

Incentives and Support Systems to Foster Private Sector Innovation

Jerry Sheehan

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Supporting Business R&D and Innovation

- Innovation a primary driver of economic growth and other social objectives
- Business the main actor in innovation
 - Business outspends government by 2:1 in OECD
 - Business produces new products and services
- Developing effective policies is challenging
 - Instruments must be tailored to specific national needs
 - Target specific types of firms and industry sectors
 - Need to take a holistic approach—policy mix
- Financing business R&D an important element of innovation support
 - Firms invest less than socially optimal
 - Traditional sources of funding difficult to tap for R&D
- Other policy instruments also important

Direct Funding of Business R&D

Policy instrument that subsidizes business R&D through the provision of a grant or contract that pays for R&D projects conducted by a firm.

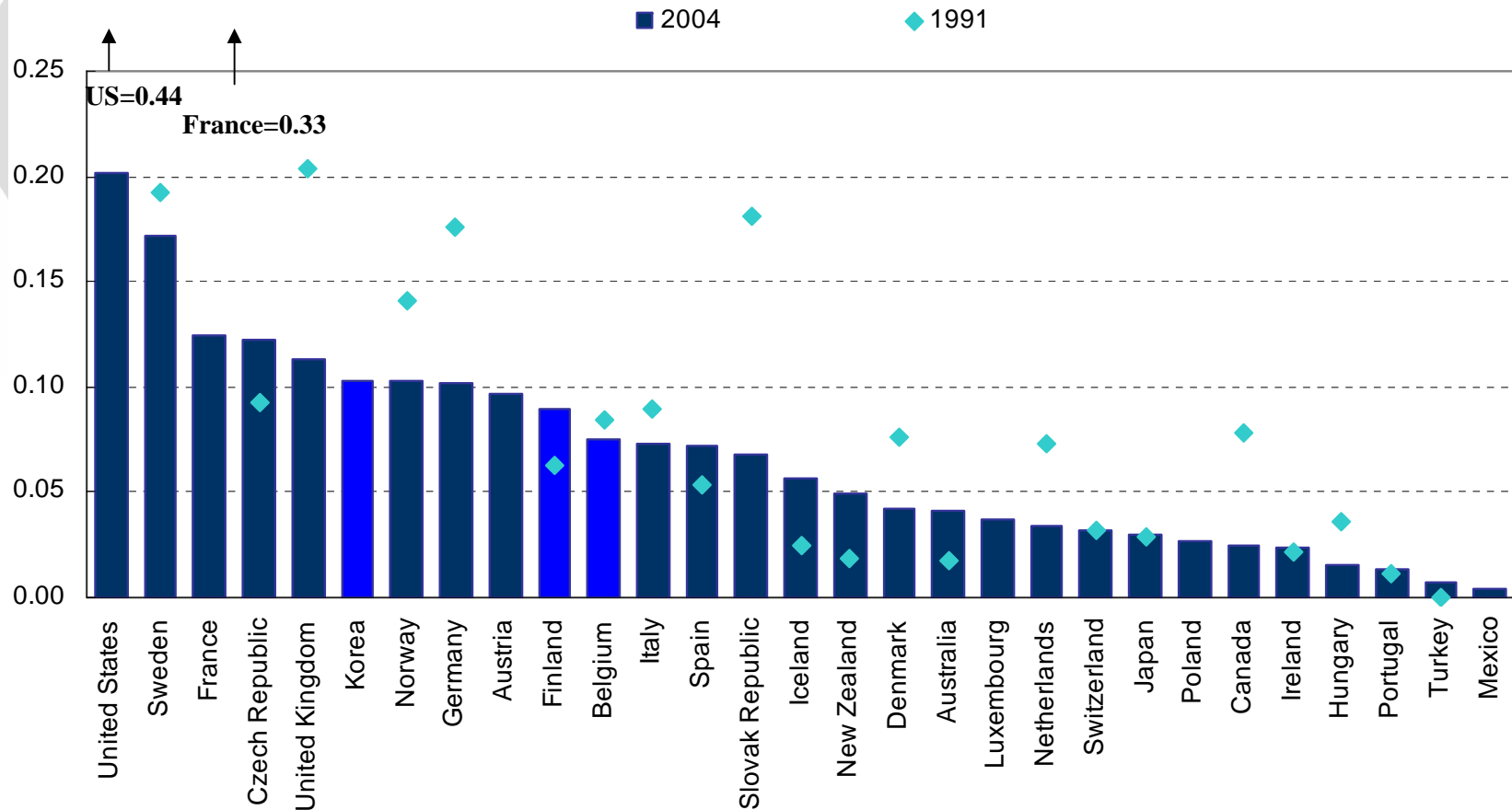
- Used in all 30 OECD countries and many non-OECD countries.
- Typically supports the costs of individual, pre-specified projects
- Administered by wide range of government ministries, e.g., science and education, industry and economy, health, defense
- Can have multiple objectives, e.g., to support commercially oriented R&D and/or to support R&D linked to another public mission (health, defense, environment, etc.) from which commercial spill-overs may result

Design elements of direct funding programs

- **Objective of program**
 - Economic growth as primary objective
 - Other public mission (health, defense, environment)
 - Specific target industry, technology
- **Supplementary objectives**
 - Foster collaboration among firms or with public research organizations
 - Mandate inclusion of SMEs?
 - International linkages, as in European Framework Programme
- **Evaluation & selection criteria**
 - Competitive selection or first-come-first-served
 - Balance among scientific & technical quality, business plan for commercialization, other criteria
 - Peer review, international peer review, selection by government officials
- **In-process review and management**
 - Mid-term reports due
 - Final output
 - Role of government in mid-course correction
- **Budget and size of individual award**
 - Budget determined in advance; link to success rate
 - Many small awards or fewer larger awards
 - Duration of grant (1 year or multiple years)
 - Co-financing by industry?

