ORGANISATION DE COOPÉRATION ET DE DÉVELOPPEMENT ÉCONOMIQUES

R&D and Innovation Policies in OECD countries: Trends and Policy Issues

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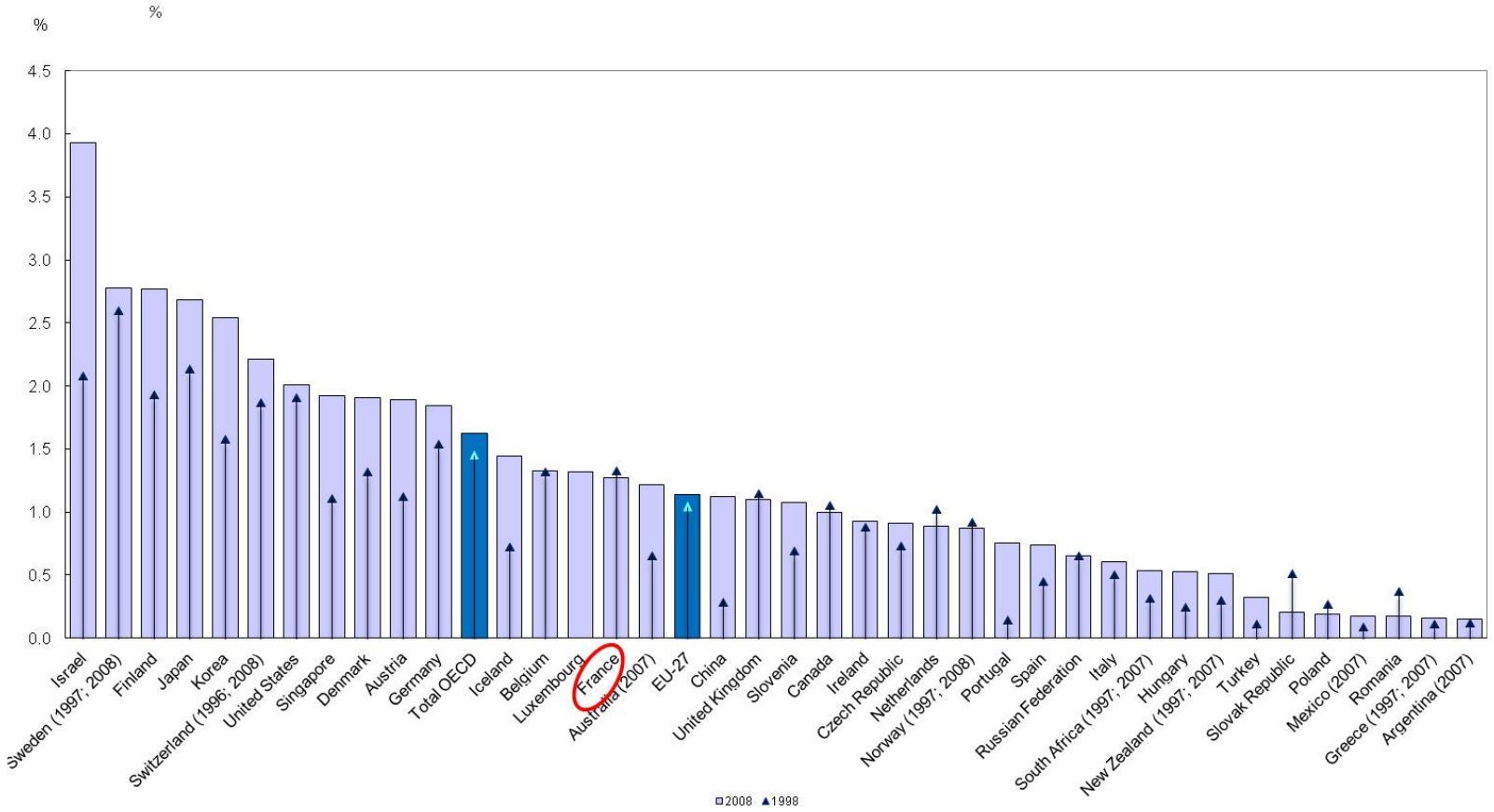
Outline

- Recent in b usiness R&D and innovation performance and funding
- R&D in the aftermath of the crisis
- Public support to R&D and Innovation programmes
  - New rationales
  - Barriers and challenges
  - Types of public/private partnerships
- Evaluation

