

The Knowledge Plexus

A systemic view on the economic geography of technological knowledge

Appendix 2

Data and statistical tables

George Chorafakis

Table 3.1: Matching grid of FP thematic areas

CD	THEMATIC CLUSTERS	FP5		FP6		FP7	
1.01	LIFE SCIENCES AND HEALTH	Quality of Life	Integrating and strengthening the ERA	Life sciences, genomics and biotechnology for health	COOPERATION	Health	Control of infectious diseases The cell factory Environment and health The ageing population and disabilities Chronic and degenerative diseases, cancer, diabetes, cardiovascular and rare diseases Research into genomes and diseases of genetic origin Neuroscience Public-health and health-services Research (including drug-related problems) Research relating to persons with disabilities
1.02	FOOD AND AGRICULTURE	Quality of Life	Integrating and strengthening the ERA	Food quality and safety	COOPERATION	Food, Agriculture, and Biotechnology	Food, nutrition and health Sustainable agriculture, fisheries and forestry, and integrated development of rural areas
1.03	INFORMATION AND COMMUNICATION TECHNOLOGIES	Information Society	Integrating and strengthening the ERA	Information society technologies	COOPERATION	Information and Communication Technologies	Systems and services for the citizen New methods of work and electronic commerce Multimedia content and tools Essential technologies and infrastructures Cross Programme Actions (CPA) Generic activities: Future and emerging technologies IST support activities
1.04	MATERIALS, NANOTECHNOLOGIES AND PRODUCTION PROCESSES	Sustainable Growth	Integrating and strengthening the ERA	Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices	COOPERATION	Nanosciences, Nanotechnologies, Materials and new Production Technologies	New materials and their production and transformation (including steel) Innovative products, processes and organisation Measurements and testing (part)
1.05	TRANSPORT, AERONAUTICS AND SPACE	Sustainable Growth	Integrating and strengthening the ERA	Aeronautics and space Sustainable development, global change and ecosystems (Transport)	COOPERATION	Transport (including Aeronautics) Space	Sustainable mobility and intermodality Land transport and marine technologies New perspectives in aeronautics
1.06	ENVIRONMENT	Environment and Sustainable Development	Integrating and strengthening the ERA	Sustainable development, global change and ecosystems (Environment)	COOPERATION	Environment (including Climate Change)	Sustainable management and quality of water Global change, climate and biodiversity Sustainable marine ecosystems The city of tomorrow and cultural heritage RTD activites of a generic nature
1.07	ENERGY	Environment and Sustainable Development	Integrating and strengthening the ERA	Sustainable development, global change and ecosystems (Energy)	COOPERATION	Energy	Cleaner energy systems, including renewables Economic and efficient energy for a competitive Europe RTD activites of a generic nature
1.08	NUCLEAR ENERGY	EURATOM	EURATOM	Controlled thermonuclear fusion Management of radioactive waste Radiation protection Other activities in the field of nuclear technologies and safety	EURATOM	Fusion energy Nuclear fission and radiation protection	Thermonuclear fusion Nuclear fission RTD activities of a generic nature Support for research infrastructures
1.09	SECURITY				COOPERATION	Security	
1.10	SOCIAL SCIENCES AND HUMANITIES	Human Potential	Integrating and strengthening the ERA	Citizens and governance in a knowledge-based society	COOPERATION	Socio-economic sciences and Humanities	Socio-Economic Knowledge Base

CD	THEMATIC CLUSTERS	FP5		FP6		FP7	
2.01	SOCIETAL IMPACT OF SCIENCE	Quality of Life	Structuring the ERA	Science and society	CAPACITIES	Science in Society	Socio-economic aspects of life sciences and technologies Bioethics
2.02	POLICY SUPPORT	Human Potential	Integrating and strengthening the ERA	Coherent development of research & innovation policies Research for policy support	CAPACITIES	Coherent development of research policies	Development of Science and Technology Polices
2.04	INTERNATIONAL COOPERATION	International Role	Integrating and strengthening the ERA	Specific measures in support of international cooperation	CAPACITIES	Activities of International Cooperation	Co-operation with certain categories of third countries Training for researchers Co-ordination
2.03	SUPPORT TO SME RESEARCH	Innovation - SME	Integrating and strengthening the ERA	Horizontal research activities involving SMEs	CAPACITIES	Research for the benefit of SMEs	Encouraging SME participation Joint Innovation / SME Activities
2.05	COORDINATION AND DIRECTED SUPPORT TO RESEARCH AND INNOVATION	Innovation - SME	Integrating and strengthening the ERA	Coordination of research activities (part) New and emerging science and technology (part)	CAPACITIES	Regions of Knowledge (part) Research Potential (part)	Co-ordination and support activities Promotion of Innovation (part)
			Structuring the ERA	Research and innovation	COOPERATION	General Activities (part)	
2.06	RESEARCH INFRASTRUCTURES	Information Society Quality of Life Environment and Sustainable Development Sustainable Growth	Structuring the ERA	Research infrastructures	CAPACITIES	Research Infrastructures	Support to research infrastructures
2.07	HUMAN CAPITAL	Human Potential	Structuring the ERA	Human resources and mobility	PEOPLE	Marie-Curie Actions	Training and mobility of researchers Access to research infrastructures Promotion of S&T excellence
					IDEAS	European Research Council	Accompanying measures for the programme

Table 3.2: Top-50 countries by whole and fractional patent counts, 1990-2011

COUNTRY	WHOLE COUNT	COUNTRY	FRACTIONAL COUNT	COUNTRY	WHOLE COUNT	COUNTRY	FRACTIONAL COUNT
US	1,542,117	US	543,782.4	BR	6,117	NZ	2,432.1
JP	1,025,201	DE	380,055.1	NZ	5,624	ZA	2,386.7
DE	948,253	JP	351,670.4	ZA	4,710	HU	2,095.2
FR	309,157	FR	138,466.5	PL	4,459	PL	1,633.0
UK	220,056	UK	98,355.4	TR	4,183	CZ	1,555.0
IT	145,096	IT	73,588.6	CZ	4,004	TR	1,553.8
KR	123,812	NL	54,663.3	SI	3,344	LU	1,273.9
NL	123,384	CH	49,977.9	LU	2,855	EL	1,208.9
CH	107,120	KR	40,380.3	EL	2,350	SI	1,119.1
CA	81,874	SE	38,419.7	PT	2,291	PT	962.9
SE	80,581	CA	29,671.4	MX	2,088	MX	811.6
BE	56,414	CN	23,596.6	MY	1,566	AR	713.0
CN	55,990	BE	23,017.2	AR	1,488	MY	598.8
FI	47,844	AT	22,695.3	CU	1,364	LI	536.8
AT	46,783	FI	20,827.4	UA	1,195	HR	394.3
IL	38,648	DK	16,347.3	LI	1,152	UA	365.7
ES	38,029	ES	16,056.5	HR	1,142	IS	355.5
DK	37,039	IL	15,439.8	SA	862	MC	349.6
AU	34,121	AU	14,973.6	SK	853	SA	343.8
IN	20,237	NO	6,550.9	SU	839	SK	341.8
NO	14,191	IN	5,341.7	IS	795	TH	255.3
RU	12,716	IE	3,753.8	RO	697	RO	254.9
IE	9,278	RU	3,643.8	BG	626	CL	248.6
HU	8,841	SG	2,797.5	TH	605	BG	235.9
SG	7,519	BR	2,453.5	CL	570	CU	190.3

Table 3.3: Top-50 NUTS3 regions by whole and fractional patent counts, 1990-2011

NUTS	WHOLE COUNTS	NUTS	FRACTIONAL COUNTS	NUTS	WHOLE COUNTS	NUTS	FRACTIONAL COUNTS
NL414	50,930	NL414	22,047.0	ITC11	12,565	DE21H	5,223.0
DE212	32,875	DE212	14,383.3	DE929	11,936	DE128	5,202.8
FR101	30,846	FR101	13,871.2	DE21H	11,746	UKJ23	4,906.7
ITC45	28,090	ITC45	12,580.2	DE71A	11,641	DE929	4,873.3
FR105	27,655	FR105	12,180.0	DEA2B	10,886	ITD55	4,667.2
DE300	27,520	SE110	12,038.5	CH011	10,816	CH011	4,603.9
SE110	25,808	CH040	10,913.0	DEA11	10,813	AT130	4,402.0
DE115	23,021	DE300	9,956.0	DE112	10,585	DE112	4,323.8
CH040	22,531	FI181	9,203.2	DEA21	10,468	UKJ33	4,168.8
FI181	21,781	DE115	9,167.9	DEA23	10,369	DEA21	4,029.0
FR714	20,385	FR714	8,995.0	UKJ23	10,332	DE116	3,824.5
FR103	18,871	FR103	8,776.8	UKJ14	10,202	UKJ14	3,747.2
FR716	17,444	SE232	7,013.3	DE712	10,150	CH021	3,725.7
DE111	16,456	FR716	6,894.1	AT130	9,892	DE71A	3,656.9
DEA1C	16,052	DE111	6,691.4	DEB3C	9,669	DEA23	3,645.1
DE128	15,018	SE224	6,556.0	DEB3I	9,612	FR623	3,595.9
SE232	14,857	ITC11	6,142.1	UKH23	9,560	DK013	3,587.6
FR104	14,665	FR104	6,042.7	UKJ33	9,418	BE211	3,573.6
DE600	14,588	DE600	6,003.0	DE719	9,113	DEA2B	3,512.2
UKH12	14,470	CH033	5,916.4	DK013	9,037	DEA11	3,508.3
SE224	13,890	DE113	5,720.7	DE126	8,992	UKH23	3,378.0
CH033	13,094	FR107	5,671.6	DE716	8,917	FI197	3,362.0
DE113	13,016	ES511	5,446.3	FR623	8,885	DE712	3,334.0
FR107	12,975	DEA1C	5,349.0	ES300	8,867	CH055	3,294.2
ES511	12,650	UKH12	5,241.2	DE116	8,842	FR108	3,272.7

