



Structural Characteristics of European FP Networks

Analysis of thematic sub-networks

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Workshop on

“Evaluating R&D Collaboration networks in Europe:

Lessons from a comprehensive interdisciplinary approach”

October 20 - 23, 2009

Zentrum für interdisziplinäre Forschung, Universität Bielefeld

Background

- Initiatives to foster collaborative R&D in precompetitive research have become a key instrument of STI-policy at the regional, national and supranational levels
- Main examples in Europe: European Framework Programmes (FPs) on Research and Technological Development
- (Co-)funding of thousands of R&D projects supporting transnational collaboration and coordination in research and transnational mobility for training purposes; seven FPs since 1984
- Knowledge on the structural properties of the collaboration networks which have emerged within the EU FPs provides information for appraising the effectiveness of EU policy in this area
- EC interested in investigation of collaboration networks resulting from their programmes for monitoring and evaluation as well as for future strategic orientation

Guiding questions

- Focus on network characteristics
 - Do network properties differ across thematic priorities?
 - Which network structures emerge in different instruments (CSC, STREP, NoE, IP)?

- Focus on pivotal key actors
 - What role do different countries play (preferences for specific topics out of the perspective of the participating countries)?
 - To what extent are companies, universities and research organisations involved (participation, collaboration patterns)?

- Focus on network evolution
 - Do networks change over time - in terms of network structures and key actors?

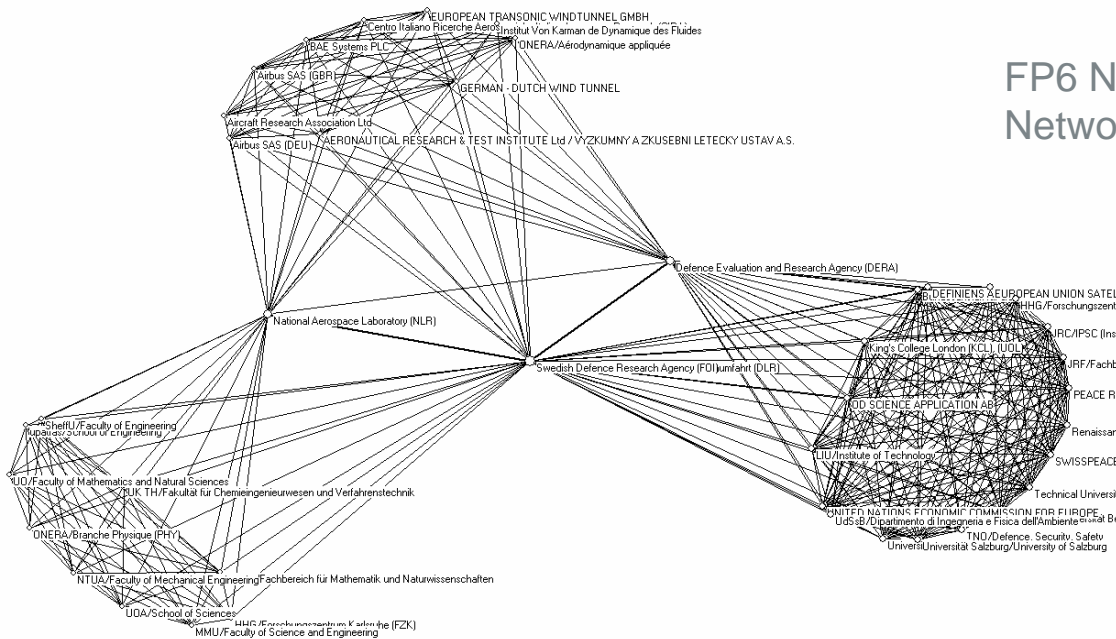
sysres EUPRO data base as reference point

Framework Programme (FP)	Period	Projects	Projects with multiple partners	Organisations	Subentities
FP1	1984–1987	3,283	1,696	1,9208	2,453
FP2	1987–1991	3,885	3,013	4,417	5,906
FP3	1990–1994	5,529	4,611	7,114	9,343
FP4	1994–1998	15,061	11,374	19,299	22,680
FP5	1998–2002	16,682	9,491	22,481	26,415
FP6	2002–2006	6,150	3,981	14,407	17,817
Total		50,590	34,166	49,624	55,555

- Source: CORDIS project data base
- Standardisation procedure
 - identification of unique organisation names (no of projects doubled)
 - identification of unique organisation types (5 different org types)
 - creation of meaningful sub-entities
 - regionalisation of geographical data to NUTS3 level

Methodology I – Network analysis

- Structural properties of FP networks
 - Characteristics of research networks based on different instruments in different thematic priorities by means of SNA indicators
 - Identification of collaboration patterns



FP6 NoE in Aerospace
Network of organisations

Methodology II – Key actor analysis

- Characteristics of the key actors in FP networks
 - Identification of core organisations as the stable backbone of networks, based on degree centrality
 - Distribution of core organisations grouped by countries and organisation types in different instruments and thematic priorities

- Ranking and comparison
 - Ranking of organisations by participation

Specific instruments in FP5/6

- Cost Shared Contracts (CSC)
 - collaborative RTD projects with the aim of obtaining new knowledge, demonstration projects with the aim of showing the viability of new technologies, and support measures for access to research infrastructures
- Specific Targeted Research Projects (STREP)
 - former CSC, objective-driven research of limited scope, focused on a single issue
- Integrated Projects (IP)
 - basic as well as applied objective-driven research with a “programme approach”; expected to assemble the necessary critical mass of activities, expertise and resources to achieve ambitious objectives
- Networks of Excellence (NoE)
 - expected to integrate the critical mass of resources and expertise to strengthen scientific and technological excellence on a focused research topic; aim at tackling fragmentation of existing research capacities