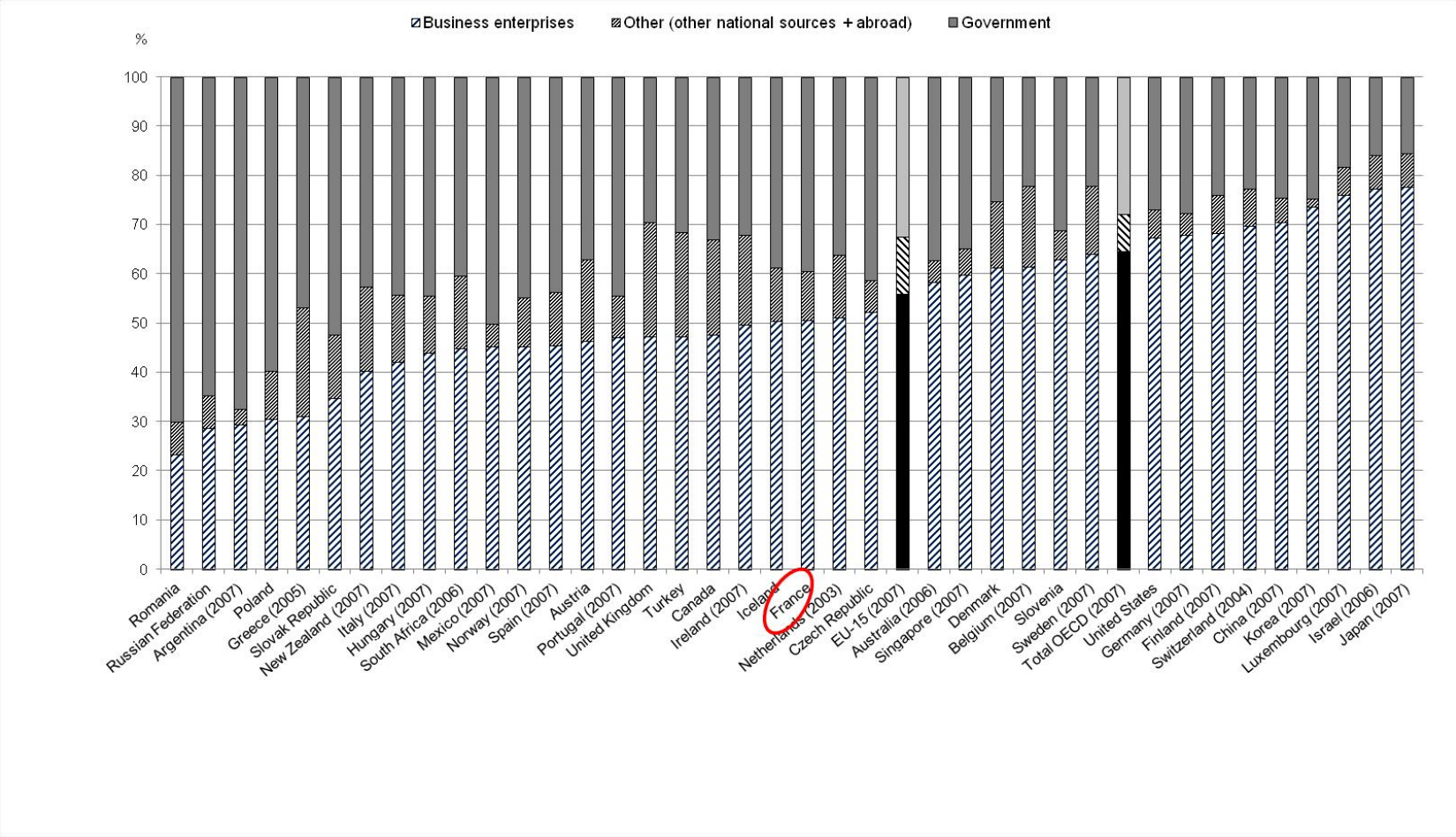
BERD intensity , by country
(1998 and 2008 or nearest year)



Source: OECD

R&D expenditure by source of funding, as % of national total

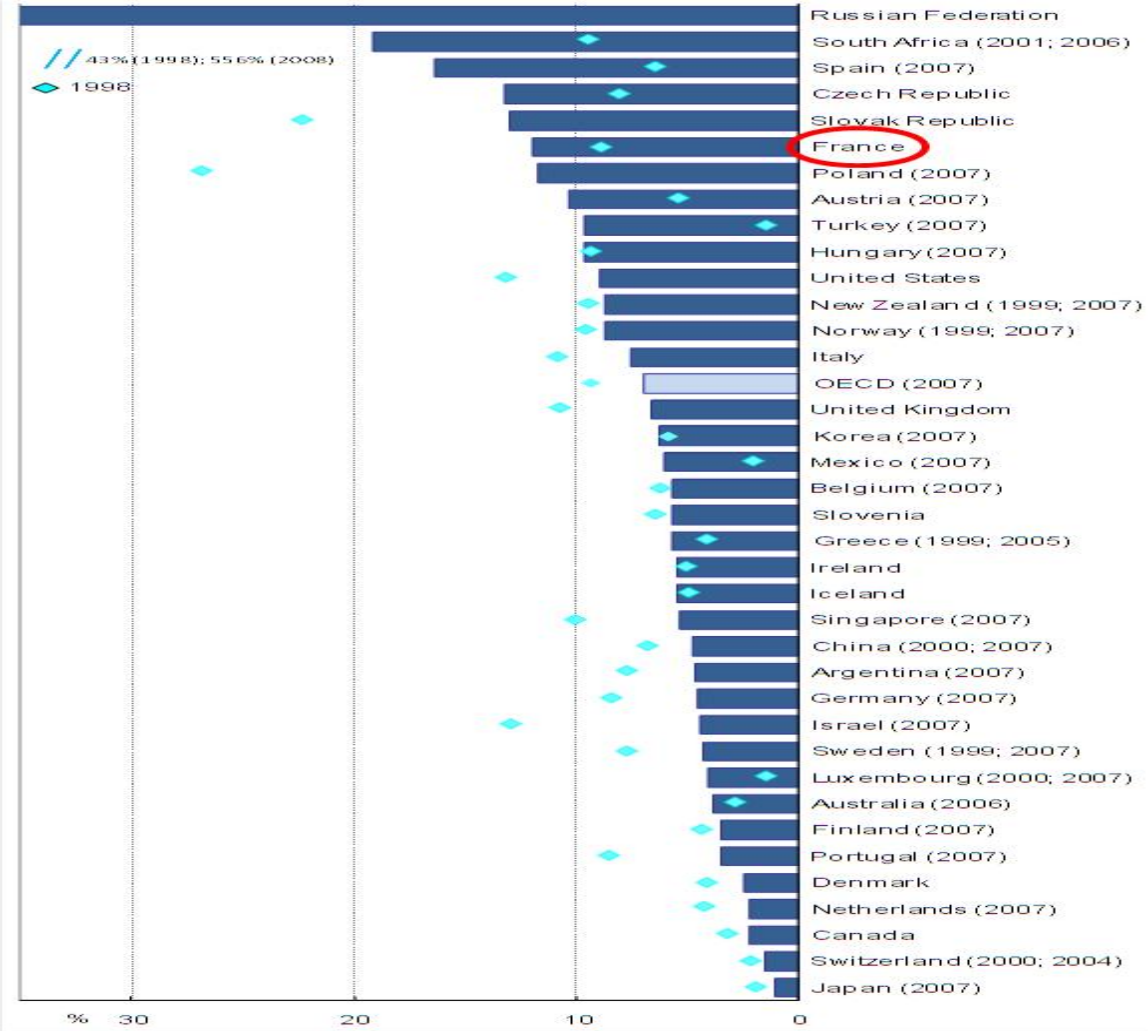
(2008 or nearest year)