Table 3.3: Top-50 NUTS3 regions by whole and fractional patent counts, 1990-2011

NUTS	WHOLE COUNTS	NUTS	FRACTIONAL COUNTS	NUTS	WHOLE COUNTS	NUTS	FRACTIONAL COUNTS
NL414	50,930	NL414	22,047.0	ITC11	12,565	DE21H	5,223.0
DE212	32,875	DE212	14,383.3	DE929	11,936	DE128	5,202.8
FR101	30,846	FR101	13,871.2	DE21H	11,746	UKJ23	4,906.7
ITC45	28,090	ITC45	12,580.2	DE71A	11,641	DE929	4,873.3
FR105	27,655	FR105	12,180.0	DEA2B	10,886	ITD55	4,667.2
DE300	27,520	SE110	12,038.5	CH011	10,816	CH011	4,603.9
SE110	25,808	CH040	10,913.0	DEA11	10,813	AT130	4,402.0
DE115	23,021	DE300	9,956.0	DE112	10,585	DE112	4,323.8
CH040	22,531	FI181	9,203.2	DEA21	10,468	UKJ33	4,168.8
FI181	21,781	DE115	9,167.9	DEA23	10,369	DEA21	4,029.0
FR714	20,385	FR714	8,995.0	UKJ23	10,332	DE116	3,824.5
FR103	18,871	FR103	8,776.8	UKJ14	10,202	UKJ14	3,747.2
FR716	17,444	SE232	7,013.3	DE712	10,150	CH021	3,725.7
DE111	16,456	FR716	6,894.1	AT130	9,892	DE71A	3,656.9
DEA1C	16,052	DE111	6,691.4	DEB3C	9,669	DEA23	3,645.1
DE128	15,018	SE224	6,556.0	DEB3I	9,612	FR623	3,595.9
SE232	14,857	ITC11	6,142.1	UKH23	9,560	DK013	3,587.6
FR104	14,665	FR104	6,042.7	UKJ33	9,418	BE211	3,573.6
DE600	14,588	DE600	6,003.0	DE719	9,113	DEA2B	3,512.2
UKH12	14,470	CH033	5,916.4	DK013	9,037	DEA11	3,508.3
SE224	13,890	DE113	5,720.7	DE126	8,992	UKH23	3,378.0
CH033	13,094	FR107	5,671.6	DE716	8,917	FI197	3,362.0
DE113	13,016	ES511	5,446.3	FR623	8,885	DE712	3,334.0
FR107	12,975	DEA1C	5,349.0	ES300	8,867	CH055	3,294.2
ES511	12,650	UKH12	5,241.2	DE116	8,842	FR108	3,272.7

Table 3.4: Evolution of patent counts, 1990-2011

YEAR	WHOLE COUNTS	FRACTIONAL COUNTS
1990	147,598	63,745
1991	138,893	59,452
1992	144,529	60,745
1993	146,004	60,292
1994	150,901	61,929
1995	161,211	65,262
1996	177,754	71,419
1997	202,974	80,630
1998	230,647	91,256
1999	253,022	99,251
2000	284,195	110,271
2001	307,356	116,617
2002	308,608	115,052
2003	319,757	118,736
2004	334,797	124,311
2005	353,524	131,002
2006	363,446	134,148
2007	355,168	131,513
2008	342,992	127,490
2009	315,314	115,237
2010	125,497	49,632
2011	35,251	14,891
TOTAL	5,199,438	2,002,881

Table 3.5: Top-ranking NUTS-3 regions by whole and fractional patent counts by year

YEAR	NUTS	WHOLE COUNTS	NUTS	FRACTIONAL COUNTS
1990	ITC45	1216	NL414	590.5
1991	FR105	1261	FR105	596.9
1992	FR105	1269	FR105	592.4
1993	FR105	1162	FR105	530.1
1994	ITC45	1041	FR101	489.1
1995	FR105	1208	FR105	559.7
1996	FR105	1264	FR105	572.2
1997	NL414	1601	NL414	777.5
1998	NL414	1718	NL414	863.8
1999	NL414	2236	NL414	1083.5
2000	NL414	2663	NL414	1301.0
2001	NL414	3441	NL414	1621.4
2002	NL414	4704	NL414	2242.2
2003	NL414	4187	NL414	1781.1
2004	NL414	3944	NL414	1576.9
2005	NL414	4038	NL414	1591.6
2006	NL414	3924	NL414	1452.1
2007	NL414	4141	NL414	1561.0
2008	NL414	3042	NL414	1124.2
2009	NL414	3536	NL414	1306.1
2010	FR714	935	FR714	407.1
2011	FR714	283	FR714	128.9

Table 3.6: Order, size and connectedness of interregional FP collaboration networks

FP	TYPE	VERTICES	ISOLATES	PENDANTS	SELFLOOPS	EDGES	COMPONENTS	BICOMPONENTS
5	ALL	1462	234	23	535	82330	(1228, 1), (1, 234)	(1205, 1), (2, 23)
6	ALL	1462	310	2	466	86926	(1152, 1), (1, 310)	(1150, 1), (2, 2)
7	ALL	1462	332	0	439	62691	(1130, 1), (1, 332)	(1130, 1)
X	ALL	1462	617	81	304	30466	(845, 1), (1, 617)	(763, 1), (2, 82)
5	ALL*	1462	237	145	331	24786	(1225, 1), (1, 237)	(1080, 1), (2, 145)
6	ALL*	1462	311	173	252	19914	(1151, 1), (1, 311)	(978, 1), (2, 173)
7	ALL*	1462	332	202	244	17083	(1130, 1), (1, 332)	(928, 1), (2, 202)
X	ALL*	1462	963	109	153	5793	(499, 1), (1, 963)	(390, 1), (2, 109)
5	BIO	1462	646	46	199	23648	(810, 1), (2, 3), (1, 646)	(770, 1), (2, 43)
6	BIO	1462	878	0	178	25518	(584, 1), (1, 878)	(584, 1)
7	BIO	1462	897	0	157	17813	(565, 1), (1, 897)	(565, 1)
X	BIO	1462	1096	44	91	6726	(366, 1), (1, 1096)	(322, 1), (2, 44)
5	BIO*	1462	652	212	109	6455	(804, 1), (2, 3), (1, 652)	(596, 1), (2, 211)
6	BIO*	1462	879	189	86	4465	(583, 1), (1, 879)	(394, 1), (2, 189)
7	BIO*	1462	898	161	80	4236	(564, 1), (1, 898)	(403, 1), (2, 161)
X	BIO*	1462	1272	57	38	948	(190, 1), (1, 1272)	(132, 1), (2, 58)
5	ICT	1462	624	19	318	30741	(834, 1), (2, 2), (1, 624)	(819, 1), (2, 17)
6	ICT	1462	779	1	206	30863	(683, 1), (1, 779)	(682, 1), (2, 1)
7	ICT	1462	847	2	181	19023	(615, 1), (1, 847)	(613, 1), (2, 2)
X	ICT	1462	1053	46	118	7961	(409, 1), (1, 1053)	(363, 1), (2, 46)
5	ICT*	1462	626	215	165	7554	(832, 1), (2, 2), (1, 626)	(619, 1), (2, 215)
6	ICT*	1462	779	193	88	5869	(683, 1), (1, 779)	(490, 1), (2, 193)
7	ICT*	1462	850	174	90	5119	(612, 1), (1, 850)	(438, 1), (2, 174)
X	ICT*	1462	1251	66	47	1192	(209, 1), (2, 1), (1, 1251)	(145, 1), (2, 65)
5	ECO	1462	586	18	258	26496	(874, 1), (2, 1), (1, 586)	(854, 1), (3, 2), (2, 17)
6	ECO	1462	874	0	162	22928	(588, 1), (1, 874)	(588, 1)
7	ECO	1462	836	1	161	16368	(626, 1), (1, 836)	(617, 1), (7, 1), (3, 1), (2, 1)
X	ECO	1462	1108	34	84	5796	(353, 1), (1, 1109)	(319, 1), (2, 34)
5	ECO*	1462	586	243	132	6791	(874, 1), (2, 1), (1, 586)	(633, 1), (2, 242)
6	ECO*	1462	876	180	62	3503	(586, 1), (1, 876)	(406, 1), (2, 180)
7	ECO*	1462	841	231	67	3305	(621, 1), (1, 841)	(388, 1), (2, 233)
X	ECO*	1462	1300	59	31	649	(162, 1), (1, 1300)	(103, 1), (2, 59)
5	SOC	1462	1162	0	48	4802	(300, 1), (1, 1162)	(300, 1)
6	SOC	1462	1101	1	72	9675	(361, 1), (1, 1101)	(360, 1), (2, 1)
7	SOC	1462	1122	0	49	6122	(340, 1), (1, 1122)	(340, 1)
X	SOC	1462	1295	22	21	1342	(165, 1), (2, 1), (1, 1295)	(145, 1), (2, 21)

