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Using archetypal analysis to derive a typology of knowledge networks in European bioclusters

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Appendix A

Table A1. Key IPC technology codes related to bioeconomy.

Technologies	IPC codes
Biotech	A01H001/00, A01H004/00, A61K038/00, A61K039/00, A61K048/00, C02F003/34, C07G011/00, C07G013/00, C07G015/00, C07K004/00, C07K014/00, C07K016/00, C07K017/00, C07K019/00, G01N33/(53, 54, 55, 57, 68, 74, 76, 78, 88, 92); G01N27/327, C12M, C12N, C12P, C12Q, C12S, ANDNOT (A61K), C07C029, C07D0475, C07K002, C08B003, C08B 7, C08H 1, C08L 89, C09D 11, C09D 189, C09J 189
Agriculture/forestry	A01B, A01C, A01D, A01F, A01G, A01J, A01K, A01L, A01M, A21B, A21C, A22B, A22C, A23N, A23P, A61D, B02B, B29B, B29C, B29D, B29K, B29L, B99Z, C03B, C08J, C12L, C13B05, C13B015, C13B025, C13B045, A01N, A01P, C05B, C05C, C05D, C05F, C05G
Pulp and paper	D21C
Machines cartons boxes printing	B31B, B31C, B31D, B31F, B41B, B41C, B41D, B41F, B41G, B41J, B41K, B41L, B41M, B41N, C14B, D01B, D01C, D01D, D01F, D01G, D01H, D02G, D02H, D02J, D03C, D03D, D03J, D04B, D04C, D04G, D04H, D05B, D05C, D06G, D06H, D06J, D06M, D06P, D06Q, D21B, D21C, D21D, D21F, D21G, D21H, D21J, D99Z A01G023/00, A01G025/00, A01N025, A01N027, A01N029, A01N031, A01N033, A01N035, A01N037, A01N039, A01N041, A01N043, A01N045, A01N047, A01N049, A01N051, A01N055, A01N057, A01N059, A01N061, A01N063, A01N065, C09K017/00, E02D003/00, C05F
Genetic engineering	A01H 1/06, C12N 15/00, C12N 1/00, C12N 5/00, C12N 7/00
Landscape management	E02B-003, E02D, E02F
Food	A01J, A01H, A21D, A23B, A23C, A23D, A23F, A23G, A23J, A23K, A23L, C12C, C12F, C12G, C12H, C12J, C13D, C13F, C13J, C13K, C13B010, C13B020, C13B025, C13B030, C13B035, C13B040, C13B050, C13B099, B67C, A21C, A22B, A22C, A21B, A21C, A22B, A22C, A23N, A23P
Proteins	C07K
Biomass	C10L005/40, C10L005/42, C10L005/44, C10L005/46, C10L005/48, C10B053/02
Biofuels	A01C3/02, C02F11/04, C05F17/02, B01D53/84, F23G7/10
Biofuels for transport	C07C-067/00, C07C-069/00; C10B-053/02; C10G, C10L-001/02, C10L-001/14, C10L-001/19, C10L-003/00, C10L-005/00, C10L-005/40, C10L-005/42, C10L-005/44, C10L-005/46, C10L-005/48, C10L-009/00; C11C-003/10, C12M-001/107, C12N-001/13, C12N-001/15, C12N-001/21, C12N-005/10, C12N-009/24, C12N-015/00; C12P-005/02, C12P-007/06-7/14, C12P-007/64, Y02E50, Y02E70/20; Y02E70/30
Biomaterials	C08B, C08C, C08H, C09F, C08L001, C08L003, C08L005, C08L007, C09J101, 103, 105, 107, C11B, C11C, C13B
Marine	A01H15, A61K36/02, 03, 04, 05
Animals livestock management	A01K, A01M, A23N017, A22B, A61D, B62C
Household appliances food related	F25D, A21B, A47J

