

# National Approaches to Selecting R&D Investment Areas

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CENTER FOR INTERNATIONAL SCIENCE AND TECHNOLOGY POLICY

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# Austria

Gross R&D 2006: €6.4 billion

R&D/GDP = 2.5%

## Strengths:

- Broad consensus among all parts of the R&D community (gov't, industry, universities, labs) for Austrian R&D policy

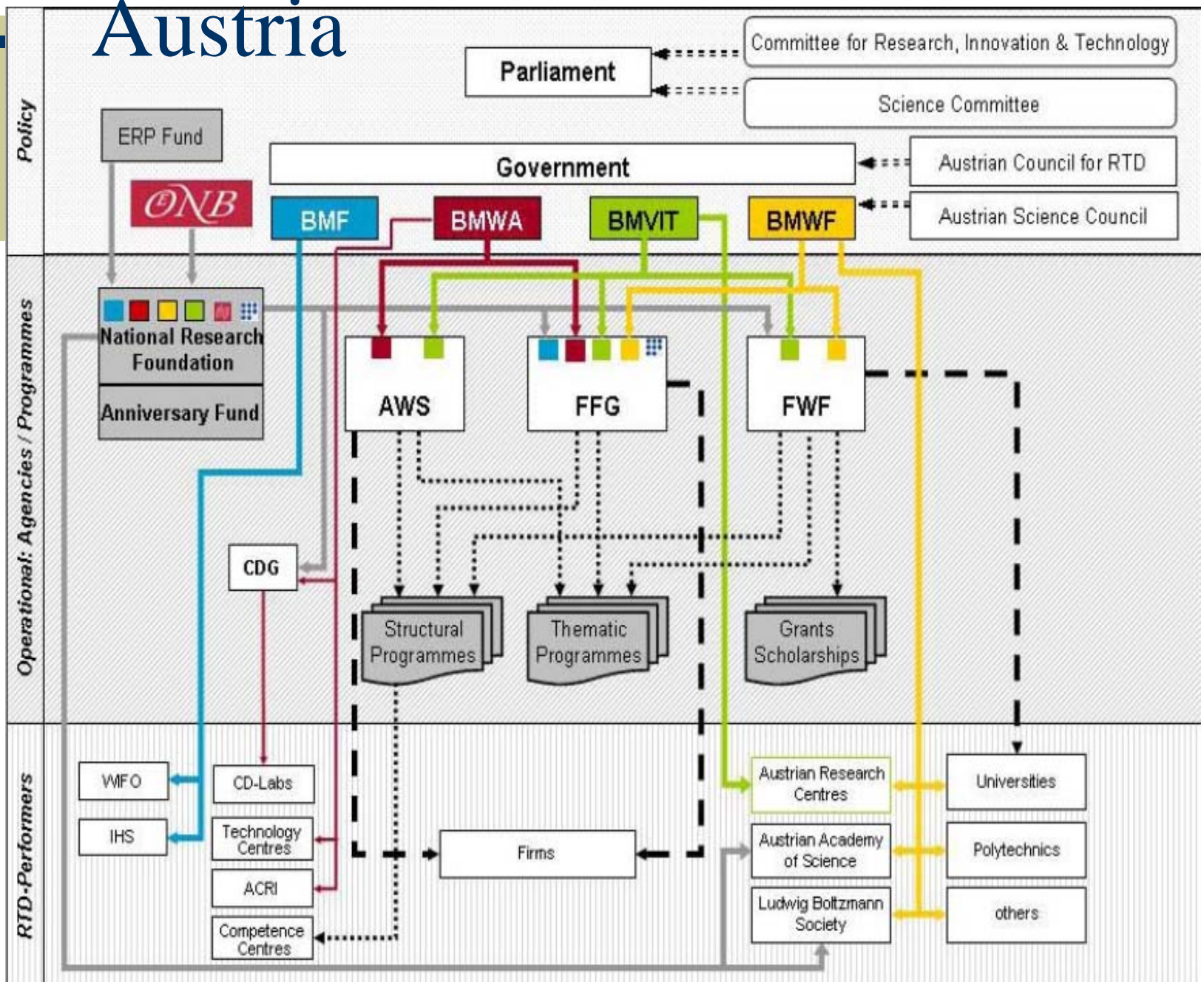
## Challenges:

- Higher education often vocational
- Coordination of R&D efforts and policies
- Banks still dominant financier of SMEs

## Features:

- Example of a country that has “caught up”

# Austria



Source: ERAWATCH Research Inventory 2008,

# Austria

## Focus of R&D funding:

- Historically bottom-up and not strictly coordinated
- Newer funding centered on economic growth through high-tech and cross-cutting missions
- Sectors that are most R&D intensive: radio / TV / communication equipment; pharmaceuticals; office machinery/computers; automotive; medical / precision instruments.



