

Regional and Cluster Policies

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Outline

1. [Introduction: Clusters and Cluster Policies](#)
2. [Cluster Policy Evaluations](#)
3. [Conclusion](#)

Clusters

- ▶ Cluster: “a geographic concentration of interconnected companies and institutions in a particular field.” (Porter [1998](#), p. 78)
- ▶ Agglomeration forces according to Marshall ([1890](#)):
 - ▶ specialised labour markets
 - ▶ input suppliers
 - ▶ knowledge spillovers
- ▶ Porter ([1998](#))
 - ▶ demanding customers
 - ▶ competitive rivalry
 - ▶ complementarities in products or technologies
- ▶ Success stories: Emilia-Romagna, Baden-Württemberg, Silicon Valley
- ▶ Empirical evidence regarding the benefits of clustering is mixed or inconclusive

Cluster Policies

- ▶ Wide diffusion of the cluster concept in policy
- ▶ Different policy types (Sternberg, Kiese, and Stockinger [2010](#)):
 - ▶ science and technology policy
 - ▶ industrial policy
 - ▶ regional policy
- ▶ ... and instruments (Uyarra and Ramlogan [2016](#)):
 - ▶ R&D funding, intermediaries, VC funds, competence centres, training activities, networking
- ▶ **Cluster oriented innovation policy** focusses on the generation and diffusion of knowledge
- ▶ Regionalised, collaborative R&D subsidies plus infrastructure and/or management structures

Cluster Policy and Knowledge Networks

- ▶ Policy focus on networks because
 - ▶ of their relevance for performance (Breschi and Lenzi [2016](#))
 - ▶ of their impact on the diffusion of knowledge (Singh [2005](#))
 - ▶ they are essential components of industrial and technology clusters (Giuliani and Bell [2008](#); Morrison and Rabelotti [2009](#))
 - ▶ Knowledge diffusion is closely linked to (future) development of the cluster (He and Fallah [2009](#))
- ▶ Justification: market and/or system failures
 - Under-investment in collective learning and collaboration activities (Buisseret, Cameron, and Georghiou [1995](#))
 - ▶ **Input additionality**: positive effects of R&D subsidies for collaborative research on R&D investment
 - ▶ **Output additionality**: positive effects on project success
 - ▶ **Behavioural additionality**: focus of cluster policy to create trust and learning to cooperate
- ▶ Sparse evidence of policy influence on cluster and network formation, development and success (Martin and Sunley [2003](#); Duranton [2011](#); Giuliani and Pietrobelli [2014](#))

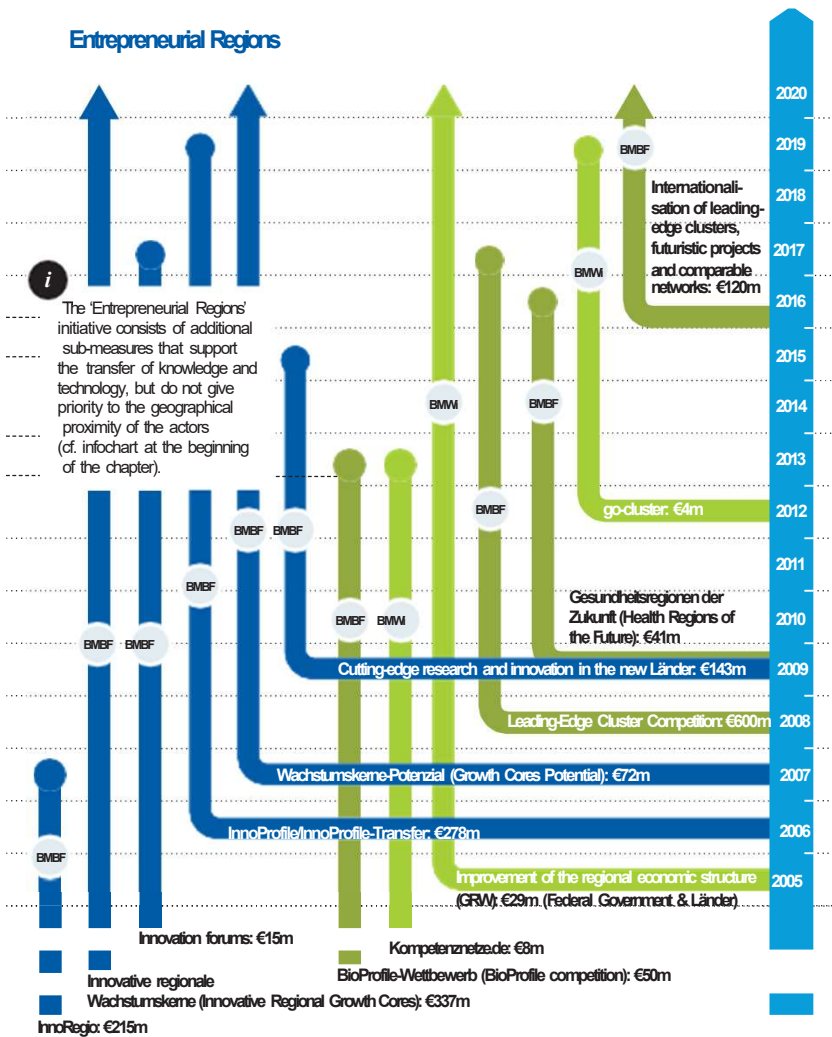
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History of Cluster Policies in Germany



- ▶ **Funding Tournaments:** often (highly) competitive
- ▶ Starting in the late 1990s with
 - ▶ BioRegio: strengthen biotechnology in Germany by means of cluster generation
 - ▶ InnoRegio: strengthen East-German regions by focussing on core competencies
- ▶ BMBF flagship: 'Leading-Edge Cluster Competition'
 - ▶ launched in 2007
 - ▶ EUR 600 million for research projects within 15 clusters
 - ▶ Goal: Strengthen German competitiveness by means of cluster generation
- ▶ BMWi programs ("go-cluster", "kompetenznetze") focus on setting up management structures and services
- ▶ Often with specific focus on East Germany (catch-up)

