Chapter 7
Asymmetric Knowledge Coordination Through the Manager-Director Hybrid Role

7.1 Network Outline and Statistical Analysis

EASIN. Hybrid (asymmetric) inter-firm coordination, where there is a mismatch of positions and a director becomes a manager somewhere else, is significantly much less present when compared with BINT and DINT relationships. There are 429 EASIN companies engaged in such form of strategic alliance (Table 7.1 in Data Appendix) in the E+N network, that is 14% of the whole EASIN. Connected internally within EASIN itself are only 112 companies. In terms of number of companies, the first place belongs to the UK (Fig. 7.1a), the second one to Italy, which has only one third of companies when compared with the first country, and the rest belongs to France, Spain and Belgium. The UK composes one third of all the engaged companies, but the most significant country in terms of economic attributes is France, second one is the UK, and the rest is similarly marginal.

Neighbors. Also, the neighbors (Table 7.2a in Data Appendix) are fewer than in previous types of coordination: the network contains 3990 neighboring companies, where 54% come from the EU28 and the rest from the remaining part of the globe (Fig. 7.1b). The leader in number of companies in Europe is the UK with 33% of the European part and 18% of the global one. The global leader is the US with 38% of companies worldwide and more than twice as much as the next country—the UK. The next in the top of Europe are France, Italy, Spain and Ireland, where the UK and France are the top European countries in terms of the economic attributes and the US, as always, is the top in the non-EU28 part.

The Financial neighbors (Table 7.2b in Data Appendix) showed a shift in the leadership, where France overtook the UK at the first place in Europe—it composes 28% of the European part and 22% of the whole. It is also in the top in terms of the economic attributes, but it is Financial companies of Sweden that are the largest in terms of economic resources, even though they make up only 2% of the European part. Overall, European Financial neighbors stand at almost 80% of economic attributes of all neighbors, considering that the HINT is the best representation of power imbalance between network actors, and it seems European Financial institutions in particular
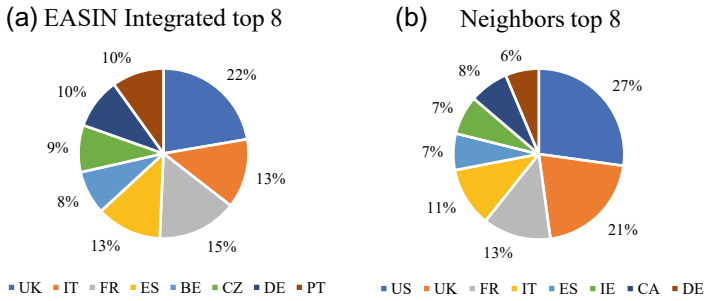
Fig. 7.1 **a**, **b** Share of top 8 countries in terms of number of companies in EASIN without isolates (**a**) and neighbors (**b**). *Legend* The percent scores represent proportion of the total, the values in the pie charts do not sum up to 100% as for clarity variables, and "the others", which are included in Tables 7.1a and 7.2a in Data Appendix, were omitted to not dim the relevance of the smallest countries of the top 8

are the key-players in the power-imbalance creation. In the non-EU28 part, the US leads with 12% of network share, and it also controls a significant proportion of the economic attributes. The most resourceful country in terms of EC and TURN is, however, Singapore where the two indexes stand at more than one third of the whole network. Even though the data availability is much scarcer in the non-EU28 part, the two leading countries they are in fact dominating the entire network with those two attributes. This shows that although the European Financial institutions may be more active and present, they are not necessarily the biggest players that are out there.

EASIN + NEIGH. By far, the most present (Table 7.3 in Data Appendix) is the US (34%) followed by the UK (19%) and France (8%). Europe covers 58% of the network and on average owns about two-thirds of the economic attributes. The following pie charts highlight the situation in more aggregated form showing the relative position of EASIN as compared to its neighbors, represented as the percent share of the total per each economic attribute. The neighbors are presented through a cross section of sectors (Fig. 7.2) with particular attention given to those most prominent ones, and the economic capabilities of the whole EU28 compared to the rest of the world are already provided in tables which can be found in the Data Appendix so it will not be duplicated here. Although EASIN is not a sector, but rather just an industry within a particular geographical context, it is added to the analysis because it is after all the focal point of the entire book. It is apparent that EASIN is always present in the top 3 along with, usually, Financial and Manufacturing sector. Companies that participate in M2D E+N represent on average more than 90% of resources of the ALL E+N network (Fig. 7.3). Although there is less of them than in M2D or D2D, they still hold high numbers in terms of economic attributes, which shows that overall it is rather the larger companies who engage in HINTs.
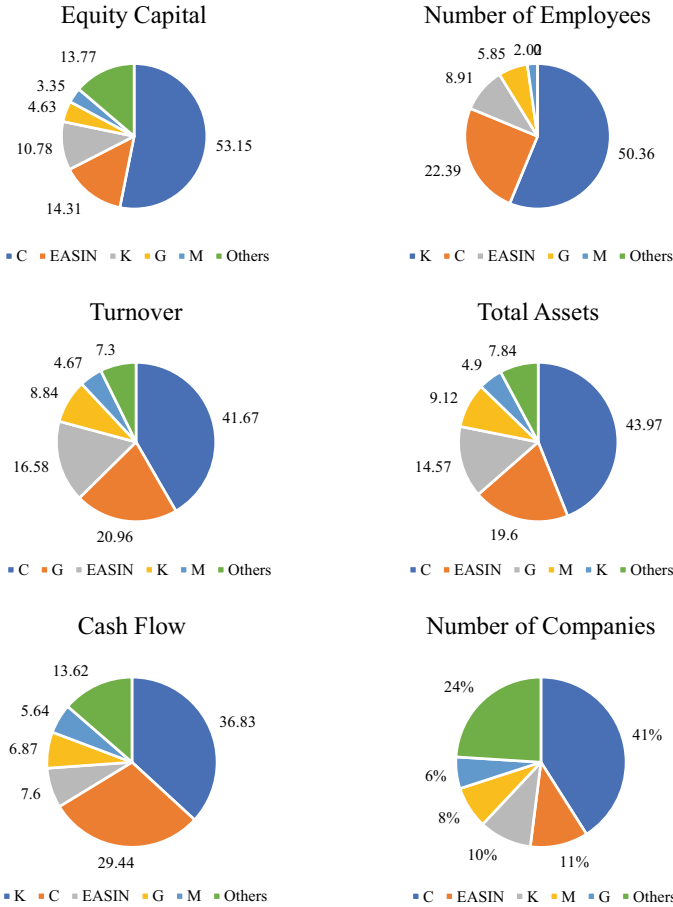
Fig. 7.2 a–f Economic attributes of EASIN compared with all its neighbors, which are grouped into their respective sectors. *Legend* The percent scores represent proportion of the total, the values in the pie charts do not sum up to 100% as for clarity variables, and "the others", which are included in Tables 7.1a and 7.2a in Data Appendix, were omitted to not dim the relevance of the smallest countries of the top 5

7.2   Correlation Analysis

EASINT. Because the formal representation of the AKE relationship orients the connection from a company where connecting person is a manager to another where s/he is a director, In_Dc refers to companies that appoint that person into their board, while Out_Dc refers to companies in which that person is a manager. Therefore, Out_Dc measures the extent to which a company acquires strategic knowledge from others giving in exchange operative knowledge, and vice versa in case of In_Dc. Due
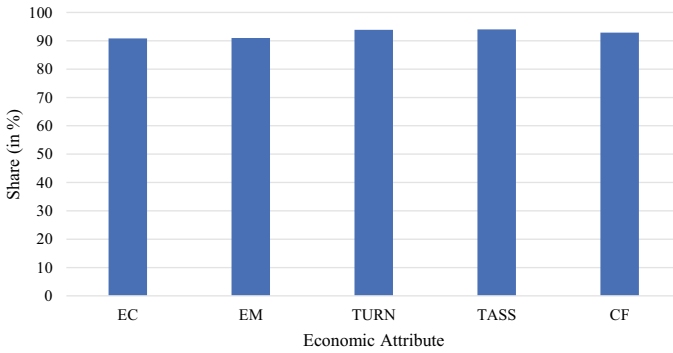
Fig. 7.3 Economic attributes of M2D E+N companies as proportion of ALL E+N companies

to this element of more complexity related to the distinction between In_ and Out_Dc, the correlations findings of EASIN and EASINT could change considerably.

Let us first analyze EASINT (Table 7.1), which is more important than EASIN (Table 7.2, Table 7.9 in Data Appendix), because it includes also EASIN companies that are connected only to NEIGH and additionally because the companies that are already connected within EASIN now regard also their connections with NEIGH.[1] This enlarged group includes now 429 companies, out of which the large majority (74%) are connected only to NEIGH.[2] There is an appreciable positive correlation between size and both types of Dc, more accentuated for In_Dc: 0.21 and 0.38 on average for binary and weighted, respectively, with values particularly high in terms of EM and CF (0.44 and 0.57, respectively). It means that larger companies are more likely to be influenced by or subjected to AKE. However, if we consider a company's relevance to exploit or be exploited by AKE connectivity at the whole network level, then the correlation holds significant and positive only between size and exploiting capacity. That is, likely and quite reasonably, only large companies are able to get advantages through AKE. If we combine the two aspects, it comes that *companies with large size tend to be associated with the capacity to exploit not only their direct neighbors, but also (through them) the rest of the network*. Conversely, the large companies that are exploited by AKE suffer it only from their direct neighbors.[3] These results are also confirmed by the fact that company size is also significantly positively associated with capacity to access knowledge flowing through the AKE chains: average binary and weighted Bc are 0.45 and 0.42, respectively, with much higher values occurring when size is measured in terms of EC and CF—0.53 and 0.49 in the former case and 0.61 and 0.57 in the latter case.

