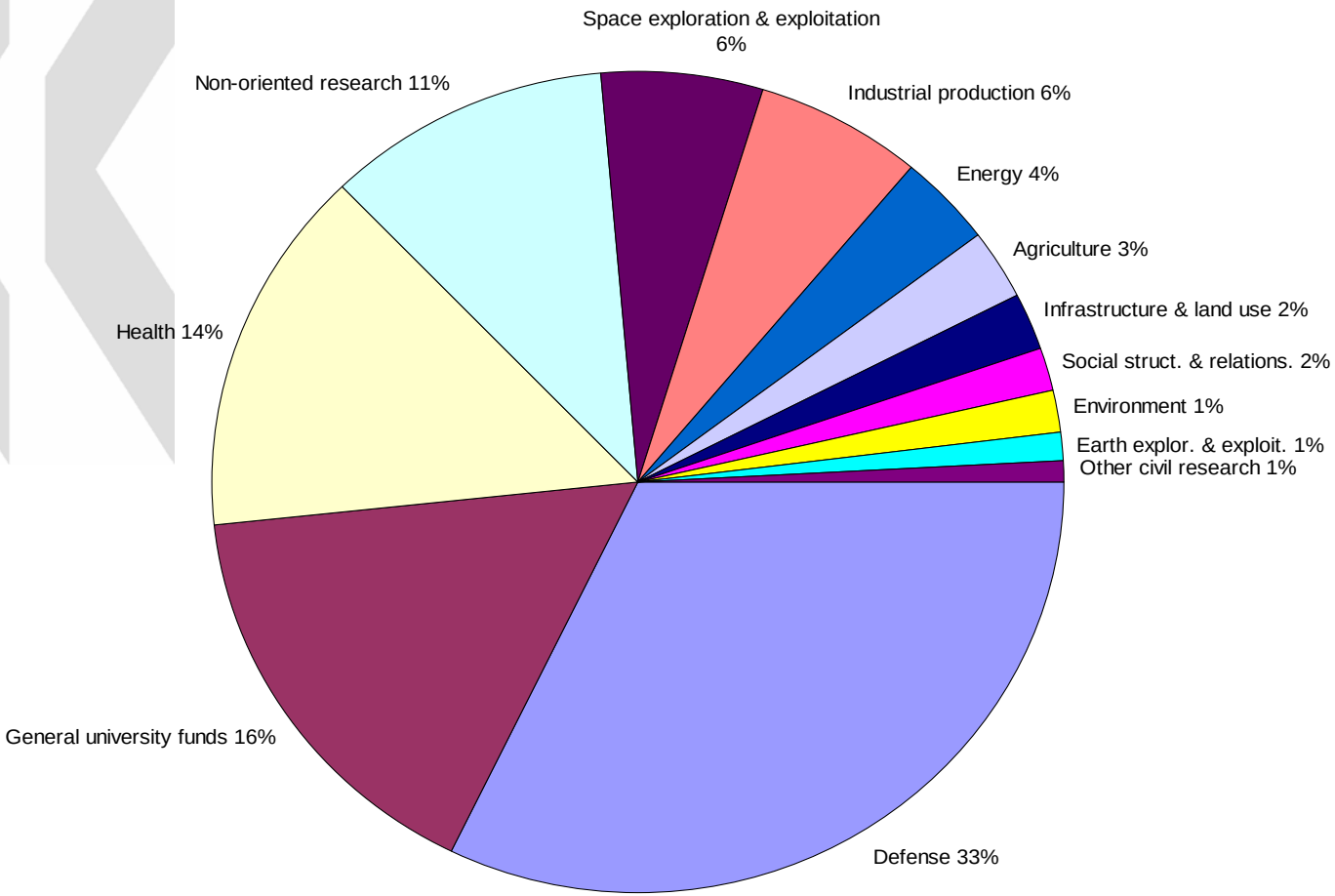
Selected OECD work on energy innovation

b) Conference on Scientific Challenges for Energy Research, May 2006 (OECD Global Science Forum)

- Preliminary findings (1):
  - Demand for energy will double by mid-century, triple by 2100. Much of existing infrastructure will have to be renewed/replaced.
  - S&T-driven efficiency gains *(not examined at GSF conference)* are important and should be pursued.
  - Existing (fossil carbon-dominated) energy system is massive and deeply entrenched. When challenged, it will "fight back".
  - There are large reserves of fossil fuels, with wide geographical distribution. S&T can contribute to their efficient extraction and utilisation. But "peak easy oil" may be upon us already.
  - For new S&T-based solutions, there is great potential in all areas. There are no fundamental insurmountable natural obstacles, but no universal quick solutions either.

Public R&D Budgets, OECD Countries, 2004

243 Billion USD (2000 constant)



Source: OECD

Notes:
- Italy and Mexico (2001), New Zealand (1999).
- Excludes European Commission, Hungary, Luxembourg and Turkey..