Source: EFI – Commission of Experts for Research and Innovation (2017, p. 59)

BioRegio vs. InnerRegio

The BioRegio Contest I

- ▶ Comparison of BioRegio and InnoRegio based on Dohse ([2007](#))
- ▶ Goal: strengthen Biotechnology in Germany
- ▶ Idea: funding of three clusters, i.e. regions with particular competencies in biotechnology
- ▶ Proposal: regions present their specific strengths (research, marketing, ideas for advancements in biotechnology)
- ▶ Selection criteria:
 - C1: Number and scale of existing companies oriented towards biotechnology in the region
 - C2: Number, profile and productivity of biotech research facilities and universities in the region
 - C3: Interaction (networking) of different branches of biotech research in the region
 - C4: Supporting service facilities (patent office, information networks, consulting)
 - C5: Strategies to convert biotechnology know-how into new products, processes and services
 - C6: A regional concept to help the start-up of biotechnology-based companies
 - C7: Provision of resources through banks and public equity to finance biotechnology companies
 - C8: Cooperation among regional biotech research institutes and clinical hospitals in the region
 - C9: Local authorities' approval practice with regard to new biotech facilities and field experiments

The BioRegio Contest II

- ▶ Selection: independent jury representing science, industry and labour unions
- ▶ 17 participating regions
- ▶ Winners: Munich, Rhineland (Cologne, Aachen, Du'sseldorf, Wuppertal), Rhine-Neckar Metropolitan Region (Heidelberg, Mannheim, Ludwigshafen)
- ▶ Special vote for Jena (Bioinstruments)
- ▶ Funding: EUR 76.7 million for 5 years and priority for proposals within the program "Biotechnology 2000"

The InnoRegio Contest

- ▶ Goal: reducing the innovation and development gap of the “New Länder”
- ▶ Establish regional innovation networks in East Germany ⇒ uncover regional innovation potentials
- ▶ Criteria:
 - C1: Novelty and originality of the approaches
 - C2: Impact on the region’s competitiveness and employment situation
 - C3: Dynamic (long run) potential of the projects
 - C4: Expected regional return of the projects
 - C5: Sustainability of the development induced by the projects
 - C6: Plausibility and maturity of the presented concepts
 - C7: Quality (intensity) of cooperation
 - C8: Regional embeddedness of the actors
 - C9: Financial contribution of the region itself
 - C10: Applicability of the approaches to other regions
- ▶ 444 applications (qualifying phase)
 - ⇒ 25 InnoRegions (development phase) (up to TEUR 154)
 - ⇒ 23 implementation phase (EUR 3.1 – 20.5 million, EUR 250 million in total)

Contrasting BioRegio and InnoRegio

	InnoRegio	BioRegio
Technology	open	specific
Geographical focus	East Germany	no
Focus	structurally lagging regions	leading dynamic regions
Goal	growth and convergence	national economic growth
Participants	regionally bounded projects	cities or even networks of cities
Applications	large number of participating projects (444 applications)	small number of participating regions (17 applications)
Main criteria	software	hardware

Lessons learned from both approaches were implemented in subsequent programs by the BMBF and BMWi

Assets and Drawbacks of funding tournaments (Dohse 2007)

Assets

- ▶ Stronger regional focus of innovation policy: taking regions seriously, acknowledge knowledge spillovers, functioning RIS
- ▶ Stimulating competition between regions ⇒ experimental process to uncover superior institutional arrangements
- ▶ Fostering regional clusters ⇒ knowledge as a strategic resource
- ▶ Substantial mobilization effects already during development of proposals (rejected initiatives were often conducted anyhow, sometimes with funding by other sources)

Drawbacks

- ▶ Discrimination of enterprises located outside target regions
- ▶ Positive externalities of regional clustering not all that clear (literature focusses on success stories)
- ▶ Success might depend on stage in the industry life cycle (early phases only)
- ▶ Goal conflicts with policies by the regions themselves ⇒ inefficient double spending
- ▶ Selection process takes more time than conventional programmes
- ▶ Conflicting goals in InnoRegio, double “picking the winners” in InnerRegio.

The BioRegio Contest

- ▶ Analysis of BioRegio impact on Networks based on Graf and Broekel ([2020](#))