---

[1] It means that the Dcs of EASIN companies do change, because now considered are also the connections with their neighbors.

[2] The number of valid observations for the correlations analyzed here varies from 248 to 429, and in most cases, significance is rather high (see Sect. 7.2 in Data Appendix).

[3] We can see these facts by looking at in- and out-eigenvector and Katz centrality indexes.

Table 7.1 Correlations in EASIN integrated

	EC	EM	TURN	TASS	CF	Average
LORC	− 0.03	− 0.02	− 0.03	− 0.02	− 0.02	–
BIDc	0.18**	0.26**	0.14*	0.17**	0.29**	0.21
BODc	0.24**	0.11	0.13*	0.14**	0.23**	0.17
WIDc	0.39**	0.44**	0.23**	0.28**	0.57**	0.38
WODc	0.32**	0.19**	0.16**	0.18**	0.34**	0.24
BBc	0.53**	0.48**	0.32**	0.30**	0.61**	0.45
WBc	0.49**	0.45**	0.30**	0.28**	0.57**	0.42
BICc	0.18**	0.24**	0.14*	0.16**	0.28**	0.20
BOCc	0.31**	0.13*	0.21**	0.20**	0.27**	0.22
BIEc	− 0.13*	0.18**	0.11	0.16**	− 0.02	0.06
BOEc	0.41**	0.05	0.61**	0.43**	0.02	0.30
WIEc	− 0.13*	0.18**	0.11	0.16**	− 0.02	0.06
WOEc	0.41**	0.05	0.61**	0.43**	0.02	0.30
BIKc	− 0.05	0.20**	0.13*	0.17**	0.05	0.10
BOKc	0.50**	0.19**	0.41**	0.33**	0.36**	0.36
WIKc	0.01	0.21**	0.13*	0.16**	0.11	0.12
WOKC	0.54**	0.24**	0.42**	0.35**	0.41**	0.39
BRc	0.03	0.03	0.04	0.02	0.05	–

Legend Statistical significance: *$P \leq 0.05$, **$P \leq 0.01$

In EASIN, there are only 112 companies, and even less of the sample with valid data, which range from 78 to 93 (see Data Appendix). There is a remarkably high positive correlation (0.58) with binary and even higher (0.62) with weighted Out_Dc, meaning that the bigger a company is the more likely it can obtain a knowledge advantage from its neighbors through its managers. This capacity to exploit AKE is even higher when considering the whole network through the neighbors' neighbors, especially when size is measured in terms of TURN and TASS: about 0.86 and 0.76, respectively. In both the EASIN versions, there is no any significant correlation of any measure of size with the number of influenced companies (LORC) or with the bridging capacity (BRc).

EASIN + NEIGH MC (1641 companies) and EASIN + NEIGH (4423 companies). Things change dramatically in the extended network (Tables 7.6, 7.7 and 7.10 in Data Appendix), where any correlation dissolves, likely also due to the lack of attributive data,[4] with the exception of a very mild positive association with LORC in the MC: 0.12 and 0.17 for EC and TURN, respectively. Therefore, it seems that outside the

---

[4] The number of valid cases drops down to between 300 and 550 in MC and between 990 and 2200 in E+N (see Data Appendix).

Table 7.2 Correlations in EASIN

	EC	EM	TURN	TASS	Average
LORC	0.09	0.02	− 0.01	− 0.04	–
BIDc	− 0.16*	− 0.09	− 0.11	− 0.14	− 0.13
BODc	0.59**	0.43**	0.67**	0.64	0.58**
WIDc	− 0.15	− 0.09	− 0.12	− 0.14	–
WODc	0.65**	0.53**	0.66**	0.66	0.63**
BBc	0.03	0.13	0.10	0.06	–
WBc	0.03	0.13	0.10	0.06	–
BICc	− 0.15	− 0.09	− 0.11	− 0.14	− 0.12
BOCc	0.60**	0.43**	0.70**	0.66**	0.60
BIEc	0.02	0.05	0.05	0.02	–
BOEc	0.43**	0.06	0.86**	0.76**	0.53
WIEc	0.02	0.05	0.05	0.02	–
WOEc	0.43**	0.06	0.86**	0.76**	0.53
BIKc	− 0.13	− 0.06	− 0.08	− 0.11	–
BOKc	0.64**	0.38**	0.81**	0.76**	0.65
WIKc	− 0.13	− 0.07	− 0.08	− 0.11	–
WOKc	0.70**	0.48**	0.81**	0.78**	0.69
BRc	0.02	0.13	0.08	0.05	–

Legend Statistical significance: $*P \le 0.05$, $**P \le 0.01$

European Aerospace Industry, inter-firm coordination through this type of asymmetric links has no association with company size, excepted for those that are at the top of long and wide chains of influenced companies.

Top 200. If ordered in terms of TASS, TURN, EC or EM (see Tables 7.8 and 7.12 in Data Appendix), in EASIN + NEIGH there is no correlation between any kind of Dc, Bc and BRc indexes and any kind of economic attributes.

Sectoral and industrial correlations. The specification of correlations for sectors and Aerospace Industry (see Tables 7.13–7.15 in Data Appendix) shows results very different from the two previous forms of coordination networks: (i) with few interesting exceptions, focusing on specific sectors does not provide a substantial gain in terms of growth of correlation; (ii) the focus on the sole Aerospace Industry does not produce higher correlations; and (iii) correlations with direct and indirect (Dc and Bc) centrality are very different. The most interesting exception is the remarkable association (> 0.5) between Out_Dc and EM in the Professional Activities sector (Table 7.13c in Data Appendix), which suggests that large companies of that particular sector generate high influence by appointing their managers into the board of others. A similar result holds also when considering TURN instead of EM as size variable.

In the Manufacturing sector (Table 7.13a in Data Appendix), the positive asso-
ciation of Out_Dc with employees' size is much weaker (0.18), but it occurs much
stronger than with Bc, meaning that large companies are usually those more able to
intermediate HINTs. A final remark should be done on the not irrelevant (0.26) posi-
tive correlation between binary In_Dc and EM in the Financial sector (Table 7.13b),
which suggests that they receive an asymmetric control from other companies that
appoint their managers into the boards of Financial companies. It could be supposed
that this fact is a sort of reciprocal control made by companies that get equity or loan
capital from Financial companies. Moreover, a milder coefficient (0.18) between
the same variables—In_Dc and EM—occurs also into the Manufacturing sector
(Table 7.13a), meaning that also between this type of companies held this same
asymmetric coordination mechanism.

7.3   Network Analysis

EASIN. The crucial network traits of both the EASIN (Table 7.3a) and the extended
version (Table 7.3b) of the asymmetric coordination are the almost total fragmenta-
tion degree[5] and the perfect hierarchical degree.[6] These two topological properties
have a lot of implications: a very low (about 0.06) global clustering coefficient (GCL),
lack of betweenness centralization (Bc_CE), an almost irrelevant degree centraliza-
tion (in both Freeman's and Snijders' measures) and, at least within the EASIN
network, a very short diameter (2) and a very short (1.04) average distance (Apl).

As we have already seen in the previous section, the EASIN network is rather small
(112 companies) grouped into 37 components, none of which is strongly connected,
out of which a very small MC (10 companies). The diffusion of this form of hybrid
coordination is rather limited: only 87 shared positions, which lowers to 12 in the MC.
In short, this network is made of a number of (many disconnected) out-trees in the
form of stars and a series of dyads. This can be confirmed by the components analysis
made in Sect. 4.3 of Chap. 4, deepened also in Sect. 7.6 of this chapter dedicated to
cluster analysis, which is supported by a visual representation. However, the weights
of links in some component, and the length and size of some chains of AKE, which
reside into the MC, make out-eigenvector centralization almost complete.[7]

EASIN + NEIGH. The network size grows enormously to 4414 when including
the neighbors (Table 7.3b), with the remarkable use of about 17 thousand shared
positions, largely occurring (63%) in the main component, which however contains
only 37% of companies. Therefore, the average number of links is almost 4 and grows

---

[5] The lower value of distance weighted fragmentation shows that links weights of peripheral nodes
and small components are smaller than those in the MC.

[6] This latter is represented by the zero value of reciprocity and geo(desic) reciprocity degree.

[7] Here, we do not apply Katz centralization, because when it is applied to a directed network like
this with many nodes having only out- or only in-edges, Katz centrality lacks validity: see Newman
(2010) and our Methodological Appendix.