# Finland

Gross R&D 2006: €5.8 billion

R&D/GDP = 3.45%

## Strengths:

- Political will behind R&D investments
- Strong knowledge flows in the innovation system

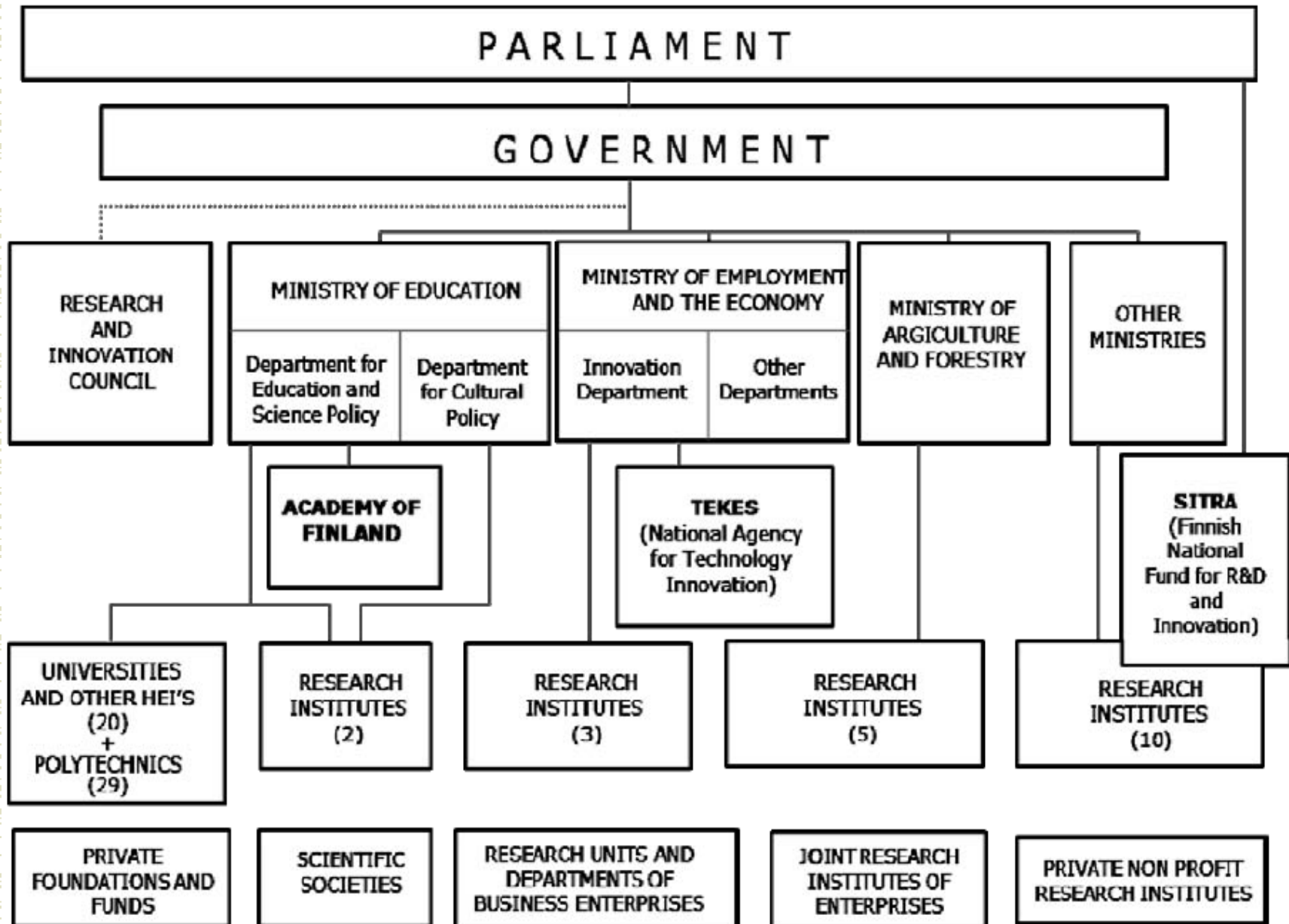
## Challenges:

- R&D investments concentrated in few industries
- Relative scarcity of innovative SMEs

## Features:

- Nokia performs nearly 50% of Finland's private R&D and is a de facto policy driver.

# Finland



# Finland

## Focus of R&D funding:

- ICT (Nokia)
- Three industries – electronics / electrotechnical, machine / metal products, and forestry – accounted for 60% of industrial output in 2005



# France

Gross R&D 2006: €37.8 billion

R&D/GDP = 2.09%

## Strengths:

- R&D investment politically favored
- Long-term R&D planning is well established