Appendix B

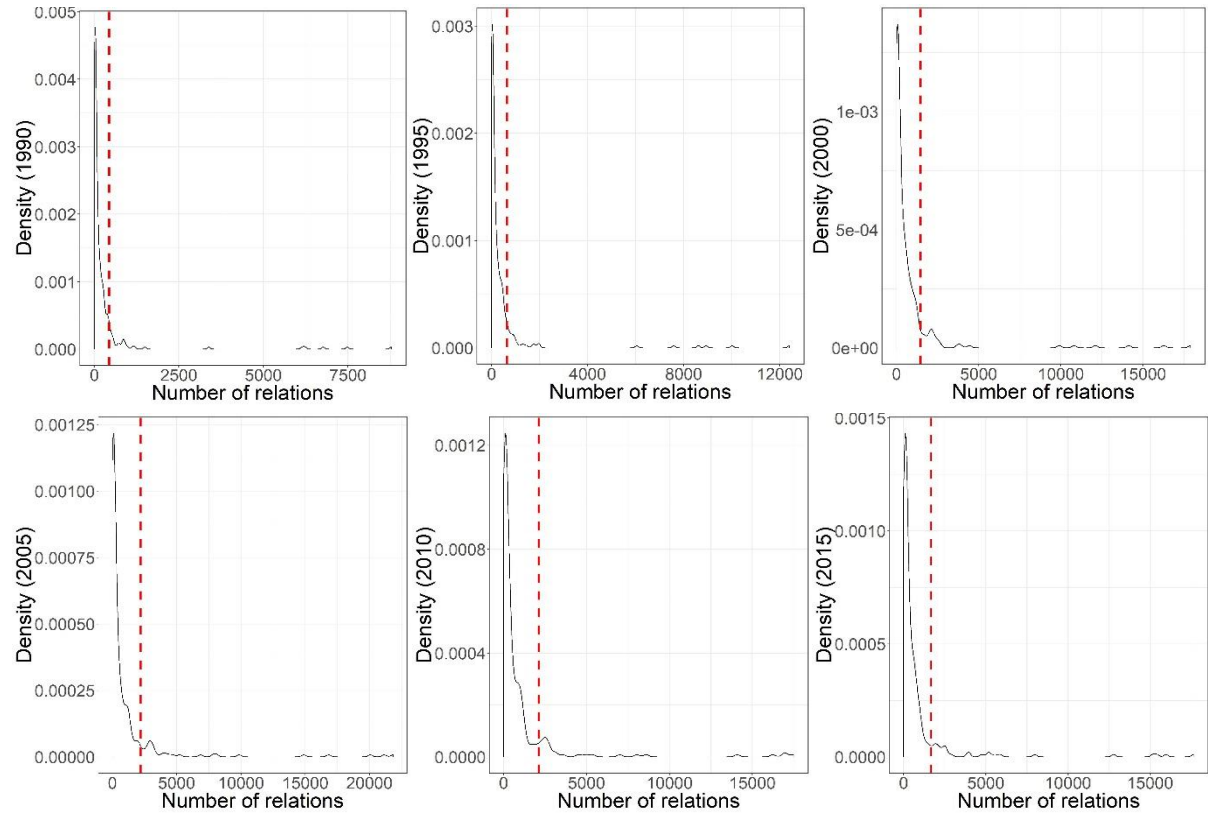


Figure B1. Density distribution and the 90th percentile for cluster identification.