Table 7.3a　M2D EASIN: main indexes of network analysis

Index	EASIN [b]	EASIN MC [b]	EASIN [w]	EASIN MC [w]
Size	112	10	112	10
Density (norm)	0.007	0.133	0.007	0.133
Density (abs)	87	12	95	12
Fragmentation	0.993	0.833	0.042	0.167
Av. link value	1	1	1.092	1.0
ADc	0.777	1.2	0.848	1.2
Out_Dc_CE (Fre)	0.038	0.469	–	–
In_Dc_CE (Fre)	0.029	0.222	–	–
Out_Dc_CE (Sni)	0.002	0.141	–	–
In_Dc_CE (Sni)	0.001	0.030	–	–
Bc_CE	0.000	0.011	0.000	0.011
RWB_CE	–	0.573	–	0.375
Out_Eig_CE	0.999	0.999	0.999	0.999
In_Eig_CE	0.999	0.999	0.999	0.999
Reciprocity	0.000	0.000	0.000	0.000
Geo-reciprocity	0.000	0.000	0.000	0.000
GORC	0.056	0.444	0.005	0.444
GIRC	0.029	–	0.005	–
Diameter	2	2	2	2
Apl	1.044	1.200	1.066	1.200
GCL	0.064	0.174	0.064	0.174
SW	27	24	–	–

Legend b = binary links, MC = main component, w = valued links; ADc = average degree centrality; Dc_CE = degree centralization: (Fre) is according to Freeman, while (Sni) is according to Snijders; Bc_CE = betweenness centralization; RWB_CE = random walk betweenness central-ization; Eig_CE = eigenvector centralization; Geo-reciprocity = hierarchical degree according to Krackhardt's approach; GORC = hierarchical degree according to the reaching capacity; Apl = average path length; GCL = global clustering coefficient; SW = small-worldliness index

to 6.5 in the main component. Due to the 40 times size increase, the diameter grows too from 2 to 6. Similarly to the EASIN-only network, this one too is fragmented into a lot of components: 328, none of which is strongly connected. Thus, *the topology of this network is very similar to that of the EASIN only: it is made by a huge number of out-trees in a star-like form whose links are oriented mostly toward the central node (in-star) or from it to the neighbors (out-star).* The largest among them, where the neighbors appoint managers to their neighbors' boards—or vice versa, but more seldom, arrive through neighbors to the central "knowledge-exploited" company—become true (centrifugally or centripetally oriented) pyramids. There are no reciprocal connections (also due to methodology, consider the Methodological Appendix), that is, no cases where company A appoints a manager into the board

Table 7.3b M2D EASIN + NEIGH: main indexes of network analysis

Index	EASIN + NEIGH [b]	EASIN + NEIGH MC [b]	EASIN + NEIGH [w]	EASIN + NEIGH MC [w]
Size	4423	1641	4423	1641
Density (norm)	0.001	0.004	0.001	0.004
Density (abs)	17,024	10,715	20,966	13,496
Fragmentation	0.999	0.995	0.233	0.275
Av. link value	1	1	1.232	1.260
ADc	3.857	6.530	4.750	8.224
Out_Dc_CE (Fre)	0.025	0.066	–	–
In_Dc_CE (Fre)	0.046	0.124	–	–
Out_Dc_CE (Sni)	0.004	0.014	–	–
In_Dc_CE (Sni)	0.004	0.017	–	–
Bc_CE	0.000	0.000	0.000	0.000
RWB_CE	–	0.465	–	0.279
Out_Eig_CE	0.704	0.705	0.704	0.705
In_Eig_CE	0.986	0.994	0.981	0.992
Reciprocity	0.000	0.000	0.000	0.000
Geo-reciprocity	0.000	0.000	0.000	0.000
GORC	0.034	0.009	0.000	0
GIRC	0.049	0.129	0	0
Diameter	6	6	12	12
Apl	1.304	1.379	–	–
GCL	0.060	0.083	0.060	0.083
SW	158	35	–	–

Legend b = binary links, MC = main component, w = valued links; ADc = average degree centrality; Dc_CE = degree centralization: (Fre) is according to Freeman, while (Sni) is according to Snijders; Bc_CE = betweenness centralization; RWB_CE = random walk betweenness central-ization; Eig_CE = eigenvector centralization; Geo-reciprocity = hierarchical degree according to Krackhardt's approach; GORC = hierarchical degree according to the reaching capacity; Apl = average path length; GCL = global clustering coefficient; SW = small-worldliness index

of company B and vice versa, but there are many cases of transitive triads, where company A appoints one or more managers into the boards of company B and C, and one of these two does the same with the other. In conclusion, *the companies that acquire a competitive advantage through AKE do it in a one-way direction, because none of the companies sharing their board has any direct (reciprocal) or even indirect (through a path) M2D flowing in the opposite direction.* Seldom (13% of cases in EASIN and 16% in E+N), they can have also an inter-board connection, and in 58% and 51% of cases (respectively), they have also a DINT connection.

EASIN + NEIGH MC. However, none of the two types of coordination reinforcements occurs in the MC of E+N, which actually is the core structure. *All this configures a strongly hierarchical relationship behind the AKE, which indeed appears as the clue of a more general subordination of the company that shares its board.* Actually, as we will see below in Sect. 7.8, in EASIN the distribution of In_ and Out_Dc is heavy-tail, where the largest majority of companies receive only one manager into their board and only one company receives 4 in-edges, and only one company sends 5 out-edges into other companies' boards. The same heavy-tail structure holds in the extended network, but with very extreme values: 10 companies have more than 100 HINT connections from the "subordinate side", that is, incoming links, out of which one has more than 209. As we explain in the Methodological Appendix, it does not mean that in that company there are 209 directors, who are managers in 209 companies. In fact, as it happens also for the M2M or D2D networks, many companies can share the same person—be s/he a manager or a director—and so the number of persons corresponding to those links is very small: it could reduce to 4–5 people, and at the extreme cases also to just one. Actually, in Sect. 3.3 (subsection *People and Positions*) of Chap. 3 we have shown that some directors and some managers connect a huge number of companies.

The main difference between M2D and the other two forms is that *the structures of "coordination by knowledge exploitation" (AKE clusters) are made essentially by open or transitive triples, while in M2M and D2D they are mostly made by cliques.* In fact, in M2D there are no strong cliques and only relatively few small groups of 3 and very rarely 4 companies. Further, as we will show more deeply in Sect. 7.9 of this chapter while discussing the heavy-tail distribution form of direct links, the companies that have the highest In_Dc usually do not have high Out_Dc, and often no Out_Dc at all, and vice versa. In other words, *a knowledge exploiter is not exploited on its own, and vice versa. The companies able to acquire AKE advantages have a truly competitive advantage, and vice versa.*

7.4   Inter-sectoral Network

In the AKE perspective, inter-sectoral network tells us to what extent sectors use this coordination mechanism to interact and whether some sector is in a particularly advantageous position with respect to others. If compared to other economic or trade inter-firm networks (i.e., Bojanowski et al., 2012; Cepeda et al., 2017; Daisuke et al., 2017), the M2D inter-sectoral network is very dense (0.54), meaning that *AKE clusters tend to be very inter-sectoral.* However, if compared with the other managers or directors' inter-sectoral networks, which score 0.87 and 0.81 normalized density, this network is much sparser (Table 7.4). This sounds rather reasonable, because AKE is a true form of exploitation that is hard to obtain with respect to symmetric (of equal relevance) forms of knowledge sharing. Likely, it is more difficult to realize it between companies of different sectors.

Table 7.4 Inter-sectoral network of the M2D network

Index	Binary	Weighted
Size	22	
Density (norm)	0.580	0.580
Density (abs)	266	16,049
Fragmentation	0.045	0.303
Av. link value	1	60.34
ADc	12	729.5
Out_Dc_CE (Fre)	0.395	–
In_Dc_CE (Fre)	0.444	–
Out_Dc_CE (Sni)	0.371	–
In_Dc_CE (Sni)	0.473	–
Bc_CE	0.104	0.122
RWB_CE	0.073	0.505
Out_Eig_CE	0.102	0.939
In_Eig_CE	0.109	0.484
Out_Katz_CE	0.001	0.220
In_Katz_CE	0.001	0.075
Reciprocity	0.729	0.987
Geo-reciprocity	0.048	0.119
GORC	0.048	0.002
GIRC	0.048	0.006
Apl	1.435	–
GCL	0.754	78.7
SW	1.45	

Legend b = binary links, MC = main component, w = valued links; ADc = average degree centrality; Dc_CE = degree centralization: (Fre) is according to Freeman, while (Sni) is according to Snijders; Bc_CE = betweenness centralization; RWB_CE = random walk betweenness centralization; Eig_CE = eigenvector centralization; Geo-reciprocity = hierarchical degree according to Krackhardt's approach; GORC = hierarchical degree according to the reaching capacity; Apl = average path length; GCL = global clustering coefficient; SW = small-worldliness index

If we compare this with the ALL network—which, by virtue, are both directed networks—we see that it has a higher degree centralization, but a much lower betweenness and eigenvector centralization. This could suggest that the main sector—that in both cases is Manufacturing—has less centrality relevance (see Table 7.16 in Data Appendix). However, if we consider weights of links and distinguish Out_Dc from In_Dc, that is exploiters from exploited sectors, we see that ranking does considerably change: with 8791 shared positions, the Manufacturing sector is far more able to get AKE advantages, followed by the Financial sector

with 1889 shared positions, then by the Wholesale sector (1065), the Professional Activities sector (884) and then EASINT (EASIN Integrated)[8] with 420 shared positions. Hence, despite the Financial sector and EASINT have almost the same number of companies (409 and 429, respectively) employing this type of coordination, *the Financial sector activates it more than 4 times intensively than EASINT companies.* This appears as a clear sign of weakness of EASINT, because being on the exploiting side of AKE indicates influence power. In this perspective, Table 7.5 is even more informative: while the Manufacturing sector is a "net exploiter" for 43% of its shared positions, EASINT is a "net exploited" for 78% of its links. Because most (54%) of Manufacturing companies are Anglo-American even in this type of coordination form, here we see the *subordination of EASINT with respect to that geographical block—the inflow is 25 times higher than the outflow.* Among the main sectors, even the Financial, the Professional Activities and the ICT sectors result to be net exploited for, respectively, 23, 37 and 45% of its shared positions, while the Wholesale confirms to be a strong sector with 43% of favorable AKE.

