NATIONAL RESEARCH UNIVERSITY

PRESENT CHALLENGES IN SCIENCE, TECHNOLOGY AND INNOVATION POLICIES

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STI policy – key challenges

- STI policy measures need to broaden horizon – adjust policy measures to the dynamism of innovation activities
- National Innovation Systems (NIS) thinking should be expanded and oriented towards the increasing global dimension
  - Policy measures become ever more comparable in different countries
  - it's hard for NIS to make a distinct difference by policy instruments – other factors count more
- Nature of innovation process is changing
  - New patterns of innovation are emerging
    - coopitition in open innovation
    - reorganisation of international value chains
    - cooperation with external (third) parties along the innovation process
  - Location of innovation activities strongly influenced by local / regional framework conditions
    - There is limited mobility of research staff needed in the industrial labs
    - Public incentivization programs need to go beyond financial aspects only

STI policy – key challenges (ctd.)

- Competition of regions for innovation hubs is increasing
- framework conditions become decisive for location of innovation hubs
- of shared LT objectives
  - Strategic positioning, prioritization, differentiation strategies
  - Experimentation
- Important for national and regional policy makers:
  - Such trends is true and evident for large multinational companies and large research entities / organizations
  - The majority of innovation still comes from small and medium sized enterprises
  - large MNCs often act as nucleus at regions / locations
  - presence of qualified HighTech SMEs is an often quoted decision factor for location decisions

Recent trends in science, technology and innovation – resulting requirements from STI actors towards policy

- Rethink ‘Innovation Policy’ – focus should switch to ‘Policy for Innovation’
- Consider innovation as the outcome of a process including many interactions of different actors in a system
- Focus on knowledge distribution (flows) and connectivity in the system
- Institutions matter (coherence) and are country (and even region) specific (no-one-size-fits-all policies)
- Innovation activities are becoming increasingly global with shared work – clusters play an important role
- Clusters per se do deliver innovation only partially – increasingly linkages between different clusters are the value drivers
- Implementation of policy measures is often considered a serious challenge – STI GOVERNANCE IS KEY!

Major trends in companies' innovation activities

- Leading companies cannot afford NOT to be the preferred partner in the industry
- These companies have to look outside their own industry to find "best practice"
- Transparency on leading experts and ease of communication have increased the competition of global companies to get access to these skills
- Open Innovation is in most cases increasingly relevant, not as a breakthrough paradigm shift but a consequent continuation of partnership programs
- Single innovation units are often no longer able to all elements of the technology system, thus current scientific development is based on distributed control inside a company or with partners outside
- The most common process to capture external ideas is the use of individual's networks
- All companies have extensive relations with leading academics worldwide
- Often focused on few selected universities
- University hires and special PhD programs are considered important sources for innovation
- Most companies have increased collaboration with customers
- Competitor relations are built for joint early stage development or "open standard" setting or to increase efficiency
- Start-ups more often approach the global companies than vice versa
- Most companies have not established incubators

Major trends in companies' innovation activities – ctd.

- Two opposing trends exist on intellectual properties, sometimes within the same company
- Strict protection of all IP around core technologies – "Freedom of Action" is key
- "Open Standards" – allow others to use IP in order to build the market
- One of the success factors of the last years is the creation of growth platforms or focus technology programs
- Open innovation is split in support of these company-wide platforms and de-central business unit needs
- Open innovation often requires new skills
- Scouting and screening of opportunities outside of "comfort zone"
- Interface management for internal and external collaboration
- Project management and other business skills from each researcher
- Few companies have started to build dedicated positions to "Open Innovation", e.g., with Business Development & Relations, others are building on existing functions for external relationships
- "Port of Entry" with multiple connections to the outside world is crucial for success in Open Innovation
- Companies invest in new innovation centers for different reasons (example Siemens Corporate Technology)
- Current people excellence
- Future expected people excellence (various, but could also include India)
- Biggest markets (e.g. China)