Appendix C

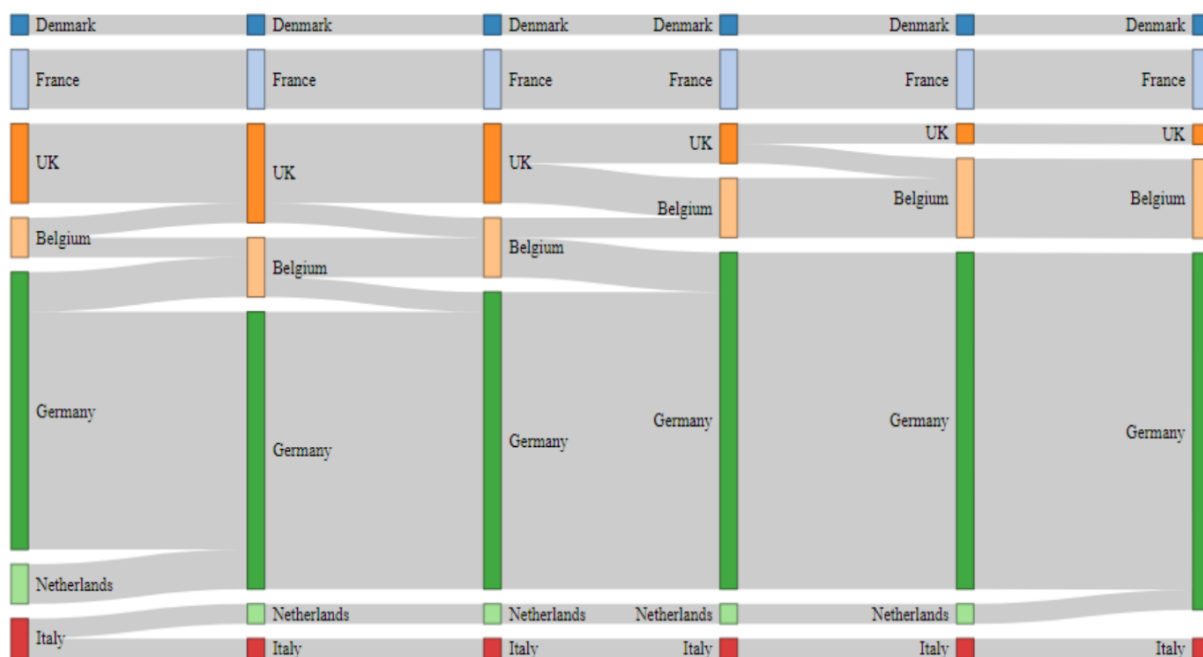


Figure C1. Share of countries with bioclusters over time.

Appendix D

Table D1. The archetypal analysis coefficients and category identification for each unit of analysis.

	NUTS2	Year	ARCH category	ARCH1	ARCH2	ARCH3	ARCH4
1	BE10	2000	4	0.00	0.22	0.12	0.66
2	BE10	2015	1	0.78	0.22	0.00	0.00
3	BE21	1990	1	0.71	0.19	0.00	0.10
4	BE21	1995	0	0.38	0.14	0.42	0.05
5	BE21	2000	4	0.15	0.16	0.06	0.64
6	BE21	2005	1	0.66	0.17	0.09	0.08
7	BE21	2010	1	0.60	0.16	0.13	0.10
8	BE21	2015	0	0.69	0.31	0.00	0.00
9	BE23	1995	1	0.69	0.04	0.11	0.16
10	BE23	2005	0	0.31	0.16	0.45	0.08
11	BE23	2010	1	0.74	0.08	0.10	0.08
12	BE23	2015	4	0.00	0.21	0.00	0.79
13	BE24	1990	0	0.41	0.08	0.27	0.24
14	BE24	1995	0	0.48	0.01	0.16	0.34
15	BE24	2000	1	0.63	0.20	0.00	0.17
16	BE24	2005	0	0.39	0.10	0.38	0.13
17	BE24	2010	0	0.49	0.08	0.42	0.01
18	BE24	2015	4	0.12	0.00	0.11	0.77
19	BE31	2010	0	0.32	0.07	0.04	0.58
20	DE11	2010	0	0.33	0.08	0.31	0.27
21	DE11	2015	0	0.16	0.09	0.38	0.37
22	DE12	1990	0	0.25	0.02	0.40	0.33
23	DE12	1995	1	0.79	0.00	0.21	0.00
24	DE12	2000	4	0.00	0.22	0.12	0.66
25	DE12	2005	4	0.00	0.11	0.00	0.89
26	DE12	2010	0	0.00	0.34	0.10	0.56
27	DE12	2015	0	0.38	0.00	0.00	0.62
28	DE13	1990	4	0.00	0.22	0.00	0.78
29	DE13	1995	0	0.26	0.00	0.23	0.51
30	DE13	2000	0	0.31	0.00	0.35	0.34
31	DE13	2005	4	0.00	0.00	0.01	0.99
32	DE13	2010	0	0.43	0.00	0.00	0.57
33	DE13	2015	0	0.00	0.33	0.02	0.65
34	DE14	2000	0	0.51	0.00	0.49	0.00
35	DE14	2005	4	0.05	0.00	0.11	0.83
36	DE14	2010	0	0.64	0.00	0.36	0.00
37	DE14	2015	1	1.00	0.00	0.00	0.00
38	DE21	1990	0	0.21	0.00	0.26	0.53
39	DE21	1995	0	0.60	0.00	0.00	0.40
40	DE21	2000	0	0.65	0.35	0.00	0.00