Though not much centralized in terms of geodesic Bc (0.10 and 0.12 for the binary and weighted version, respectively), this network is very much centralized in terms of weighted RWBc (0.5), which is a much more effective and informative measure. The Manufacturing sector is again the leader in accessing this indirect form of AKE (see Table 7.16 in Data Appendix), followed by the Professional Activities and the Financial sectors with half capacity, and then by EASINT with a little bit less capacity. It means that *though the Professional Activities sector, the Financial sector and EASINT are AKE exploited more than exploiters, they have anyway a high capacity to access strategic knowledge produced by other sectors with AKE forms.* In this sense, it is noticeable that the Wholesale sector, which is a strong net exploiter in direct relationships, has a weaker capacity to access AKE advantages by accessing flows circulating between other sectors.

There is also a lower binary reciprocity, which is here 0.78, while in the ALL network is complete, but indeed, when considering links' weights, even in this network reciprocity is almost full, meaning that, when considering the intensity of knowledge flow, there is no any particular sector more exploited than others. Interestingly, both these networks are weakly shaped in a small-world way, though the GCL of both networks is rather high, especially in the ALL network. This is due to the extremely high fragmentation and directionality of scarce flows, and its economic meaning is that *AKE advantages are not transferred across AKE clusters: by keeping them "entrapped" in each cluster, "exploiters companies" are very attentive to not share such competitive advantages with others.*

As we can see (Tables 7.6a and 7.6b), unlikely of M2M and D2D coordination forms, only 16% of links are internal to each sector: the largest majority is cross-sectoral. Such percentage almost doubles in the Financial (K) sector, and it raises up to 24% in the Manufacturing (C) sector, while it is very small in EASINT (4%). Hence,

---

[8] We remind that the integrated version of EASIN includes also the companies that in EASIN are isolated, but become connected when considering also its neighbors. In M2D EASINT is made of 429 companies, 342 more than EASIN.

Table 7.5 Cross-sectoral power gap in M2D

Sector	EXT-INT weighted links	EXT-INT share on TOT links (%)
C	5324	43
G	637	43
L	155	18
H	132	14
A	86	29
F	59	16
I	21	18
U	10	100
T	9	69
E	4	25
R	− 2	− 4
D	− 7	− 4
Q	− 10	− 17
B	− 32	− 43
O	− 48	− 73
S	− 55	− 20
P	− 73	− 46
N	− 286	− 19
J	− 862	− 45
M	− 1027	− 37
K	− 1109	− 23
EASINT	− 2926	− 78

it seems that *the Financial sector employs this asymmetric way of coordination within itself much more intensively than it would happen between companies of other sectors.*

Because the largest majority of AKE is cross-sectoral, it is therefore important to deepen this aspect, so to discover who is more significantly exploiting/influencing whom. Now, if we look at the inter-sectoral out-flows (Table 7.17 in Data Appendix, Table 7.7 and Fig. 7.3), we see that *the Manufacturing sector exploits AKE advantages of the other sectors with the following shares: 71% of EASINT, 74% of Information sector, 49% of the Professional Activities sector and 43% of the Financial sector.* Therefore, the Manufacturing sector managers can substantially acquire the other sectors' strategic knowledge. Quite interestingly, besides itself (with the 24% of share), *the Financial sector is particularly influential (43%) on the Administrative and Institutional sector.* In an industry such as the Aerospace, characterized by the essential role of public institutions as both customers and regulators, that relative majority share is *a clear sign of the strategic choice of banks and other financial operators to access the very crucial information residing into the board of the most*

Table 7.6a Share of internal (binary) links across sectors

Sector	IDB	ShITB (%)	EDB	TDB	ShTB (%)	ShIB (%)
C	1460	54	1131	6040	35	24
EASINT	87	3	2354	2441	14	4
K	698	26	1565	2263	13	31
M	160	6	1380	1540	9	10
J	82	3	1140	1222	7	7
G	26	1	349	879	5	3
N	52	2	771	823	5	6
L	15	1	246	499	3	3
H	48	2	317	487	3	10
F	21	1	110	168	1	13
A	29	1	41	157	1	18
S	1	0	153	154	1	1
P	4	0	109	113	1	4
I	6	0	43	69	0	9
O	0	0	57	57	0	0
D	18	1	37	55	0	33
B	2	0	47	49	0	4
Q	0	0	34	34	0	0
R	0	0	29	29	0	0
T	0	0	2	11	0	0
U	0	0	0	10	0	0
E	0	0	4	8	0	0
Total	2709	100	9919	17,108	100	16

Legend Acronyms explained in the list of abbreviations
ShITB = IDB/total IDB (vertically)
ShTB = TDB/total TDB (vertically)
ShIB = IDB/TDB

important institutions giving in exchange only operative knowledge (or maybe just nothing else).

Conversely, from the perspective of sectors chosen as targets for employing a sector's effort of AKE exploitation, the largest part of the Manufacturing managers appointed as directors are placed into EASINT (27%), itself (24%), 15% the Financial sector, 12% the Information sector and 11% into the Professional Activities sector. EASINT's main efforts to access strategic information through hybrid connections go to itself (23%), to the Manufacturing sector (20%), the Financial (14%) and the Professional Activities sector (13%). As for the Financial sector, the largest part goes to itself (39%), then the Manufacturing sector (12%) and to EASINT with only 8%, thus showing a *relatively scarce interest to employ this way to acquire*

Table 7.6b Share of internal (weighted) links of sectors

Sector	IDW	ShITW (%)	EDW	TDW	ShTW (%)	ShIW (%)
C	2150	60	1317	8791	39	24
EASINT	95	3	3251	3346	15	3
K	740	21	2258	2998	13	25
M	173	5	1738	1911	8	9
J	107	3	1277	1384	6	8
G	31	1	397	1065	5	3
N	55	2	857	912	4	6
H	48	1	355	535	2	9
L	15	0	333	503	2	3
F	25	1	126	210	1	12
A	54	2	51	191	1	28
S	2	0	162	164	1	1
P	4	0	111	115	1	3
D	47	1	39	86	0	55
I	6	0	43	70	0	9
O	0	0	57	57	0	0
B	4	0	49	53	0	8
Q	0	0	35	35	0	0
R	0	0	29	29	0	0
T	0	0	2	11	0	0
E	0	0	6	10	0	0
U	0	0	0	10	0	0
Total	3556	100	12,493	20,966	100	16

Legend Acronyms explained in the list of abbreviations
ShITW = IDW/total IDW (vertically)
ShTW = TDW/total TDW (vertically)
ShIW = IDW/TDW

strategic knowledge. The Professional Activities sector addresses its hybrid connections mostly to the Manufacturing sector (25%), itself (20%), EASINT (16%) and the Financial sector (12%). Such flows tell us that EASINT and the most important sectors are very intertwined not only with the symmetric links of BINT and DINT, but also even through HINT. However, they also disclose that EASINT exploits AKE more from itself than from the other sectors: 95 shared positions, followed by 83 from the Manufacturing, 58 from the Financial, 54 from the Professional Activities, etc. Vice versa, EASINT is exploited far more by the others than by itself: 3251 shared positions appointed by other sectors, out of which 2373 are with the Manufacturing sector, that is, coming from the Anglo-American companies. This means that *horizontal HINTs are much less diffused than vertical HINTs when EASINT*

Table 7.7 Major 30 cross-sectoral coordination efforts

Source	Target	Weight
C	EASINT	2373
C	K	1298
C	J	1030
C	M	945
K	N	395
G	C	343
N	K	251
C	G	246
G	M	230
M	C	224
K	C	222
C	N	205
L	K	186
C	H	182
G	EASINT	164
C	L	161
K	EASINT	147
M	EASINT	137
J	C	132
G	K	125
H	EASINT	123
K	M	116
M	K	109
H	M	108
J	J	107
G	N	91
N	M	86
EASINT	C	83
H	K	79
J	M	78

is the "victim of exploitation", while they are only a little bit more diffused when EASINT is the exploiter.

If we look at bilateral AKE (Table 7.7), we see that the four highest bilateral AKEs occur between the Manufacturing sector on the exploiting side and EASINT, the Financial, the ICT and the Professional Activities sectors on the exploited side, with the former having almost double (2373) shared positions than the second one (1298). Indeed, in the list of the early 30 partnerships, while the Financial sector appears already at the fifth rank—and with a remarkable number of shared positions (395),

to see EASINT on the side of exploiters, we must scroll almost the whole list, and with a rather small number (83) of shared positions appointed into the Manufacturing sector. This is another way to look at the AKE between the Manufacturing (and thus the Anglo-American) companies and EASINT, which favors the former against the latter.