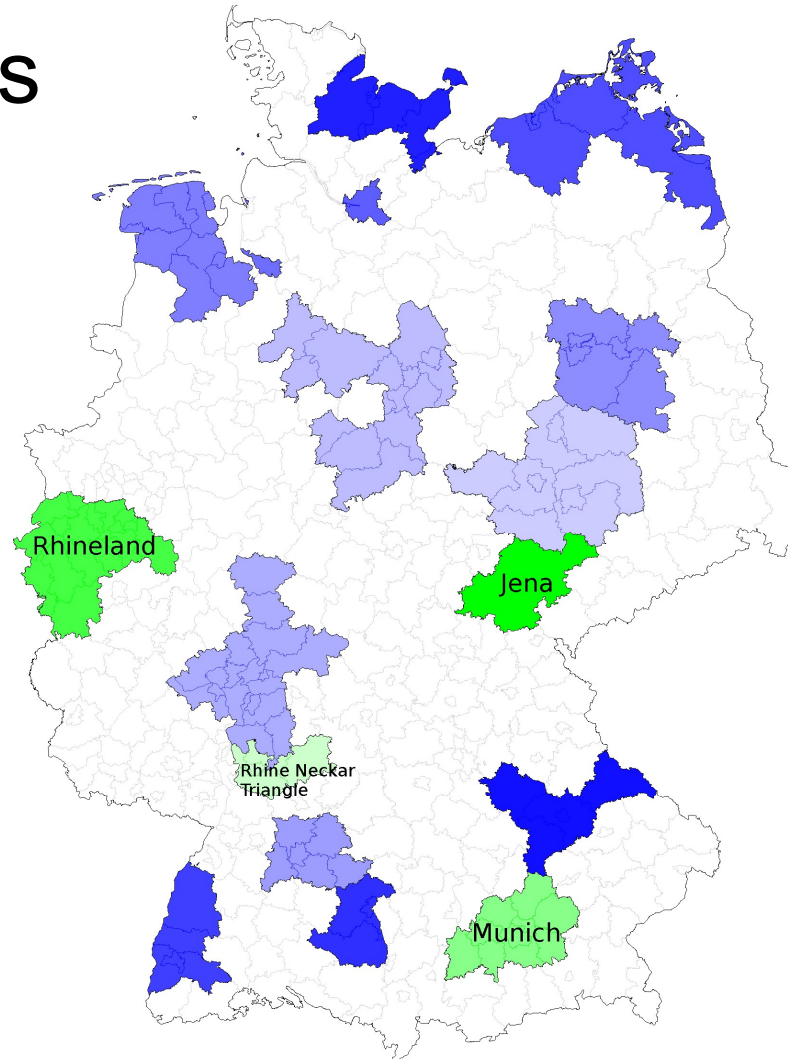
Research questions

Cluster policies try to increase innovation and interaction. What are its (long term) effects on

1. innovation activity and
2. knowledge networks?

- ▶ Competitive program to select the (three) most promising Biotech clusters in Germany in order to increase the competitiveness of the German Biotechnology industry
- ▶ Duration: Initiated in 1995, funding between 1997 and 2002 (2004)
- ▶ Identification of regions
 - ▶ Overall 17 clusters, 13 participants and 4 winners
 - ▶ Non winning regions received funding for developing the strategy
 - ▶ defined as having at least one funding recipient within BioRegio aggregates of NUTS3 regions