Direct government funding of business R&D

Government-funded business R&D as % of GDP



Source: OECD MSTI Database 2006-2

R&D tax incentives

Policy instruments that aims to increase business expenditure on R&D by providing financial benefits through the tax system

- Typically in the form of a tax *credit* to be taken against taxes owed or an *allowance* that reduces taxable corporate earnings.
- Typically administered through *corporate tax system*, but the some countries administer them through *wage/payroll tax* reductions.
- *Increasingly popular*. Used in 19 OECD countries in 2006, up from 12 in 1996.
- Still *not universally* used due to concerns about effectiveness and deadweight loss.

Design elements in tax incentives

- **Structure of incentive**
 - Credit vs. allowance
 - Volume vs. incremental (i.e., apply to *all* R&D or just *increase* in R&D)
- **Definition of qualifying R&D**
 - R&D or all innovation expenses (e.g., in Spain)
 - In-house vs. external R&D
 - Some preferences for funding public & basic research (Denmark, Japan, Norway, UK)
 - Foreign R&D (within EEA) allowed in Ireland; not in US, Australia or Canada
- **Other allowable expenditures**
 - Cost of licensing patents in Canada, France, Hungary, Portugal, Spain
 - Patent defense and technology monitoring in France
- **Administration/enforcement**
 - R&D projects certified in advance in Netherlands, Norway, Spain
 - Claimed company-level expenditures subject to review by tax authorities in Australia, Ireland, UK, US
- **Budgeting**
 - Most countries have no budget for R&D tax incentives. Claims vary depending on corporate R&D expenditures
 - A priori budget established in Netherlands

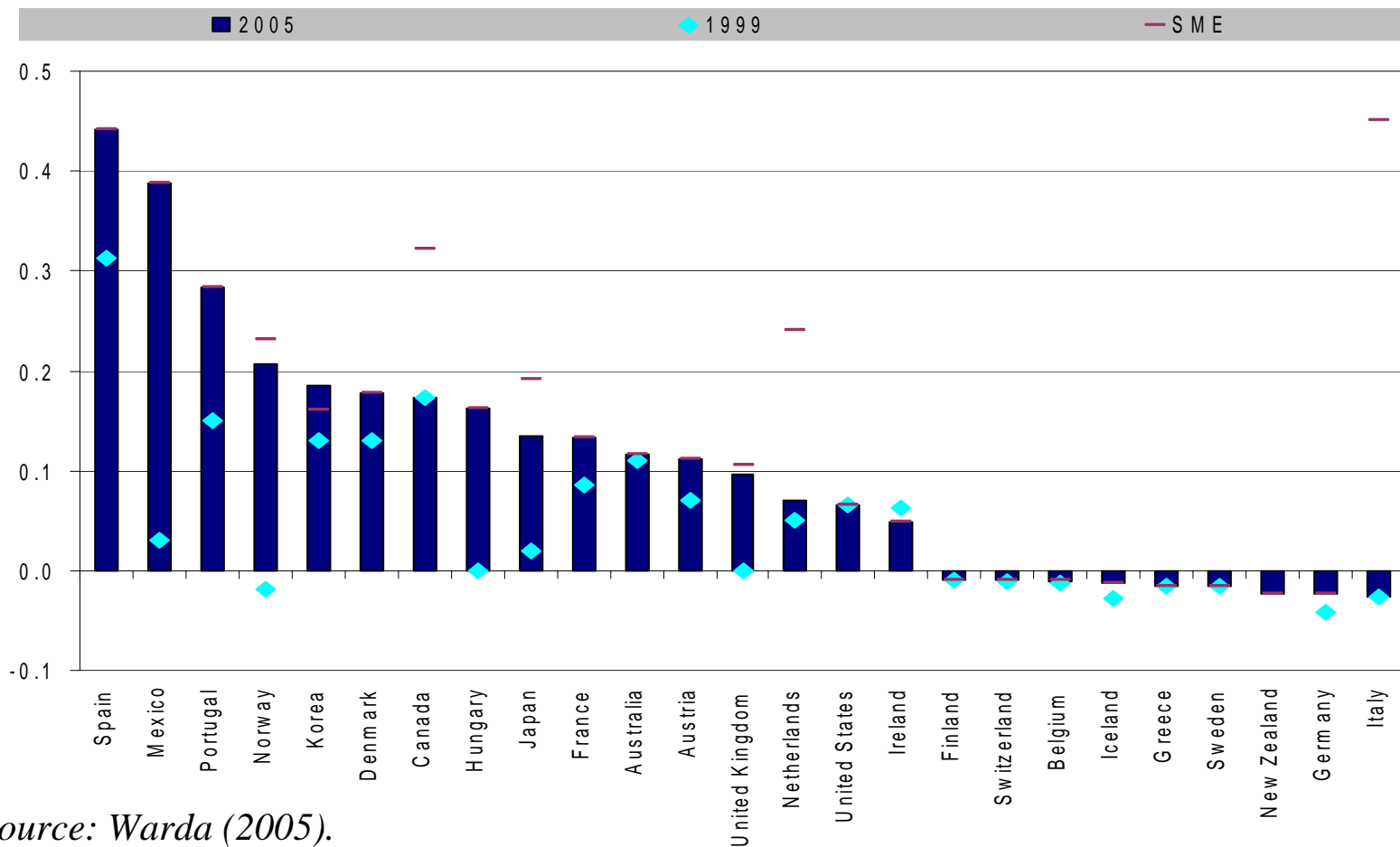
R&D Tax Incentives in OECD Countries

Type of Incentive	Large firm		SME
Volume	<i>Denmark</i> (150%) <i>Hungary</i> (100-300%) Mexico (30%) <i>Czech Republic</i> (200%)	<i>Belgium</i> (113.5%) Canada (20%) Japan (10-12%) Netherlands (14%) Norway (18%) Poland (30%) <i>UK</i> (125%)	<i>Belgium</i> (118%) Canada (25%) Japan (15%) Italy (30%) Netherlands (42%) Norway (20%) Poland (50%) <i>UK</i> (150%)
Combination (Vol/Incr)	<i>Australia</i> (125%/175%) France (5%/45%) Portugal (20%/50%)	<i>Austria</i> (125%/135%) Korea (7%/40%) Spain (30%/50%)	Korea (15%/50%)
Incremental	Ireland (20%)	United States (20%)	
None	Finland Iceland Slovak Republic	Germany Luxembourg Sweden Turkey	Greece New Zealand Switzerland

Notes: **Bold** indicates incentive introduced after 2000. *Italics* indicates tax allowance instead of tax credit. France has additional tax incentives for young, innovative firms.