41	DE21	2005	1	0.86	0.00	0.14	0.00
42	DE21	2010	0	0.00	0.14	0.36	0.50
43	DE21	2015	0	0.17	0.00	0.41	0.41
44	DE26	1990	1	0.42	0.21	0.21	0.16
45	DE26	1995	1	0.99	0.01	0.00	0.00
46	DE26	2000	0	0.45	0.00	0.24	0.32
47	DE26	2005	0	0.56	0.01	0.00	0.44
48	DE26	2015	1	0.77	0.00	0.23	0.00
49	DE30	1990	0	0.24	0.33	0.17	0.26
50	DE30	2000	0	0.38	0.10	0.00	0.52
51	DE30	2005	4	0.00	0.09	0.13	0.78
52	DE30	2010	0	0.00	0.00	0.27	0.73
53	DE30	2015	2	0.15	0.85	0.00	0.00
54	DE40	2005	0	0.72	0.00	0.00	0.28
55	DE40	2010	4	0.14	0.00	0.17	0.69
56	DE40	2015	0	0.52	0.20	0.00	0.28
57	DE60	1995	0	0.45	0.38	0.00	0.17
58	DE60	2000	0	0.54	0.00	0.17	0.29
59	DE60	2005	4	0.18	0.02	0.18	0.62
60	DE60	2010	0	0.00	0.68	0.00	0.32
61	DE60	2015	0	0.00	0.05	0.60	0.35
62	DE71	1990	0	0.06	0.05	0.27	0.62
63	DE71	1995	4	0.23	0.05	0.11	0.61
64	DE71	2000	0	0.00	0.41	0.00	0.59
65	DE71	2005	0	0.72	0.00	0.28	0.00
66	DE71	2010	0	0.00	0.21	0.32	0.48
67	DE71	2015	1	0.80	0.00	0.20	0.00
68	DE72	1990	1	1.00	0.00	0.00	0.00
69	DE72	1995	0	0.50	0.00	0.36	0.14
70	DE72	2005	0	0.36	0.00	0.28	0.36
71	DE92	2010	4	0.05	0.24	0.00	0.72
72	DE92	2015	0	0.32	0.00	0.00	0.68
73	DE93	2015	0	0.35	0.00	0.19	0.45
74	DEA1	1990	2	0.00	0.75	0.09	0.16
75	DEA1	1995	4	0.20	0.00	0.00	0.80
76	DEA1	2000	1	0.66	0.15	0.03	0.17
77	DEA1	2005	4	0.00	0.14	0.24	0.63
78	DEA1	2010	0	0.36	0.00	0.40	0.24
79	DEA1	2015	0	0.38	0.00	0.07	0.55
80	DEA2	1990	0	0.00	0.00	0.47	0.53
81	DEA2	1995	0	0.00	0.56	0.06	0.37
82	DEA2	2000	4	0.18	0.22	0.02	0.58
83	DEA2	2005	4	0.11	0.17	0.13	0.58
84	DEA2	2010	0	0.38	0.00	0.27	0.35
85	DEA2	2015	0	0.00	0.71	0.00	0.29
86	DEA3	1990	4	0.10	0.00	0.22	0.67