The BioRegions



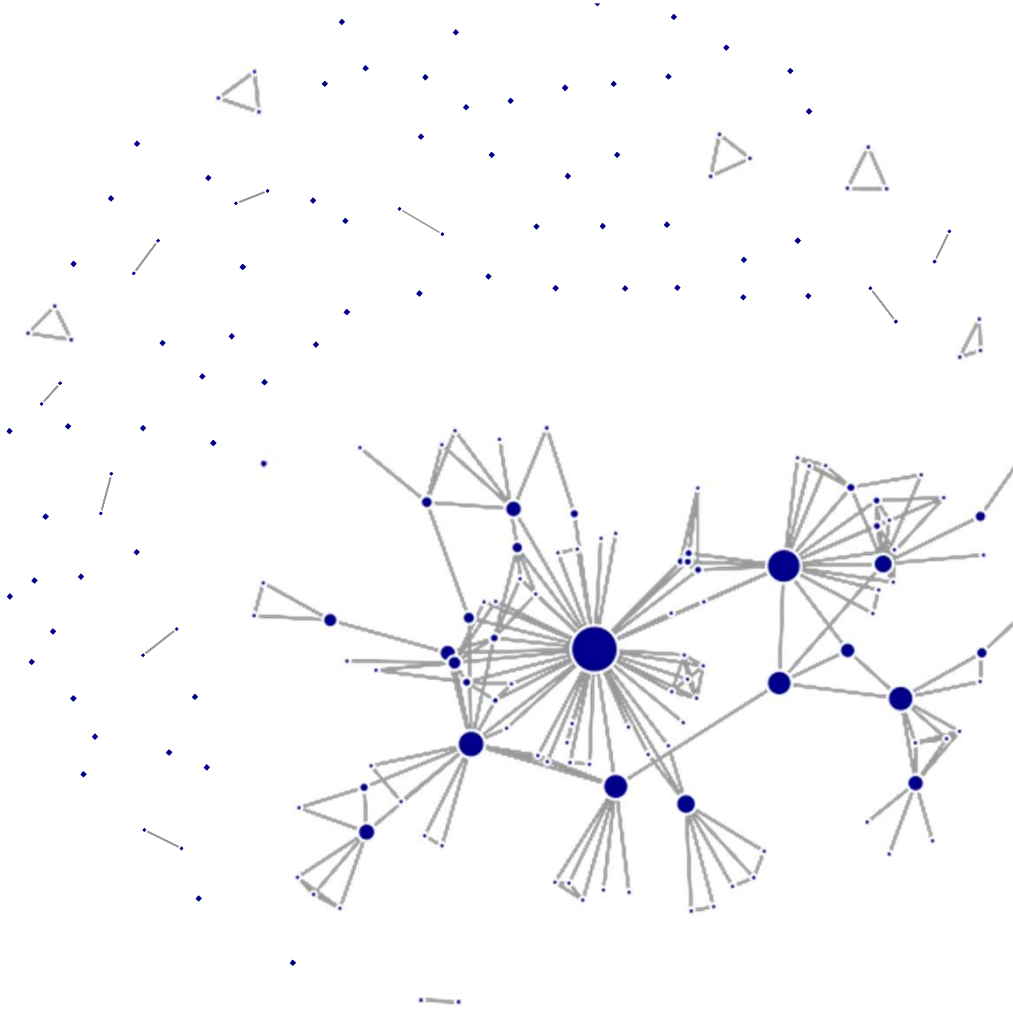
winners – green, participants – blue

Data

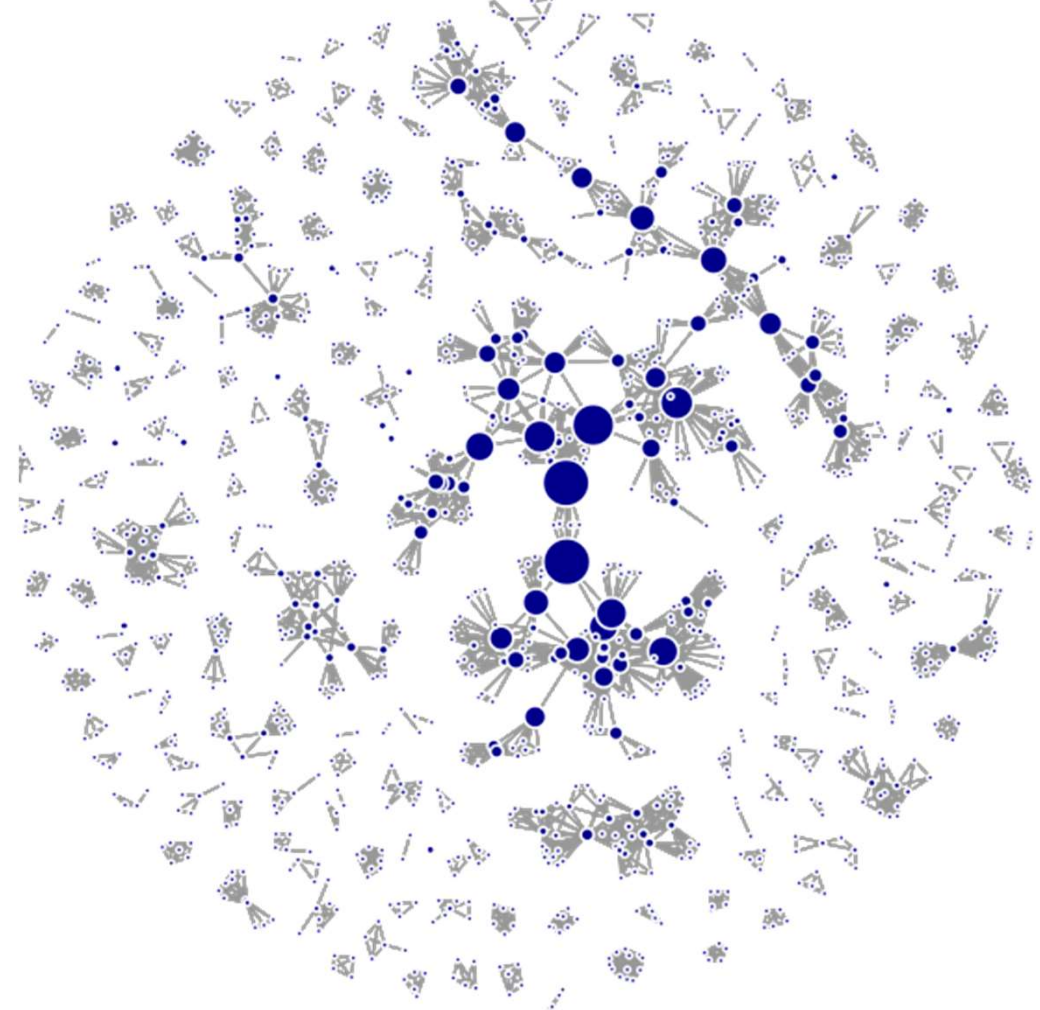
- ▶ Patent data
 - ▶ Biotech patents with at least one inventor located in respective region
 - ▶ OECD Regpat spring 2018
- ▶ Two types of networks
 - ▶ Applicants are linked via common inventors (mobility and co-patents) (Cantner and Graf [2006](#))
 - ▶ Co-inventor networks (Breschi and Lenzi [2016](#))
 - ▶ parsing and cleaning of inventor names
 - ▶ OECD HAN database for harmonized applicant names
 - ▶ 7-year moving windows: 1985-1991 to 2007-2013
- ▶ Funding
 - ▶ Public funding data of the BMBF (Foerderkatalog.de)
 - ▶ Information on funding focus and program
 - Biotechnology in general and BioRegio contest

Example Networks (Rhine-Neckar 2004)