Selected OECD work on energy innovation

b) Conference on Scientific Challenges for Energy Research, May 2006 (OECD Global Science Forum)

- Preliminary findings (2):
  - S&T tasks are widely distributed along the continuum from basic research, to development/demonstration/integration, to product.
  - There is a corresponding division of tasks between public and private funding and research.
  - In some areas (e.g., nuclear, carbon capture and storage) implementation requires large investments and long financial timeframes.
  - Energy R&D funding levels are relatively low. *Given the importance of the issues for society, and given the promise of science, should funding be higher?*
- Preliminary conclusion: There is a need for more/better harmonisation of R&D policy with overall national and international priorities and goals in the energy domain.

Overall trends in science and innovation

- Growing public budgets in several OECD countries.
- Some pick-up in private spending, as economic conditions improve.
- Research and innovation rising on the political agenda (also outside the OECD area) – partly linked to globalisation.
- Several low-income countries are becoming more involved in science and innovation: some are aiming to “leapfrog” – a challenge for OECD countries to stay ahead
- Wide range of policy initiatives to strengthen scientific research, foster private investment, and link science and industry, such as:
  1. Reforms to public research
  2. Growing use of public-private partnerships
  3. Reforms to public support for private R&D

1. Policies towards Public Research (universities and public research organisations)

- INSTITUTIONAL CHANGES TO IMPROVE POLICY COHERENCE
  - New organisations in several countries to improve and professionalize funding mechanisms, strategies, growing inter-ministerial co-operation
  - Emphasis on evaluation to improve policy delivery
- STRENGTHENING PUBLIC RESEARCH
  - Reforming governance of public research remains important (e.g. university reforms and reforms to public research institutions) – focus on autonomy, performance contracts, privatisation
  - Ensure best research is funded – focus on excellence, relevance and achieving critical mass
  - Efforts to improve the balance between competitive and institutional (block) funding: too much competitive funding may lead to a short-term focus (e.g. in New Zealand)
  - Focus on infrastructure for science and research – concerns about the sustainability of investments, international co-operation to share (growing) costs of research

2. Public-private partnerships (1)

- Public-private partnerships in research and innovation are expanding because:
  - They can provide effective platforms for pre-competitive R&D in areas where innovation is rooted in science
  - PPPs can help build innovative networks in new multidisciplinary research fields (*e.g.* nanotechnology, genomics)
- But also because they can contribute to other objectives:
  - They can increase the impact of public R&D funding on business R&D and business behaviour (e.g. changes in the type or orientation of research)
  - They can help create new avenues for commercial spill-overs from public research
  - They can help link small and medium-sized firms to scientific research
  - They can increase synergies between regional innovation systems

2. Factors for successful public-private partnerships

- Long-term commitment from both government and industry, based on a shared vision
- Achieve critical mass but also deep reach within the National Innovation System (e.g. complement large PPPs with support to smaller research teams).
- Build on existing networks but do not neglect areas where potential actors are still dispersed (e.g. in multidisciplinary research) and/or inexperienced.
- Implement efficient/competitive selection and steering/financing mechanisms that ensure a sustainable balance between public and private interests
- Other areas that require attention:
  - Organisation and management of such projects.
  - Evaluation of such efforts - the key to learning and improvements in policy.
- Moreover, fostering links also requires finding a balance between different aims of public policy with regards to scientific institutions, e.g. in carrying out long-term scientific research and being relevant to commercial businesses.

3. Fostering business innovation

- SUPPORT FOR BUSINESS R&D AND INNOVATION
  - Some streamlining and consolidation of innovation support measures
  - Growing focus on competitive-based and merit based competitive funding
  - A search for “smart” support for business R&D
  - Growing focus on innovation instead of R&D, greater attention for services
  - R&D tax credits in search of more efficiency; new R&D tax credits for labour charges
  - Focus on leveraging government procurement policies to foster innovation and develop lead markets – the lack of lead markets is considered a particular problem for Europe.
  - A growing importance of regions in research and innovation – and a growing interest in clusters and policies that can support clusters

Conclusions

- OECD work on science and innovation indicates that the outcomes of research depend on the broader environment for innovation, ranging from scientific institutions to commercialisation and the necessary business conditions for innovation. Good research is not enough.
- A range of reforms to research policies can improve the effectiveness of funding, e.g. the use of public-private partnerships, reforms to public research organisations, etc.
- The focus of research and innovation policies is still primarily on technological innovation - not on commercialisation or the development of services.
- Decisions on where to focus research funding are not yet always well informed: many OECD countries still lack adequate mechanisms to help identify future needs and set priorities.
- International co-operation in research remains a problem – addressing global challenges, such as climate change, could benefit from a coordinated research effort – within Europe, much duplication of effort remains.

For more information

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Thank you