FP	TYPE	VERTICES	ISOLATES	PENDANTS	SELFLOOPS	EDGES	COMPONENTS	BICOMPONENTS
5	SOC*	1462	1163	93	21	1317	(299, 1), (1, 1163)	(206, 1), (2, 93)
6	SOC*	1462	1101	120	38	1842	(361, 1), (1, 1101)	(241, 1), (2, 120)
7	SOC*	1462	1122	107	22	1451	(340, 1), (1, 1122)	(233, 1), (2, 107)
X	SOC*	1462	1392	32	10	168	(67, 1), (3, 1), (1, 1392)	(36, 1), (2, 33)
5	RIS	1462	1101	0	79	8921	(361, 1), (1, 1101)	(359, 1), (3, 1)
6	RIS	1462	1182	2	55	7355	(280, 1), (1, 1182)	(276, 1), (3, 1), (2, 2)
7	RIS	1462	1131	0	81	9898	(331, 1), (1, 1131)	(331, 1)
X	RIS	1462	1271	12	23	1924	(191, 1), (1, 1271)	(179, 1), (2, 12)
5	RIS*	1462	1102	123	28	1429	(360, 1), (1, 1102)	(237, 1), (2, 123)
6	RIS*	1462	1182	108	18	959	(280, 1), (1, 1182)	(171, 1), (2, 109)
7	RIS*	1462	1131	108	25	1566	(331, 1), (1, 1131)	(223, 1), (2, 108)
X	RIS*	1462	1402	25	3	107	(60, 1), (1, 1402)	(32, 1), (2, 28)
5	EDU	1462	905	27	107	23475	(555, 1), (2, 1), (1, 905)	(530, 1), (2, 26)
6	EDU	1462	915	9	113	27796	(547, 1), (1, 915)	(534, 1), (3, 2), (2, 9)
7	EDU	1462	938	11	94	18285	(524, 1), (1, 938)	(513, 1), (2, 11)
X	EDU	1462	1111	34	46	8725	(351, 1), (1, 1111)	(316, 1), (2, 35)
5	EDU*	1462	986	75	43	5719	(476, 1), (1, 986)	(401, 1), (2, 75)
6	EDU*	1462	994	86	48	5017	(468, 1), (1, 994)	(382, 1), (2, 86)
7	EDU*	1462	1018	82	50	4525	(444, 1), (1, 1018)	(362, 1), (2, 82)
X	EDU*	1462	1285	43	15	893	(175, 1), (2, 1), (1, 1285)	(134, 1), (2, 42)
5	PRC	1462	329	45	329	28383	(1133, 1), (1, 329)	(1088, 1), (2, 45)
6	PRC	1462	417	8	290	31367	(1045, 1), (1, 417)	(1037, 1), (2, 8)
7	PRC	1462	426	10	235	22099	(1036, 1), (1, 426)	(1021, 1), (4, 1), (3, 1), (2, 10)
X	PRC	1462	944	108	126	4969	(516, 1), (2, 1), (1, 944)	(404, 1), (2, 113)
5	PRC*	1462	415	211	160	6911	(1045, 1), (2, 1), (1, 415)	(831, 1), (2, 215)
6	PRC*	1462	616	238	92	4450	(846, 1), (1, 616)	(607, 1), (2, 239)
7	PRC*	1462	687	244	83	3534	(775, 1), (1, 687)	(529, 1), (2, 246)
X	PRC*	1462	1316	50	30	491	(145, 1), (1, 1317)	(91, 1), (2, 54)
5	RES	1462	835	45	128	12464	(621, 1), (2, 3), (1, 835)	(576, 1), (3, 3), (2, 42)
6	RES	1462	987	26	82	9926	(475, 1), (1, 987)	(449, 1), (2, 26)
7	RES	1462	1058	23	78	6494	(404, 1), (1, 1058)	(381, 1), (2, 23)
X	RES	1462	1222	25	42	2715	(238, 1), (2, 1), (1, 1222)	(215, 1), (2, 24)
5	RES*	1462	946	146	59	3504	(513, 1), (2, 1), (1, 947)	(367, 1), (2, 147)
6	RES*	1462	1089	99	39	2297	(371, 1), (2, 1), (1, 1089)	(271, 1), (2, 101)
7	RES*	1462	1134	86	43	1940	(328, 1), (1, 1134)	(242, 1), (2, 86)
X	RES*	1462	1332	46	17	499	(130, 1), (1, 1332)	(83, 1), (2, 47)
5	AIC	1462	405	91	242	24164	(1057, 1), (1, 405)	(966, 1), (2, 91)
6	AIC	1462	416	45	233	31094	(1046, 1), (1, 416)	(1001, 1), (2, 45)

FP	TYPE	VERTICES	ISOLATES	PENDANTS	SELFLOOPS	EDGES	COMPONENTS	BICOMPONENTS
7	AIC	1462	418	79	237	22526	(1044, 1), (1, 418)	(965, 1), (2, 79)
X	AIC	1462	959	103	141	6538	(502, 1), (1, 960)	(397, 1), (2, 105)
5	AIC*	1462	687	202	141	4500	(773, 1), (2, 1), (1, 687)	(566, 1), (2, 208)
6	AIC*	1462	752	182	122	4581	(707, 1), (2, 1), (1, 753)	(524, 1), (2, 184)
7	AIC*	1462	737	215	116	4150	(725, 1), (1, 737)	(508, 1), (2, 217)
X	AIC*	1462	1295	60	62	582	(161, 1), (1, 1301)	(92, 1), (2, 69)

Table 3.7: Graph measures of interregional FP collaboration network

FP	TYPE	DIAMETER	DISTANCE			DENSITY	CLUSTERING			DEGREE			SWI
		bin	bin	frq	str	bin	bin	frq	str	bin	frq	str	bin
5	ALL	4	1.982	0.488	1.916	0.077	0.593	0.002	0.001	112.627	585.863	77.847	6.2
6	ALL	3	1.912	0.413	2.053	0.081	0.590	0.002	0.001	118.914	713.306	64.665	5.6
7	ALL	4	1.972	0.504	2.046	0.059	0.572	0.002	0.001	85.761	417.144	53.786	7.3
X	ALL	4	2.049			0.029	0.449			41.677			8.5
5	ALL*	5	2.446	1.165	2.213	0.023	0.377	0.003	0.003	33.907	86.435	44.162	12.3
6	ALL*	5	2.435	1.194	2.366	0.019	0.391	0.003	0.003	27.242	70.825	35.690	16.2
7	ALL*	6	2.501	1.277	2.376	0.016	0.359	0.003	0.003	23.369	56.966	29.952	16.7
X	ALL*	5	2.281			0.005	0.210			7.925			13.2
5	BIO	5	2.182	0.872	3.183	0.022	0.372	0.003	0.002	32.350	88.468	13.496	8.3
6	BIO	3	1.892	0.517	2.338	0.024	0.310	0.002	0.001	34.908	120.215	11.570	5.1
7	BIO	3	1.957	0.646	2.379	0.017	0.284	0.002	0.001	24.368	70.555	10.740	6.3
X	BIO	4	2.005			0.006	0.178			9.201			7.0
5	BIO*	6	2.817	1.727	3.477	0.006	0.142	0.004	0.004	8.830	14.711	7.742	11.5
6	BIO*	5	2.636	1.554	2.690	0.004	0.145	0.003	0.003	6.108	11.109	6.337	14.1
7	BIO*	5	2.599	1.534	2.694	0.004	0.137	0.003	0.002	5.795	10.126	6.051	13.5
X	BIO*	5	2.269			0.001	0.066			1.297			11.2
5	ICT	5	2.084	0.617	2.854	0.029	0.417	0.002	0.001	42.053	133.564	16.489	7.6
6	ICT	3	1.924	0.508	2.921	0.029	0.361	0.002	0.002	42.220	176.705	12.884	5.6
7	ICT	3	1.990	0.667	2.734	0.018	0.311	0.004	0.003	26.023	80.155	10.884	7.0
X	ICT	4	2.066			0.007	0.204			10.891			7.2
5	ICT*	5	2.699	1.518	3.303	0.007	0.195	0.002	0.002	10.334	20.434	9.384	15.1
6	ICT*	5	2.583	1.476	3.392	0.005	0.194	0.007	0.007	8.029	16.516	7.082	16.9
7	ICT*	5	2.605	1.527	3.066	0.005	0.150	0.009	0.008	7.003	12.774	6.095	13.3
X	ICT*	5	2.391			0.001	0.065			1.631			8.8
5	ECO	4	2.128	0.747	2.825	0.025	0.431	0.003	0.003	36.246	112.865	14.870	9.5
6	ECO	4	1.936	0.577	2.700	0.021	0.309	0.003	0.002	31.365	98.888	8.128	5.6
7	ECO	4	2.067	0.776	3.046	0.015	0.321	0.006	0.005	22.391	52.990	6.752	8.5
X	ECO	4	2.058			0.005	0.176			7.929			7.3
5	ECO*	6	2.812	1.679	3.291	0.006	0.171	0.005	0.005	9.290	16.272	8.365	15.4
6	ECO*	6	2.747	1.687	3.020	0.003	0.140	0.006	0.006	4.792	7.889	4.458	18.6
7	ECO*	6	2.848	1.866	3.369	0.003	0.108	0.008	0.009	4.521	6.776	3.776	15.6
X	ECO*	4	2.455			0.001	0.044			0.888			7.6
5	SOC	4	2.048	1.074	4.238	0.004	0.149	0.003	0.003	6.569	12.495	1.877	6.3
6	SOC	4	1.946	0.845	4.213	0.009	0.188	0.007	0.003	13.235	28.609	2.557	4.9