Applicant network



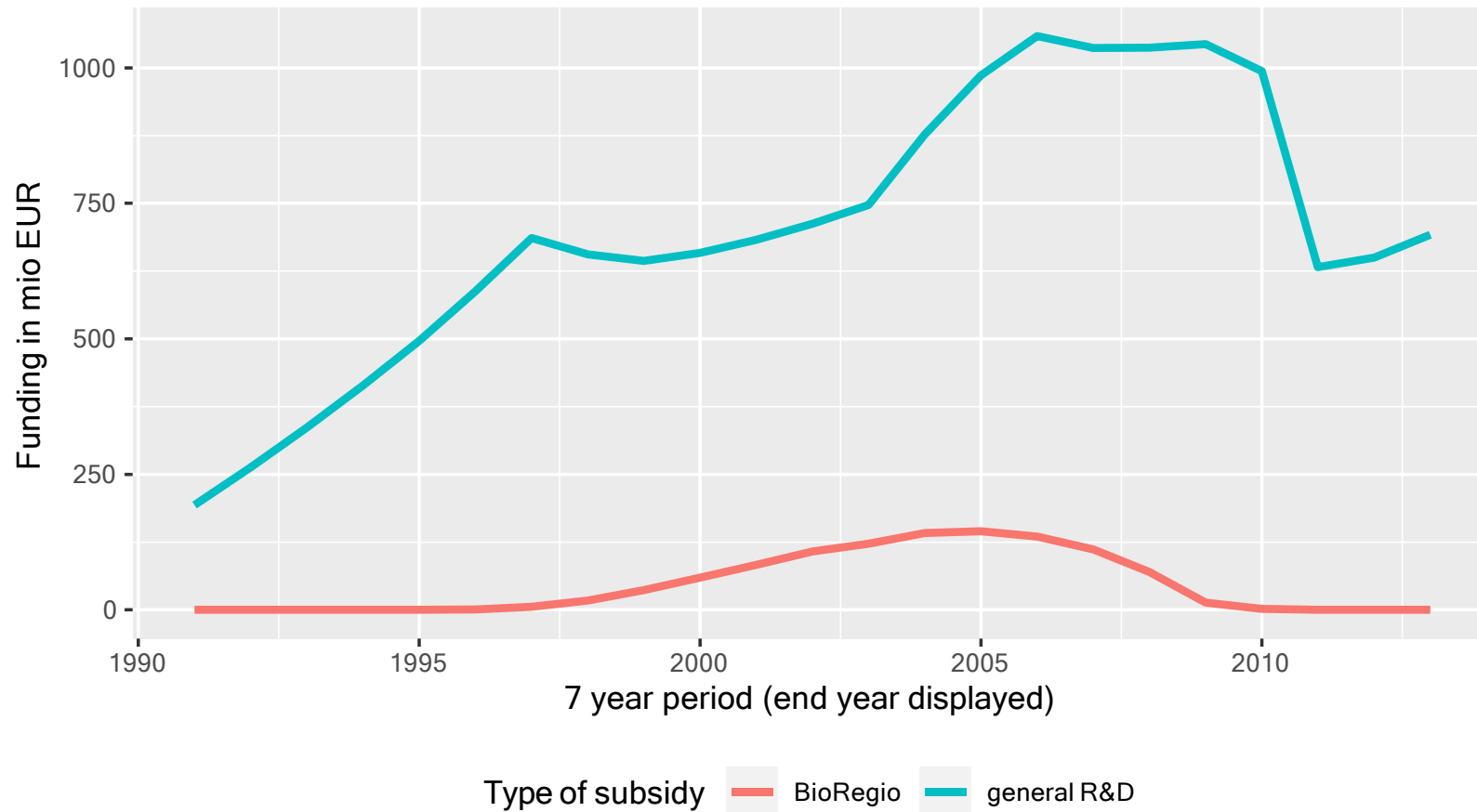
Co-inventor network



Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Max
<i>Dependent variables : innovation activity</i>					
Patcount	391	280.913	331.738	0	1,245
Vcount.app	391	96.706	93.193	0	370
Vcount.inv	391	587.588	630.800	0	2,312
<i>Dependent variables : application network structure</i>					
Density	386	0.027	0.030	0.000	0.333
Mean degree	387	1.337	0.757	0.000	3.289
Mean strength	387	4.234	2.551	0.000	11.581
Connectedness	386	0.083	0.073	0.000	0.350
Share MC	387	0.246	0.139	0.047	1.000
Centralization	386	0.095	0.051	0.000	0.276
Transitivity	320	0.600	0.237	0.000	1.000
<i>Independent variables: policy</i>					
BioRegion	391	0.235	0.425	0	1
RD.funds.Bio	391	41.136	52.719	0.011	277.130
BioRegio.funds	391	2.687	8.129	0.000	46.185
AfterBioReg	391	0.391	0.489	0	1
<i>Independent variables: controls</i>					
Teamsize.inv	387	4.035	0.507	2.583	5.505
Teamsize.all.inv	391	3.076	0.534	2.045	4.452

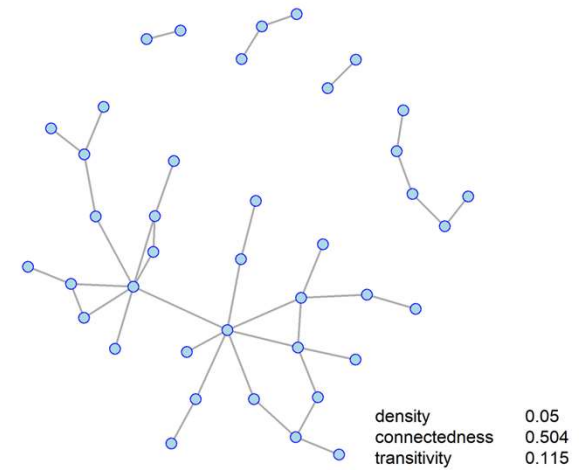
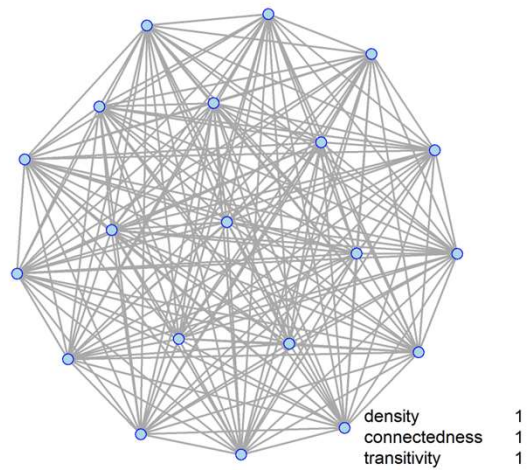
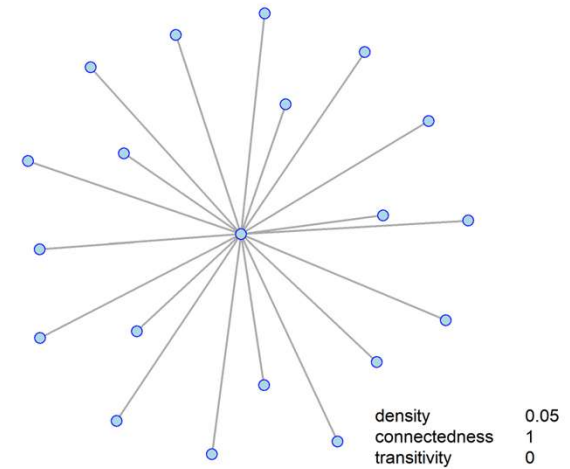
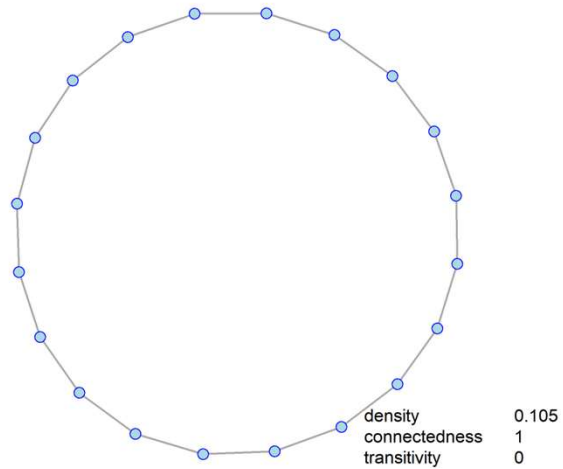
Biotech and BioRegio Funding