## Challenges:

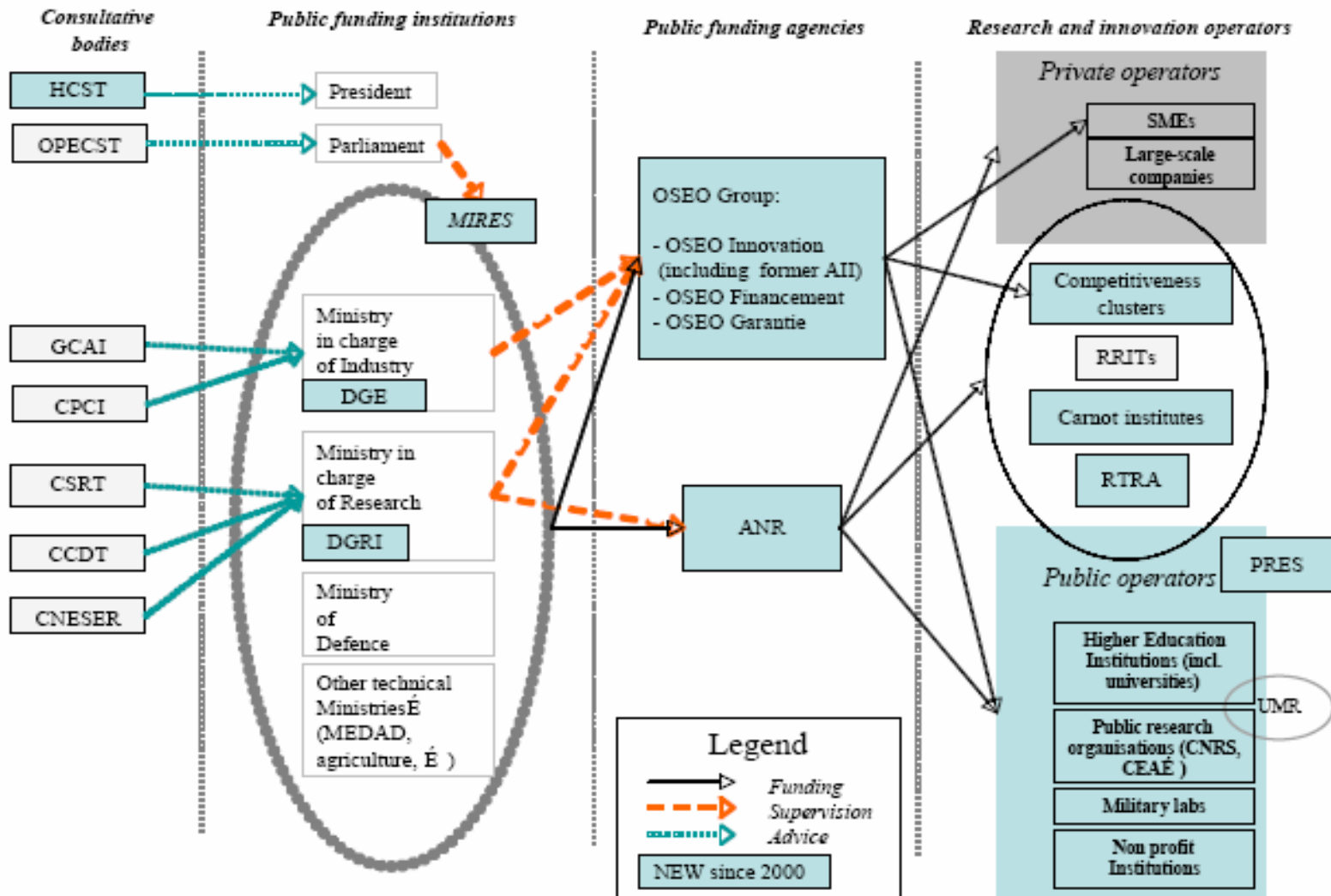
- Raise private sector, especially SME, investment in R&D
- Improve R&D collaboration among sectors
- Increase commercialization of PRO knowledge

## Features:

- PRO researchers enjoy lifetime appointments, high degree of research freedom. Major reorganization of CNRS



# France



Source: ERAWATCH Research Inventory, Technopolis France

# France

## Focus of R&D funding:

- Gov't funding primarily in aerospace, machinery, instruments. Decreased gov't spending for private sector defense work
- Increasing SME participation in private R&D funding (26%)
- Manufacturing sector relatively high share of high-tech (instruments, electronics, pharmaceuticals, ground transport, chemicals, aerospace)
- CNRS is largest PRO in Europe; accounting for 25% of French gov't spending on civilian R&D

# Germany

Gross R&D 2006: €58.8 billion

R&D/GDP = 2.53%

## Strengths:

- Institutionally entrenched recognition of R&D's benefits
- Vigorous pursuit of economic exploitability for innovations
- Solid private R&D funding