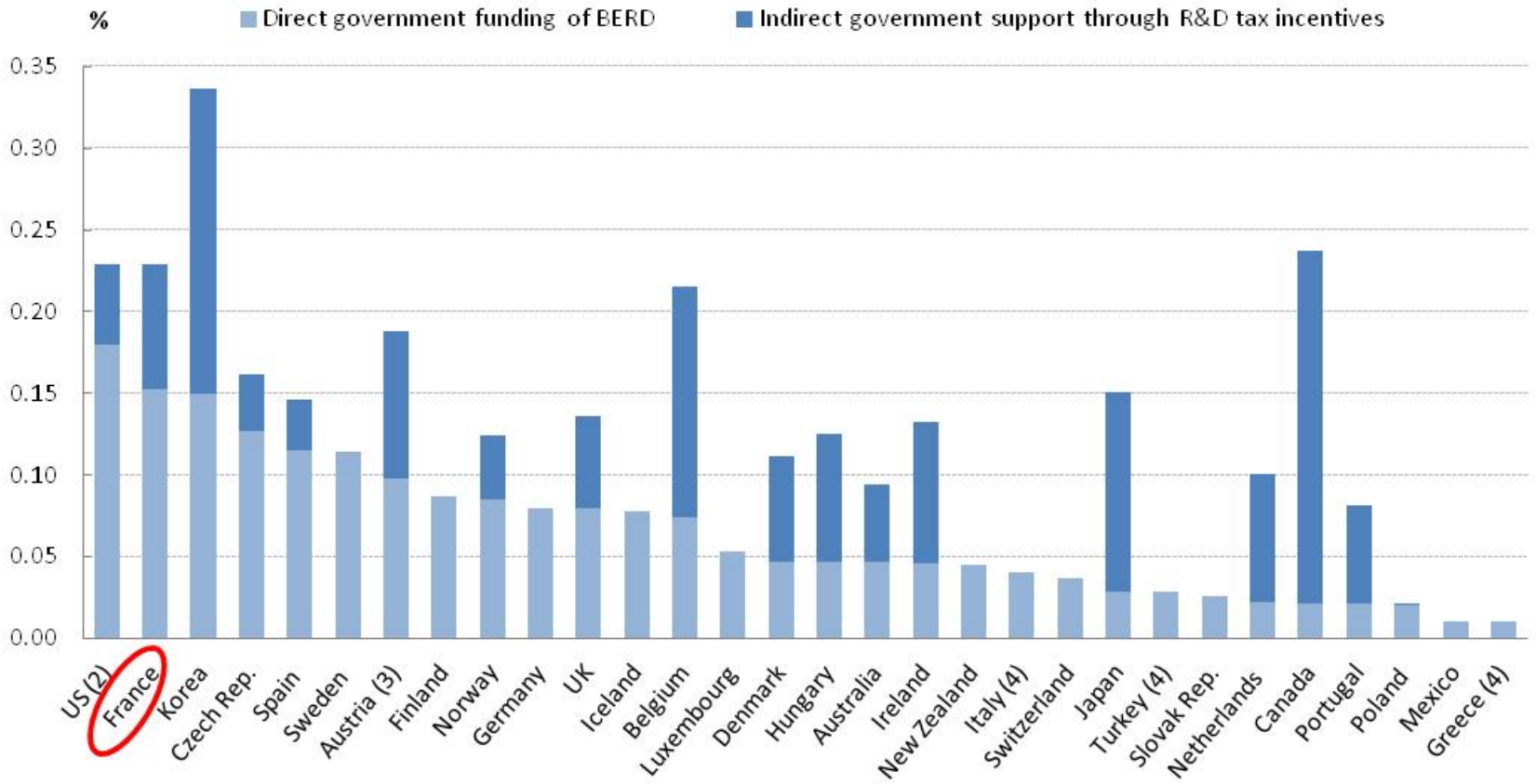
Source: OECD

Government financed R&D in business 1998-2008

(as percentage of R&D performed in the business sector)



Direct and indirect government funding of business R&D and tax incentives for R&D, 2008 (as % of GDP)