Relative generosity of tax incentives: B-index

Rate of tax reduction for 1 unit of R&D spending (1 minus B-index)



Source: Warda (2005).

Mix of instruments for financing business R&D

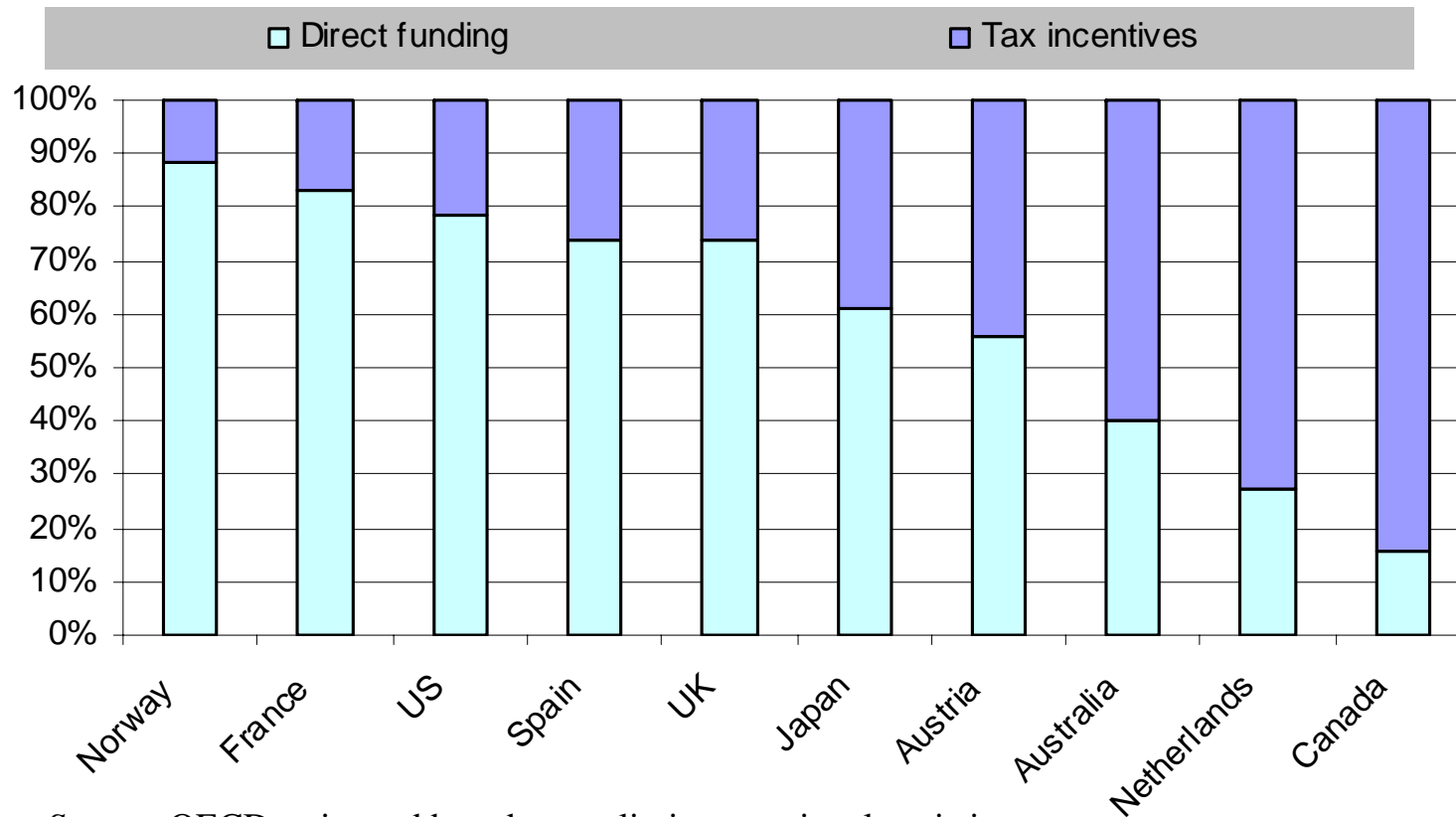
Country	Tax incentives		Direct funding	
	<i>PPP millions</i>	<i>% BERD</i>	<i>PPP millions</i>	<i>% BERD</i>
Australia	328	6.8	219	4.1
Austria	154	4.5	193	5.6
Canada	1381	14	258	2.6
France	543	2.2	2655	11.1
Japan	431	0.5	681	0.8
Netherlands	470	8.1	175	3.4
Norway	24	1.3	178	10.4
Spain	285	3.9	802	12.5
UK	860	2.8	2408	10.9
US	6356	3.1	23,535	10.7

Source: OECD estimated based on preliminary national statistics

Note: Most recent years available.