BioRegio Influence on Innovation Activity

	<i>Dependent variable:</i>		
	Δ Patcount.app	Δ Vcount.app	Δ Vcount.inv
RD.funds.Bio	-0.018 (0.064)	-0.043** (0.021)	-0.126 (0.115)
BioRegio.funds	2.678*** (0.608)	0.443** (0.207)	3.633*** (1.135)
AfterBioReg	-49.014*** (5.832)	-15.906*** (2.010)	-95.634*** (11.003)
BioRegion \times AfterBioReg	-27.992*** (7.549)	-8.158*** (2.484)	-38.444*** (13.845)
RD.funds.Bio \times BioRegio.funds	-0.009** (0.005)	-0.002 (0.002)	-0.020** (0.009)
Teamsize.inv	1.473 (3.786)	0.782 (1.289)	7.321 (7.061)
Teamsize.all.inv	-2.847 (9.139)	-1.381 (3.095)	-12.320 (17.014)
lag(Patcount.app, 1)	-0.053*** (0.015)		
lag(Vcount.app, 1)		-0.053*** (0.016)	
lag(Vcount.inv, 1)			-0.059*** (0.016)
Year	2.443** * (0.527)	0.841** * (0.190)	5.320** * (1.015)
Observations	371	371	371
Adjusted R ²	0.419	0.371	0.388
F Statistic	32.450***	27.056***	28.885***

Network Structures



BioRegio Influence on Network Structure

	<i>Dependent variable:</i>						
	Density	Mean degree	Mean strength	Connectedness	Share MC	Centralization	Transitivity
RD.funds.Bio	0.00001 (0.00005)	0.002* (0.001)	0.010*** (0.003)	0.0003*** (0.0001)	0.001*** (0.0002)	0.0002** (0.0001)	-0.001*** (0.0003)
BioRegio.funds	-0.0003 (0.0005)	0.013 (0.009)	0.025 (0.029)	0.002** (0.001)	0.002 (0.002)	0.002* (0.001)	-0.012*** (0.004)
AfterBioReg	0.008* (0.005)	-0.304*** (0.086)	-0.165 (0.286)	-0.017* (0.010)	-0.023 (0.021)	-0.020** (0.010)	-0.021 (0.040)
BioRegion × AfterBioReg	0.009 (0.006)	-0.066 (0.104)	0.513 (0.344)	0.020 (0.012)	0.053** (0.025)	-0.0002 (0.012)	-0.084* (0.044)
RD.funds.Bio × BioRegio.funds	0.00000 (0.00000)	-0.0001 (0.0001)	-0.0001 (0.0002)	-0.00002** (0.00001)	-0.00003 (0.00002)	-0.00000 (0.00001)	0.0001*** (0.00003)
Vcount.app	0.00001 (0.00004)	0.002*** (0.001)	0.002 (0.002)	0.0001 (0.0001)	0.0004** (0.0002)	-0.0004*** (0.0001)	-0.0002 (0.0003)
Teamsize.all.inv	0.019*** (0.007)	-0.087 (0.121)	-0.730* (0.401)	0.009 (0.014)	-0.041 (0.030)	0.008 (0.014)	0.222*** (0.064)
Year	-0.003*** (0.0004)	0.026*** (0.008)	0.107*** (0.026)	-0.002** (0.001)	-0.005*** (0.002)	0.001 (0.001)	-0.001 (0.004)
Observations	386	387	387	386	387	386	320
R ²	0.211	0.180	0.303	0.150	0.172	0.125	0.109
Adjusted R ²	0.159	0.126	0.257	0.093	0.117	0.066	0.040
F Statistic	12.097***	9.942***	19.709***	7.949***	9.374***	6.417***	4.516***

Note: *p<0.1; **p<0.05; ***p<0.01

Main Findings

- ▶ **BioRegio** successful in fostering innovation activities, BUT, not sustainable
- ▶ Effects on network cohesion not robust and not sustained
- ▶ Lower transitivity breaking up cliques
- ▶ Increased centralisation few actors coordinate strategy
- ▶ Almost no sustainable effect on network cohesion (except share in main comp.)
- ▶ **General R&D subsidies** with a robust, positive effect on network cohesion

Overall, we should be sceptical regarding the long term, structural effects of cluster policies

Leading Edge Cluster Competition

The Leading Edge Cluster Competition (LECC)

- ▶ Section based on Töpfer, Cantner, and Graf ([2019](#))
- ▶ Extensive R&D funding program: “flagship” program of German innovation policy
- ▶ Based on former cluster policies in Germany like BioRegio and InnoRegio
- ▶ Tournament with three rounds of competition (2008, 2010, 2012)
- ▶ Open for all fields of technologies
- ▶ Five clusters per round selected – received in subsequent years up to 40 million e funding for joint R&D-projects
- ▶ Objectives:
 - ▶ increase international competitiveness create/sustain leading positions
 - ▶ promote joint R&D projects
 - ▶ create new knowledge and
 - ▶ strengthen cooperation networks (enlarge/intensify)

Research Approach

- ▶ Initial effects of the LECC (Cantner, Graf, and Hinzmann [2013](#))
 - ▶ funding collaboration increasing cohesion **C**
 - ▶ key actors in strategy process increasing centralisation **C**
 - ▶ bridging science and industry increased share of such ties **X**
 - ▶ regional focus increased share of local links **C**
 - ▶ systemic perspective mobilize links beyond funding **?**

“long term” results?

How selective is the program on the actor level?