87	DEA3	1995	0	0.39	0.14	0.00	0.47
88	DEA3	2000	0	0.33	0.00	0.49	0.18
89	DEA3	2005	4	0.10	0.07	0.24	0.60
90	DEA3	2010	4	0.14	0.20	0.16	0.50
91	DEA3	2015	0	0.00	0.29	0.51	0.20
92	DEA5	1990	0	0.53	0.00	0.00	0.47
93	DEA5	1995	0	0.43	0.00	0.25	0.32
94	DEA5	2000	0	0.15	0.28	0.00	0.57
95	DEA5	2005	0	0.23	0.00	0.31	0.46
96	DEA5	2010	4	0.21	0.05	0.00	0.74
97	DEA5	2015	0	0.02	0.00	0.28	0.70
98	DEB1	1990	0	0.13	0.01	0.37	0.48
99	DEB1	1995	0	0.00	0.39	0.22	0.38
100	DEB1	2000	0	0.31	0.00	0.35	0.33
101	DEB1	2005	1	0.55	0.19	0.12	0.14
102	DEB3	1990	0	0.36	0.14	0.18	0.33
103	DEB3	1995	4	0.00	0.20	0.24	0.56
104	DEB3	2000	4	0.04	0.00	0.21	0.75
105	DEB3	2005	4	0.11	0.00	0.00	0.89
106	DEB3	2010	0	0.00	0.54	0.00	0.46
107	DEB3	2015	4	0.22	0.00	0.00	0.78
108	DEF0	1995	0	0.06	0.35	0.11	0.48
109	DEF0	2000	0	0.00	0.00	0.61	0.39
110	DEF0	2005	0	0.43	0.12	0.27	0.19
111	DEF0	2010	4	0.17	0.00	0.00	0.83
112	DEF0	2015	0	0.38	0.00	0.62	0.00
113	DK01	1990	0	0.23	0.00	0.36	0.42
114	DK01	1995	0	0.30	0.00	0.49	0.22
115	DK01	2000	4	0.21	0.08	0.00	0.72
116	DK01	2005	0	0.00	0.24	0.32	0.44
117	DK01	2010	4	0.00	0.21	0.19	0.59
118	DK01	2015	4	0.21	0.00	0.01	0.79
119	FR10	1990	0	0.12	0.00	0.36	0.53
120	FR10	1995	0	0.03	0.29	0.00	0.68
121	FR10	2000	0	0.00	0.32	0.25	0.43
122	FR10	2005	0	0.53	0.00	0.47	0.00
123	FR10	2010	0	0.48	0.00	0.00	0.52
124	FR10	2015	2	0.00	0.90	0.01	0.09
125	FR42	1990	0	0.00	0.27	0.53	0.20
126	FR42	1995	0	0.02	0.11	0.38	0.50
127	FR42	2000	0	0.00	0.36	0.26	0.37
128	FR42	2005	4	0.00	0.13	0.15	0.72
129	FR42	2010	0	0.00	0.51	0.19	0.30
130	FR42	2015	0	0.00	0.72	0.27	0.01
131	FR71	1990	0	0.01	0.09	0.34	0.56
132	FR71	1995	0	0.00	0.43	0.57	0.00