Companies' propensity for adopting hybrid coordination. Average propensity of EASIN companies to (actively or passively) adopt shared positions in the form of hybrid manager-director coordination is 0.85, which corresponds to the average link value showed in Table 7.3a if we consider that it resembles the connected part— and there are also the isolates what makes the index go below 1. For the whole extended network (Table 7.8), that propensity is much higher (4.8 shared positions per company), and for EASINT, it is even higher (7.8). Interestingly, with respect to the five main sectors (C, G, J, K and M), that propensity reaches the highest value, and it is mostly due to the coordination with external companies. More specifically, when distinguishing between the exploiter versus exploited role, the Financial (K), the ICT (J) and the Professional Activities (M) sectors show a much higher propensity to be exploited (EIDW) than exploiting (EODW). Conversely, the Manufacturing (C) and Wholesale (G) companies seem to have the opposite propensity (Fig. 7.4).

7.5   Inter-country Network

EASIN. Only 15 EU28 countries are involved in this type of hybrid coordination (Table 7.9), and its links are much less dense than the inter-sectoral network, which is also bigger than this one (22): normalized density is 0.167 versus 0.58, corresponding to 35 links in binary and 95 in weighted terms. Conversely, it is very similar to the inter-country network of D2D, which has about the same number of countries (16) and links (30), but it has actually a much higher intensity of shared positions, confirming that this hybrid type of coordination is used in a more parsimonious way, likely due to the difficulty to be accepted by the "exploited party". In both networks, there are 9 the same missing countries, out of which the larger ones in terms of size are Austria, Poland or Czech Republic. The difference is much bigger with the M2M inter-country network, which involves almost all EU28 countries and has an intensity of connections 16 times stronger than it, showing the strength of such coordination also at inter-country level. Consequently, the average number of shared positions per each link between countries is much lower: 2.7 for M2D, 18.9 for D2D and 14.6 for M2M. Each country has 2.3 average connections, channeling 6.3 shared positions, which become about 50 for D2D and 61 for M2M.

Further, this M2D network is rather fragmented: 0.605 versus 0.547 of M2M and 0.35 of D2D. This is due to the fact that this is a directed network, while the other two are undirected, and thus, even after aggregating companies into countries, many countries do not have reciprocal connections: reciprocity is only 0.17 and 0.56, in binary and weighted terms, respectively. Even georeciprocity is rather high (0.49

**Table 7.8** Companies' weighted propensity to coordinate across sectors

Sectors	# of companies	# of (weighted) links per company			
		IDW	EODW	EIDW	Total
A	35	1.54	3.91	1.46	5.46
B	12	0.33	1.42	4.08	4.42
C	1657	1.30	4.01	0.79	5.31
D	25	1.88	1.28	1.56	3.44
E	6	0.00	1.67	1.00	1.67
EASINT	429	0.22	0.76	7.58	7.80
F	76	0.33	2.43	1.66	2.76
G	251	0.12	4.12	1.58	4.24
H	127	0.38	3.83	2.80	4.21
I	26	0.23	2.46	1.65	2.69
J	199	0.54	2.09	6.42	6.95
K	409	1.81	2.81	5.52	7.33
L	144	0.10	3.39	2.31	3.49
M	328	0.53	2.17	5.30	5.83
N	198	0.28	2.88	4.33	4.61
O	5	0.00	1.80	11.40	11.40
P	31	0.13	1.23	3.58	3.71
Q	16	0.00	1.56	2.19	2.19
R	16	0.00	1.69	1.81	1.81
S	39	0.05	2.74	4.15	4.21
T	4	0.00	2.75	0.50	2.75
U	1	0.00	10.00	0.00	10.00
No data	380	–	–	–	–
Total	4414	0.44	2.77	3.26	4.83

Legend Acronyms explained in the list of abbreviations

and 0.54, in binary and weighted terms, respectively), meaning that AKE remains unequal even indirectly, that is, moving alongside paths.

If measured in binary terms, no any country has particularly better capacity to exploit the others, as witnessed by the two indexes of Out_Dc centralization (particularly low for the Snijders' index), but if we consider the intensity of this hybrid coordination, four countries (and especially France) have a significantly better capacity (Table 7.18 in Data Appendix). Conversely, In_Dc centralization is rather high in both binary and weighted terms, showing that the UK is often the major target of direct exploitation, as it can be seen also in Fig. 7.5. If we look at the indirect capacity to exploit other countries, we see that, especially when considering the intensity of exploitation, this power is very much centralized, as it is witnessed by weighted

Fig. 7.4 The inter-sectoral graph of EASIN + NEIGH coordination. *Legend* The size of nodes varies accordingly to the number of companies, while the size of links varies with its weight, that is, the number of coordination agreements under the form of the hybrid department-board relations
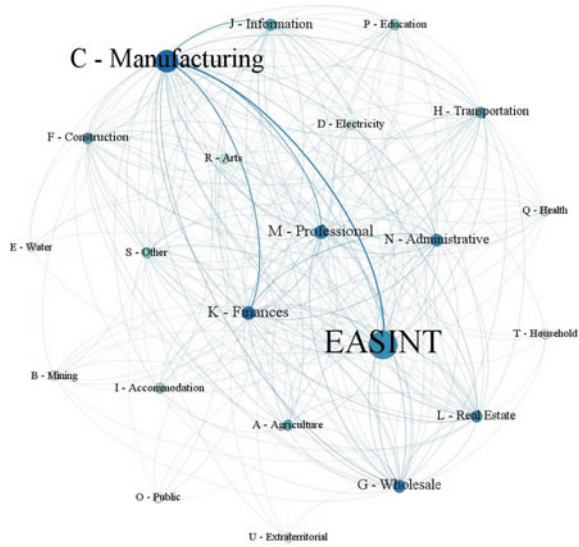
out-eigenvector and Katz centralization (Table 7.9), and concentrated in the hands of France and the UK (Table 7.18 in Data Appendix). The same holds for the side of exploited countries, where the UK appears to be the preferred target.

Because of high fragmentation, intermediation power and the variance of exploitation components size are both relatively low, as shown by Bc_CE and GORC. However, *especially when considering weighted values, France and the UK appear to be the key countries also in accessing strategic knowledge flowing through this coordination mechanism* (Table 7.11). Finally, this network is shaped in a lowly SW way, indicating the reluctance of AKE to be transferred across clusters of countries (Tables 7.10a and 7.10b).

The degree of geographical closure is strictly less than 30% (Tables 7.10a and 7.10b), thus *showing a clear preference for inter-country relationships*, in evident contrast with what occurs for inter-board and inter-departmental connections, which round about 82–79% and 72–77%, respectively (in binary and weighted terms).

Hybrid coordination propensity per company. Within EASIN, companies' propensity to employ hybrid coordination is generally very low, with the three remarkable exceptions of the Netherlands (3.67), entirely due to the capacity to exploit other countries' companies, followed by Belgium (1.83), mostly in the role of exploited by other countries' companies, and then Denmark and France (1.47), more in the active exploitation role (Table 7.12).

EASIN + NEIGH. Unlike EASIN, in the extended network HINT involves almost all countries (61) through 392 inter-country connections (Table 7.13), not far from the analogous M2M inter-country network, which involves as well 61 countries through 560 connections (Table 5.15). However, as we have seen in the previous chapter, through the existence of huge cliques and the extremely high coordination

Table 7.9 Inter-country network of EASIN

Index	Binary	Weighted
Size	15	
Density (norm)	0.167	
Density (abs)	35	95
DD	0.01	
Fragmentation	0.605	0.528
Av. link value	1	2.714
ADc	2.33	6.33
Out_Dc_CE (Fre)	0.204	–
In_Dc_CE (Fre)	0.587	–
Out_Dc_CE (Sni)	0.033	–
In_Dc_CE (Sni)	0.184	–
Bc_CE	0.184	0.161
Out_Eig_CE	0.422	0.556
In_Eig_CE	0.554	0.919
Out_Katz_CE	0.057	0.503
In_Katz_CE	0.129	0.864
Reciprocity	0.171	0.558
Geo-reciprocity	0.506	0.456
GORC	0.256	0.021
GIRC	0.342	0.017
Apl	2.120	4.205
GCL	0.347	0.869
SW	5.261	

propensity, this inter-departmental coordination at inter-country level is implemented by almost 2.8 shared positions, while here there are only 21 thousand hybrid shared positions. Conversely, inter-board coordination at inter-country level of the extended network involves only 45 countries through 258 connections, which however are implemented with 354 thousand shared directors (Table 5.16). Therefore, *AKE is very diffused across EASINT neighbors, but it is used in a very selective and specific way, which means it is restricted to very small weak (and mostly transitive) cliques or relatively large out-components.* Indeed, the large majority (83%) of links and shared positions are implemented in neighbor-to-neighbor coordination, a share that is very high, but actually less than what characterizes BINT and DINT coordination. Conversely, in terms of number of companies, the share of neighbors is superior to that corresponding to M2M and D2D: 83 and 85%, respectively. Consequently to this much smaller intensity of coordination, the average number of shared positions per each pair of companies is only 53, while for D2D is 1252 and M2M is 2586.