Four thematic priorities in FP5/FP6 in focus

Thematic priority	FP	Sub-programme	Instrument	Projects	Participants
Aerospace	FP5	GROWTH (Aeronautics)	CSC	131	801
	FP6	FP6-AEROSPACE	IP	27	595
	FP6	FP6-AEROSPACE	NoE	3	43
	FP6	FP6-AEROSPACE	STREP	96	620
Energy & Environment	FP5	EESD	CSC	1,017	3,947
	FP6	FP6-SUSTDEV	IP	97	1,953
	FP6	FP6-SUSTDEV	NoE	16	449
	FP6	FP6-SUSTDEV	STREP	167	1,373
ICT	FP5	IST	CSC	1554	5,462
	FP6	FP6-IST	IP	176	2,119
	FP6	FP6-IST	NoE	49	914
	FP6	FP6-IST	STREP	483	2,393
Life Science	FP5	LIFE QUALITY**	CSC	794	2, 335
	FP6	FP6-LIFESCIHEALTH	IP	87	917
	FP6	FP6-LIFESCIHEALTH	NoE	29	568
	FP6	FP6-LIFESCIHEALTH	STREP	140	746

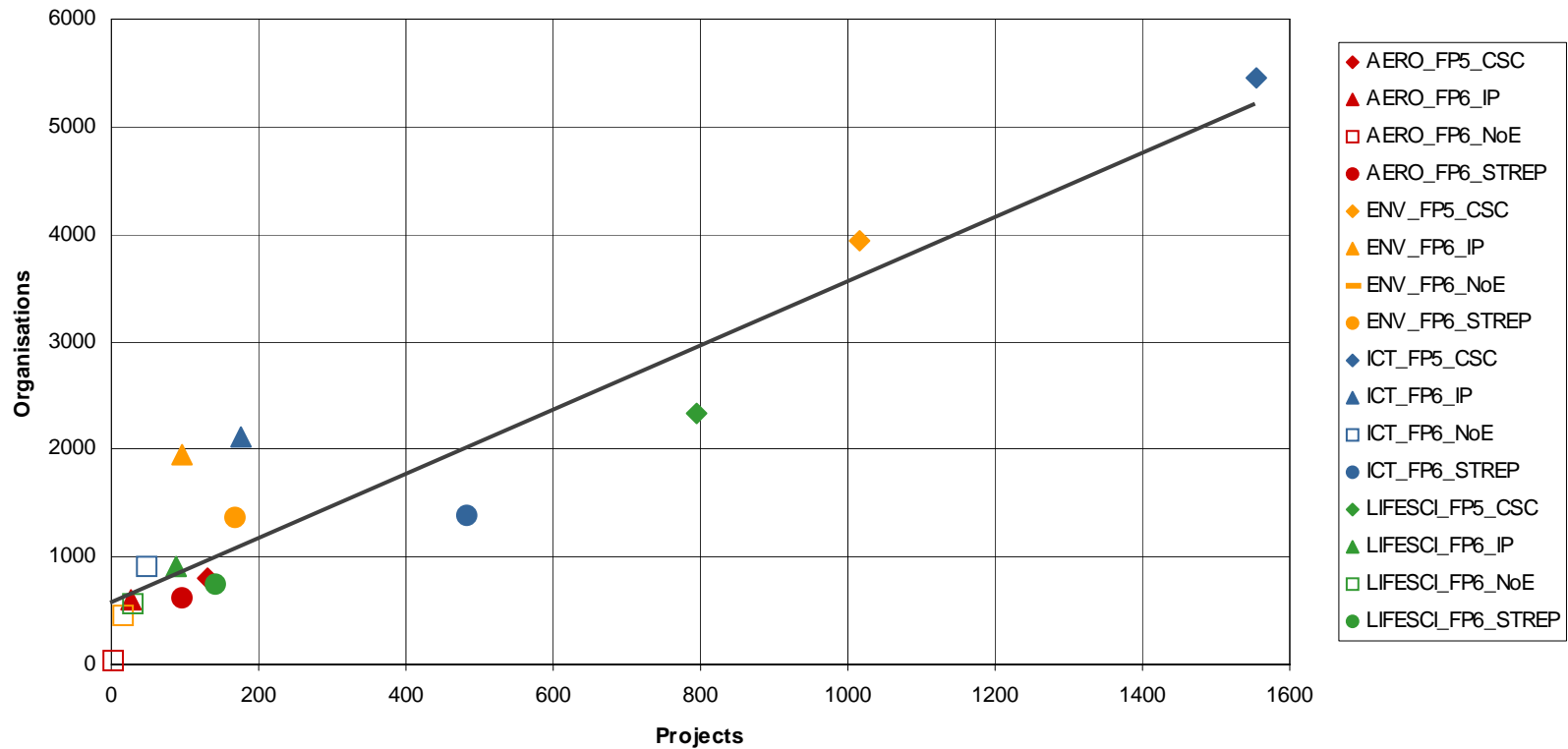
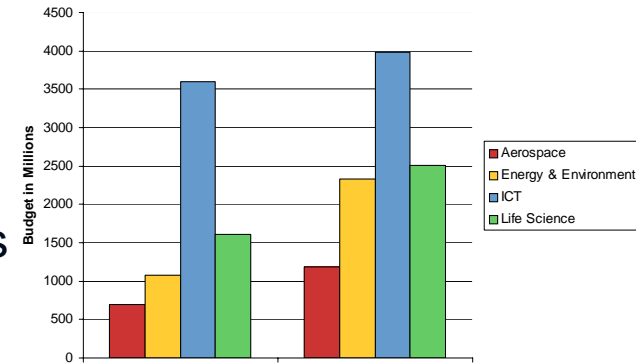
Note: ** in LIFE QUALITY projects in Key actions *Food, nutrition and health* and *Sustainable agriculture, fisheries and forestry* are not included