- ▶ Method
 - ▶ Primary data collection: questionnaire surveys in fall 2011 and late summer 2013
 - ▶ Max. **ten most important** research partners (free recall)

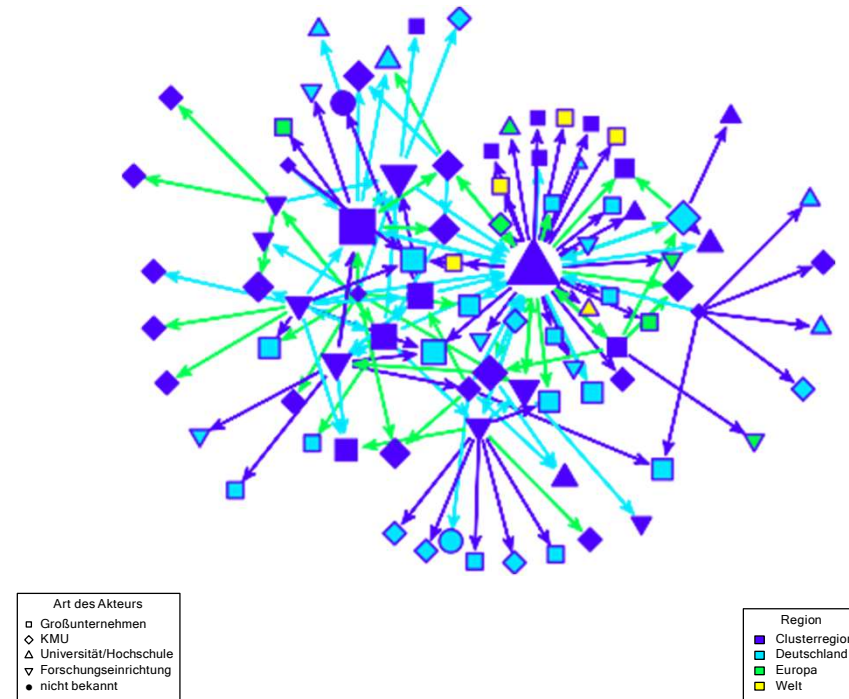
Example networks

Cool Silicon 2011



Antworten: 17 – Akteure: 97

Cool Silicon 2013

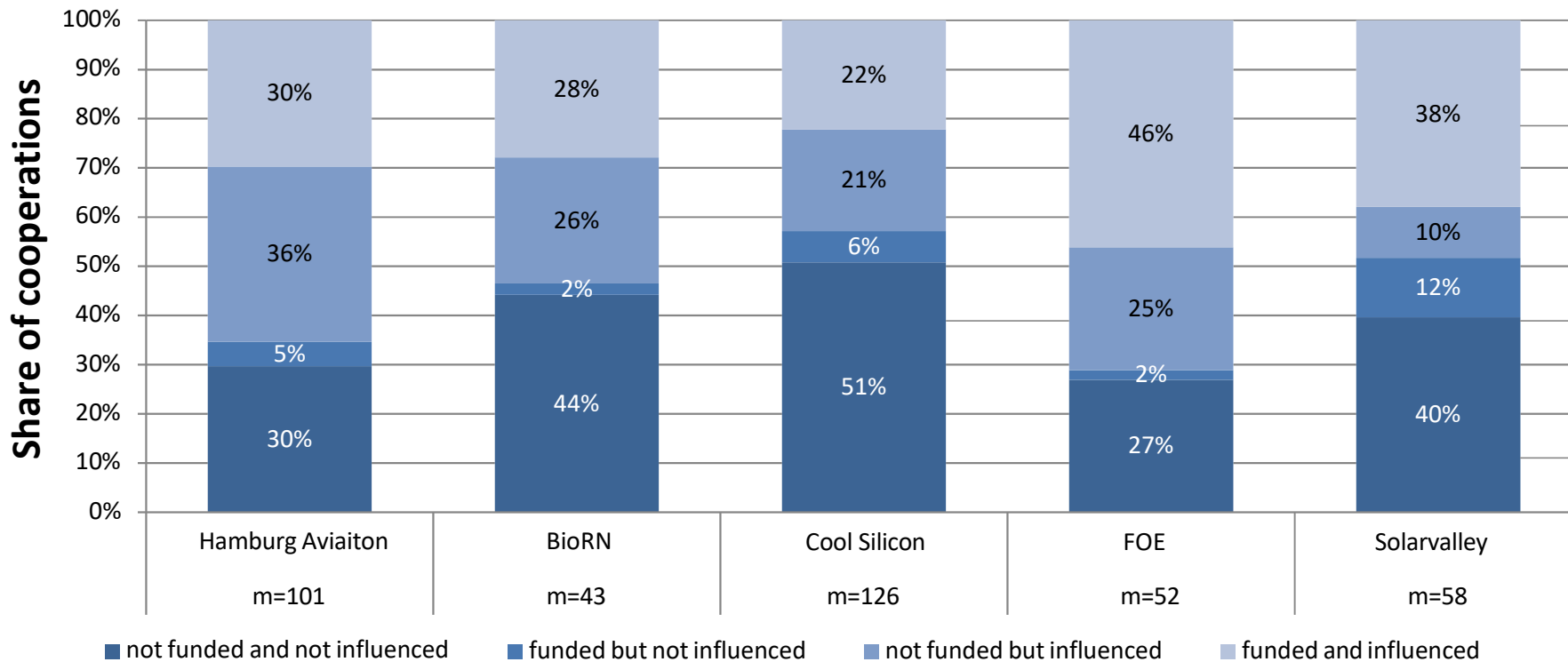


Antworten: 21 – Akteure: 89

green = initiated by LECC
 lightblue = intensified by LECC
 blue = no LECC influence