Fig. 7.5 The inter-country graph of EASIN coordination. *Legend* The size of nodes varies accordingly to the number of companies, while the size of links varies with its weight, that is, the number of coordination agreements under the form of the hybrid department-board relations
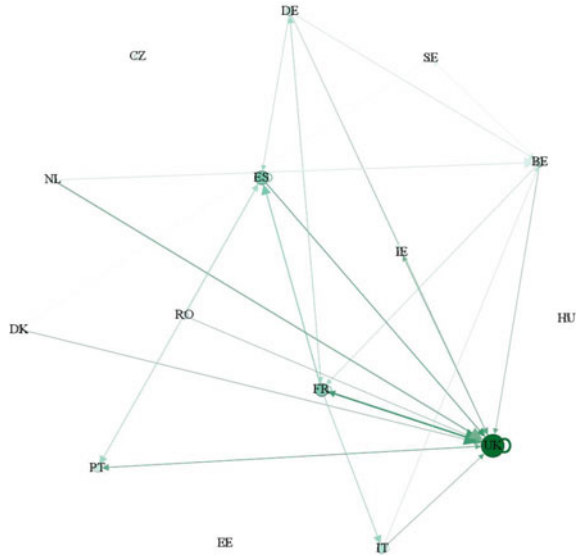

Table 7.10a Share of internal (binary) links of countries

Countries	IDB	ShITB (%)	EDB	TDB	ShTB (%)	ShIB (%)
UK	12	35	23	35	30	34
FR	5	15	4	20	17	25
ES	6	18	7	13	11	46
NL	0	0	0	9	8	0
DE	0	0	2	7	6	0
BE	0	0	6	6	5	0
IT	4	12	2	6	5	67
PT	1	3	5	6	5	17
RO	2	6	0	5	4	40
CZ	2	6	0	2	2	100
DK	0	0	0	2	2	0
IE	0	0	2	2	2	0
SE	0	0	2	2	2	0
EE	1	3	0	1	1	100
HU	1	3	0	1	1	100
Total	34	100	53	117	100	29

Legend Total links per country are a sum of internal and the larger value of external links. Acronyms explained in the list of abbreviations

ShITB = IDB/total IDB (vertically)

ShTB = TDB/total TDB (vertically)

ShIB = IDB/TDB

Table 7.10b   Share of internal (weighted) links across countries

Countries	IDW	ShITW (%)	EODW	EIDW	TDW (%)	ShTW (%)
UK	13	36	26	39	30	33
FR	5	14	4	23	18	22
ES	6	17	7	13	10	46
NL	0	0	0	11	8	0
BE	0	0	8	8	6	0
DE	0	0	2	7	5	0
IT	4	11	3	7	5	57
PT	2	6	5	7	5	29
RO	2	6	0	5	4	40
DK	0	0	0	3	2	0
CZ	2	6	0	2	2	100
IE	0	0	2	2	2	0
SE	0	0	2	2	2	0
EE	1	3	0	1	1	100
HU	1	3	0	1	1	100
Total	36	100	59	131	100	27

Legend Total links per country are a sum of internal and the larger of external links. Acronyms explained in the list of abbreviations
ShITW = IDW/total TDW (vertically)
ShTW = TDW/total TDW (vertically)
ShIW = IDW/TDW

Table 7.11   Major 5 cross-country coordination efforts

Source	Target	Weight
FR	UK	9
NL	UK	6
NL	BE	5
FR	ES	4
ES	UK	3

Consistently, the average number of shared positions is much higher in these latter two types of coordination.

Binary reciprocity has an intermediate level (0.43), which about doubles when considering links weights, meaning that most intensive links are reciprocal. However, what is rather surprising is that geodesic reciprocity has an intermediate value for both binary and weighted measures: 0.5 and 0.46, respectively. Further, there are small size differences among out-components for both binary and weighted measures, as witnessed by GORC: 0.21 and 0.09, respectively. All this explains the absence of strong cliques, the smallness of weak cliques and the medium value of (binary)

Table 7.12 Companies' weighted propensity to coordinate across EASIN countries

Country	# of companies	IDW	EODW	EIDW	Total
BE	6	0.00	0.50	1.33	1.83
CZ	3	0.67	0.00	0.00	0.00
DE	7	0.00	1.00	0.29	1.29
DK	2	0.00	1.50	0.00	1.50
EE	2	0.50	0.00	0.00	0.00
ES	16	0.38	0.38	0.44	0.81
FR	15	0.33	1.20	0.27	1.47
HU	2	0.50	0.00	0.00	0.00
IE	2	0.00	0.00	1.00	1.00
IT	9	0.44	0.22	0.33	0.56
NL	3	0.00	3.67	0.00	3.67
PT	6	0.33	0.17	0.83	1.00
RO	4	0.50	0.75	0.00	0.75
SE	2	0.00	0.00	1.00	1.00
UK	33	0.39	0.15	0.79	0.94
Total	112	0.64	0.42	1.05	0.27

Legend Acronyms explained in the list of abbreviations

fragmentation, much higher than in the analogous extended inter-country D2D and M2M networks: 0.42 versus 0.09 and 0.03, respectively. However (and interestingly), despite such traits and a consequent not high value of global clustering (0.57), the small-world structure of this network is 5.4 (Table 7.13), which indeed is small, but anyway double than that of the two analogous inter-country coordination networks and triple of all inter-sectoral networks. This means that *the strategic knowledge obtained through this type of coordination flows more easily across clusters of countries than across sectors and more easily than across clusters of countries of the other two types of coordination.*

Like the EASIN + NEIGH inter-country network, the centralization degree of exploiting countries is lower than that of exploited countries: Out_Dc_CE (Sni) is 0.17, and In_Dc_CE (Sni) is 0.22. If we look at the former group of countries (Table 7.19 in Data Appendix), the US is by far the most important country with almost 11 thousand positions of managers appointed as directors in some other country (see also Fig. 7.6). Very distantly, the UK (2903) and France (1707) do follow, with EASINT placed only at the 7th rank. Such a dominant position is confirmed also by the extremely high score of weighted out-eigenvector centralization (0.93) and the high Out_Katz centralization (0.59), meaning that *the US and the UK exert their exploitation power also indirectly throughout the network.* If we turn the view to the exploited countries, in binary terms EASINT is the number one, followed by the UK, IT and the US. In weighted terms, the UK is the first one, followed by EASINT,

Table 7.13 Inter-country network of EASIN + NEIGH

Index	Binary	Weighted
Size	61	
Density (norm)	0.107	
Density (abs)	392	20,966
Fragmentation	0.421	0.511
Av. link value	1	53.49
ADc	6.43	343.7
Out_Dc_CE (Fre)	0.433	–
In_Dc_CE (Fre)	0.552	–
Out_Dc_CE (Sni)	0.176	–
In_Dc_CE (Sni)	0.220	–
Bc_CE	0.240	0.197
RWB_CE	0.283	0.617
Out_Eig_CE	0.242	0.929
In_Eig_CE	0.263	0.902
Out_Katz_CE	0.001	0.585
In_Katz_CE	0.001	0.482
Reciprocity	0.434	0.889
Georeciprocity	0.502	0.460
GORC	0.157	0.002
GIRC	0.259	0.008
Apl	2.045	5.225
GCL	0.574	78.03
SW	5.354	

the US, France and Italy. The values of weighted In_Eig and In_Katz centralization are aligned with those of out-edges, and here, the *UK is the most indirectly exploited country, followed by the US and EASINT, both presenting one third of the UK's score.*

Very interesting is the fact that, despite its weak position in terms of direct AKE, EASINT has the first rank in terms of weighted Bc, thus showing to have the best capacity to access strategic knowledge by intercepting its flow across the whole network. The second place is covered by Canada, followed by the US, Spain and France, while the UK, which is so strong in direct AKE, is positioned only at the 8th place. However, the distances between these main countries regarding this capacity are small, and in fact, the corresponding centralization index is rather low (0.197). Conversely, if we turn to the more sophisticated measure of intermediating capacity, as expressed by RWBc, the US covers the first place, closely followed by Italy at short distance, then followed by EASINT and the UK, which have a similar score, corresponding to one third of the US. Hence, despite exploited in direct AKE relationships, EASINT is in the group of five countries that can better access strategic

Fig. 7.6 The inter-country
graph of EASIN + NEIGH
coordination. *Legend* The
size of nodes varies
accordingly to the number of
companies, while the size of
links varies with its weight,
that is, the number of
coordination agreements
under the form of the hybrid
department-board relations
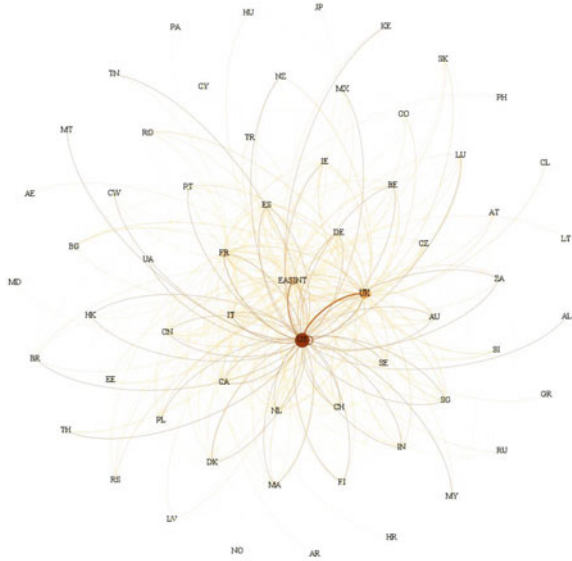
knowledge through this type of coordination mechanism, a group composed by the
US, the UK, Canada and Italy.