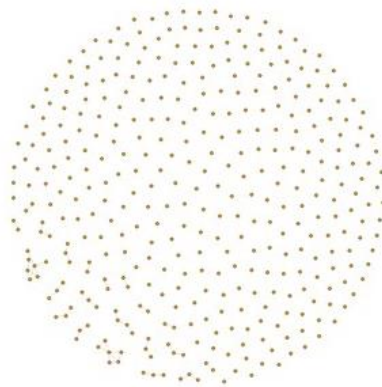
133	FR71	2000	0	0.29	0.07	0.26	0.38
134	FR71	2005	0	0.15	0.18	0.33	0.33
135	FR71	2010	0	0.00	0.51	0.34	0.14
136	FR71	2015	4	0.21	0.16	0.09	0.54
137	ITC1	1990	0	0.16	0.38	0.37	0.08
138	ITC4	1990	0	0.33	0.00	0.05	0.62
139	ITC4	1995	0	0.43	0.26	0.00	0.30
140	ITC4	2000	0	0.00	0.08	0.60	0.32
141	ITC4	2005	0	0.00	0.47	0.35	0.18
142	ITC4	2010	0	0.66	0.03	0.00	0.31
143	ITC4	2015	0	0.17	0.00	0.52	0.31
144	NL32	1990	4	0.21	0.10	0.14	0.55
145	NL33	1990	0	0.00	0.74	0.26	0.00
146	NL33	1995	4	0.16	0.21	0.00	0.64
147	NL33	2000	2	0.00	1.00	0.00	0.00
148	NL33	2005	2	0.14	0.67	0.19	0.00
149	NL33	2010	3	0.08	0.03	0.80	0.09
150	UKD6	1990	0	0.00	0.00	0.52	0.48
151	UKD6	1995	0	0.00	0.22	0.42	0.36
152	UKH1	1995	3	0.19	0.00	0.66	0.15
153	UKH1	2000	0	0.00	0.59	0.00	0.41
154	UKH1	2005	0	0.22	0.02	0.32	0.44
155	UKH2	1990	4	0.09	0.00	0.16	0.75
156	UKH2	1995	3	0.00	0.00	1.00	0.00
157	UKH2	2000	0	0.00	0.54	0.46	0.00
158	UKJ1	1990	2	0.00	0.97	0.03	0.00
159	UKJ1	1995	3	0.03	0.13	0.72	0.12
160	UKJ1	2000	2	0.00	0.93	0.07	0.00
161	UKJ1	2005	4	0.25	0.00	0.17	0.58
162	UKJ1	2010	0	0.03	0.53	0.11	0.32
163	UKJ1	2015	0	0.02	0.51	0.38	0.08
164	UKJ2	1990	0	0.00	0.00	0.67	0.33
165	UKJ2	1995	0	0.12	0.00	0.30	0.58
166	UKJ2	2000	4	0.22	0.00	0.00	0.78

Appendix E

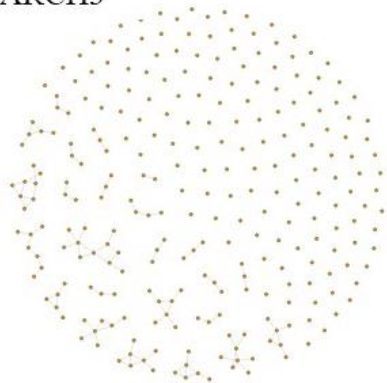
ARCH1



ARCH2



ARCH3



ARCH4

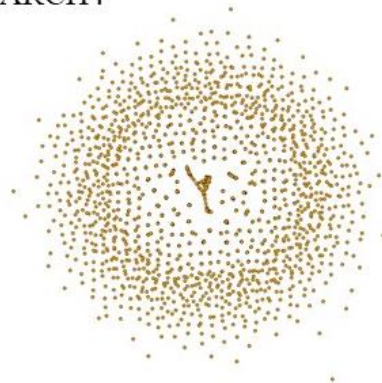


Figure E1. Typical cluster networks for each archetype.