Mobilization effect of the LECC

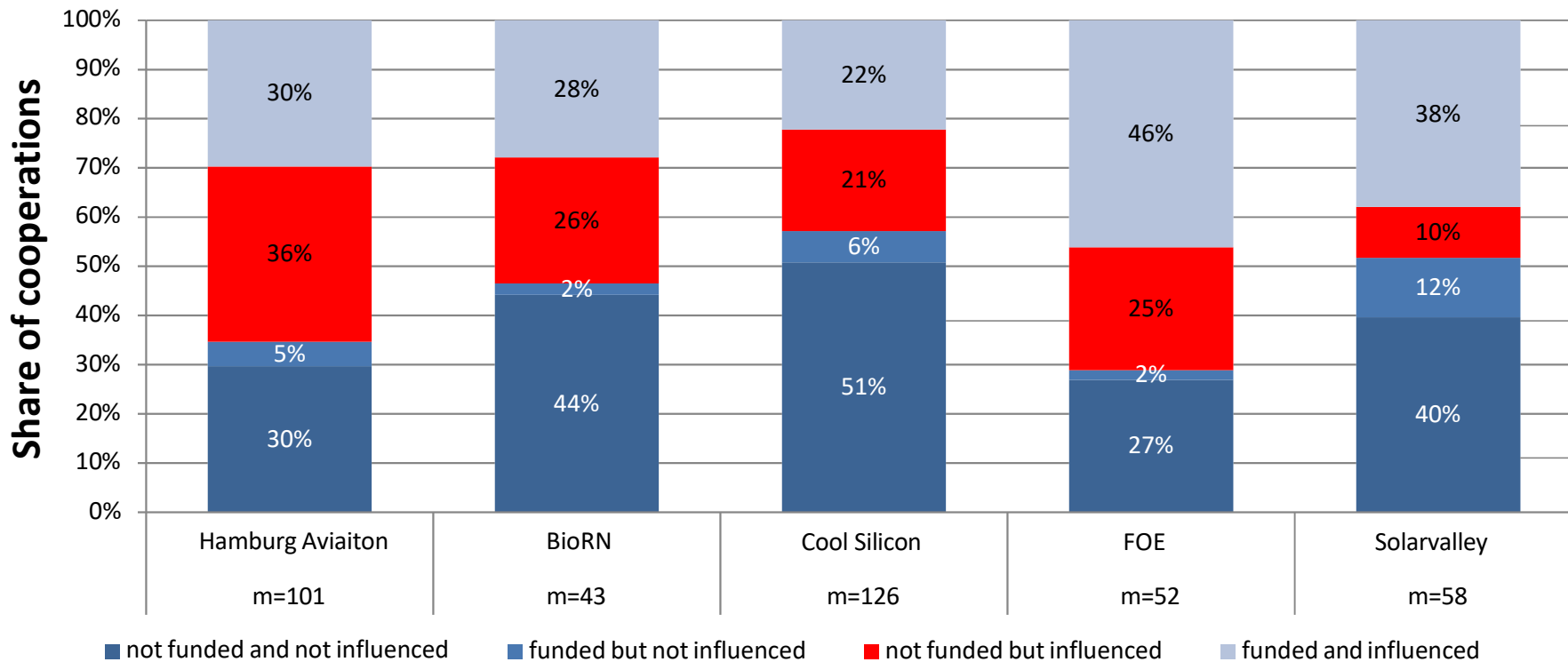
- ▶ Impact of the Leading-Edge Cluster competition on strategic cooperation in 2011
- ▶ Funding vs. influence



m: number of linkages

Mobilization effect of the LECC

- ▶ Impact of the Leading-Edge Cluster competition on strategic cooperation in 2011
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m: number of linkages

Structural effects of the LECC

	Hamburg Aviation			BioRN			Cool Silicon		
	2007	2011	2013	2007	2011	2013	2007	2011	2013
Initiated linkages by LECC	-	45.5%	25.9%	-	41.9%	27.5%	-	20.6%	27.6%
Intensified linkages by LECC	55.6%	19.8%	35.0%	29.4%	11.6%	17.6%	37.3%	22.2%	36.8%
Initiated or intensified linkages by LECC	55.6%	65.3%	60.8%	29.4%	53.5%	45.1%	37.3%	42.9%	64.5%
Density (related to respondent)	0.040	0.154	0.132	0.023	0.068	0.038	0.070	0.132	0.155
Centralization (indegree)	0.056	0.141	0.173	0.057	0.024	0.082	0.058	0.081	0.153
dito without initiated linkages	-	0.053	0.130	-	0.034	0.046	-	0.042	0.124

	FOE			Solarvalley		
	2007	2011	2013	2007	2011	2013
Initiated linkages by LECC	-	53.8%	35.7%	-	34.5%	19.7%
Intensified linkages by LECC	52.9%	17.3%	17.9%	30.8%	13.8%	42.6%
Initiated or intensified linkages by LECC	52.9%	71.2%	53.6%	30.8%	48.3%	62.3%
Density (related to respondent)	0.000	0.167	0.133	0.015	0.106	0.027
Centralization (indegree)	0.115	0.106	0.163	0.073	0.104	0.052
dito without initiated linkages	-	0.070	0.090	-	0.048	0.056

- Density: initially, LECC increases interconnectedness sustainable interconnectedness in Hamburg, Cool Silicon & FOE
- Centralization: concentration of linkages increasing centralization ⇒ focus on main actors within the network

LECC: Main findings

- ▶ Challenging process of data collection ⇒ few observations
Limited possibilities for analysis
- ▶ Indication of a net mobilization effect of the LECC
- ▶ LECC increased interconnectedness especially in early phase
- ▶ Increased share of local linkages
- ▶ Increasing centralization of R&D networks

Conclusions

- ▶ Cluster policy here: cluster oriented innovation policy
 - ▶ **Individual effects** are comparable to other types of direct R&D funding
 - ▶ **Mobilization effects** even before funding
 - ▶ **Structural effects** are difficult to assess and appear mostly in the early funding phases
 - ▶ Centralization of R&D networks due to cluster policies ⇒ problem?
 - ▶ Discrimination of outsiders ⇒ problem?
 - ▶ Bureaucratic selection and administration processes
- Overall, no obvious advantages compared with direct R&D funding (national perspective)
 - Policy learning
 - ▶ BioRegio was criticised for “double-picking-winners”, subsequent programs were open to different technologies
 - ▶ LECC with strong effects on local linkages was followed by a program to help clusters establish more international linkages

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