Policy Mix for Financing Business R&D

Relative shares of direct funding as tax incentives
(% of total financial support to business R&D)



Source: OECD estimated based on preliminary national statistics

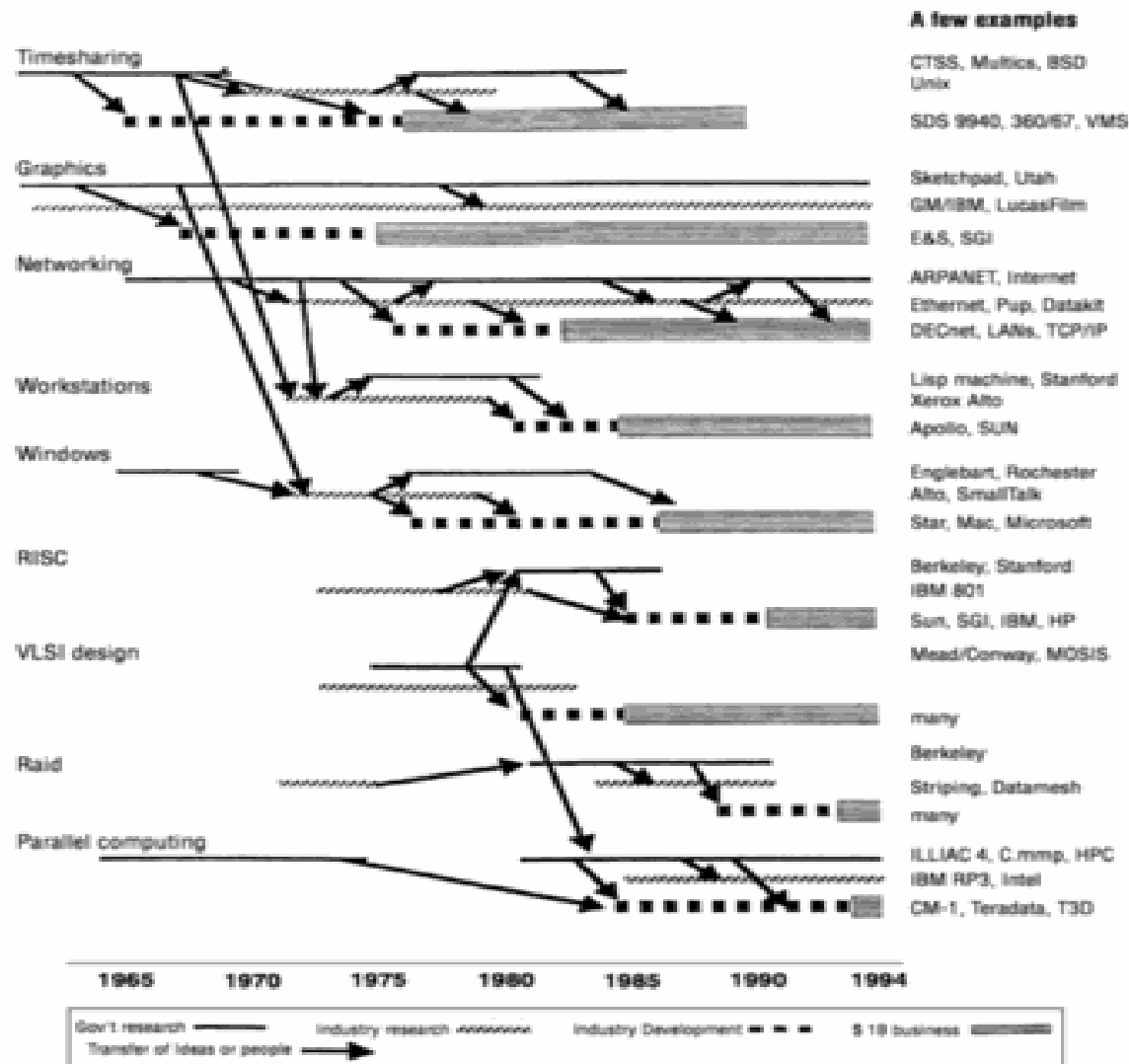
Note: Most recent years available.

Evaluating Tax Incentives

- Hard to do
 - Not typically linked to an individual project, so hard to identify tangible, quantifiable output
 - Costs to government and industry are diffuse
- Econometric analysis of *input additionality* (how much more R&D input?)
 - Variation in results: roughly 1:1 return
 - Larger gains seen in long term
 - Do not entice non-performers to start R&D
 - Unlikely to direct R&D into novel directions
 - Limited estimates/data by sector, firm size, etc.

“R&E tax credit affects firms at the level of general budget considerations, not at the level of strategic R&D choices. . . . R&D strategies derive from fundamental business and technological objectives, with little or no consideration given to the R&E tax credit per se.” (US Congress, Office of Technology Assessment, 1995).

Evaluating Direct Funding Programs



Evaluate input and *output* additionality (how much output from the R&D effort?)

Measuring *Behavioral* Additionality

How does government R&D support affect the behavior of firms and the way they conduct R&D?