- Identification of 16 thematic sub-networks comprising for a given thematic priority **only** those projects with a specific contract type (CSC/STREP, IP, NoE)

Characteristics of thematic priorities

Number of projects and organisations

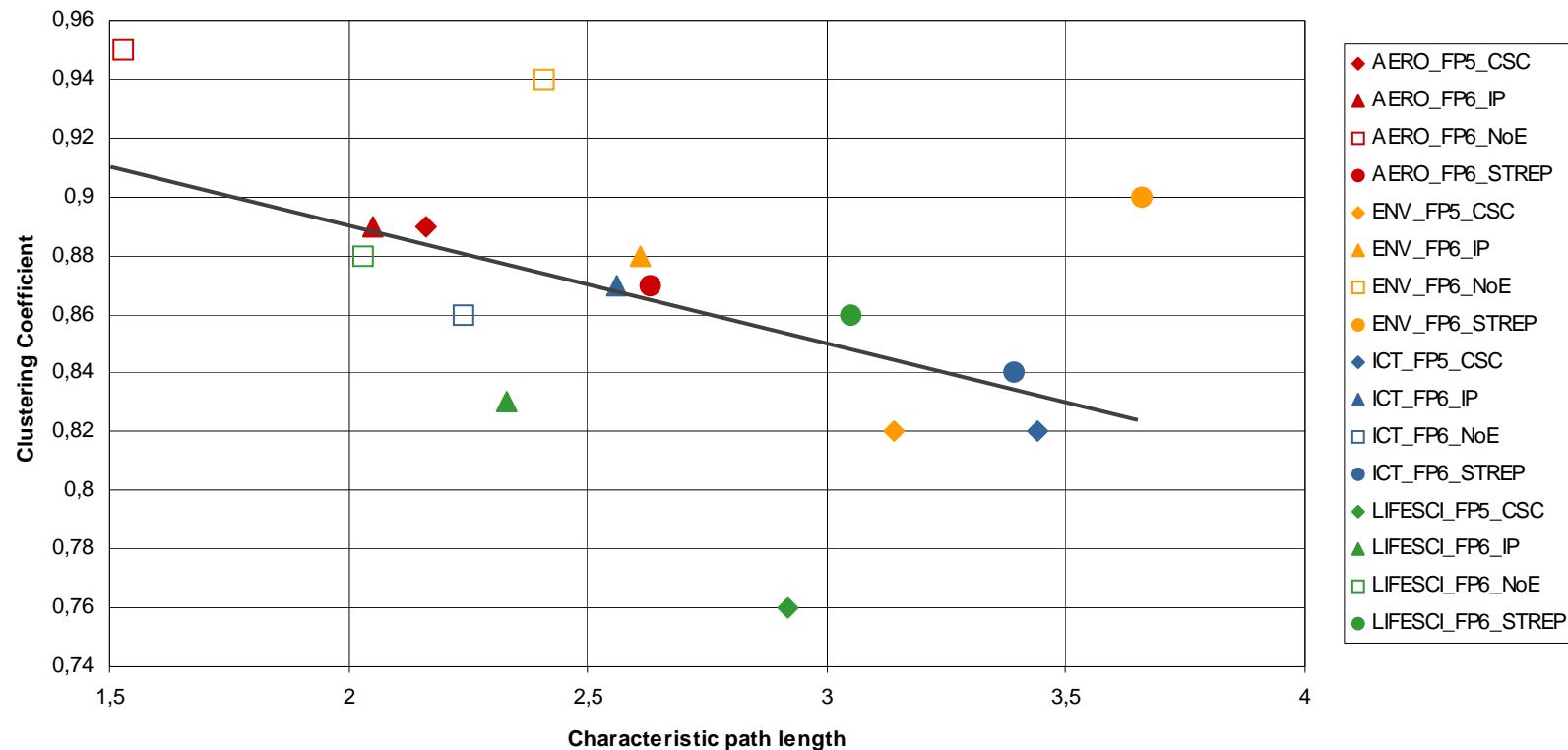
- Networks of different sizes due to different budgets and instruments (contract types)