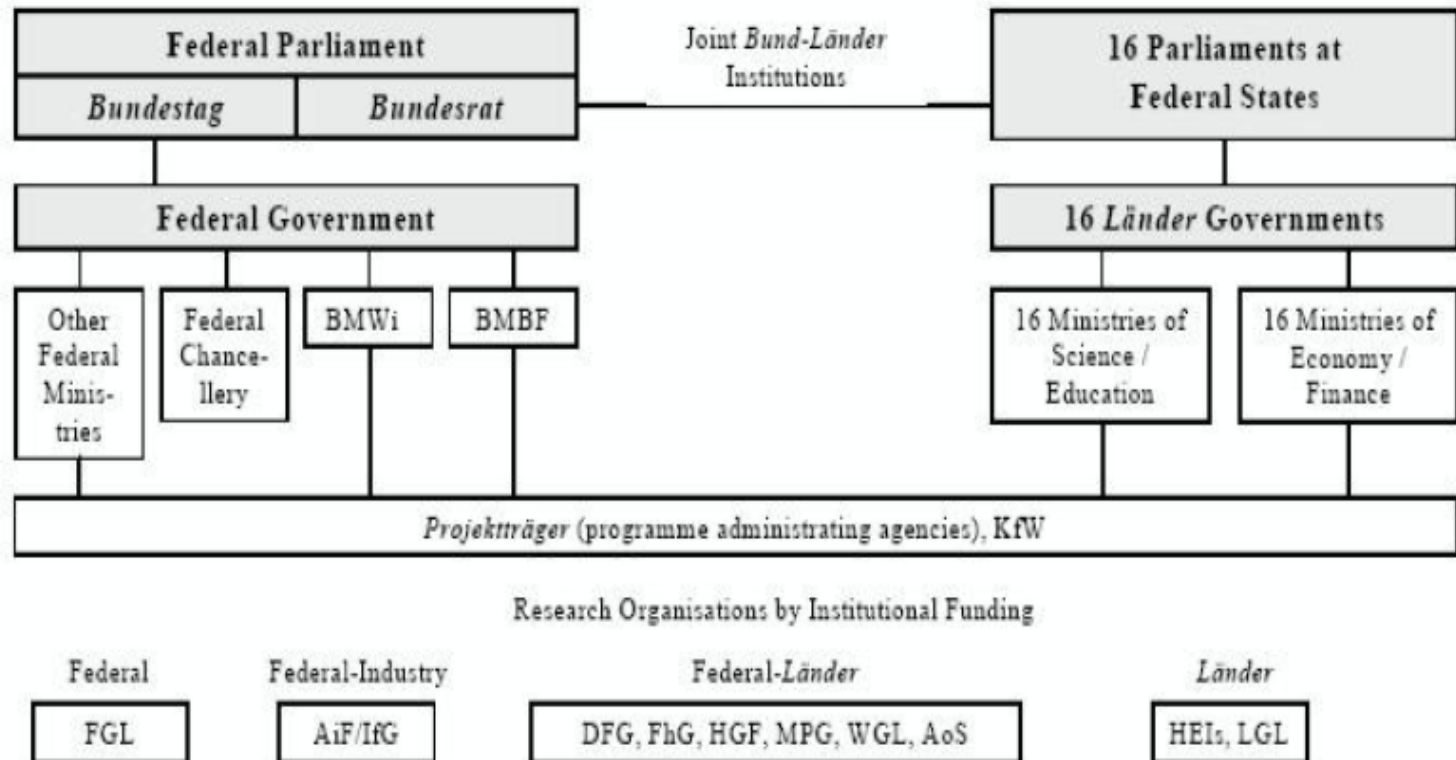
## Challenges:

- Higher education can be too rigid and lead to bottlenecks
- Silos of R&D can hinder investments in cross-cutting issues

## Features:

- Has largest research system in the EU, accounting for approx. 25% of EU-27 R&D expenditures

# Germany



Source: ERAWATCH Research Inventory,

<http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=35&countryCode=DE&parentID=34>

# Germany

## Focus of R&D funding:

- Manufacturing sectors, especially medium-tech, drive high demand for private R&D
- Aerospace is the only sector receiving over 10% of its R&D funding from the gov't (55%)
- Long-term focus on networks for knowledge diffusion



# Poland

Gross R&D 2006: €1.5 billion

R&D/GDP = 0.56%

## Strengths:

- Historical appreciation of science
- Current education reform

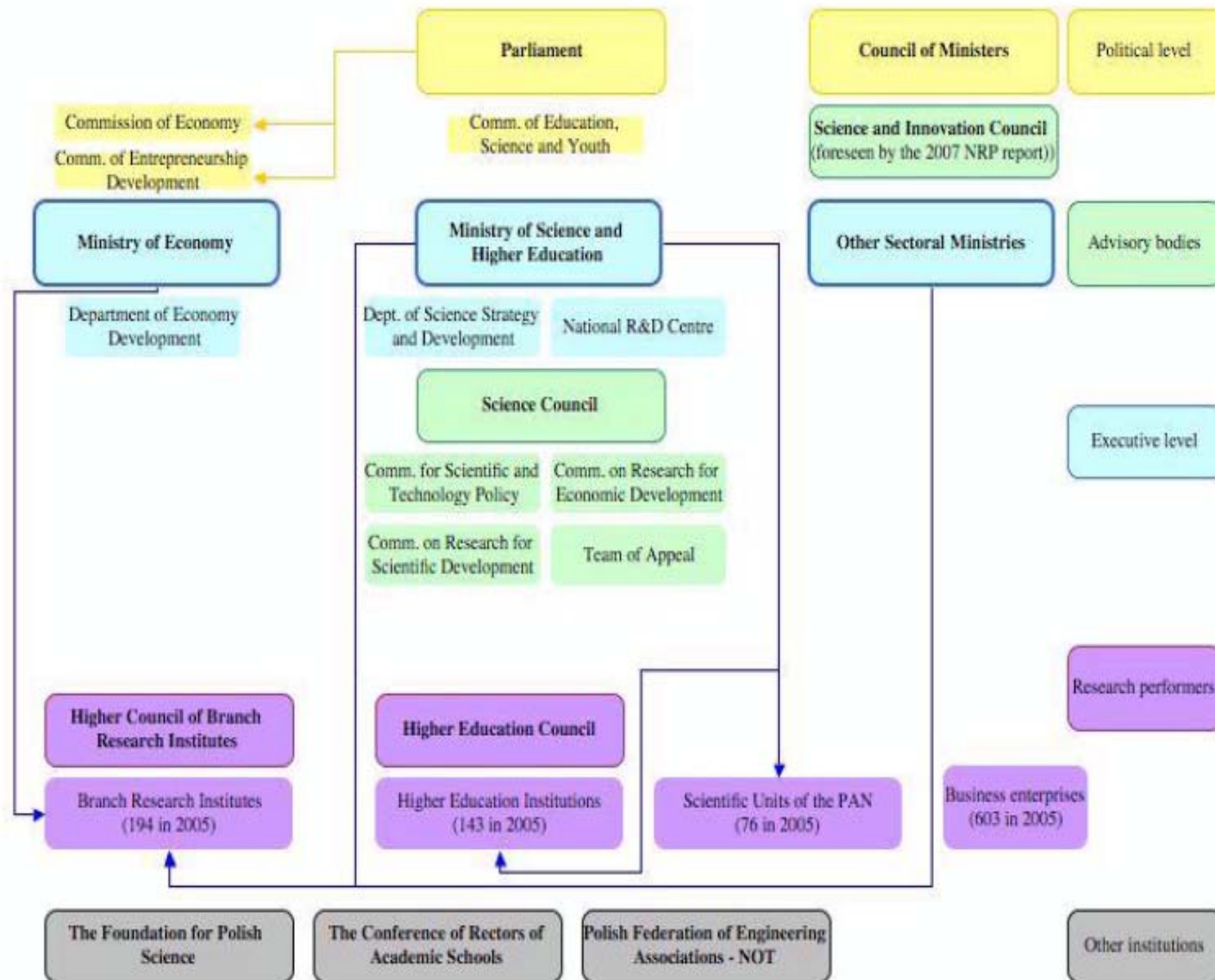
## Challenges:

- R&D funding tends to be reactive and not long-term planned
- Little coordination of policy at national level

## Features:

- Legacy of socialist system
- Switching to market economy

# Poland



Source: ERAWATCH Research Inventory (2008)

# Poland

## Focus of R&D funding:

- Multi-annual thematic programs newly begun in energy, health, agriculture and the environment
- Relatively strong in chemistry, physics, materials, plants, animals
- Effort to raise business R&D, but firms lack capacity to absorb knowledge efficiently





# Sweden

## Strengths:

Gross R&D 2006: €11.7 billion

R&D/GDP = 3.63%

- Strong universities
- High-quality labor force

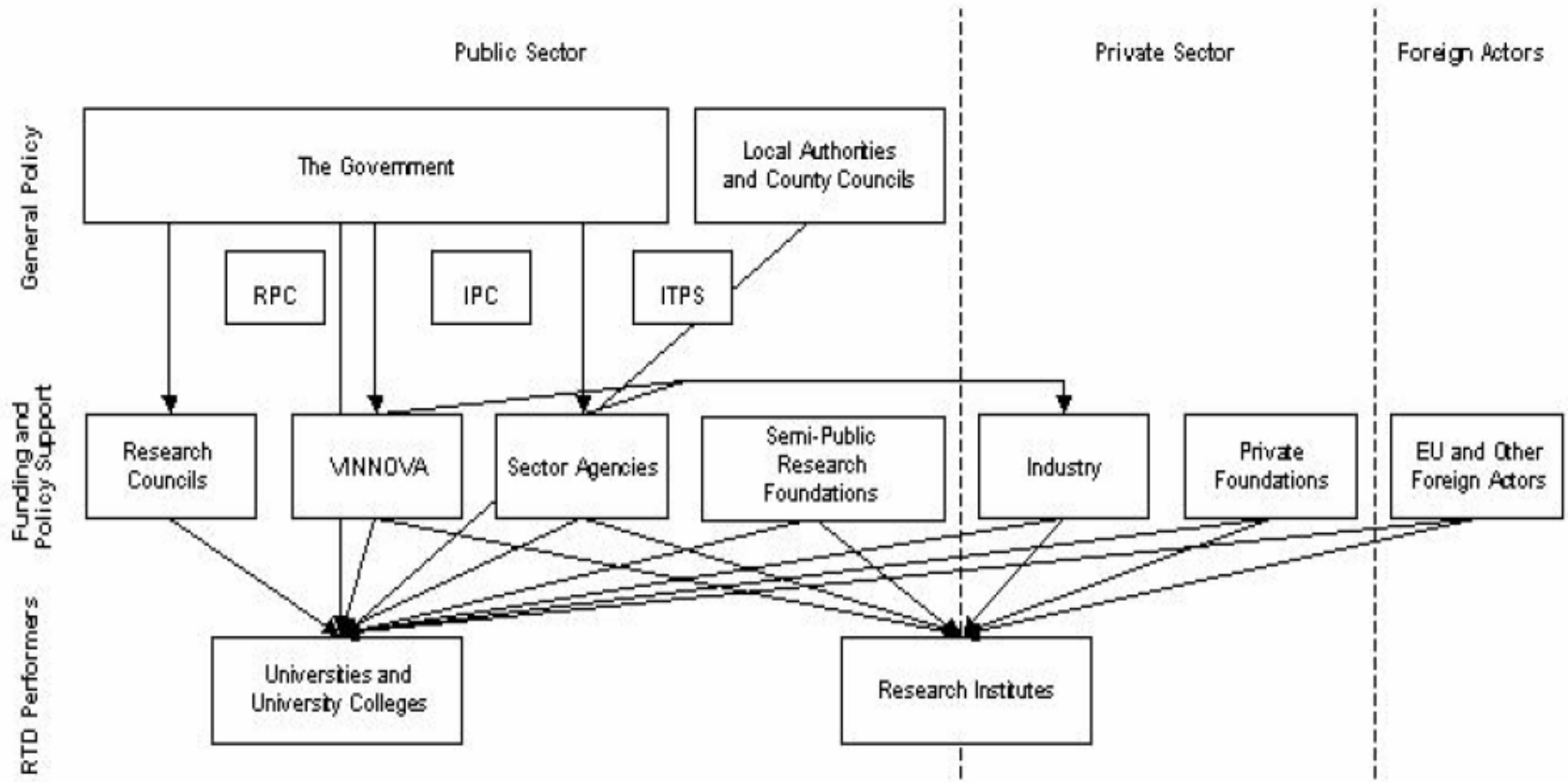
## Challenges:

- Loose coordination at policy and operations level
- Swedish Paradox: long-term commitment to high R&D investment not generating expected growth. (True?)

## Features:

- One of largest % of GDP invested in R&D in EU
- Private sector R&D dominated by a few MNCs
- History of welfare society relying on high-tech innovation

# Sweden



# Sweden

## Focus of R&D funding:

- ICT (Ericsson), engineering and machinery (Volvo, Scania) and pharmaceuticals (AstraZeneca)
- Effect of a few large MNCs has been to shape political views on R&D focus areas
- Life sciences, engineering, and sustainable development identified in latest gov't thematic plan



# UK

Gross R&D 2006: €34.0 billion

R&D/GDP = 1.73%

## Strengths:

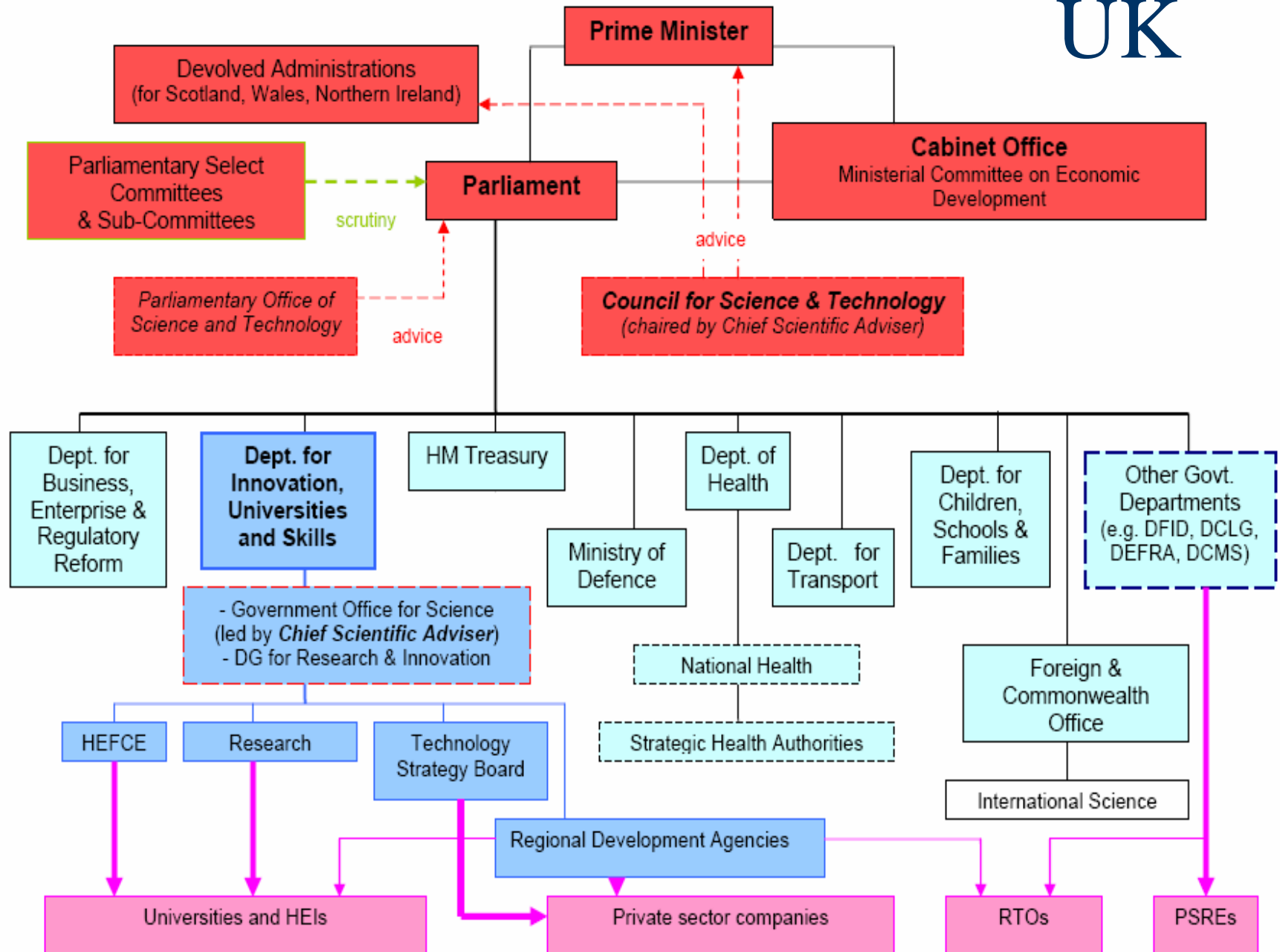
- Scientific excellence. Internationally competitive
- S&T policy leaning very much toward innovation policy