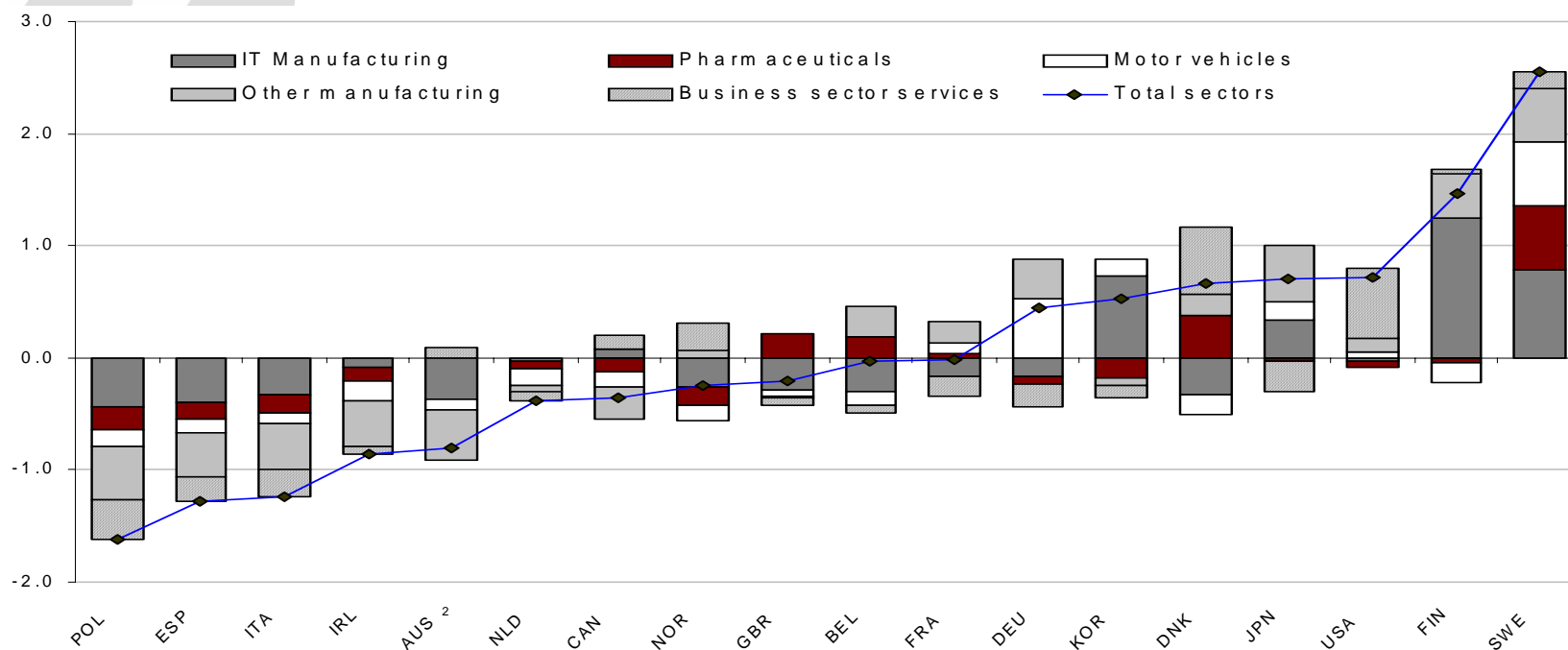
- More challenging R&D
 - Japan: More than 40% of respondents claim challenging, high-risk R&D is main benefit of participation
 - Finland found that selection process heightened this effect;
- More collaboration
 - Germany: Almost half of collaborations endured beyond project completion (1/4 of industry-science collaborations).
 - US: Almost half of ATP joint-venture participants continued working w/ partners 2 years later.
- Improved R&D management
 - Australia: 65% of R&D Start participants reported changes in firm management to comply with programme requirements
 - Belgium/Flanders: Traditional SMEs reported benefits from learning how to manage R&D processes

Comparing R&D financing instruments

Criterion	Policy instrument	
	Direct funding	Tax incentives
Effectiveness in boosting levels of business R&D	Varies depending on selection criteria, design, and capability of gov't administrators.	Tend to generate >\$1 in R&D for each \$1 in lost revenue
Ability to target industries/sectors	Good. Gov't can establish criteria	Limited. Some targeting of SMEs
Ability to influence business R&D behavior	Can affect collaboration, management of R&D	Limited. Can encourage increased R&D investment.
Selection of projects	Government selects among industry proposals.	Industry decides without intervention.
Administrative costs	High, to establish bureaucracy	Low, but hard to estimate. Enforcement costs vary
Government skills needed	Strong skills in selecting projects, managing program	Effective, efficient tax administration.
Scope of participating firms	Limited to selected firms	All R&D-performing firms
Summary	Good for building R&D capacity in specific sectors, concentrating resources. Incremental and radical innovation	Good for providing basic financial incentive/reward to business; incremental innovation

Targeting industry sectors

Contribution of selected industries to aggregate R&D intensity in the business sector
(deviation from OECD average, 1999-2002)

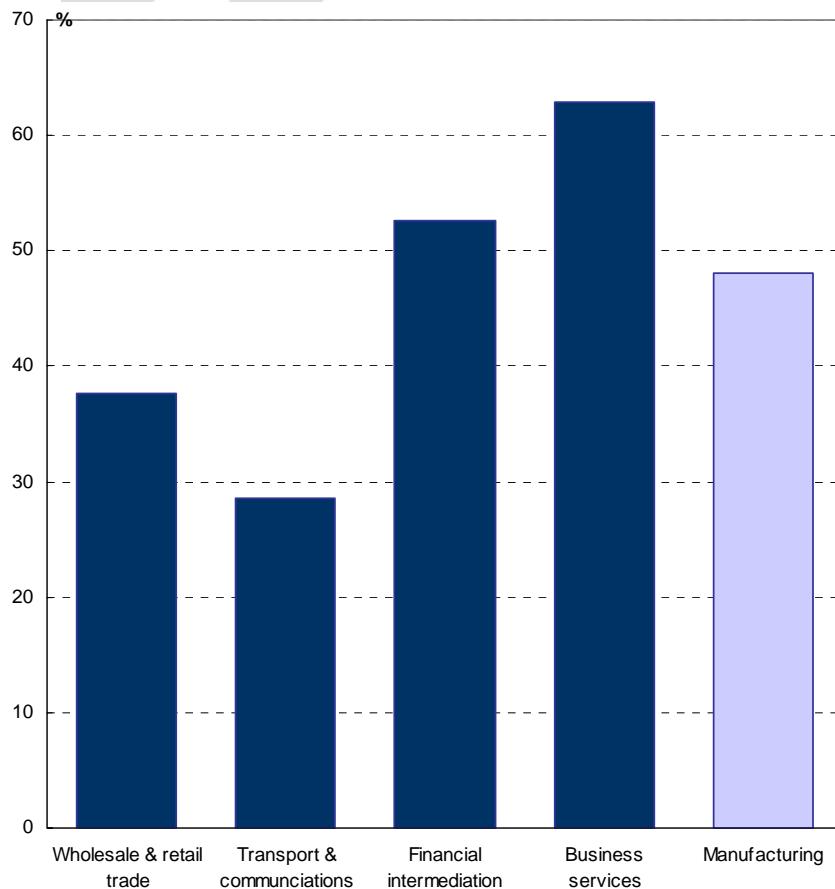


Source: OECD STAN and ANBERD databases

- Sectoral targeting frequently used in direct funding programs; **not** (yet) used in R&D tax incentives.
- Process for identifying targeted sectors is key consideration.