EASINT turns out to interact almost entirely with its neighbors (Table 7.14),
rather than among itself. The country with the largest number of links in M2D is
the US, which is more inclined to work with the outside, rather than with their own
country peers. The UK on the other hand is oriented toward the opposite. The degree
of country closure of this type of coordination mechanism is even smaller than that
of EASINT countries (Tables 7.15a and 7.15b)—0.28 in binary and 0.24 in weighted
terms— and much smaller than in the analogous M2M and D2D networks, to reverse
the picture. A possible explanation is that this type of coordination is more selective
and specifically targeted, therefore less influenced by geographical criteria.

Consistently with what we have discussed above about the US dominance and the
weak position of EASINT, we see that, among the twelve main bilateral AKE, the
US covers the first three positions and appears eight times, the UK twice and France
and Canada once. Those eight AKEs with the US in the role of exploiters cover the
75% of the shared positions activated by the early 30 bilateral AKE (Table 7.16).
Among them, EASINT is only once on the exploiters' side and six on the exploited
side.

Hybrid coordination propensity per country. While the average propensity of the
whole extended network to adopt this coordination form is 5.2 shared positions per
company (Table 7.17), most main countries have a much higher propensity: the UK
10.2, EASINT 8.2, DE 7.4, the US 7.3, the NL 6.8 and FR 6.2. At a closer view,
it is further confirmed that the UK and EASINT are mostly providers of strategic
knowledge: 7.2 and 8 shared positions per company, respectively. Conversely, the

Table 7.14 Cross-country power gap in M2D

Country	EXT-INT weighted links	EXT-INT share on TOT links (in %)
US	8067	67
EASINT	3683	95
UK	3656	46
IT	754	59
CA	707	90
DE	596	99
NL	432	68
SE	255	96
AU	250	98
ES	220	55
CH	195	80
MY	165	100
BE	160	49
TH	147	100
SG	143	100
CZ	71	31
PT	− 98	− 37
SK	− 114	− 55
FR	− 247	− 10
IE	− 334	− 43

Legend The top 20 countries are selected according to the total WDc

US and DE are rather operative knowledge providers: 6 and 7.3, respectively. The NL has the interesting role of intensively balancing the two sides of operative and strategic knowledge asymmetric exchanges.

7.6   Cluster Analysis

As for the previous chapters, we run cluster analysis over three clusters[9] (Tables 7.18, 7.19 and Fig. 7.7), whose features are further analyzed by projecting each cluster within its network, thus evidencing where they are placed, and distinguished are also their geographical and sectoral aspects.

---

[9] The methodological procedure to create the clustering analysis is explained in the Methodological Appendix.

Table 7.15a   Share of internal (binary) links across early 20 countries

Countries	IDB	ShIB	EODB	EIDB	TDB	ShTB
US	1592	0.24	970	7847	0.33	0.20
UK	1968	0.30	3285	5253	0.22	0.37
EASINT	87	0.01	2497	2584	0.11	0.03
FR	1291	0.19	608	1899	0.08	0.68
IT	256	0.04	820	1076	0.05	0.24
IE	555	0.08	138	693	0.03	0.80
DE	2	0.00	31	512	0.02	0.00
CA	20	0.00	218	386	0.02	0.05
NL	102	0.02	269	371	0.02	0.27
ES	91	0.01	179	270	0.01	0.34
BE	71	0.01	29	266	0.01	0.27
SE	5	0.00	233	238	0.01	0.02
PT	160	0.02	38	200	0.01	0.80
CZ	75	0.01	23	199	0.01	0.38
SK	129	0.02	0	176	0.01	0.73
CH	19	0.00	146	165	0.01	0.12
TH	0	0.00	147	147	0.01	0.00
AU	3	0.00	89	139	0.01	0.02
MY	0	0.00	130	130	0.01	0.00
SG	0	0.00	126	126	0.01	0.00
Total	6655	1.00	10,369	23,856	1.00	0.28

Legend Total links per country are a sum of internal and the larger value of external links. Acronyms explained in the list of abbreviations
ShITB = IDB/total IDB (vertically)
ShTB = TDB/total TDB (vertically)
ShIB = IDB/TDB

EASIN. In cluster analysis of EASIN, just like in previous chapters, additionally was used normalized TURN, lowered by one decimal point to match scale of network indexes.

Cluster 1. This cluster is in fact only 1 company—Airbus from France, which has very high relative direct and indirect connectivity—as it is a member of the largest component in the network, and also, it has the largest TURN (Fig. 7.8).

Cluster 2. It includes exactly half of companies; they have more TURN than companies in Cluster 3, much more out-going direct and indirect relationships and almost no incoming relationships (Fig. 7.9).

Table 7.15b Share of internal (weighted) links across early 20 countries

Countries	IDW	ShITW	EODW	EIDW	TDW	ShTW
US	1962	0.27	998	10,993	0.36	0.18
UK	2158	0.29	5069	7227	0.23	0.30
EASINT	95	0.01	3414	3509	0.11	0.03
FR	1310	0.18	666	1976	0.06	0.66
IT	265	0.04	946	1211	0.04	0.22
IE	555	0.08	153	708	0.02	0.78
DE	4	0.00	31	573	0.02	0.01
CA	39	0.01	240	545	0.02	0.07
NL	102	0.01	269	371	0.01	0.27
ES	91	0.01	255	346	0.01	0.26
BE	84	0.01	40	288	0.01	0.29
SE	5	0.00	246	251	0.01	0.02
PT	181	0.02	42	223	0.01	0.81
SK	161	0.02	0	208	0.01	0.77
CZ	80	0.01	26	205	0.01	0.39
CH	25	0.00	163	188	0.01	0.13
MY	0	0.00	165	165	0.01	0.00
TH	0	0.00	147	147	0.00	0.00
AU	3	0.00	117	139	0.00	0.02
SG	0	0.00	130	130	0.00	0.00
Total	7353	1.00	13,613	30,810	1.00	0.24

Legend Total links per country are a sum of internal and the larger of external links. Acronyms explained in the list of abbreviations
ShITW = IDW/total TDW (vertically)
ShTW = TDW/total TDW (vertically)
ShIW = IDW/TDW

Cluster 3. It includes almost half of companies; they have very little TURN when compared with other companies of the network, and they also have almost only incoming relationships (Fig. 7.10).

EASIN Integrated. When considering EASINT, the three clusters are distinguished basically by the different level of In_Dc, because in all of them Out_Dc and Out_Cc are low. The biggest cluster—the third one—includes the largest majority of companies, which have a low degree of all the three variables, while *the first and the second cluster identifies the elective "preys" of knowledge exploitation made by some EASIN companies, but mostly by neighbors.* In fact, the cluster analysis of the extended network has just shown that in the first cluster there is a significant number of exploiting companies, and the following cluster analysis of EASIN also shows that there is a small number of exploiting companies too (Tables 7.20 and 7.21; Fig. 7.11).

Table 7.16 Major 30 cross-country coordination efforts

Source	Target	Weight
US	UK	4250
US	EASINT	2452
US	IT	544
UK	US	478
US	FR	462
UK	EASINT	202
FR	US	188
CA	EASINT	184
US	CA	166
US	SE	165
US	MY	141
US	TH	141
NL	UK	139
DE	US	136
DE	UK	127
BE	NL	120
CA	UK	118
US	SG	100
EASINT	UK	99
CZ	UK	98
AU	US	97
ES	ES	91
LU	UK	91
US	AU	87
DE	EASINT	85
US	CH	84
US	CN	78
FR	EASINT	75
RO	ES	72
NL	EASINT	67

EASIN + *NEIGH*. By employing binary In_ and Out_Dc and Out_Cc, cluster analysis has discovered three clusters (Tables 7.22, 7.23 and Fig. 7.12): the former two have a marked value of some variable, while the third cluster, which is by far the biggest one (Table 7.22), is made by companies that have indistinctively low values of all the three variables used in this analysis. This clusterization outcome is confirmed also by the analysis of degree centrality done in the next chapter, enriched by the information provided by closeness centrality (Table 7.23).

Table 7.17 Companies' weighted propensity to coordinate across early 20 EASIN + NEIGH countries

Country	# of companies	IDW	EODW	EIDW	Total
US	1515	1.30	5.96	0.66	7.26
UK	712	3.03	1.05	7.12	10.15
EASINT	429	0.22	0.85	7.96	8.18
FR	317	4.13	1.25	2.10	6.23
IT	227	1.17	0.32	4.17	5.33
ES	117	0.78	0.48	2.18	2.96
IE	113	4.91	0.60	1.35	6.27
CA	102	0.38	4.96	2.35	5.34
DE	78	0.05	7.29	0.40	7.35
BE	75	1.12	2.72	0.53	3.84
PT	74	2.45	0.55	0.57	3.01
CZ	73	1.10	1.71	0.36	2.81
DK	63	0.98	0.98	0.13	1.97
NL	55	1.85	4.82	4.89	6.75
CH	40	0.63	1.43	4.08	4.70
FI	39	1.54	0.56	0.85	2.38
SK	39	4.13	1.21	0.00	5.33
SE	33	0.15	0.42	7.45	7.61
CY	26	0.92	0.00	0.15	1.08
CN	24	0.58	2.21	3.96	4.54
Total	2636	1.57	1.97	2.56	5.15

Legend Total links per country are a sum of internal and the larger value of external links. Acronyms explained in the list of abbreviations
ShITW = IDW/total TDW (vertically)
ShTW = TDW/total TDW (vertically)
ShIW = IDW/TDW