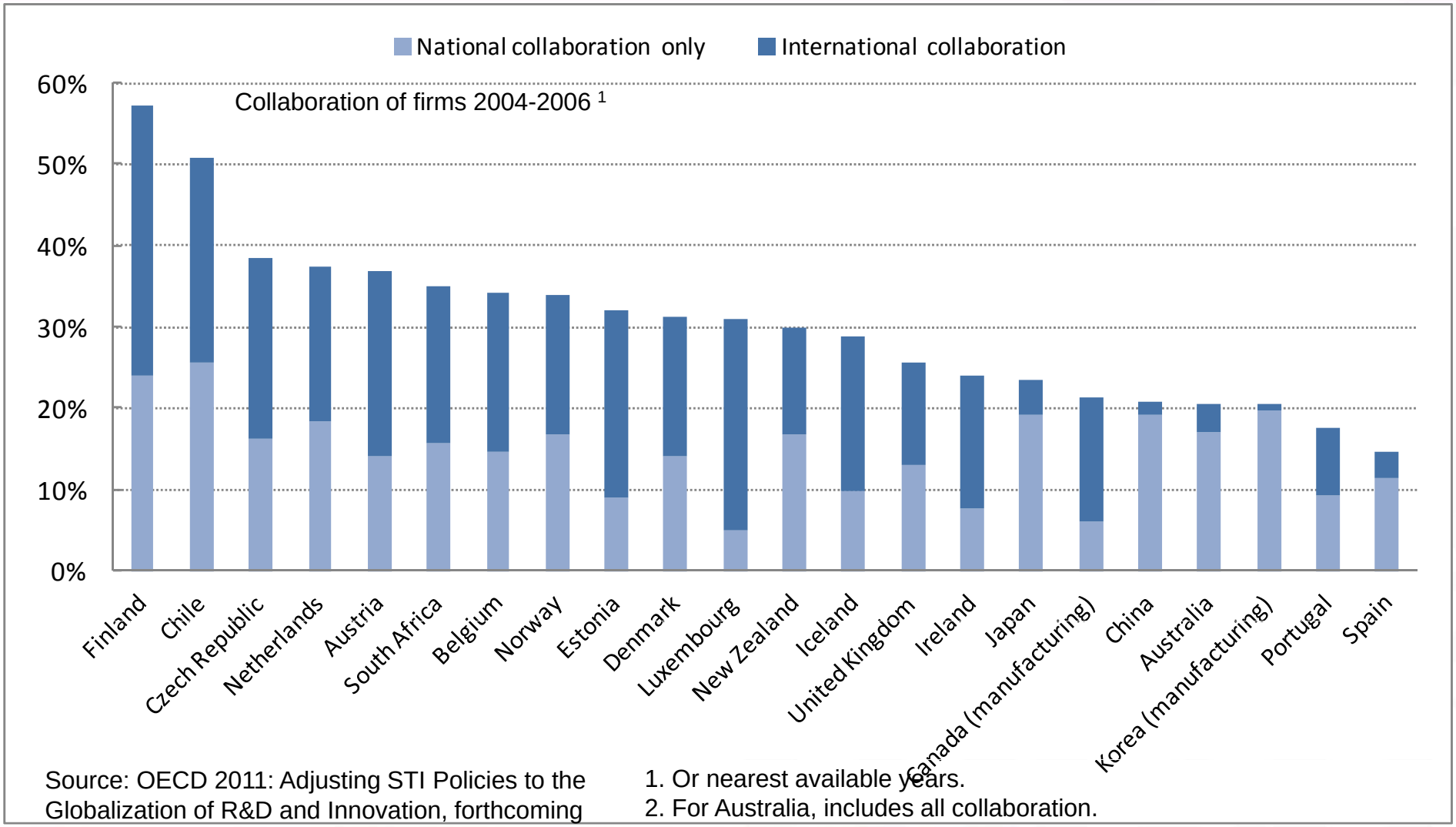
Major trends in companies' R&D activities