Targeting Services: Service sector industries *are* innovative. . .

Share of innovative firms, CIS3 Survey,
1998-2000



Source: OECD Science, Technology and Industry

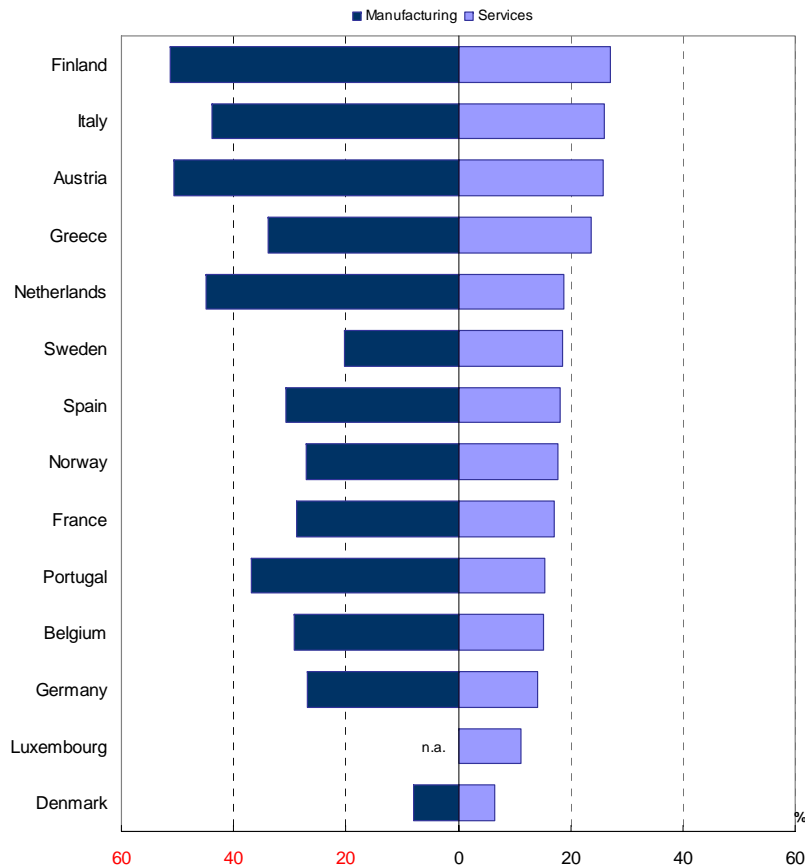
Outlook 2004.
16 April 2007

Services innovation driven by:

- Acquisition of equipment and knowledge (especially IT)
- Training & education (share of highly educated is twice that in manufacturing in many countries)
- Intramural and external R&D (primarily in business services: computing, software, telecommunications)
- Patterns differ by industry sector (e.g., finance versus business services)

. . . but policy needs differ

Share of manufacturing and service firms receiving public funding, 1998-2000



Source: *Enhancing the Performance of the Service Sector, OECD, 2005.*

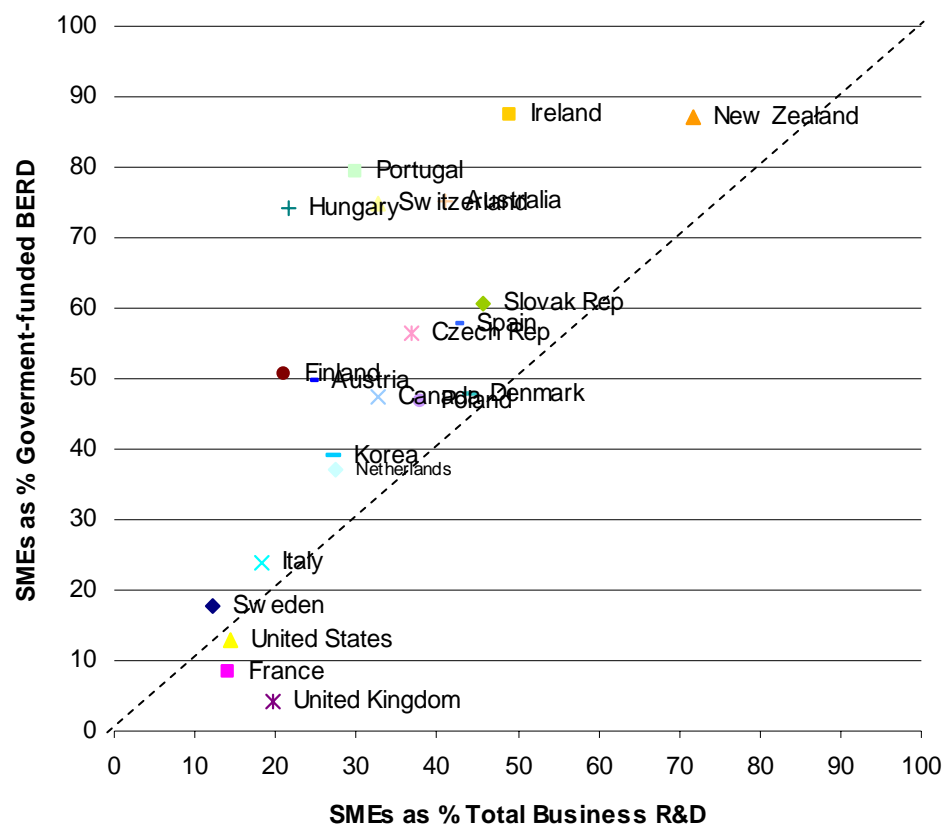
- Limited service sector participation in innovation programs.
- Most services programs to date focus on development and deployment of IT
- Policy should also promote education & training; collaboration; acquisition of knowledge & technology
- R&D programmes could be better-suited to service needs.
- Development of standards
- Entrepreneurship

Targeting financial support to SMEs

Policy instruments

- R&D “set-asides” for SMEs (UK, US, Neth)
- Funding programs for traditional SMEs
- Funding programs for startups
- Preferential R&D tax incentives
- Tailored tax incentives