Characteristics of thematic priorities

Network structure

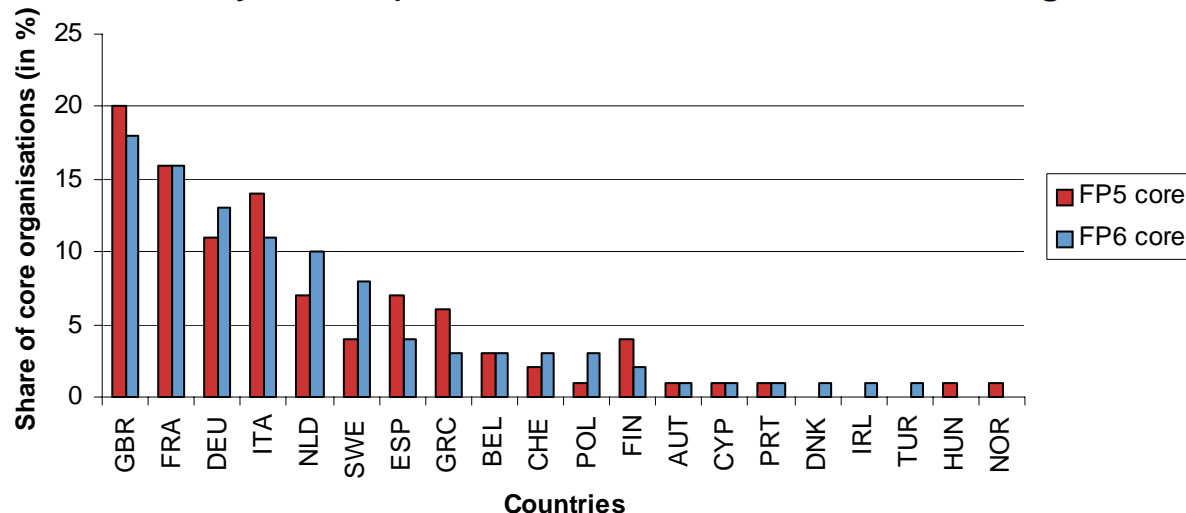
- Networks of different structure (path length, local clustering) due to different instruments



Identification of core organisations in FP5 & FP6

Country characteristics

- Definition of core organisations
 - Nodes with large degree (i.e. many partners) → backbone of networks
 - Share defined by the square root of total number of organisations

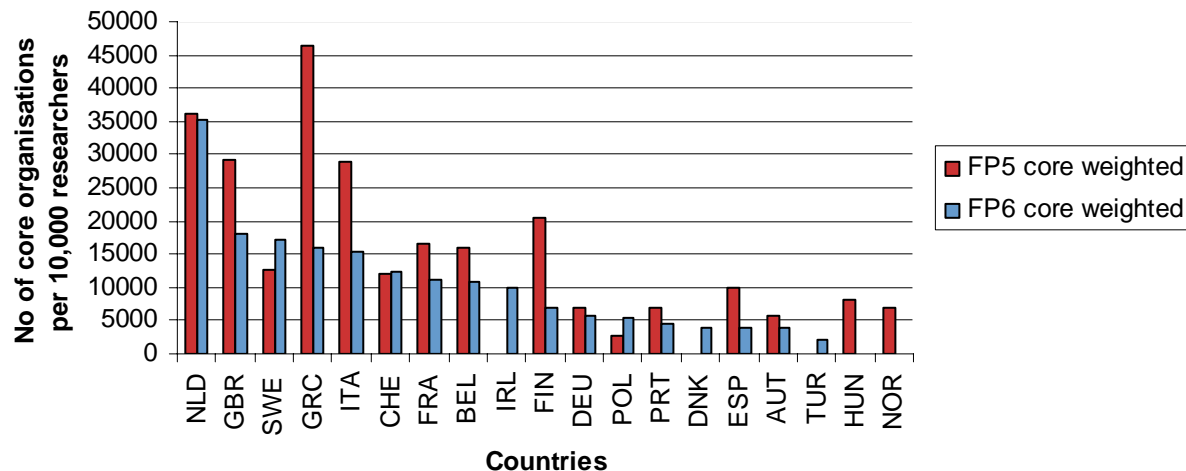


- For most countries, share of core organisations is equal to share of total number of participants
- Exception: GBR, FRA, ITA, NLD → large research organisations?
- FP6: Increased number of core organisations from DEU, NLD, SWE