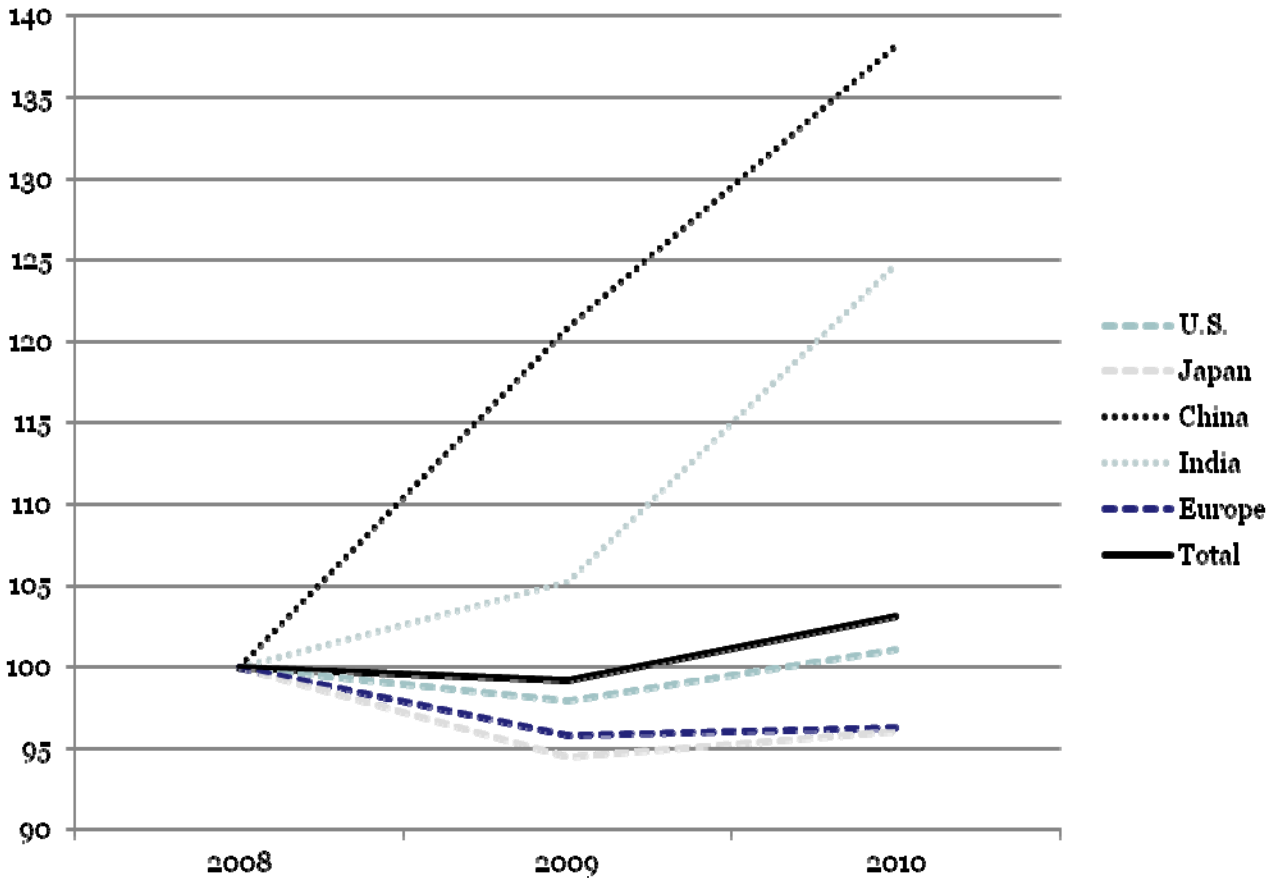
Source: OECD

R&D Over the crisis

- In almost all OECD countries business R&D declined at the end of 2008, then recovered progressively at the end of 2009.
- On average, for large firms, the yearly drop was around 2-3% in 2009 (EU: -3%, US: -5%, JP: 0%).
- The decline was more pronounced in the automobile and IT sectors, while pharma remained positive.
- Chinese and Indian firms have not been significantly hit (continued growth).

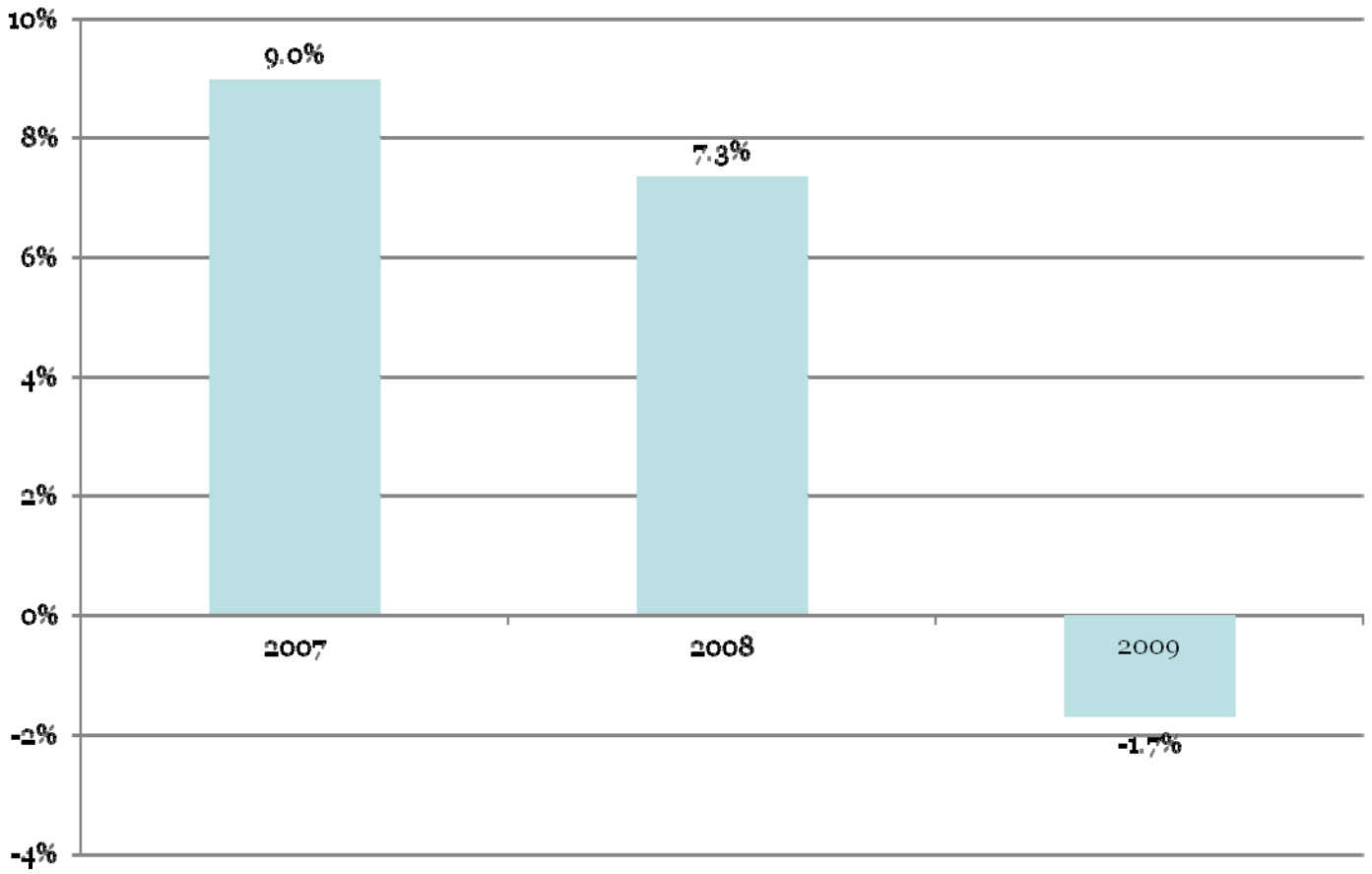
R&D over the crisis

(source: R&D Magazine, Battelle)