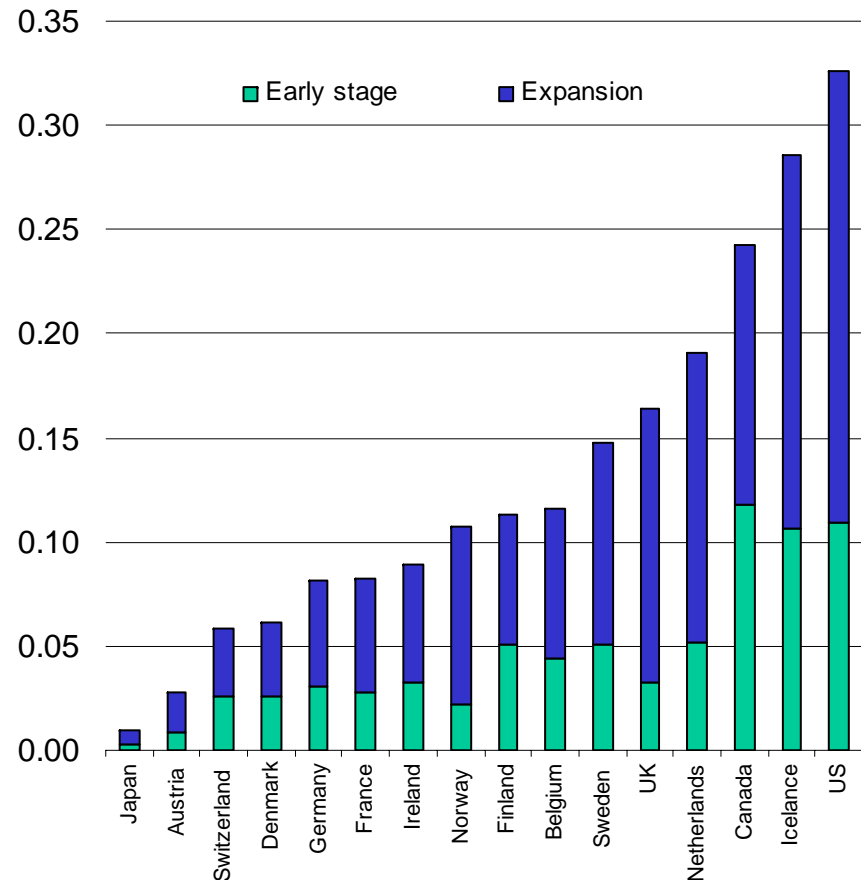
Share of SMEs in direct R&D funding programs
(most recent year available)



Public Support to VC

- Finances entrepreneurial firms, *not* R&D
- VC and business angels
- Direct measures
 - public venture capital funds
 - public contribution to private VC fund
 - Tap into international VC markets instead?
- Indirect measures
 - Tax incentives
 - Treatment of stock
 - Secondary markets
 - Cross-border M&A
 - Bankruptcy procedures

Venture capital as a % of GDP



Public-Private Collaboration: Industry-science linkages

Forms of Collaboration

Formal

Joint labs
Spin-offs
Licensing
Research contracts

Informal

Mobility of researchers
Co-publications
Conferences, etc.
Informal contacts
Flow of graduates to
industry

Routes to Commercialisation

Entrepreneurial route: spin-offs/spin-outs
Patenting route: licensing of technology
Cooperative route: joint and collaborative research

Beyond financing: Impediments to business innovation

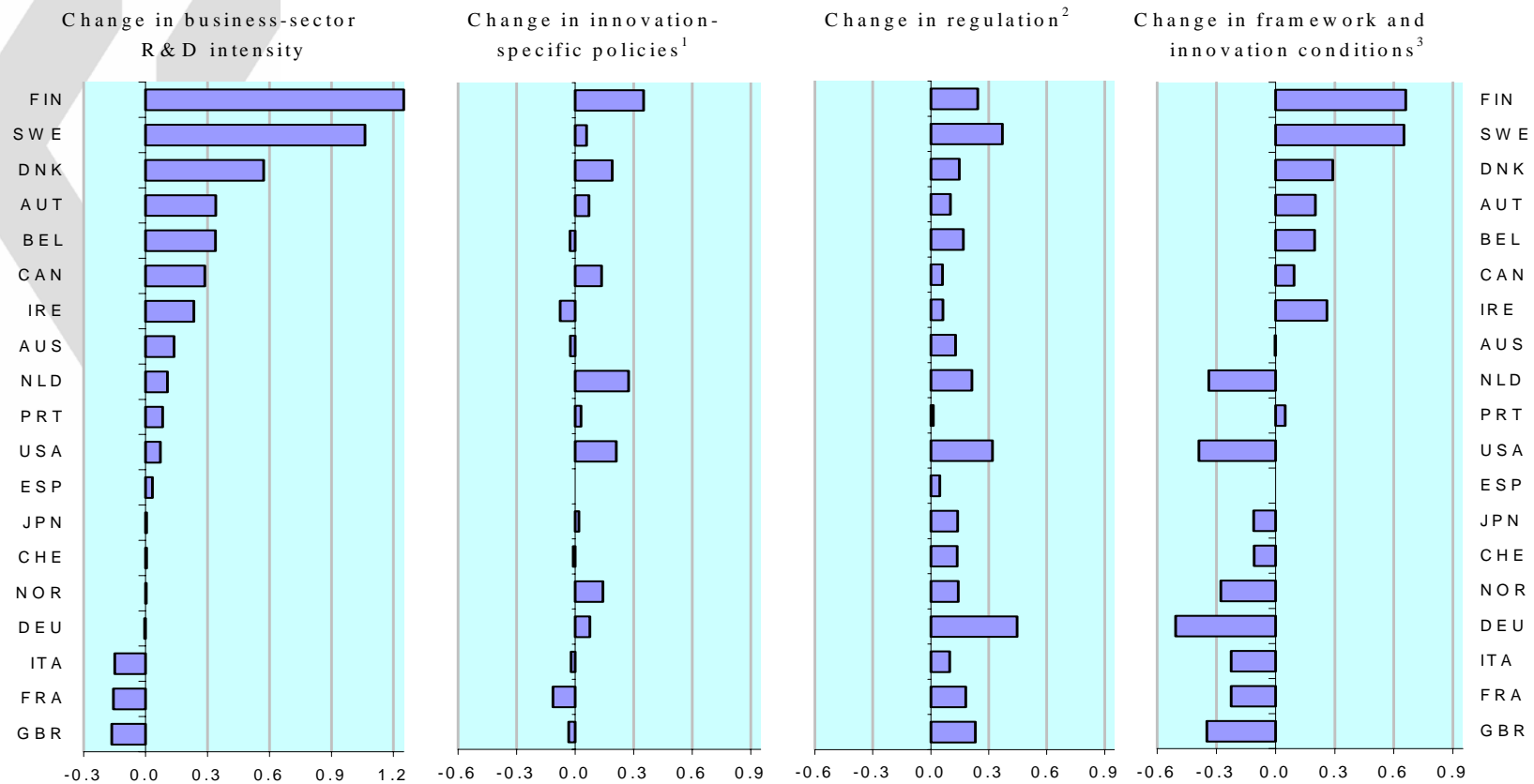
- Lack of resources for innovation
 - Financing
 - Knowledge (science, technology, marketing, etc.)
 - Human resources
- Lack of incentive to innovation
 - Limited domestic or international competition
 - Marketplace does not reward innovation
 - Difficult to appropriate returns from innovation
 - Industry structure tilted toward low-technology
 - Limited tolerance for risk-taking
- Policy instruments need to match impediments