FP	TYPE	DIAMETER	DISTANCE			DENSITY	CLUSTERING				DEGREE			SWI
		bin	bin	frq	str	bin	bin	frq	str	bin	frq	str	bin	
7	SOC	4	2.012	1.055	4.831	0.006	0.169	0.009	0.006	8.375	14.382	1.880	6.4	
X	SOC	4	2.104			0.001	0.077			1.836			7.1	
5	SOC*	6	2.808	2.090	4.714	0.001	0.039	0.003	0.003	1.802	2.349	1.057	6.5	
6	SOC*	6	2.771	2.031	4.813	0.002	0.059	0.005	0.005	2.520	3.302	1.426	10.8	
7	SOC*	5	2.880	2.249	5.307	0.001	0.049	0.008	0.008	1.985	2.427	1.078	7.4	
X	SOC*	5	2.400			0.000	0.014			0.230			5.6	
5	RIS	3	1.909	0.809	3.429	0.008	0.183	0.005	0.004	12.204	23.435	2.565	5.3	
6	RIS	4	1.859	0.703	3.312	0.007	0.149	0.002	0.001	10.062	24.618	2.002	4.0	
7	RIS	3	1.842	0.572	2.780	0.009	0.173	0.003	0.001	13.540	37.075	3.384	4.1	
X	RIS	4	2.015			0.002	0.097			2.632			7.3	
5	RIS*	5	2.852	2.147	3.767	0.001	0.052	0.007	0.006	1.955	2.435	1.390	9.8	
6	RIS*	6	2.734	1.882	3.688	0.001	0.058	0.005	0.006	1.312	1.951	1.108	20.2	
7	RIS*	4	2.594	1.579	3.122	0.001	0.087	0.005	0.005	2.142	3.670	1.865	16.1	
X	RIS*	6	2.644			0.000	0.008			0.146			5.8	
5	EDU	4	2.009	0.913	5.897	0.022	0.265	0.006	0.003	32.114	78.118	9.941	4.2	
6	EDU	5	1.930	0.782	7.124	0.026	0.277	0.005	0.004	38.025	112.882	8.656	3.7	
7	EDU	4	2.032	0.902	6.009	0.017	0.240	0.006	0.003	25.014	56.305	7.659	4.6	
X	EDU	5	2.007			0.008	0.164			11.936			4.5	
5	EDU*	5	2.456	1.554	3.082	0.005	0.104	0.005	0.005	7.824	11.304	5.669	5.8	
6	EDU*	5	2.528	1.719	3.647	0.005	0.095	0.009	0.008	6.863	9.290	4.522	5.8	
7	EDU*	5	2.522	1.696	3.270	0.004	0.083	0.005	0.004	6.190	8.393	4.399	5.3	
X	EDU*	5	2.412			0.001	0.038			1.222			5.2	
5	PRC	5	2.293	0.986	4.495	0.027	0.416	0.003	0.002	38.828	84.739	12.017	10.9	
6	PRC	4	2.152	0.837	7.631	0.029	0.450	0.003	0.002	42.910	104.282	9.290	10.0	
7	PRC	5	2.293	1.056	7.889	0.021	0.437	0.005	0.003	30.231	63.119	7.514	13.8	
X	PRC	6	2.374			0.005	0.213			6.798			16.7	
5	PRC*	7	2.954	1.917	3.854	0.006	0.117	0.002	0.003	9.454	14.044	6.966	13.3	
6	PRC*	7	2.952	1.920	4.061	0.004	0.127	0.006	0.005	6.088	9.778	4.796	19.4	
7	PRC*	7	3.038	2.053	4.088	0.003	0.096	0.005	0.005	4.834	7.263	3.769	17.2	
X	PRC*	6	2.657			0.000	0.038			0.672			7.5	
5	RES	5	2.191	0.979	6.381	0.012	0.291	0.002	0.001	17.051	57.105	8.410	9.6	
6	RES	4	2.085	0.830	7.933	0.009	0.233	0.001	0.001	13.579	53.592	5.602	7.4	
7	RES	4	2.120	0.897	6.518	0.006	0.195	0.002	0.001	8.884	34.425	4.868	8.3	
X	RES	4	2.014			0.003	0.121			3.714			7.7	
5	RES*	6	2.690	1.565	3.053	0.003	0.115	0.002	0.002	4.793	9.610	5.029	12.6	
6	RES*	5	2.520	1.405	2.794	0.002	0.098	0.002	0.002	3.142	6.618	3.508	12.0	
7	RES*	5	2.486	1.413	2.657	0.002	0.094	0.003	0.003	2.654	5.800	3.091	11.4	

FP	TYPE	DIAMETER	DISTANCE				DENSITY	CLUSTERING				DEGREE			SWI
		bin	bin	frq	str	bin	bin	frq	str	bin	frq	str	bin		
X	RES*	4	2.259			0.000	0.043			0.683			8.6		
5	AIC	4	2.315	1.291	8.546	0.023	0.361	0.003	0.002	33.056	53.008	6.203	10.4		
6	AIC	5	2.216	1.128	13.275	0.029	0.412	0.007	0.003	42.536	76.001	5.955	9.0		
7	AIC	5	2.353	1.305	10.621	0.021	0.364	0.007	0.004	30.815	49.166	5.658	11.0		
X	AIC	4	2.326			0.006	0.208			8.944			10.9		
5	AIC*	7	2.969	2.214	4.246	0.004	0.101	0.002	0.003	6.156	8.014	4.122	13.3		
6	AIC*	7	2.857	2.108	4.332	0.004	0.105	0.005	0.005	6.267	8.204	4.058	12.0		
7	AIC*	7	2.951	2.195	4.328	0.004	0.093	0.006	0.005	5.677	7.198	3.650	10.7		
X	AIC*	7	2.806			0.001	0.027			0.796			5.3		

Table 3.8: Order, size and connectedness of interregional co-invention networks

YEAR	VERTICES	ISOLATES	PENDANTS	SELFLOOPS	EDGES	COMPONENTS	BICOMPONENTS
ALL	1462	116	23	1247	86073	(1341, 1), (1, 121)	(1300, 1), (3, 2), (2, 37)
1990	1462	520	44	736	7074	(902, 1), (3, 1), (2, 6), (1, 545)	(816, 1), (4, 1), (3, 2), (2, 87)
1991	1462	510	44	736	6900	(917, 1), (3, 2), (2, 3), (1, 533)	(825, 1), (4, 1), (3, 5), (2, 86)
1992	1462	492	60	754	7630	(929, 1), (3, 1), (2, 3), (1, 524)	(824, 1), (3, 2), (2, 106)
1993	1462	481	48	762	8250	(944, 1), (2, 2), (1, 514)	(867, 1), (3, 4), (2, 71)
1994	1462	459	44	804	8444	(966, 1), (4, 1), (3, 1), (2, 2), (1, 485)	(876, 1), (3, 4), (2, 89)
1995	1462	438	53	814	9114	(990, 1), (3, 1), (2, 4), (1, 461)	(903, 1), (3, 3), (2, 87)
1996	1462	426	43	827	10100	(989, 1), (4, 1), (2, 6), (1, 457)	(913, 1), (4, 2), (3, 4), (2, 71)
1997	1462	405	46	840	11800	(1025, 1), (2, 1), (1, 435)	(953, 1), (3, 1), (2, 71)
1998	1462	377	42	891	12974	(1072, 1), (2, 1), (1, 388)	(994, 1), (3, 5), (2, 69)
1999	1462	373	39	919	14282	(1062, 1), (3, 1), (2, 2), (1, 393)	(990, 1), (4, 1), (3, 4), (2, 65)
2000	1462	354	36	934	15805	(1079, 1), (5, 1), (3, 1), (2, 2), (1, 371)	(1010, 1), (4, 1), (3, 3), (2, 68)
2001	1462	344	30	929	16883	(1094, 1), (2, 1), (1, 366)	(1035, 1), (4, 1), (3, 3), (2, 51)
2002	1462	328	46	932	17537	(1107, 1), (3, 1), (2, 3), (1, 346)	(1036, 1), (4, 2), (3, 2), (2, 66)
2003	1462	310	34	951	17642	(1122, 1), (2, 5), (1, 330)	(1066, 1), (3, 3), (2, 55)
2004	1462	292	42	957	18207	(1151, 1), (2, 2), (1, 307)	(1075, 1), (10, 1), (5, 1), (4, 1), (3, 1), (2, 60)
2005	1462	290	23	962	18796	(1152, 1), (2, 3), (1, 304)	(1106, 1), (3, 2), (2, 45)
2006	1462	270	36	983	19183	(1171, 1), (2, 3), (1, 285)	(1107, 1), (3, 4), (2, 59)
2007	1462	277	21	1004	19969	(1166, 1), (3, 1), (2, 1), (1, 291)	(1117, 1), (4, 1), (3, 2), (2, 45)
2008	1462	250	38	1005	20347	(1188, 1), (2, 3), (1, 268)	(1132, 1), (3, 1), (2, 57)
2009	1462	272	32	1000	19277	(1174, 1), (1, 288)	(1116, 1), (3, 3), (2, 52)
X	1462	877	70	486	1483	(191, 1), (69, 1), (41, 1), (27, 1), (23, 1), (21, 1), (19, 1), (6, 1), (5, 1), (4, 3), (3, 5), (2, 19), (1, 995)	(117, 1), (52, 1), (22, 1), (11, 1), (10, 1), (7, 1), (6, 3), (5, 3), (4, 4), (3, 13), (2, 153)

Table 3.9: Graph measures of interregional co-invention network

YEAR	DIAMETER	DISTANCE			DENSITY	CLUSTERING			DEGREE			SWI
	bin	bin	frq	str	bin	bin	frq	str	bin	frq	str	bin
ALL	6	2.1421	0.1687	0.2419	0.0806	0.4532	0.0001	0.0001	117.7469	3570.5267	2319.6133	4.6
1990	8	3.1991	0.8921	1.1845	0.0066	0.2177	0.0005	0.0009	9.6772	83.7592	58.3300	17.4
1991	8	3.2576	0.9865	1.3014	0.0065	0.2317	0.0007	0.0010	9.4391	73.7127	51.8805	18.8
1992	9	3.1900	0.9259	1.2162	0.0071	0.2213	0.0007	0.0008	10.4378	83.0917	57.0384	16.4
1993	7	3.1101	0.9106	1.2307	0.0077	0.2461	0.0010	0.0009	11.2859	86.0479	59.1040	16.8
1994	9	3.1397	0.8411	1.1556	0.0079	0.2349	0.0009	0.0010	11.5513	90.3885	61.4664	18.1
1995	7	3.0912	0.8167	1.1105	0.0085	0.2371	0.0011	0.0011	12.4679	99.5841	68.1520	16.7
1996	7	2.9968	0.7598	1.0572	0.0095	0.2551	0.0007	0.0011	13.8167	112.2845	73.9321	16.2
1997	7	2.8846	0.7210	1.0024	0.0110	0.2544	0.0007	0.0006	16.1423	133.1382	87.4484	14.0
1998	7	2.8718	0.6635	0.9237	0.0121	0.2685	0.0008	0.0007	17.7483	150.9699	99.2741	14.8
1999	8	2.7914	0.6027	0.8419	0.0134	0.2569	0.0005	0.0004	19.5376	167.5157	110.6533	12.1
2000	8	2.7402	0.5614	0.7974	0.0148	0.2729	0.0005	0.0004	21.6211	189.6607	124.1571	11.9
2001	6	2.7113	0.5291	0.7711	0.0158	0.2878	0.0003	0.0003	23.0958	210.3119	135.7098	12.0
2002	7	2.6951	0.5041	0.7236	0.0164	0.2780	0.0003	0.0002	23.9904	222.0643	141.7828	11.2
2003	7	2.7151	0.4963	0.7300	0.0165	0.2888	0.0003	0.0002	24.1341	231.4172	146.4619	11.9
2004	9	2.7699	0.5327	0.7601	0.0170	0.2959	0.0003	0.0002	24.9070	237.1122	151.2775	11.9
2005	8	2.6954	0.4607	0.6926	0.0176	0.2998	0.0003	0.0002	25.7127	260.8605	161.2538	11.6
2006	7	2.7049	0.4877	0.7167	0.0180	0.2942	0.0003	0.0002	26.2421	262.5636	166.0172	11.4
2007	8	2.6527	0.4582	0.6677	0.0187	0.3017	0.0003	0.0002	27.3174	268.6512	168.8760	11.3
2008	6	2.6875	0.4981	0.7427	0.0191	0.3017	0.0003	0.0003	27.8345	255.7880	166.9800	11.3
2009	7	2.7139	0.4998	0.7293	0.0180	0.2980	0.0003	0.0002	26.3707	241.5814	155.4438	11.6
X	16	5.6719			0.0014	0.1221			2.0287			5.9