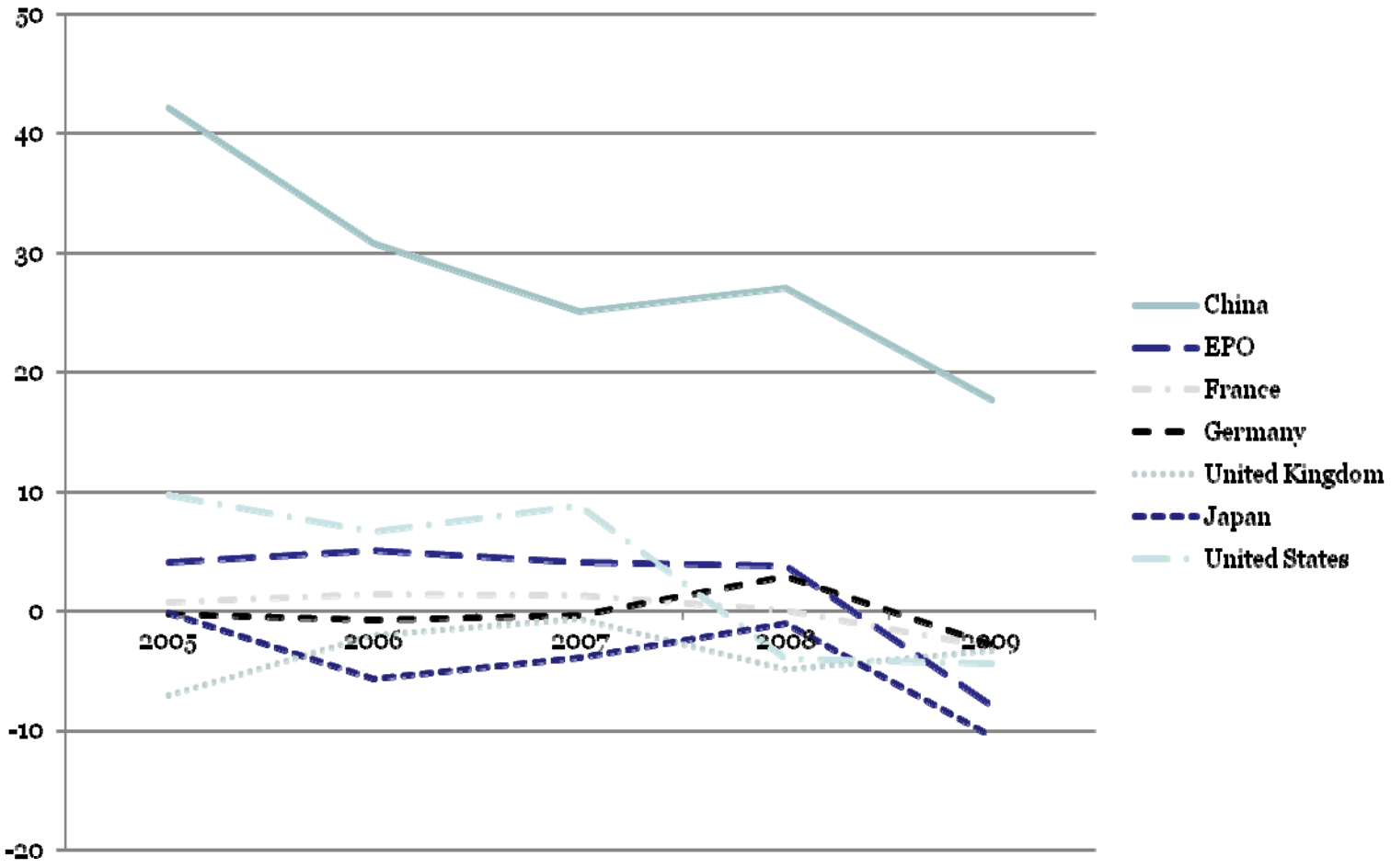
Business R&D – 2000 largest firms

(Source: SEC, WIPO calculations)



Patent filings

drop in the number of filings to major patent offices by residents. Source: WIPO



What is specific about this crisis?

- It started in the financial sector: this might magnify difficulties related to financing
- It has been sudden and deep (drop in demand) = demand collapsed
- Originated at a time when productivity growth was already slow: a sustainable recovery will require faster productivity, hence innovation

Innovation policy responses to the crisis: three main pillars

1. Safeguarding the basis for innovation

2. Fostering new sources of growth

3. Achieving long-term fiscal sustainability

1. Safeguarding the basis for innovation (1)

- Rationales:
  - External shocks can lead to misallocation of capital by the market away from risky and innovative ventures
  - Creative destruction in time of crisis may lead to problems of market selection : promising high tech SMEs shut down with impact on global value chains and employment
  - Long-term loss of human capital through internal and external brain drain
  - Due to high sunk costs and lead times to develop researchers, supply must be preserved to enable a rapid response when demand increases

1. Safeguarding the basis for innovation (2)

- Some policy measures:
  - emergency measures to free up credit for SMEs (e.g. loans, credit lines)
  - new instruments such as “credit mediation”
  - New public investment funds/banks to fill gap left by collapse of credit and VC market
  - Short-term stimulus measures to support demand in key industrial sectors (e.g. auto)
  - Special measures to accelerate R&D tax credits (e.g. CIR in France)
  - Special measures to preserve high skill employment (e.g. Dutch scheme to temporarily transfer redundant business researchers to the public research sector)

Short-term response (1) : Stimulus package measures relating to innovation and long-term growth