Identification of core organisations in FP5 & FP6

Country characteristics weighed by number of researchers

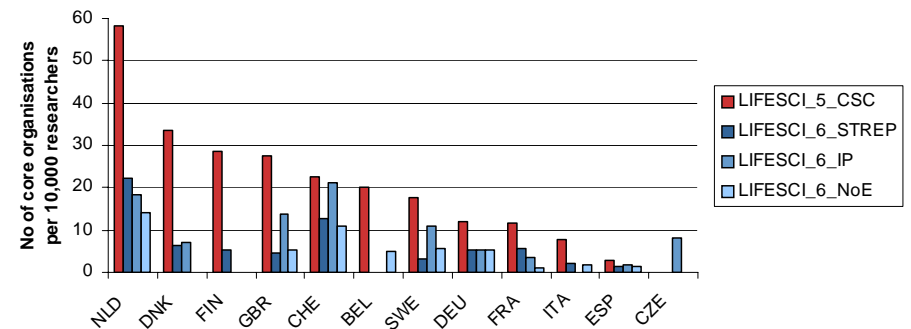
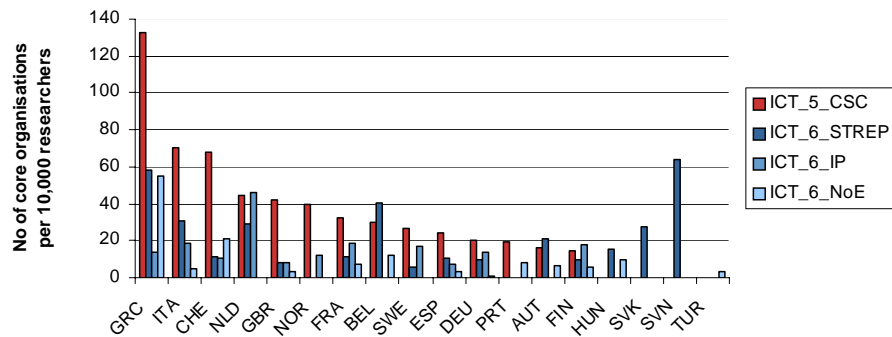
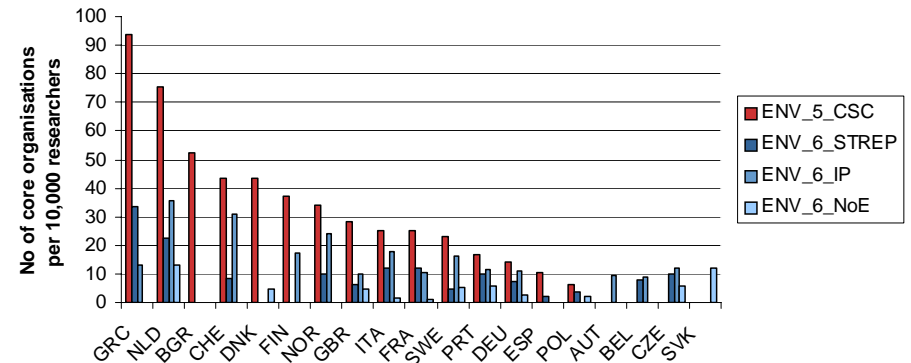
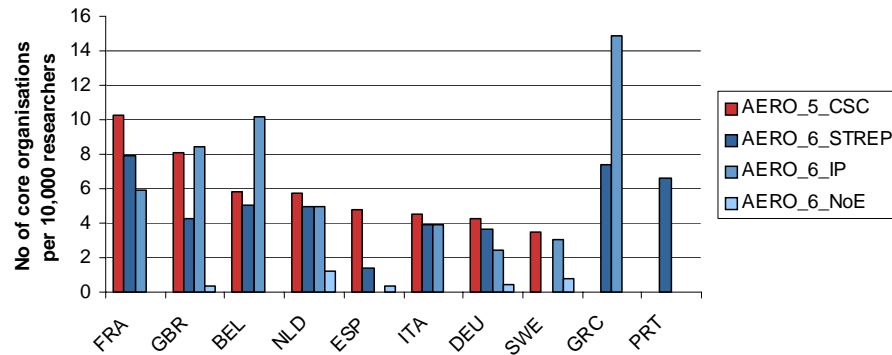
- Definition of core organisations
 - Number of nodes with large degree per 10,000 researchers → perspective of the participating countries
 - Differences between FP5 and FP6 due to different number of participants in FP6!



- Compared to the total number of researchers GRC, NLD, GBR, ITA and FIN are strongly involved in FP5
- Different order in FP6: decrease of core organisations from GRC, ITA, FIN; increase of IRL!

Core organisations in thematic priorities

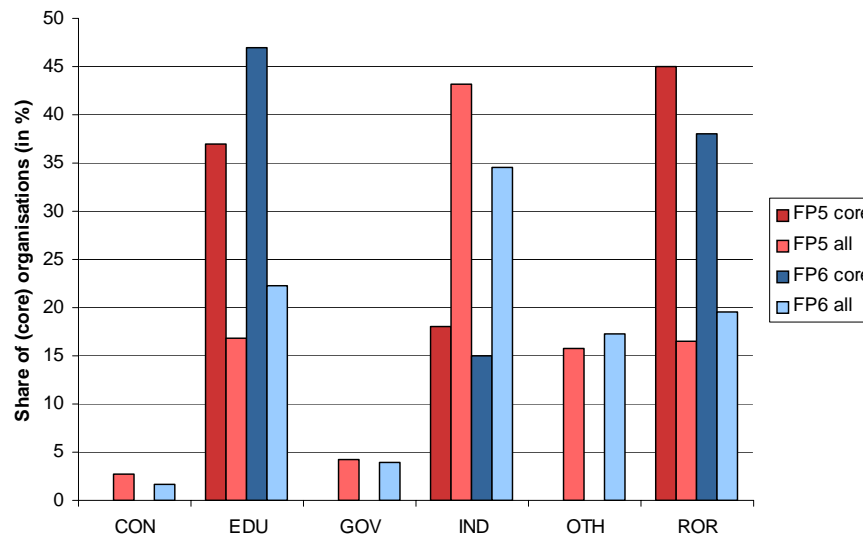
Country characteristics weighted by number of researchers



Identification of core organisations in FP5 & FP6

Involvement of actor groups

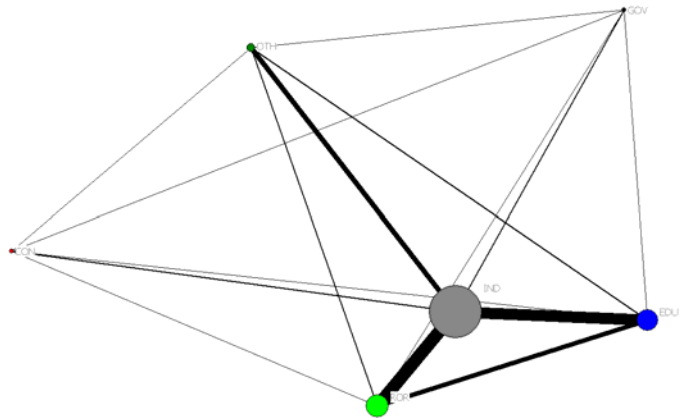
- Definition
 - Nodes with large degree (many partners) → backbone of networks