Table 3.10: Order, size, connectedness and graph measures of JVSA collaboration networks

	COUNTRIES		NUTS3 REGIONS	
	bin	frq	bin	frq
AVERAGE DISTANCE	2.169	0.945	3.284	2.375
AVERAGE DEGREE	11.573	398.058	3.199	4.705
AVERAGE CLUSTERING	0.535	0.000	0.115	0.008
SWI	4.505	4.800	10.360	14.924
DIAMETER	4		8	
DENSITY	0.113		0.008	
VERTICES	100		397	
ISOLATES	0		128	
PENDANTS	26		112	
SELF-LOOPS	48		37	
EDGES	558		635	
MAXIMAL CLIQUES	145		521	
CLIQUE NUMBER	15		6	
COMPONENTS	(99, 1), (1, 1)		(243, 1), (3, 2), (2, 9), (1, 130)	
BICOMPONENTS	(69, 1), (2, 30)		(134, 1), (3, 4), (2, 114)	

Table 3.11: Power-law distribution test results for interregional FP participation network

FP	TYPE	Binary graph					Weighted graph (tie strength)				
		KSd	γ	logL	tail	xmin	KSd	γ	logL	tail	xmin
5	ALL	0.182	1.655	-5356.8	848	29	0.080	1.703	-2894.2	481	25.5
6	ALL	0.175	1.592	-5858.4	923	23	0.079	2.175	-932.8	138	159.2
7	ALL	0.161	1.470	-6357.5	1091	7	0.078	1.990	-1362.1	216	72.6
5	ALL*	0.168	1.459	-5024.5	1080	2	0.079	1.676	-2646.5	485	13.3
6	ALL*	0.149	1.434	-4763.7	1151	1	0.085	1.931	-1231.0	205	47.5
7	ALL*	0.178	1.471	-4383.4	1130	1	0.081	1.900	-1337.2	234	33.0
5	BIO	0.162	1.490	-3905.3	760	4	0.084	2.158	-725.0	139	33.1
6	BIO	0.189	1.629	-2776.7	482	15	0.061	2.022	-761.6	148	24.3
7	BIO	0.163	1.570	-2809.8	534	7	0.056	2.072	-695.2	137	24.8
5	BIO*	0.241	1.650	-1992.4	490	3	0.074	1.969	-901.6	202	11.0
6	BIO*	0.227	1.759	-998.6	220	7	0.070	1.471	-1702.7	579	0.4
7	BIO*	0.237	1.721	-1132.6	262	5	0.093	1.853	-792.6	179	8.1
5	ICT	0.168	1.447	-4340.7	800	4	0.072	1.828	-1386.7	277	13.6
6	ICT	0.179	1.521	-3541.1	614	9	0.086	1.854	-1080.2	217	14.1
7	ICT	0.172	1.567	-2933.5	556	7	0.075	1.907	-932.8	189	15.4
5	ICT*	0.237	1.636	-2157.6	523	3	0.074	1.924	-884.4	184	14.1
6	ICT*	0.237	1.665	-1542.9	359	4	0.086	1.713	-1092.9	255	4.7
7	ICT*	0.219	1.700	-1322.8	301	5	0.081	1.828	-874.8	200	7.2
5	ECO	0.160	1.486	-4304.7	833	4	0.083	1.516	-2967.7	803	1.1
6	ECO	0.184	1.590	-2843.6	506	11	0.070	1.991	-725.3	151	16.2
7	ECO	0.168	1.549	-3044.3	605	5	0.083	1.562	-1948.8	579	1.0
5	ECO*	0.261	1.670	-2083.2	522	3	0.079	1.458	-2532.0	866	0.4
6	ECO*	0.305	1.696	-1639.3	586	1	0.071	1.589	-1295.8	394	1.1
7	ECO*	0.262	1.724	-1159.5	305	3	0.074	1.505	-1564.9	617	0.3
5	SOC	0.174	1.606	-1329.7	293	4	0.113	2.036	-474.7	137	4.6
6	SOC	0.174	1.586	-1705.7	329	7	0.107	2.059	-475.3	122	7.5
7	SOC	0.198	1.626	-1543.1	330	5	0.088	1.797	-734.0	237	1.9
5	SOC*	0.231	1.822	-607.5	173	3	0.110	2.066	-366.8	122	3.1
6	SOC*	0.246	1.746	-743.0	199	3	0.099	1.502	-837.0	351	0.3
7	SOC*	0.297	1.840	-641.0	185	3	0.111	1.575	-714.5	322	0.3
5	RIS	0.194	1.656	-1734.1	345	8	0.094	2.128	-489.1	131	7.2
6	RIS	0.197	1.648	-1319.8	255	9	0.100	1.894	-500.4	139	3.9
7	RIS	0.195	1.649	-1625.0	308	10	0.091	1.795	-690.1	175	4.3
5	RIS*	0.278	1.972	-487.6	133	5	0.079	1.621	-788.3	331	0.5
6	RIS*	0.314	1.887	-505.9	172	2	0.090	1.783	-419.7	142	1.5
7	RIS*	0.323	1.755	-862.3	331	1	0.084	1.574	-775.3	294	0.5

FP	TYPE	Binary graph					Weighted graph (tie strength)				
		KSd	γ	logL	tail	xmin	KSd	γ	logL	tail	xmin
5	EDU	0.207	1.716	-2107.6	352	26	0.109	1.918	-1071.1	220	14.8
6	EDU	0.194	1.695	-2336.2	383	27	0.118	1.917	-994.5	207	13.8
7	EDU	0.191	1.546	-2405.3	427	9	0.124	2.039	-825.6	175	16.4
5	EDU*	0.162	1.444	-1935.8	476	1	0.119	1.954	-810.0	181	10.8
6	EDU*	0.170	1.573	-1500.3	341	3	0.123	2.087	-651.2	151	11.9
7	EDU*	0.177	1.635	-1328.4	301	4	0.130	1.700	-1010.6	245	3.8
5	PRC	0.188	1.568	-4882.2	954	6	0.050	2.129	-1144.3	256	15.0
6	PRC	0.177	1.594	-4698.1	889	8	0.045	1.935	-1445.7	363	6.3
7	PRC	0.176	1.558	-4630.5	972	4	0.060	2.043	-966.6	232	9.5
5	PRC*	0.201	1.582	-3412.2	1047	1	0.054	2.152	-909.5	225	10.1
6	PRC*	0.280	1.706	-2340.2	846	1	0.061	1.878	-1037.8	290	3.7
7	PRC*	0.314	1.758	-2012.4	775	1	0.058	1.989	-787.2	222	4.6
5	RES	0.173	1.537	-2552.0	524	4	0.079	1.724	-1033.8	228	6.2
6	RES	0.184	1.592	-1872.1	374	6	0.103	1.755	-712.3	157	6.9
7	RES	0.174	1.528	-1639.8	354	3	0.086	1.788	-592.6	131	7.5
5	RES*	0.224	1.644	-1364.3	370	2	0.087	1.660	-978.3	246	2.9
6	RES*	0.248	1.680	-972.6	274	2	0.094	1.923	-467.7	109	8.4
7	RES*	0.259	1.637	-990.5	328	1	0.095	1.820	-471.6	112	6.0
5	AIC	0.154	1.511	-4228.6	843	4	0.077	2.154	-871.4	212	10.9
6	AIC	0.160	1.478	-4732.2	907	4	0.085	1.822	-1506.9	402	3.8
7	AIC	0.161	1.493	-4315.3	893	3	0.085	2.325	-721.2	178	13.2
5	AIC*	0.259	1.665	-2256.2	775	1	0.072	1.959	-804.1	207	6.0
6	AIC*	0.255	1.635	-2150.0	710	1	0.088	1.668	-1348.0	395	1.7
7	AIC*	0.295	1.682	-2066.8	725	1	0.090	1.528	-1791.5	704	0.4

Table 3.12: Power-law distribution test results for interregional patent co-invention network