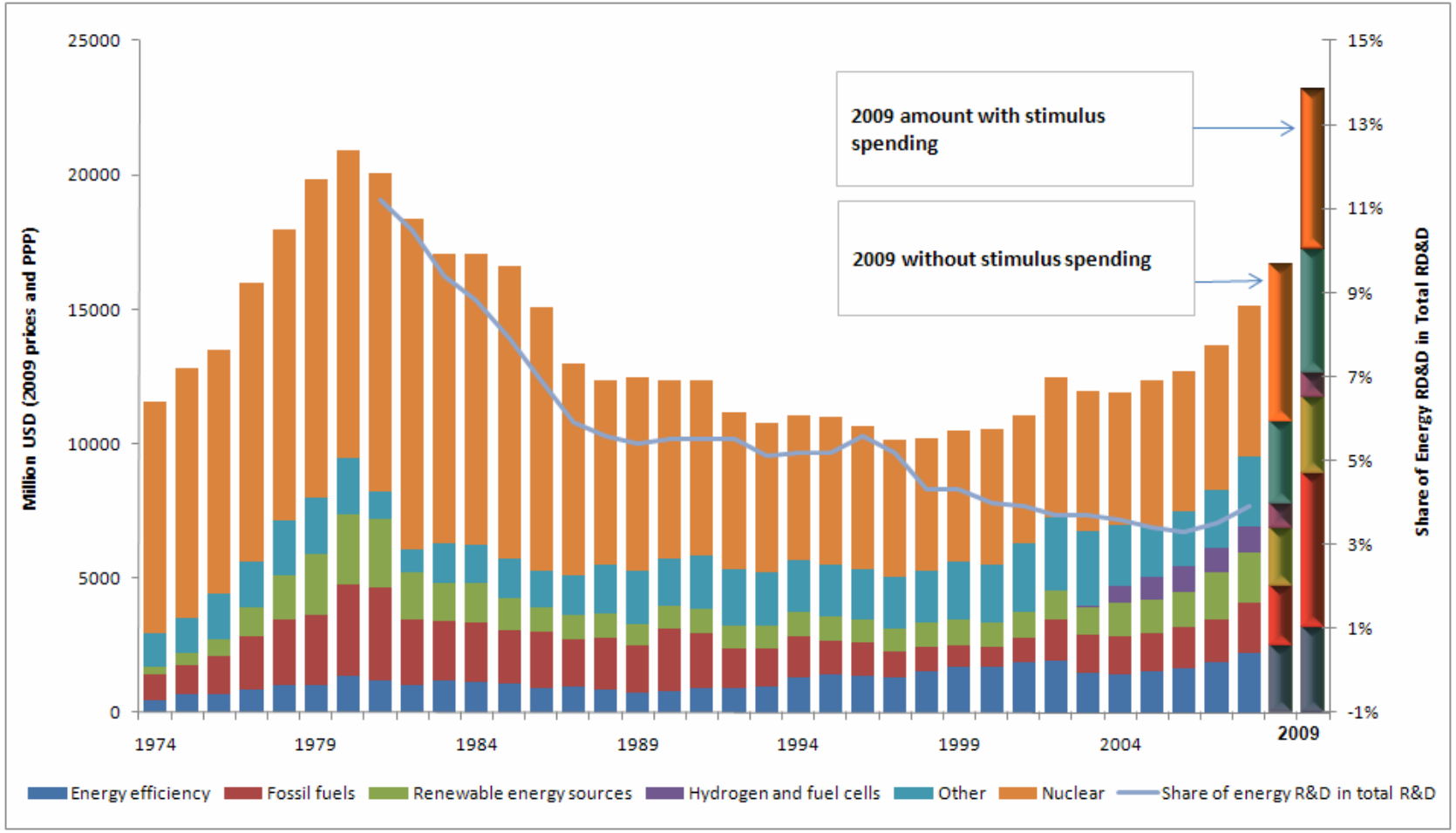
- **Improving the infrastructure (e.g. roads, transport, ICT)**
- **Support for science, R&D and innovation**
- **Investment in human capital, education and training (including schools, teachers)**
- **Promoting investment in and uptake of «green» technologies and innovations to foster energy efficiency**
- **Support for innovation and entrepreneurship (incl. support for SMEs, venture capital)**

2. Fostering New Sources of Growth (1)

Rationale:

- Innovation is need to raise productivity and raise trend growth
- Without growth, the path toward fiscal consolidation is not sustainable
- In the absence of monetary policy levers (i.e. in individual Euro countries) and weak fiscal positions, growing pressure on exchange rates and rise in protectionism.
- Structural policies (e.g. product and labour market reforms) can play a role in fostering growth but require time and can be difficult to implement politically in times of weak recovery
- Innovation and entrepreneurship policies play a role, but impact greater when linked to other structural policies and framework conditions = need for a whole-of-government approach!

Green Energy R&D: Public sector RD&D spending with/without stimulus in the IEA countries



2. Fostering new sources of growth (2)

- Some policy measures:

– Strengthening public support to R&D in key technologies areas (e.g. nano, bio) as well as in infrastructure (e.g ICTs, broadband)

– Focusing and targeting public R&D around competitive goals and "grand challenges" (e.g. energy, environment) = greening innovation!

– Improving access, commercialisation and exploitation public research data and intellectual property

– Fostering knowledge networks and markets (e.g. licensing, trademarks, patents, mobility)

– Foster training and skill upgrading in SMEs, not only access to finance

– Emphasis on entrepreneurship education from primary to higher education

Recent trends in STI priorities: Environment, energy, health

	Strategic STI policy priority areas											
	National security	Environment, climate change and oceans	Natural resources and energy	Food security	Health & related life sciences (incl. biotech.)	Social challenges (incl. pension, transport, urbanisation, housing)	Engineering and advanced manufacturing	New materials/ technologies (incl. nanotech.)	ICT	Children, education and creativity	Regional influence, tourism and culture	Others[1]
Austria												
Belgium (Flanders)		ν			ν	ν		ν	ν			ν
Belgium (Wallonia)				ν	ν	ν	ν					ν
Canada		ν	ν		ν			ν	ν			
Czech Republic		ν	ν		ν	ν			ν		ν	
Denmark		ν	ν	ν	ν	ν		ν	ν	ν		
Finland	ν	ν	ν			ν						
France		ν	ν		ν	ν		ν	ν			
Germany	ν	ν	ν		ν	ν	ν	ν	ν			ν
Hungary		ν	ν		ν			ν	ν			
Israel		ν	ν		ν			ν	ν			ν
Italy	ν	ν	ν	ν	ν		ν	ν	ν		ν	
Japan		ν	ν	ν	ν	ν			ν	ν	ν	
Korea	ν	ν	ν	ν	ν	ν	ν	ν	ν	ν	ν	ν
Netherlands	ν	ν	ν	ν	ν	ν		ν		ν		ν
New Zealand		ν	ν	ν	ν	ν						
Norway		ν	ν	ν	ν			ν	ν	ν	ν	
Slovenia		ν	ν	ν	ν	ν		ν	ν			
Spain		ν	ν		ν			ν	ν			
South Africa		ν	ν		ν	ν						ν
Sweden	ν	ν	ν		ν	ν	ν	ν			ν	
Turkey	ν	ν	ν	ν	ν		ν	ν	ν			
United Kingdom		ν			ν			ν	ν			
United States	ν	ν	ν		ν							

3.Achieving long-term fiscal sustainability (1)

- Rationales:
  - Excessive fiscal consolidation can stunt recovery and growth
  - Need to safeguard support for “innovation” and future sources of growth = ring fencing public research and education.
  - But limited public financing also calls for low cost or fiscally neutral measures to support innovation.