## Challenges:

- VC for start-ups relatively scarce

## Features:

- Raising incentives, removing barriers to entrepreneurship
- Relatively well developed capital markets.
- Private non-profit sector significant R&D funder/performer



# UK

## Focus of R&D funding:

- Shifting away from traditional funding measures towards building a contributory environment for innovation
- Promoting university-industry linkages
- 50% of gov't R&D goes to defense
- Pharmaceuticals account for 24% of total (public and private) R&D spending



# Japan

Gross R&D 2004: \$107.7 billion

R&D/GDP = 3.18%

## Strengths:

- Second largest R&D expenditure after US
- Broad consensus of gov't, private sector, the public, and media on importance of S&T and innovation

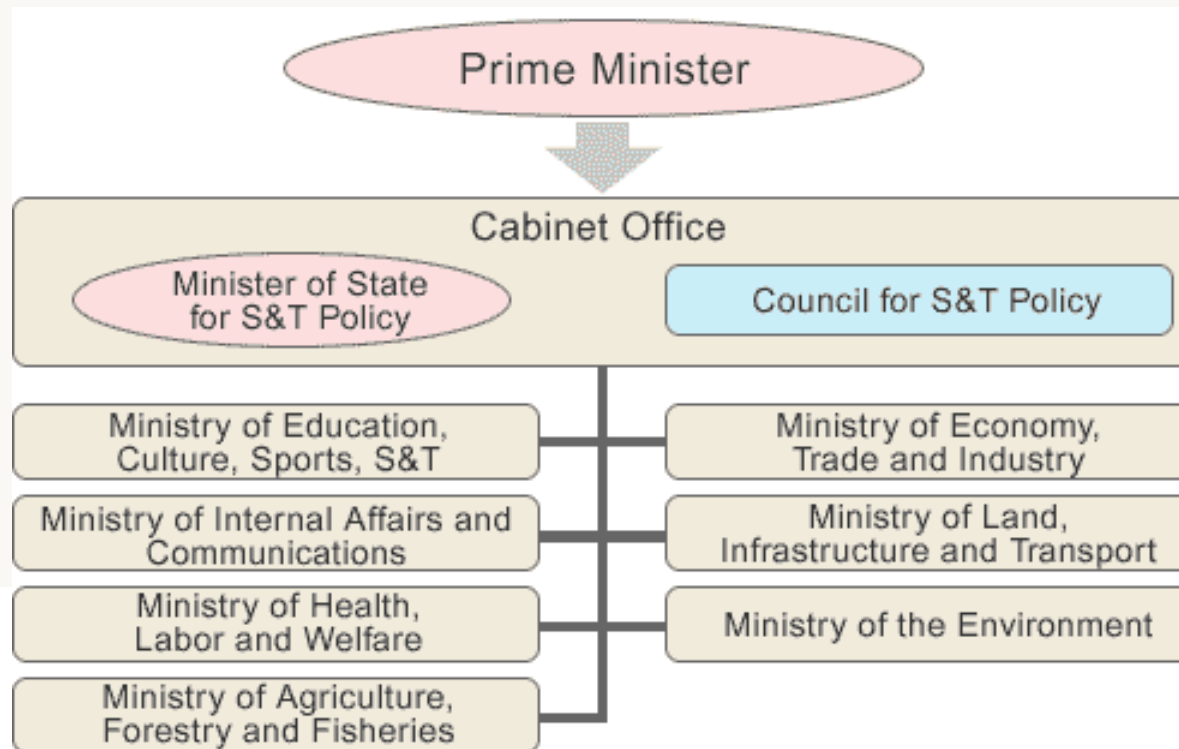
## Challenges:

- Promote entrepreneurship
- Raise venture capital, high-risk financing

## Features:

- MONODZUKURI – combining skill, technology, and science in production. Establish KBE
- High share of private sector R&D funding (72%)

# Japan



Source: <http://www8.cao.go.jp/cstp/english/about/administration.html>



# Japan

## Focus of R&D funding:

- S&T Plan (2006-2010) focuses on commercialization and human resources
- Primary and Secondary focus areas defined:
  - Primary: life sciences, IT, nanotech, materials, environmental sciences
  - Secondary: energy, infrastructure, oceans, outer space



# Brazil

Gross R&D 2004: \$9.03 billion\*

R&D/GDP = 1.28%

## Strengths:

- Policies enacted to shift R&D burden and culture to private sector and reinforce pillars of KBE