YEARS	Binary graph					Weighted graph (interaction)				
	KSd	γ	logL	tail	xmin	KSd	γ	logL	tail	xmin
1990	0.216	1.741	-3140.8	838	3	0.069	1.905	-2092.6	346	46.7
1991	0.206	1.748	-3112.0	835	3	0.079	2.011	-1589.1	258	65.4
1992	0.197	1.712	-3255.7	847	3	0.063	1.963	-1972.7	327	52.3
1993	0.192	1.676	-3430.0	864	3	0.065	2.086	-1660.3	269	76.3
1994	0.190	1.688	-3525.6	898	3	0.082	2.115	-1509.2	239	92.5
1995	0.189	1.665	-3659.7	913	3	0.057	2.061	-1957.1	316	74.4
1996	0.199	1.635	-3795.7	920	3	0.072	2.060	-1810.8	284	89.3
1997	0.193	1.665	-3853.9	897	4	0.078	1.919	-2752.8	442	57.7
1998	0.199	1.587	-4372.8	1009	3	0.079	2.348	-1276.9	188	210.5
1999	0.187	1.625	-4284.1	961	4	0.076	2.325	-1227.0	176	244.3
2000	0.194	1.657	-4260.9	936	5	0.079	2.177	-1686.9	243	191.5
2001	0.190	1.646	-4354.8	948	5	0.070	2.346	-1288.8	181	291.3
2002	0.191	1.629	-4459.3	956	5	0.063	2.169	-1776.4	253	204.9
2003	0.192	1.629	-4513.8	968	5	0.073	2.200	-1666.3	235	230.2
2004	0.179	1.639	-4621.2	1000	5	0.058	2.110	-2001.9	285	186.2
2005	0.185	1.634	-4753.1	1024	5	0.058	2.164	-1871.8	263	223.7
2006	0.186	1.623	-4791.6	1022	5	0.063	2.188	-1917.2	270	228.6
2007	0.190	1.666	-4779.8	1017	6	0.066	2.244	-1762.4	247	257.0
2008	0.192	1.610	-4961.3	1046	5	0.066	2.158	-2161.0	308	200.3
2009	0.194	1.622	-4843.8	1032	5	0.063	2.204	-1973.2	283	206.1

Table 3.13: Power-law distribution test results for interregional JVSA network

	KSd	γ	logL	tail	xmin
Binary graph	0.414	2.090	-490.8	268	1
Weighted graph	0.399	1.975	-549.6	268	1

Table 3.14: Assortativity indices of interregional patent co-invention network

YEAR	ATTRIBUTE				DEGREE		
	BLOC	COUNTRY	REGION	ECCENTRICITY	bin	frq	int
ALL	0.452	0.376	0.035	0.092	-0.025	-0.056	-0.055
1990	0.807	0.760	0.211	0.291	0.117	0.048	0.038
1991	0.830	0.773	0.214	0.500	0.112	0.020	0.017
1992	0.812	0.741	0.198	0.326	0.101	0.013	0.011
1993	0.803	0.748	0.195	0.319	0.090	0.025	0.018
1994	0.786	0.723	0.202	0.361	0.109	0.023	0.019
1995	0.792	0.719	0.188	0.240	0.110	0.019	0.012
1996	0.762	0.693	0.178	0.289	0.099	0.022	0.013
1997	0.715	0.656	0.158	0.240	0.078	0.010	0.006
1998	0.711	0.652	0.154	0.154	0.075	-0.001	-0.005
1999	0.692	0.624	0.142	0.340	0.075	0.007	0.002
2000	0.684	0.618	0.133	0.372	0.056	-0.010	-0.016
2001	0.652	0.589	0.124	0.324	0.060	-0.007	-0.009
2002	0.652	0.586	0.125	0.136	0.068	-0.005	-0.007
2003	0.641	0.572	0.124	0.105	0.076	0.012	0.008
2004	0.627	0.577	0.125	0.262	0.085	0.006	0.004
2005	0.640	0.570	0.123	0.171	0.081	0.009	0.012
2006	0.631	0.560	0.122	0.104	0.078	0.008	0.008
2007	0.639	0.565	0.123	0.210	0.062	0.002	0.006
2008	0.628	0.564	0.120	0.168	0.069	0.001	0.002
2009	0.649	0.570	0.125	0.143	0.075	0.006	0.006

Table 3.15: Assortativity indices of JVSA networks

	BLOC	COUNTRY	REGION	ECCENTRICITY	DEGREE
NUTS-3	0.347	0.277	0.028	0.349	-0.072
NUTS-0	0.139	0.019		0.034	-0.369

Table 3.16: Assortativity indices of interregional FP participation network

FP	NTYPES	ATTRIBUTE				DEGREE		
		BLOC	COUNTRY	REGION	ECCENTRICITY	bin	frq	str
5	ALL	0.054	0.029	0.007	0.023	-0.292	-0.143	-0.136
6	ALL	0.041	0.024	0.005	-0.169	-0.309	-0.132	-0.116
7	ALL	0.048	0.028	0.006	-0.146	-0.303	-0.145	-0.134
X	ALL	0.051	0.029	0.007	-0.001	-0.469		
5	ALL*	0.090	0.057	0.013	-0.063	-0.236	-0.154	-0.154
6	ALL*	0.084	0.057	0.011	-0.051	-0.276	-0.146	-0.144
7	ALL*	0.089	0.058	0.013	-0.015	-0.270	-0.164	-0.159
X	ALL*	0.102	0.069	0.016	-0.236	-0.418		
5	BIO	0.065	0.029	0.006	0.009	-0.212	-0.129	-0.118
6	BIO	0.018	0.014	0.002	-0.124	-0.272	-0.132	-0.115
7	BIO	0.037	0.019	0.003	-0.126	-0.262	-0.141	-0.120
X	BIO	0.039	0.018	0.002	-0.252	-0.440		
5	BIO*	0.090	0.050	0.013	0.138	-0.154	-0.117	-0.115
6	BIO*	0.082	0.050	0.009	-0.038	-0.269	-0.163	-0.163
7	BIO*	0.066	0.045	0.009	-0.097	-0.249	-0.151	-0.148
X	BIO*	0.075	0.058	0.008	-0.087	-0.397		
5	ICT	0.052	0.036	0.010	0.059	-0.227	-0.151	-0.138
6	ICT	0.035	0.024	0.003	-0.157	-0.293	-0.151	-0.144
7	ICT	0.043	0.026	0.004	-0.173	-0.285	-0.182	-0.178
X	ICT	0.039	0.029	0.005	-0.006	-0.449		
5	ICT*	0.101	0.077	0.018	-0.053	-0.220	-0.160	-0.167
6	ICT*	0.067	0.054	0.006	-0.094	-0.299	-0.207	-0.213
7	ICT*	0.063	0.046	0.009	-0.066	-0.246	-0.194	-0.192
X	ICT*	0.072	0.067	0.005	-0.005	-0.394		
5	ECO	0.070	0.036	0.008	0.059	-0.252	-0.160	-0.159
6	ECO	0.038	0.017	0.003	-0.082	-0.262	-0.161	-0.130
7	ECO	0.041	0.030	0.007	0.094	-0.221	-0.167	-0.156
X	ECO	0.056	0.026	0.004	-0.059	-0.423		
5	ECO*	0.113	0.070	0.016	-0.004	-0.182	-0.149	-0.151
6	ECO*	0.097	0.047	0.008	0.074	-0.264	-0.167	-0.164
7	ECO*	0.091	0.069	0.015	0.063	-0.233	-0.194	-0.192
X	ECO*	0.141	0.063	0.009	0.035	-0.362		
5	SOC	0.010	-0.013	-0.003	-0.070	-0.218	-0.150	-0.146
6	SOC	0.007	-0.001	0.000	-0.065	-0.212	-0.164	-0.129
7	SOC	-0.001	-0.005	0.000	-0.075	-0.199	-0.167	-0.138
X	SOC	0.006	-0.016	-0.008	-0.039	-0.432		

FP	NTYPES	ATTRIBUTE				DEGREE		
		BLOC	COUNTRY	REGION	ECCENTRICITY	bin	frq	str
5	SOC*	0.006	-0.011	-0.001	0.079	-0.164	-0.131	-0.132
6	SOC*	0.041	0.020	0.007	0.102	-0.186	-0.142	-0.141
7	SOC*	0.015	0.004	0.002	0.049	-0.161	-0.143	-0.137
X	SOC*	0.106	-0.001	-0.017	-0.168	-0.384		
5	RIS	0.041	0.011	0.001	-0.106	-0.201	-0.159	-0.139
6	RIS	0.039	0.020	-0.001	-0.107	-0.203	-0.138	-0.096
7	RIS	0.032	0.014	0.000	-0.056	-0.260	-0.167	-0.130
X	RIS	0.037	0.009	-0.006	-0.251	-0.403		
5	RIS*	0.048	0.023	0.008	-0.023	-0.236	-0.183	-0.182
6	RIS*	-0.006	0.016	-0.006	0.040	-0.291	-0.230	-0.249
7	RIS*	0.001	0.010	-0.005	-0.021	-0.308	-0.218	-0.217
X	RIS*	-0.127	-0.050	-0.040	0.308	-0.351		
5	EDU	0.030	0.009	0.000	0.011	-0.211	-0.162	-0.140
6	EDU	0.016	0.009	0.000	0.013	-0.237	-0.172	-0.159
7	EDU	0.035	0.016	0.002	0.024	-0.199	-0.154	-0.131
X	EDU	0.023	0.006	-0.002	0.003	-0.372		
5	EDU*	0.020	0.000	0.001	-0.014	-0.152	-0.116	-0.116
6	EDU*	0.059	0.024	0.003	-0.021	-0.119	-0.105	-0.099
7	EDU*	0.054	0.026	0.004	0.000	-0.129	-0.106	-0.099
X	EDU*	0.064	0.016	-0.001	-0.037	-0.235		
5	PRC	0.088	0.052	0.013	-0.058	-0.160	-0.125	-0.123
6	PRC	0.069	0.045	0.008	0.048	-0.191	-0.125	-0.125
7	PRC	0.073	0.042	0.008	0.007	-0.171	-0.127	-0.122
X	PRC	0.084	0.065	0.013	-0.059	-0.421		
5	PRC*	0.143	0.088	0.023	0.095	-0.087	-0.082	-0.081
6	PRC*	0.130	0.095	0.018	0.071	-0.181	-0.145	-0.147
7	PRC*	0.135	0.089	0.018	0.076	-0.167	-0.137	-0.136
X	PRC*	0.165	0.122	0.025	0.124	-0.338		
5	RES	0.045	0.012	0.001	0.015	-0.301	-0.147	-0.129
6	RES	0.036	0.007	0.001	0.025	-0.312	-0.131	-0.106
7	RES	0.042	0.011	0.001	0.043	-0.321	-0.161	-0.137
X	RES	0.029	0.008	-0.004	-0.174	-0.442		
5	RES*	0.048	0.024	0.006	0.095	-0.226	-0.131	-0.133
6	RES*	0.074	0.025	0.000	-0.060	-0.257	-0.134	-0.136
7	RES*	0.053	0.023	0.004	-0.053	-0.277	-0.172	-0.165
X	RES*	0.031	0.017	-0.007	-0.012	-0.410		
5	AIC	0.057	0.041	0.009	-0.035	-0.260	-0.205	-0.191