3.Achieving long-term fiscal sustainability (2)

Examples of fiscal neutral or low cost measures to enhance efficiency of public support to business R&D and entrepreneurship:

- Improving competition and regulations on business
- Streamlining direct support to business innovation
- Simplify SME and entrepreneurship and policy programmes by reducing strategy areas and simplifying support mechanisms (e.g. in Canada and the Netherlands)
- Improving effectiveness of indirect support like R&D tax credits through better evaluation and design consistent with industrial structure
- Incentivising greater industry-science collaboration through public/private partnerships and cluster policies
- Increasing demand-side innovation measures (e.g. regulations, public procurement, standards)

3. Achieving long-term fiscal sustainability (3)

- Cross-government approach to support innovation and entrepreneurship
- Prioritising public research funding by using foresight and evaluation tools
- Reform of public research funding streams to incentivise collaboration
- Improving quality of research training and skills, fostering multidisciplinary and mobility

Traditional and New Rationales for Business R&D and innovation programmes

- Improve productivity and growth
- Improve connectivity within national innovation system
- Develop new capabilities
- Strengthen areas of competence and advantage (e.g. exporting sectors)
- Budget pressures and rising costs and complexity of R&D at the frontier
- Achieving critical mass and excellence through public-private collaboration
- Public/private collaboration as a means of linking supply and demand
- Private/Collaboration is enabled by ICTs and the rise of Open Science/Open Innovation Models/Cloud computing
- Global challenges increase demands for collaboration

Barriers and challenges in supporting business R&D and innovation

- Financing – valley of death
- Legal and regulatory Barriers to commericalisation and development
- IPR issues
- Regional/National and Governance Challenges
  - Avoiding duplication and fostering synergies
- Aligning Incentives between public and private actors
  - Financing
  - Outcomes
  - Evaluation

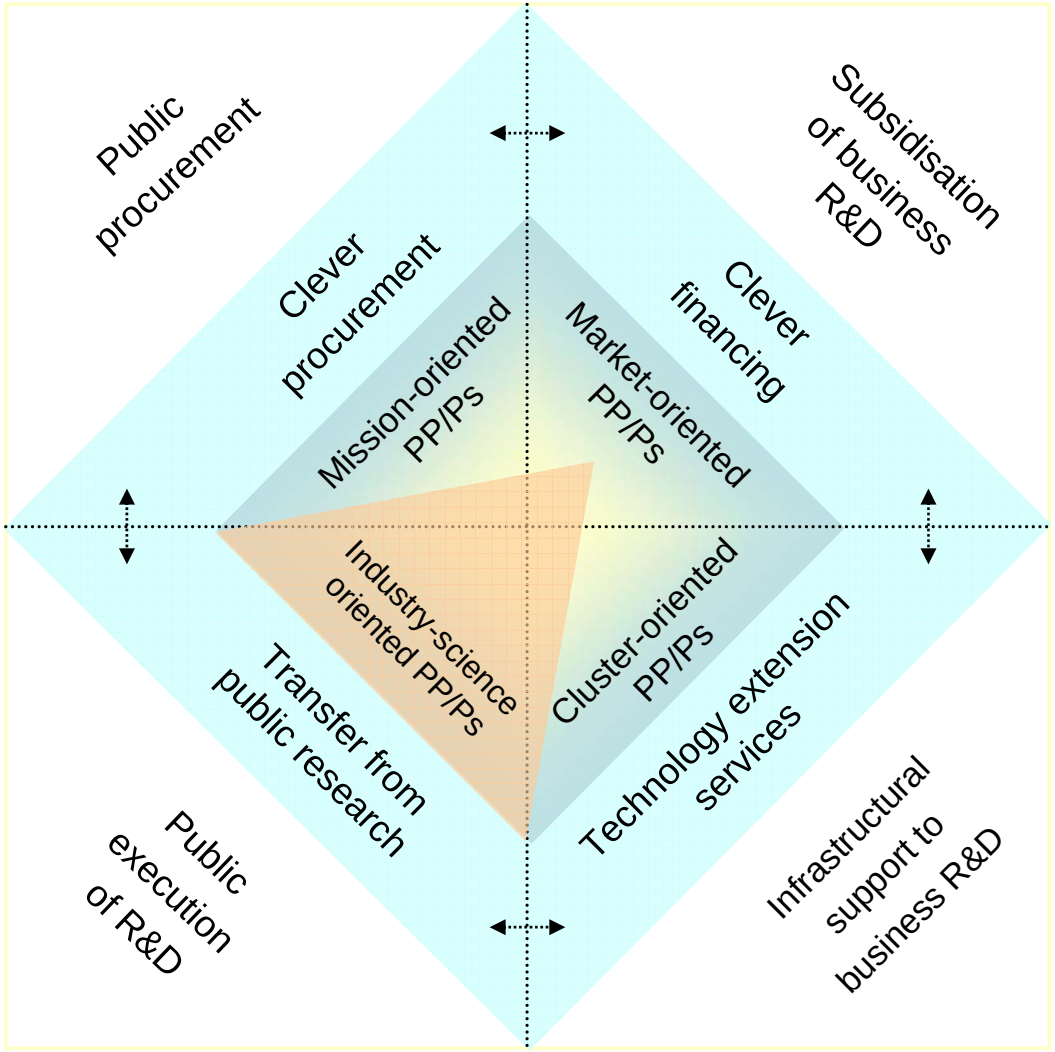
Focus on Public-Private Partnerships

- As opposed to other policy instruments, and to more casual relationships between government and industry, PP/Ps are characterised by:
  - Institutionalisation
  - Government as a partner
  - Shared objectives and a clearly defined public interest
  - Active involvement and co-investment of resources

Some examples

- UK: Energy Technologies Institute ; 50:50 public private partnership to provide funding for university, SMEs and larger firms in international collaborations
- Italy: Joint-labs between government/university and industry in specific areas (nano, new materials, biotech)
- Canada: 8 large scale Centres of Excellence in Commercialisation and Research involving international peer reviewed competition
- Spain : CENIT programme links firms, public research around big projects to create critical mass
- United States: Technology Innovation Programme funding high risk precompetitive technology. Industry input and university participation with a focus on SMEs