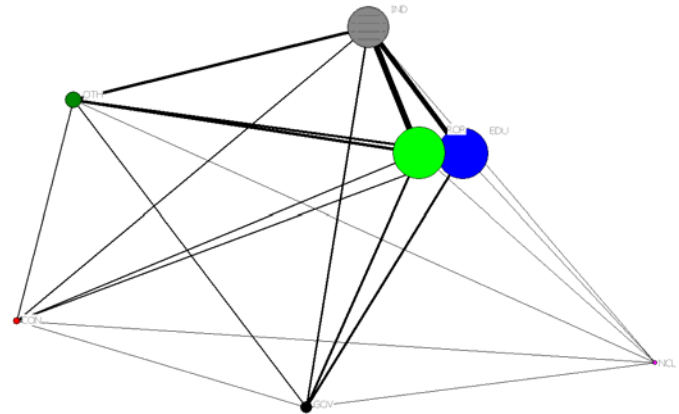
- EDU and ROR account for the highest share of core organisations
- High number of organisations in IND, but low share of core organisations (FP6: 15%)
- CON, GOV and OTH not present in core group

Science-industry collaboration in FP5

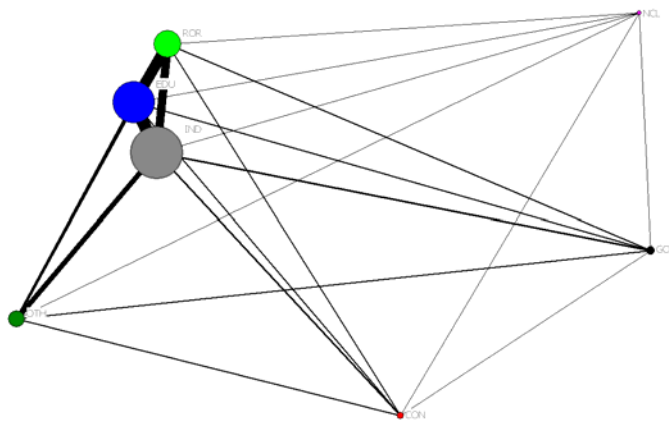
Characteristics of thematic priorities



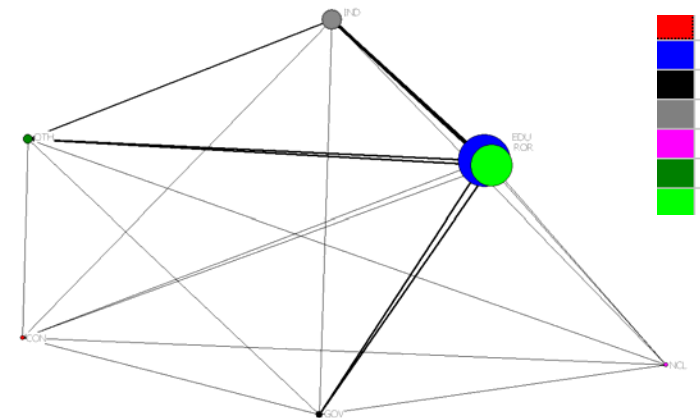
Aerospace



Environment & Energy



ICT