Framework policies that influence business innovation

- **Human resources: education & labor markets**
 - Basic educational skills & accessible, high-performing tertiary education system
 - Training of scientists and engineers
 - Employment protection laws (influence ability to hire/fire)
- **Openness and restrictions on FDI**
 - Foreign R&D makes large contribution to productivity growth
 - Multiple channels: FDI, international mobility of human resources, participation of foreign firms/researchers in R&D programmes, etc.
 - Openness influenced by FDI regulations and active support for mobility and engagement in international networks of innovation where appropriate.
- **Product market competition**
 - Strong PMR encourages investments in innovation to stay ahead of competitors, but can weaken firm's ability to appropriate returns
- **Intellectual property protection**
 - Strong IPR can enable firms to appropriate returns from investment in innovation, but can foster monopoly positions and limit knowledge diffusion.
 - Strike balance between IPR and product market regulation
 - Ensure quality of patents and promote diffusion (e.g., through licensing, research access).

Many factors influence innovation performance

Contribution to change in business R&D intensity, 1991-2000, as % GDP

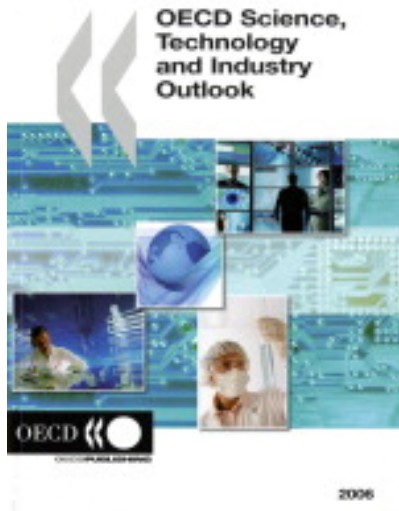


1. Includes public financial support for private R&D (both grants and tax incentives), R&D performed in public institutions and the share of the latter that is funded by the private sector.
2. Includes product market regulation, employment protection legislation and the strength of intellectual property rights.
3. Includes indicators of a country's exposure and capacity to absorb foreign knowledge as well as of broad financial and economic conditions. Residual factors that can not be accounted for by the statistical relation are also included in this category.

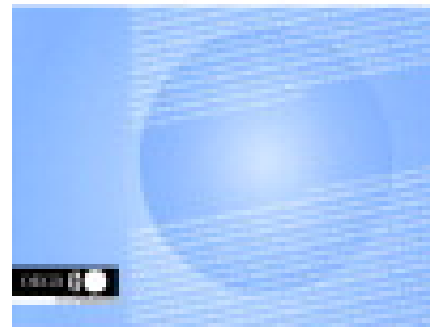
Source: OECD, Going for Growth 2006
16 April 2007

For more information

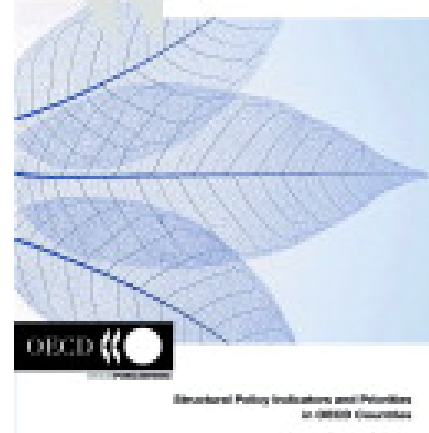
*STI Outlook
2006*



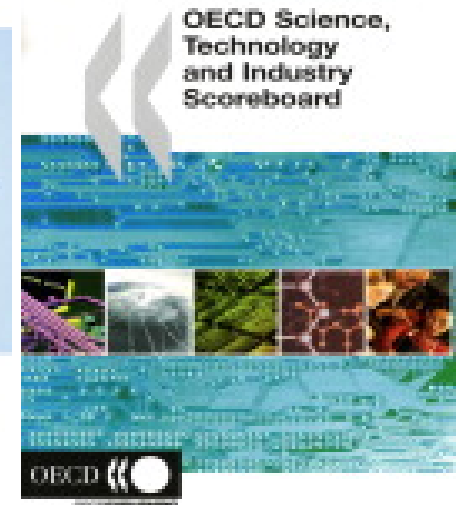
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www.oecd.org/sti/innovation
Jerry.sheehan@yahoo.com