FP	NTYPES	ATTRIBUTE				DEGREE		
		BLOC	COUNTRY	REGION	ECCENTRICITY	bin	frq	str
6	AIC	0.042	0.026	0.006	-0.034	-0.283	-0.213	-0.207
7	AIC	0.060	0.033	0.009	-0.048	-0.256	-0.205	-0.201
X	AIC	0.065	0.046	0.012	0.001	-0.418		
5	AIC*	0.143	0.121	0.029	0.070	-0.112	-0.100	-0.105
6	AIC*	0.126	0.090	0.022	0.123	-0.149	-0.130	-0.132
7	AIC*	0.114	0.090	0.028	0.072	-0.129	-0.120	-0.120
X	AIC*	0.178	0.161	0.059	0.163	-0.236		

Table 3.17: Top-50 regions by centralities in interregional FP participation network, 1998-2011

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
1	FR101	0.040	FR101	0.789	FR101	1.293
2	ITE43	0.020	DE212	0.150	ITE43	1.289
3	DE212	0.020	EL300	0.103	DE212	1.289
4	ES300	0.020	ITE43	0.085	ES300	1.289
5	EL300	0.018	ES300	0.053	UKI11	1.288
6	UKI11	0.017	FI181	0.051	BE100	1.288
7	BE100	0.017	ES511	0.049	FR105	1.287
8	FI181	0.014	AT130	0.041	EL300	1.286
9	ITC45	0.013	BE100	0.037	SE110	1.285
10	ES511	0.013	ITC45	0.025	FI181	1.284
11	AT130	0.012	ES523	0.025	ITC45	1.284
12	SE110	0.012	DE111	0.020	ES511	1.283
13	FR105	0.011	SE110	0.020	AT130	1.283
14	DE300	0.009	NL221	0.019	DE300	1.281
15	ITC11	0.008	NL333	0.018	PT171	1.280
16	PT171	0.007	FR105	0.017	FR623	1.279
17	NL333	0.007	HU101	0.016	NL326	1.279
18	HU101	0.007	ITC11	0.016	NL221	1.277
19	NL326	0.007	UKI11	0.016	UKJ14	1.277
20	DE111	0.007	NO011	0.015	NL310	1.276
21	SE232	0.006	ITC33	0.014	HU101	1.276
22	DK011	0.006	PT171	0.014	UKH12	1.276
23	BE242	0.006	DE600	0.012	ITC11	1.276
24	PL127	0.006	PL127	0.011	DK011	1.276
25	NL221	0.006	ES212	0.010	CH040	1.276

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
26	NL310	0.005	IE021	0.010	DEA23	1.275
27	IE021	0.005	DK012	0.009	CZ010	1.275
28	UKH12	0.005	ES521	0.009	BE242	1.275
29	NO011	0.005	FR623	0.009	DE125	1.274
30	CZ010	0.005	DK011	0.009	CH011	1.274
31	CH040	0.005	SE232	0.009	DE600	1.274
32	UKJ14	0.005	EL122	0.008	FR104	1.273
33	FR623	0.005	ITE14	0.008	FR716	1.273
34	DK012	0.005	UKM25	0.008	DEA22	1.273
35	DE600	0.005	DED31	0.008	NL333	1.273
36	ITC33	0.005	DE502	0.007	FR714	1.273
37	ES213	0.005	AT312	0.007	SE232	1.272
38	DEA23	0.005	DK042	0.006	PL127	1.272
39	SI021	0.005	FR716	0.006	FR103	1.272
40	ES523	0.004	DE21H	0.006	DE111	1.271
41	EL122	0.004	AT221	0.006	IE021	1.271
42	DE122	0.004	ES213	0.006	DE122	1.271
43	FR714	0.004	AT314	0.006	BE310	1.270
44	FR716	0.004	ITD44	0.005	NO011	1.270
45	AT221	0.004	BE234	0.005	DE21H	1.268
46	DEA21	0.004	UKE32	0.005	UKK14	1.268
47	CH011	0.004	EE001	0.005	DK012	1.268
48	ITE14	0.004	NL310	0.005	UKJ11	1.268
49	SE224	0.004	UKD31	0.005	ITC33	1.268
50	UKM25	0.004	ITE32	0.004	CH013	1.267

Table 3.18: Top-50 regions by centralities in interregional patent co-invention network, 1990-2009

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
1	ITC45	0.011	DE212	0.231	DE300	7.336
2	DE300	0.011	DE300	0.202	DE212	7.329
3	DE212	0.010	SE110	0.165	DEA1C	7.329
4	FR101	0.007	DEA1C	0.150	DEA2B	7.326
5	FI181	0.007	FR716	0.135	DE21H	7.319
6	SE110	0.006	DEA21	0.122	DEA11	7.318
7	DE115	0.006	ITC45	0.121	DEA24	7.314
8	FR105	0.006	DEA2B	0.111	DEA23	7.313
9	NL414	0.006	FR101	0.094	DE21C	7.305
10	HU101	0.006	CH031	0.091	DEA21	7.305
11	DE600	0.006	DE71A	0.087	DEA1A	7.303
12	CH040	0.005	DE128	0.082	DEA1D	7.301
13	ES300	0.005	SE224	0.074	DE21L	7.297
14	DEA1C	0.005	CH070	0.069	DE414	7.288
15	FR714	0.005	DEA23	0.068	DE218	7.286
16	UKH12	0.005	ITC42	0.068	DE217	7.279
17	FR716	0.005	ES300	0.068	DE21B	7.278
18	DE128	0.005	FR422	0.067	DE428	7.271
19	ES511	0.005	CH040	0.067	DE71A	7.270
20	DE111	0.005	UKJ11	0.065	DE21N	7.267
21	FR103	0.004	DE21C	0.063	DE426	7.267
22	DE929	0.004	DE716	0.061	DEA25	7.265
23	ITE43	0.004	UKH12	0.059	DE712	7.263
24	AT130	0.004	CH033	0.058	DE216	7.259
25	ITC11	0.004	DE715	0.049	DE21K	7.252

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
26	EL300	0.004	UKJ14	0.048	DEA14	7.251
27	DE71A	0.004	AT130	0.047	DEA27	7.250
28	UKJ14	0.004	DE123	0.046	DE716	7.246
29	SE232	0.004	SE125	0.043	DE21E	7.246
30	RO321	0.004	FI181	0.043	DEA16	7.246
31	FR104	0.004	DE600	0.038	DE128	7.245
32	PL127	0.004	PL514	0.038	DEA2C	7.244
33	DEA11	0.004	FR103	0.037	DE412	7.241
34	HR011	0.004	DE115	0.035	DE715	7.241
35	DE21H	0.004	FR421	0.035	DE21F	7.241
36	SE224	0.004	DK013	0.035	DEA13	7.240
37	DEA2B	0.004	DEA11	0.035	DE718	7.238
38	DEB3C	0.004	DE252	0.034	DE423	7.235
39	DE712	0.004	NL414	0.033	DE719	7.234
40	DEB3I	0.003	ES511	0.033	FR716	7.231
41	CH033	0.003	UKD22	0.031	DE21A	7.230
42	DE126	0.003	EL300	0.030	DE711	7.225
43	DED21	0.003	ITD55	0.030	DEA19	7.223
44	DE113	0.003	NL310	0.029	DE125	7.222
45	UKH23	0.003	DE712	0.027	DE126	7.221
46	DEA23	0.003	DE254	0.027	DEB3I	7.217
47	DE719	0.003	PL127	0.027	DEB3C	7.216
48	FR623	0.003	NL423	0.027	DEA26	7.215
49	UKJ23	0.003	DED21	0.025	DE71C	7.214
50	DEA21	0.003	HU101	0.025	DEB34	7.214

Table 3.19: Top-50 regions by centralities in interregional JVSA network, 1990-2009

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
1	UKI11	0.040	UKI11	0.017	UKI11	0.133
2	FR101	0.030	FR101	0.015	FR101	0.132
3	FR105	0.017	FR105	0.005	FR105	0.127
4	DE212	0.017	DE212	0.005	DE212	0.126
5	UKH12	0.012	UKH12	0.004	UKH12	0.126
6	UKI23	0.012	CH031	0.003	UKI23	0.125
7	CH031	0.012	UKI23	0.003	UKJ14	0.123
8	DE300	0.009	SE110	0.002	ITC11	0.120
9	SE110	0.009	DE300	0.002	UKI12	0.118
10	ITC45	0.009	ES300	0.002	DEA22	0.118
11	ES300	0.009	NO011	0.001	CH031	0.114
12	UKJ14	0.009	BE100	0.001	ES300	0.113
13	NL326	0.008	ITC45	0.001	FR103	0.111
14	DE712	0.006	NL414	0.001	FR714	0.111
15	BE100	0.006	DE712	0.001	DE111	0.111
16	FI181	0.006	DE111	0.001	ITF33	0.111
17	ITC11	0.006	FR716	0.001	SE110	0.109
18	IE021	0.006	DEA11	0.001	ITC45	0.109
19	NO011	0.006	NL326	0.001	UKF14	0.107
20	DE111	0.006	UKJ14	0.001	DE300	0.107
21	DE600	0.006	DK011	0.001	FR716	0.106
22	NL414	0.006	UKJ23	0.001	FR104	0.105
23	DK011	0.005	FI181	0.001	UKG12	0.105
24	CH040	0.005	ITC11	0.001	NL326	0.105
25	FR716	0.005	CH013	0.001	NL414	0.103