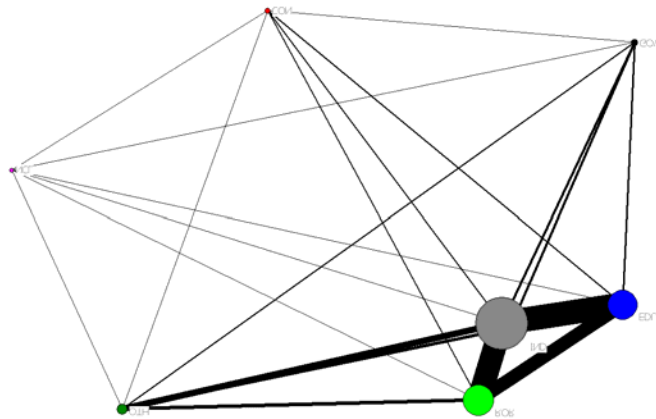


Life Sciences

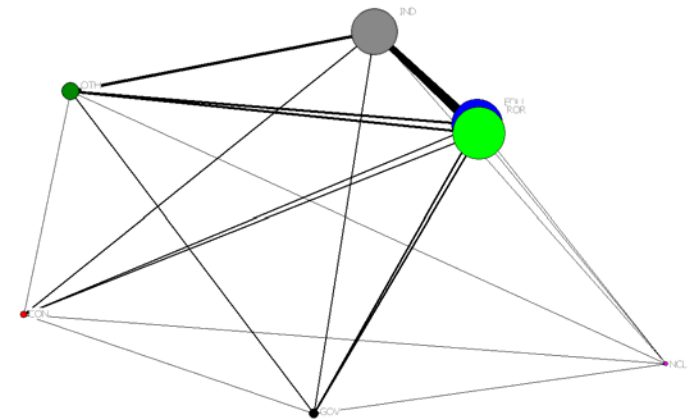


Science-industry collaboration in FP6

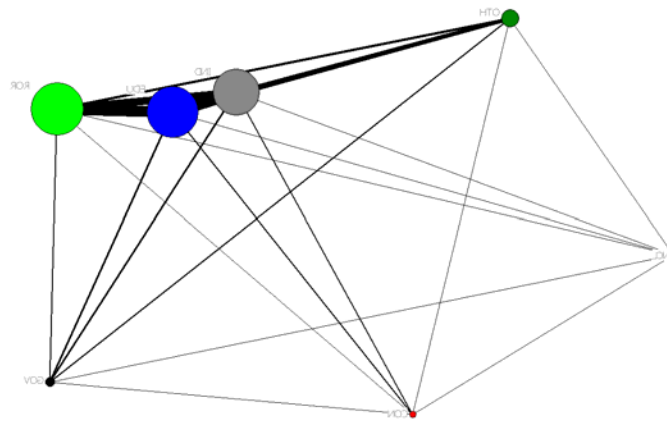
Characteristics of thematic priorities



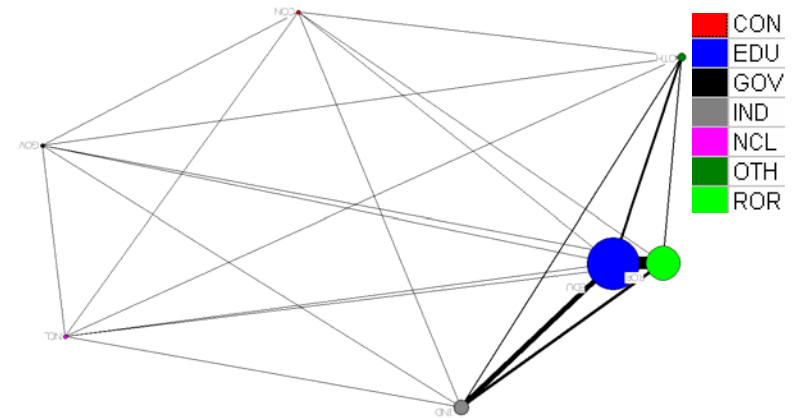
Aerospace



Environment & Energy



ICT

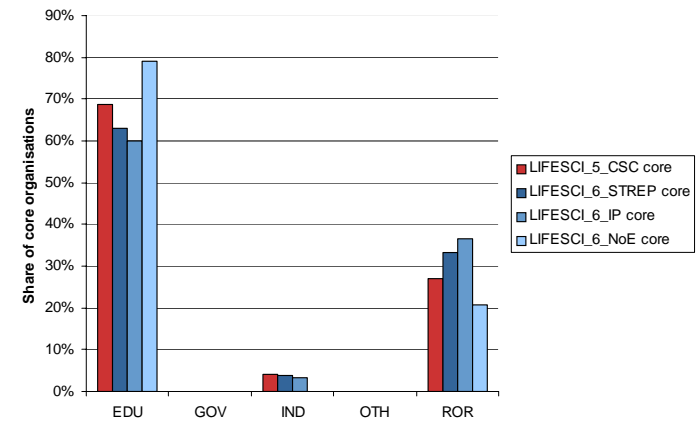
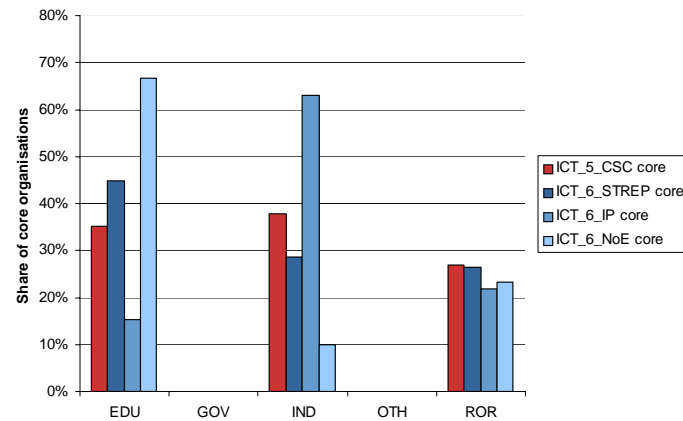
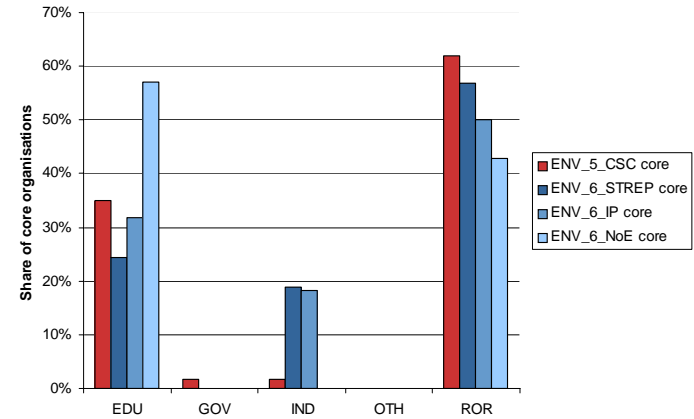
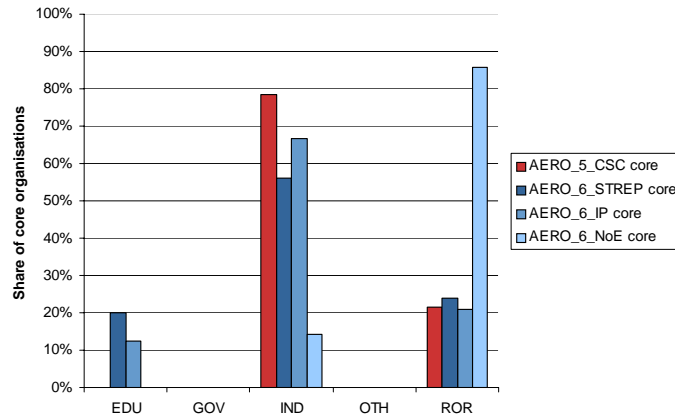