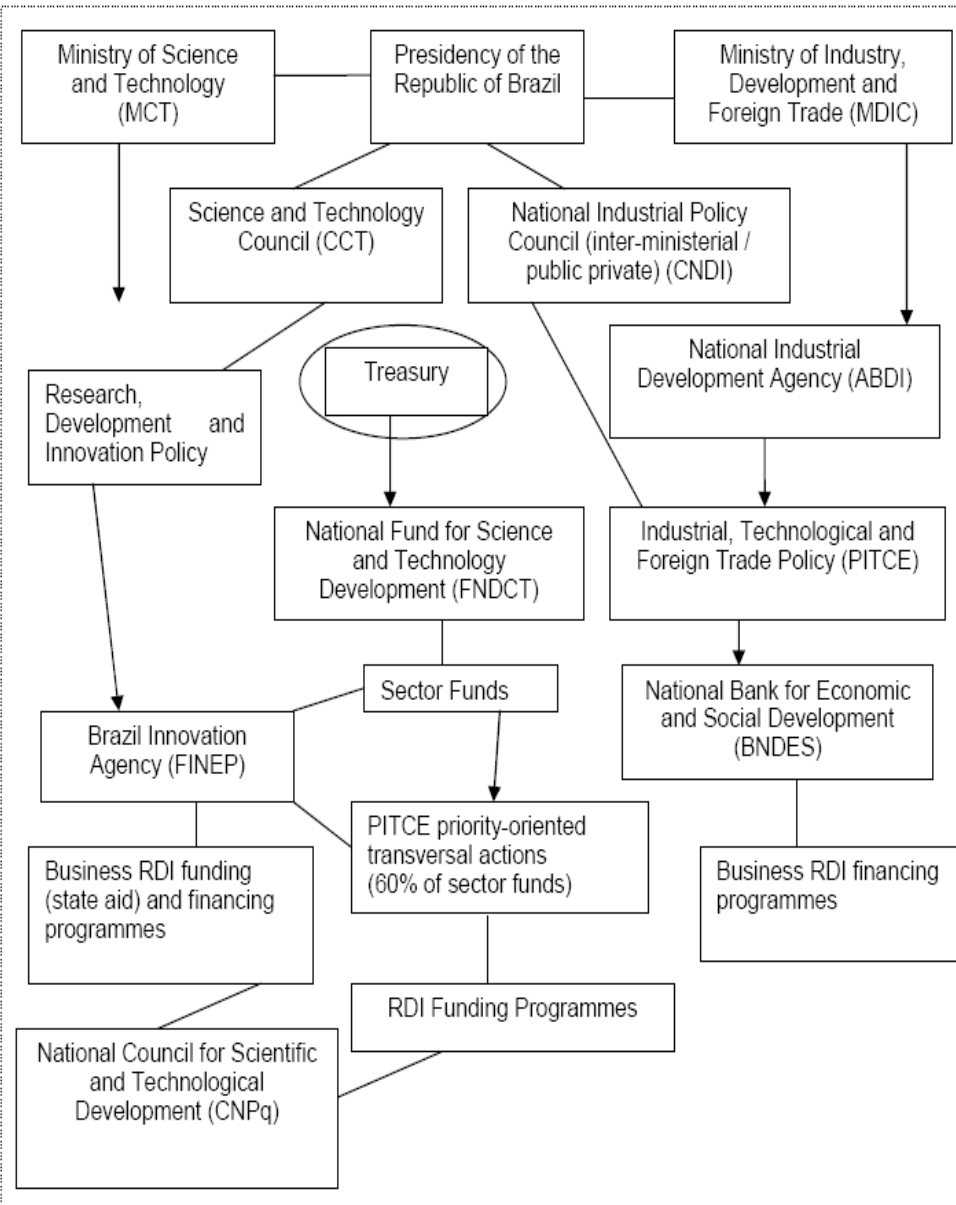
## Challenges:

- Business R&D role small and may be dropping
- Staying on target while experiencing growing pains
- Coordination among Brazil's regions, especially with efforts in national topics (e.g., energy production and use)

## Features:

- Industries formed under strong protectionism, limiting perceived need for extensive R&D by private firms

# Brazil



# Brazil

## Focus of R&D funding:

- Investments for future economic growth in biotechnology and nanotechnology
- Biofuels, and renewable bio-energy in general
- Regional investments and regional differences extensive (e.g., Sao Paulo State accounts for 47% of Brazil's business R&D and is the largest recipient of public R&D funding)



# Common Threads

## Buzzwords:

Entrepreneurship, innovation, competitiveness, clusters, IPR, knowledge production/transmission

## Collaboration:

- All examined countries have policies to boost innovation by encouraging collaboration and networks
- Many policies similar to Triple Helix model
- Universities generally seen as economic forces, especially through production of graduates who can function in a knowledge-driven society



# Variants

## Evaluation:

- Use and role of evaluation for R&D programs varies; generally follows strength of R&D infrastructure

## Funding:

- Success of R&D high risk funding, especially for SMEs, has varied, though most policies highlight its importance

## Human resources:

- Well-trained and critically-thinking students, researchers, and entrepreneurs generally seen as very important to progress in innovation and economic growth