PP/Ps for research and innovation – a Typology



Increased use of PP/Ps for innovation

- An expansion of PP/Ps is observed in several directions:
  - First and foremost, programmes to promote strategic R&D co-operation between universities, public research institutes and private firms are very popular since the end of the 1990s
  - PP/Ps are preferred instruments to promote research in strategic emerging research fields (e.g. genomics, nanotechnology)
  - They are also increasingly used to promote development of and access to human resources for S&T or facilitate early stage financing of technology-based firms
- Overall, they now account for a significant share of S&T budget in several countries

Ensuring industry commitment while balancing public and private objectives

- A bottom-up, competitive selection of PP/P projects is a good practice
- Clear arrangements regarding IPRs are necessary to engage private firms.
- For managing the portfolio of PP/P centres (networks) there may be a need to use some “top-down criteria” in defining research fields where proposals for PP/Ps projects should be encouraged
- To avoid a drift over time in the research agenda of established PP/Ps, strong leadership in management and rigorous evaluation are key

Institutional embedment within the innovation system

- Managing PP/P programmes within government
  - Inter-ministerial coordination
  - Governance structures (e.g. strategic steering versus operation)
- Flexible organisational models
  - Virtual or “real’ centres?
  - Status of PP/Ps within public research organisations (e.g. regarding evaluation of researchers, IPRs, etc.)
- Efficient knowledge management and strong leadership in daily operation

Selection and financing

Co-financing arrangements are central elements of the incentive structure of PP/Ps.

They vary from programme to programme (centre/network)

- Key critieria include:
  - Technical feasability/merit and potential for broad-based economic benefits (ATP/TIP type approach used in the US)
  - Project's degree of challenge, novelty and time to market (Tekes approach)
- There is room for improvement:
  - Provide different levels of government financial contribution to different types of PP/Ps?
  - Lowering budget contribution as PP/Ps mature?

Open Issues

New modes for selecting and financing P/PPs and R&D projects

- Rise of venture-based models in project selections
- Use of options pricing in R&D project financing decisions

Industry-science collaboration across borders

- Ensuring national benefits from openness

Research and technology convergence issues

Evaluation of public support to business R&D and innovation

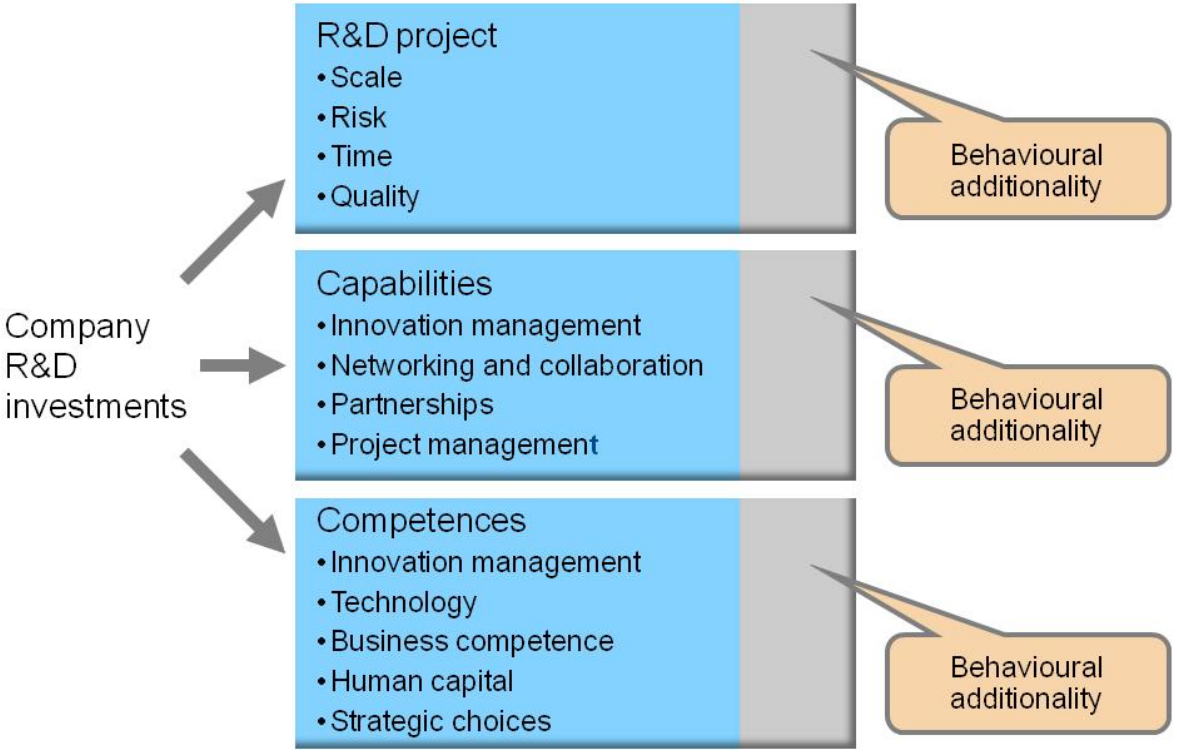
- Economic and societal challenges increase demands for evaluating individual schemes and a portfolio of collaboration
- Three generic criteria:
  - Efficiency of Implementation
  - Impact and Effectiveness
  - Appropriateness (internal and external)

Measuring "additionality"

- input and output additionality

- "behaviourial additionality": does collaboration change the research culture in firms and/or parterning universities

Case Study : Behavioural additionality at TEKES



Use and limits of evaluations

- Need for evaluating “system wide” effects! This require:
  - new metrics (but with stakeholder involvement)
  - new communication channels (to decision makers, to agents, stakeholders)
- Different uses of evaluation; strategic insights for project management
- Evalautions can inform on the rationale, implementation and goal attainment of programmes, but not as successful in demonstrating the economic and wider social impacts
- Problems of comparability persist

- Evaluations can demonstrate positive private returns and externalities of R&D, both on the marco, meso and micro level but only in terms of orders of magnitude and with considerable range of estimates
- Feed-back /use of evaluations can be constrained by lack of data on negative findings
- In practice, feed-back requires political buy-in

Issues for further research

How to further improve evaluation methods and practices ?

--- There are new techniques being developed but are often context specific and data dependent. (e.g. (e.g. micro-econometric modelling)

How to place evaluations in context? :

evaluation of different instruments using a systems perspective

Taking an incremental approach: how far can we go given limits in terms of data and political processes?

Thank you for your attention

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www.oecd.org/sti/innovation