- Core product development is and will be pursued at the headquarter;
- A number of applied research as well as development centres are distributed globally;
- A significant number of R&D centres are started as public/private-partnerships globally;
- share of R&D expenditure for collaborative research rose to approx. 10-20% of total spending.
- The number of research partners is steadily rising hence the complexity of interface management is becoming even more significant.
- Global markets are considered markets for human resources (domestic research facilities).
- Companies source R&D from multiple locations around the world but maintain strong links with home base
- Global companies are attracted to locations with strong research base
- Strong geographical research spillovers between public research and industrial research
- Cooperation culture, shared norms and trust between actors are important; rooted in social and political institutions of regions and nations
- MNCs maintain closer research and collaboration ties with international partners then domestic firms embedded in local economy
- Often access to human resources is an issue
- MNCs often establish local presence to gain access to local tacit knowledge base

Companies will innovate where they find the relevant know how

	Factors influencing Choice of R&D Locations	Implications for STI policy
Most important	• Proximity to production and sales • High availability of researchers • Access to specialized R&D knowledge • Access to markets • Proximity to technology poles / incubators	• Important to support investments in production facilities and guarantee best educational system, availability of know how and other technology players (clusters), and provide infrastructure for fast global reach
Least important	• . . . • Low labour cost of researchers • Proximity to suppliers • Low degree of regulation • Access to public support funds	• NOT important to fight high labour cost, provide extraordinary public funding or reduce regulations

Collaboration of enterprises



Source: OECD 2011: Adjusting STI Policies to the Globalization of R&D and Innovation, forthcoming

1. Or nearest available years.
2. For Australia, includes all collaboration.

STI policy measures rank high on countries' priorities

	Priority level 'attractiveness for R&D and innovation'	Direct financial support	General fiscal incentives	R&D tax incentives	Taxation of intellectual assets and revenues	Adminis-trative support	Provision of infrastructure	Public procure-ment	Active recruit-ment of foreign firms	Advertising and interna-tional campaigns	Other
	Country self-reported note (1-8)	New or enhanced policy initiatives to attract new R&D activities through FDI (taken between 2008 and 2010)									
Austria	8	v	v	v			v		v		
Canada	n.a.	v	v	v (1)			v		v	v	
Czech Republic	6		v	v		v	v		v		
Denmark	5					v					
Finland	7	v				v	v	v	v	v	
France	8			v			v		v		
Germany	7	v				v	v		v	v	
Hungary	7	v		v		v				v	
Israel	8		v			v			v	v	
Japan	n.a.			v							
Korea	7	v	v	v	v	v	v	v	v		
Netherlands	6		v	v	v		v		v		
New Zealand	7			v							
Norway	7			v							
Poland	5	v	v	v		v	v		v	v	
Slovenia	8	v		v						v	
South Africa	4	v	v	v						v	
Spain	6	v		v							
Sweden	7						v	v			
United Kingdom	n.a.			v					v		
United States	3										v (2)

Note: only countries that have responded the STI Outlook Questionnaire 2010 are included in the table.

1): Canada's Scientific Research and Experimental Development tax incentive programme enhanced access for SMEs since 2008.

2) : US States have own/additional measures.

Source: OECD: Science, Technology and Industry Outlook 2010 .