RANK	NUTS-3	EIGENVECTOR	NUTS-3	BETWEENNESS	NUTS-3	CLOSENESS
26	UKI12	0.005	NL421	0.001	DE913	0.101
27	DE21H	0.005	FR103	0.001	DE21H	0.099
28	DEA22	0.005	FR714	0.001	DE712	0.099
29	FR103	0.005	IE021	0.000	DEA11	0.098
30	DEA11	0.004	UKJ11	0.000	UKH33	0.097
31	UKJ11	0.004	EL300	0.000	NO011	0.097
32	UKJ23	0.004	SE232	0.000	IE021	0.097
33	EL300	0.004	ES618	0.000	SE232	0.097
34	DK012	0.003	CH011	0.000	UKJ11	0.097
35	CH011	0.003	CH040	0.000	BE242	0.096
36	SE232	0.003	UKI12	0.000	NL226	0.096
37	UKL22	0.003	DE600	0.000	DEA47	0.095
38	DEA12	0.003	DE21H	0.000	BE100	0.095
39	UKH23	0.003	NL423	0.000	UKJ23	0.093
40	CH013	0.003	DE929	0.000	UKH23	0.093
41	DEA24	0.003	UKH23	0.000	FR724	0.092
42	ITF33	0.003	DK012	0.000	ES511	0.092
43	FR714	0.003	DEA24	0.000	DEA23	0.092
44	NL331	0.003	ES511	0.000	UKH14	0.092
45	UKM25	0.003	UKM25	0.000	DK012	0.092
46	UKH33	0.003	DE126	0.000	CH024	0.092
47	NL332	0.003	NL332	0.000	DE115	0.092
48	FR104	0.003	DEA23	0.000	ITC33	0.092
49	ITE43	0.003	FR106	0.000	BE212	0.091
50	BE211	0.003	AT130	0.000	FI181	0.091

Table 3.20: Top-100 regional dyads by edge-betweenness centrality in the interregional FP participation network

RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE
1	FR101	DE212	0.137	51	ITE17	FR101	0.005	26	FR101	FR623	0.010	76	FR101	LV006	0.004
2	FR101	EL300	0.088	52	UKH12	FR101	0.005	27	ES212	FR101	0.010	77	FR101	DE300	0.004
3	FR101	ITE43	0.073	53	NL213	FR101	0.005	28	DK011	FR101	0.010	78	FI181	FI1A2	0.004
4	FI181	FR101	0.050	54	FR101	FR823	0.005	29	DK012	FR101	0.010	79	FR101	UKM22	0.004
5	ES511	FR101	0.048	55	CZ010	FR101	0.005	30	FR101	SE232	0.010	80	FR101	PL213	0.004
6	FR101	ES300	0.044	56	FR101	FR534	0.005	31	EL300	EL122	0.009	81	UKJ32	FR101	0.004
7	FR101	AT130	0.041	57	FR101	PT114	0.005	32	ITE14	FR101	0.009	82	ITE21	FR101	0.004
8	FR101	BE100	0.038	58	FR101	ITD36	0.005	33	DED31	FR101	0.009	83	FR101	DE929	0.004
9	ES523	FR101	0.025	59	FI181	FI193	0.005	34	DE502	FR101	0.009	84	IE023	FR101	0.004
10	FR101	ITC45	0.023	60	ES705	EL300	0.005	35	FR101	UKM25	0.009	85	FI181	FI133	0.004
11	SE110	FR101	0.020	61	FR101	DEC01	0.005	36	DE212	AT312	0.008	86	FR101	ES422	0.004
12	FR101	NL221	0.020	62	FR301	FR101	0.005	37	FR101	DK042	0.007	87	ES611	ES300	0.004
13	FR101	NL333	0.020	63	FR101	UKG23	0.005	38	FR101	FR716	0.007	88	FR101	FR714	0.004
14	FR101	DE111	0.019	64	ES230	ITC45	0.005	39	FR101	DE21H	0.007	89	DE212	DE11D	0.004
15	FR105	FR101	0.018	65	ITE32	FR101	0.005	40	AT314	AT312	0.007	90	FR101	ITD20	0.004
16	HU101	FR101	0.017	66	FR101	NO051	0.005	41	FR101	ES213	0.007	91	FR101	ES415	0.004
17	UKI11	FR101	0.017	67	FR101	FR103	0.005	42	DE212	AT221	0.007	92	LT00A	FR101	0.004
18	FR101	NO011	0.016	68	NL414	DE212	0.005	43	BE234	FR101	0.006	93	FR101	DEA33	0.004
19	FR101	ITC11	0.015	69	FR101	CH024	0.005	44	FR101	UKE32	0.006	94	FR101	DE131	0.004
20	PT171	FR101	0.015	70	SI021	FR101	0.005	45	UKD31	FR101	0.006	95	UKH13	FR101	0.004
21	ITC33	FR101	0.014	71	ITD55	FR101	0.005	46	NL310	FR101	0.006	96	DE212	AT223	0.004
22	DE600	FR101	0.014	72	FR101	UKM34	0.004	47	FI181	EE001	0.006	97	FR101	FR824	0.004
23	PL127	FR101	0.012	73	UKC22	FR101	0.004	48	ITD44	FR101	0.006	98	FR101	SE224	0.004
24	IE021	FR101	0.011	74	UKG31	FR101	0.004	49	ITE43	EL300	0.006	99	FR101	NO061	0.004
25	ES523	ES521	0.010	75	FR101	DE122	0.004	50	ITF42	ITE43	0.005	100	FR101	UKF22	0.004

Table 3.21: Top-100 regional dyads by edge-betweenness centrality in the interregional patent co-invention network

RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE	RANK	NODE 1	NODE 2	VALUE
1	DE212	DE300	0.110	51	FR421	DE124	0.020	26	DK013	SE224	0.036	76	DEA33	DEA35	0.014
2	DEA2B	FR716	0.102	52	CH033	CH032	0.020	27	CH033	CH031	0.035	77	CH040	DE300	0.014
3	SE110	DEA21	0.087	53	DE712	DE71A	0.020	28	DE123	DE128	0.035	78	SE110	IE021	0.014
4	DEA2B	DEA1C	0.072	54	BE213	FR231	0.020	29	DEA23	DEA1C	0.034	79	DE719	DE712	0.014
5	FR101	FR716	0.071	55	DK013	CZ010	0.020	30	FR101	FR103	0.034	80	BE242	BE100	0.014
6	DE71A	DEA1C	0.070	56	PT162	DE212	0.020	31	AT130	DE212	0.034	81	DE600	DEA11	0.013
7	CH070	ITC42	0.069	57	DEA36	DEA13	0.020	32	DEA11	DEA1C	0.033	82	DE21N	DE212	0.013
8	ITC45	ITC42	0.069	58	ES511	DEA11	0.019	33	DE252	DE212	0.033	83	DED21	DE212	0.013
9	DEA23	DEA21	0.065	59	UKJ14	RO321	0.019	34	DEA23	DEA2B	0.031	84	DEB3C	DE128	0.013
10	SE110	SE224	0.064	60	HU101	DE212	0.019	35	EL300	ES300	0.030	85	BE211	BE234	0.013
11	DE21C	DE212	0.064	61	DEG03	DE300	0.018	36	DE128	DE212	0.029	86	DED21	DE300	0.013
12	CH070	DE21C	0.063	62	ITD55	ITD54	0.018	37	DE123	DE115	0.028	87	SE110	SE232	0.013
13	UKJ11	CH031	0.060	63	ITD54	SE224	0.018	38	ITD55	ITC45	0.027	88	DE501	DE300	0.012
14	CH040	CH033	0.053	64	ITE43	ITC45	0.018	39	CH040	DE212	0.027	89	FR413	LU000	0.012
15	DEA21	DE300	0.051	65	DE254	DE252	0.018	40	PL127	PL514	0.027	90	DEA56	DEA1A	0.012
16	DE715	DE128	0.050	66	FR413	FR421	0.017	41	NL423	DEA21	0.027	91	DE911	DE300	0.012
17	DE716	DE715	0.049	67	DEA13	DEA1C	0.017	42	FR421	FR422	0.024	92	HR011	DE716	0.012
18	DEA1C	DE300	0.045	68	DEA36	DEA35	0.017	43	UKH12	CH031	0.024	93	DE71A	DEB3J	0.012
19	DE716	DE71A	0.044	69	BG411	DE128	0.016	44	DE600	DE300	0.024	94	DE254	SE110	0.012
20	FR422	CH031	0.043	70	UKH33	ITD31	0.016	45	NL423	NL414	0.023	95	DE719	DE264	0.011
21	SE125	SE110	0.043	71	ITC45	ITD31	0.016	46	SE110	ES300	0.023	96	SE224	NO011	0.011
22	FR716	FR422	0.042	72	UKH33	UKH12	0.016	47	DE123	DE124	0.022	97	DE238	DE212	0.011
23	SE125	PL514	0.039	73	UKJ11	UKJ23	0.015	48	ES511	ES300	0.022	98	BE213	BE242	0.011
24	SE110	FI181	0.038	74	NL310	NL414	0.015	49	FR103	FR231	0.021	99	DE146	AT130	0.011
25	UKJ14	UKJ11	0.036	75	UKH12	UKM25	0.015	50	FR422	CH032	0.021	100	NL310	DE21N	0.011

Table 3.22: Kendall rank correlation coef. between FP participation and patent co-invention networks

FP	PAGERANK	DEGREE	LOAD	CLOSENESS	CLUSTERING
5	0.489	0.461	0.336	0.378	0.155
6	0.463	0.426	0.313	0.335	0.113
7	0.455	0.417	0.342	0.302	0.108