Life Sciences



Core organisations in thematic priorities

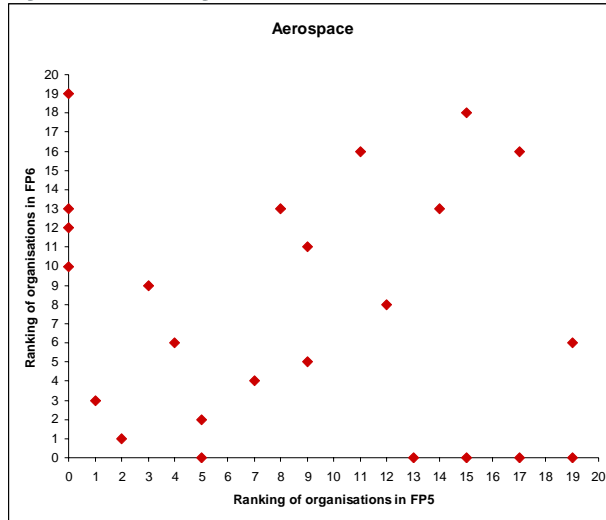
Involvement of actor groups



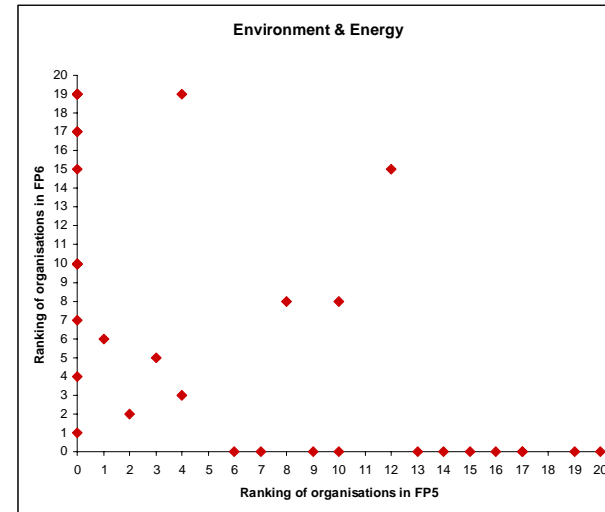
Ranking of organisations by participation (top 20)

Stability and dynamics in thematic priorities

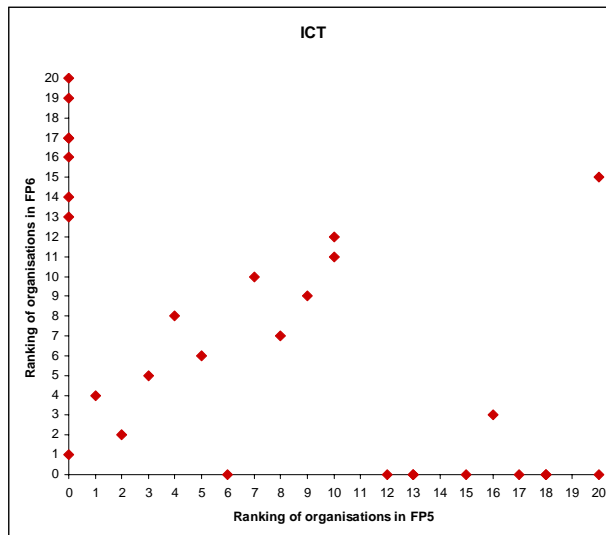
stable



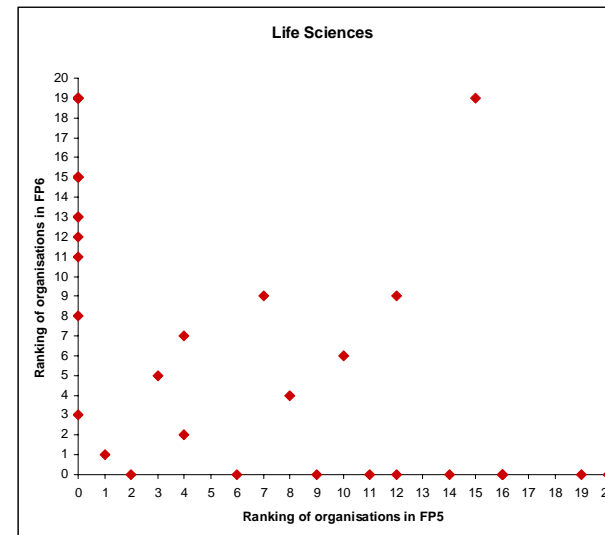
dynamic



stable
for 1-12



dynamic?



Conclusions

- The analysis of network structures points to changing patterns of collaboration structure across instruments in different FPs, but only few across thematic priorities.
- However, the analysis of country and organisation type characteristics – in particular when taking into account core organisations – highlights specific spatial and institutional (collaboration) patterns across thematic priorities.
- Characterisation and structural comparison of thematic sub-networks can be deepened by identifying the underlying micro-structures („zooming in“).
- To strengthen the role of companies or actors from NMS in the FPs, specific governance rules on the level of thematic priorities might be more effective.



Thank you for your attention!

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