Recent STI policy measures to strengthen international linkages (2008-2010)

	Link domestic firms to foreign sources of research and innovation						
	Additional or prefe-rential funding	Co-funding	Support to find interna-tional partners	R&D tax incentives	Provision of infra-structures and support	Cluster initiatives	Other
	Measures/ initatives in place in 2010						
Australia		ν				ν	
Austria			ν			ν	
Canada	ν		ν		ν		
Czech Republic			ν			ν	
Denmark	ν	ν	ν			ν	
Finland	ν		ν			ν	
France	ν		ν				
Germany	ν		ν		ν	ν	
Hungary	ν		ν				
Israel	ν	ν	ν			ν	
Italy			ν				ν
Korea	ν	ν	ν	ν		ν	
Netherlands	ν		ν			ν	
Norway	ν		ν				
Slovenia	ν						
South Africa			ν	ν			
Spain	ν		ν				
Sweden			ν			ν	
United Kingdom			ν				

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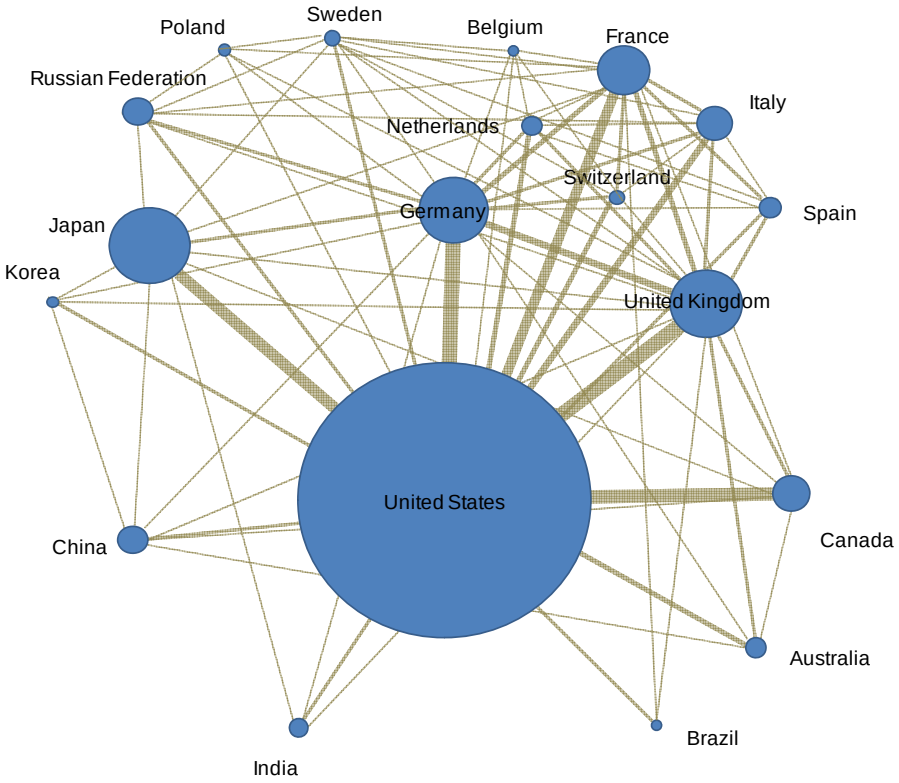
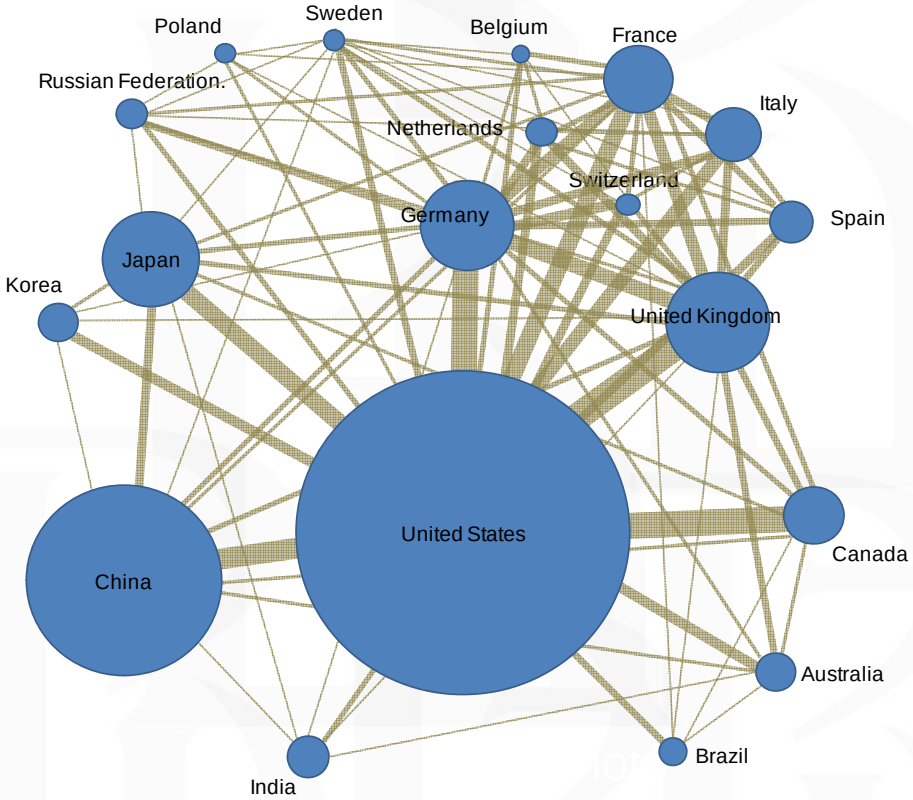
Source: OECD: Science, Technology and Industry Outlook 2010 .

International linkages ever increasing – new players arise

1998



2008



Source: OECD 2011: Adjusting STI Policies to the Globalization of R&D and Innovation, forthcoming

Growth of number of publications in Genomics, Biotechnology and Nanotechnology

Field	Indicator	total	1998	2008	change %
Genomics	*N*	21,833	1,619	2,526	56.02
	Number of authors per paper	5.27	4.69	6.03	28.63
	International co-authored %	66.95	60.78	**74.15**	22.00
	Number of countries	97	51	64	25.49
Biotechnology	*N*	8,617	597	954	59.80
	Number of authors per paper	4.21	3.60	4.61	28.07
	International co-authored %	57.31	43.89	**62.26**	**41.88**
	Number of countries	89	45	45	0.00
Nanotechnology	*N*	84,044	4,695	10,823	130.52
	Number of authors per paper	4.80	4.38	5.13	17.31
	International co-authored %	64.51	57.06	**67.98**	19.13
	Number of countries	112	75	86	14.67

Source: Heimeriks, Gaston; Leydesdorff, Loet (2011) Emerging Search Regimes: Measuring Co-evolutions among Research, Science, and Society, p. 12

Reasonable STI Policy actions

- STI strategy
  - Do NOT interfere in company's Open Innovation activities!
  - Active enabler of global activities
  - Continue to build on strengths and reputation, e.g., initiate and support clusters on selected sharply defined fields
  - Support broader regional initiatives
- Education strategy
  - Build education portfolio with focus on competence fields
  - Avoid duplication of research fields at universities
  - Define performance indicators
  - Build Elite Universities (not requested by all interviewees)
  - International exchange programs and technology networks
- More basic engineering and science talents
  - Create incentives for technology studies and careers
  - Start technology programs already in primary schools
  - Securing education more important than Nobel Prices

Reasonable STI Policy actions (ctd.)

- Emphasis on core science and not on fashion fields
  - Request for other academic programs
  - Programs to develop “mavericks”, e.g., in design
- Financial engineering
  - Public-private-partnership
  - Balance IPR ownership between business and academics
  - Enable sabbaticals for academics in the industry
- Marketing and reputation
  - Better market know how and university excellence
  - Attract international students to fill gaps without too much loss of knowledge to emerging countries afterwards
- Funding
  - Incentivize “Private Sponsorships” for university chairs
  - Public investment in “Technology Leadership Programs”
  - Simple funding programs
  - Tax incentives or direct funding of R&D programs and investments
  - possibility to use funding program also for piloting phase

Thank you for your attention!

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