Table 7.18 EASIN attributes by clusters

Attribute	General (abs.)	Cluster 1 (share in %)	Cluster 2 (share in %)	Cluster 3 (share in %)
# of companies	78	1	11	88
TURN	191,465[b]	39	30	31
EM	266[a]	4	63	33
EC	52,897[b]	18	62	20
TASS	231,880[b]	31	42	27

Legend [a],000; [b],000,000 current US$

Table 7.19 EASIN clusters statistics

General	BODc	BIDc	BOCc	TURN	C1	BODc	BIDc	BOCc	TURN
Average	0.777	0.777	0.007	2455[b]	Average	5	0	0.049	70,624[b]
Min	0	0	0	0	Min	5	0	0.049	70,624[b]
Max	5	4	0.049	70,624[b]	Max	5	0	0.049	70,624[b]
Median	1	1	0.009	34[b]	Median	5	0	0.049	70,624[b]
C2	BODc	BIDc	BOCc	TURN	C3	BODc	BIDc	BOCc	TURN
Average	2.375	0	0.021	3129[b]	Average	0.435	0.913	0.003	1937[b]
Min	2	0	0.018	0	Min	0	0	0	0
Max	4	0	0.036	70,624[b]	Max	1	3	0.009	29,579[b]
Median	2	0	0.018	15[b]	Median	0	1	0	63[b]

Legend [a],000; [b],000,000 current US$
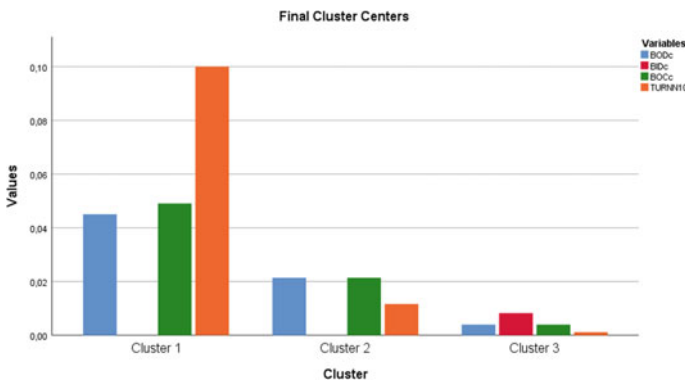
Fig. 7.7 EASIN clusters

Cluster 1. Including 2% of companies, this cluster represents those with the largest Out_Dc, barely any In_Dc, and the largest Out_Cc (out-closeness centrality). Therefore, they are the centers of the star structures, the so-called authorities, which exploit others by giving operating knowledge in exchange for strategic knowledge and, at the same time, the ones which can more easily access other, further strategic knowledge because they are closer to them. They are highlighted in Figs. 7.13 and 7.14, where it is visible that at times they mix up with each other as well.

The most central companies come mostly from the US, the UK and France, showing that *the Anglo-American companies are particularly effective in exploiting others' strategic knowledge by giving in exchange operative knowledge*. Particularly interesting is the fact that *the strategic knowledge acquisition made by American companies through AKE is markedly oriented to acquire it from other countries instead within the US*. In fact, unlike for M2M and D2D, the share of weighted

Fig. 7.8 Cluster 1 in EASIN
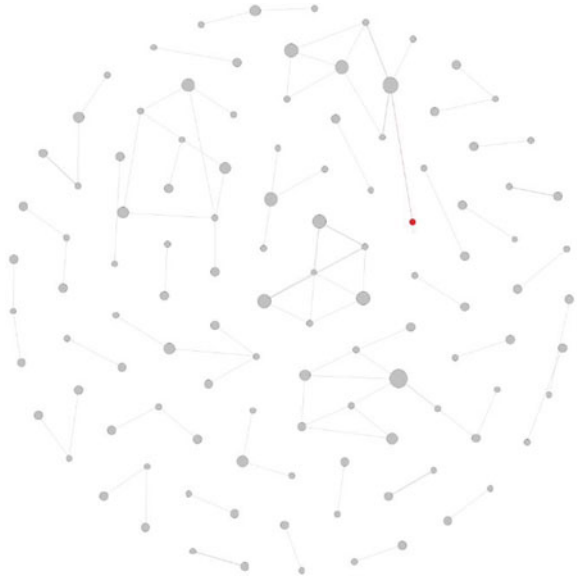
Fig. 7.9 Cluster 2 in EASIN
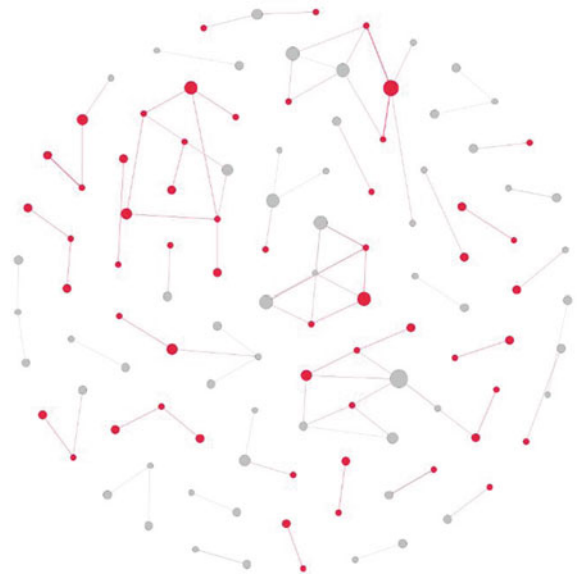
internal links on total links is, for M2D, only 18% (see Table 7.15b). Sector-wise, these intensive predators are mostly in the Manufacturing (C) and Finance (K) sectors.

Cluster 2. This cluster is made up of less than 1% of companies and has close to none Out-Dc and Out_Cc, but has exceptionally high In_Dc. They are the pure victims of
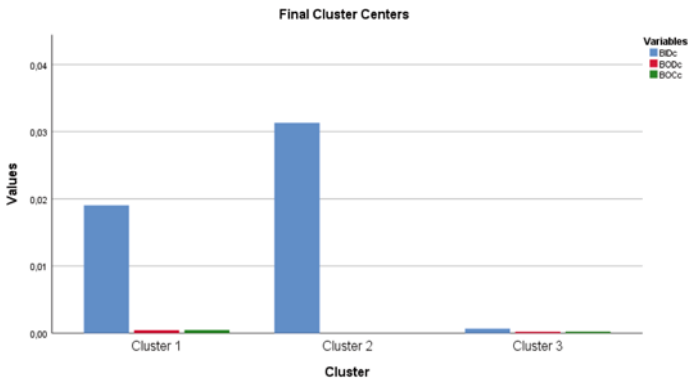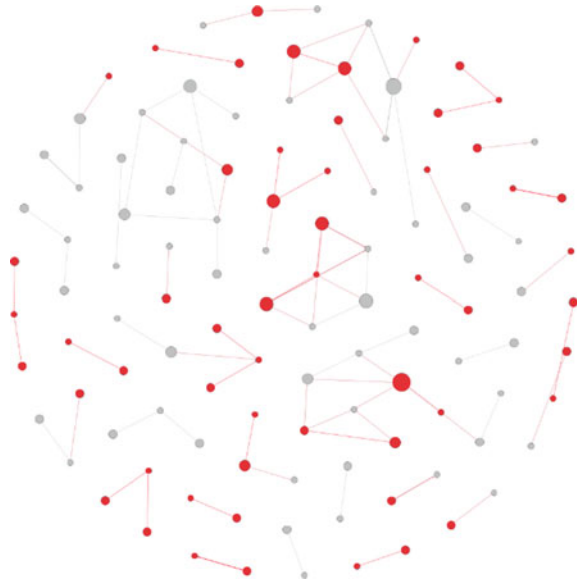
Fig. 7.10 Cluster 3 in EASIN

Fig. 7.11 EASIN integrated clusters

Table 7.20 EASIN integrated attributes by clusters

Attribute	General (abs. val.)	Cluster 1 (share in %)	Cluster 2 (share in %)	Cluster 3 (share in %)
# of companies	287	2	1	97
TURN	351,677[b]	30	43	28
EM	604[a]	37	24	39
EC	87,161[b]	58	19	23
TASS	505,272[b]	31	40	29

Legend [a],000; [b],000,000 current US$

Table 7.21 EASIN Integrated clusters statistics

General	BIDc	BODc	BOCc	TURN	C1	BIDc	BODc	BOCc	TURN
Average	7	1	0.0003	1225[b]	Average	3	1	0.0003	382[b]
Min	0	0	0.0000	0	Min	0	0	0.0000	0
Max	162	14	0.0032	79,591[b]	Max	52	14	0.0032	16,918[b]
Median	1	0	0.0000	9[b]	Median	1	0	0.0000	7[b]
C2	BIDc	BODc	BOCc	TURN	C3	BIDc	BODc	BOCc	TURN
Average	3	4	0.0012	75,107[b]	Average	98	1	0.0003	7512[b]
Min	1	0	0.0000	70,624[b]	Min	31	0	0.0000	2[b]
Max	4	7	0.0025	79,591[b]	Max	162	9	0.0022	29,579[b]
Median	3	4	0.0012	75,107[b]	Median	95	0	0.0000	825[b]

Legend [a],000; [b],000,000 current US$

Table 7.22 EASIN + NEIGH attributes by clusters

Attribute	General (abs. val.)	Cluster 1 (share in %)	Cluster 2 (share in %)	Cluster 3 (share in %)
# companies	1562	2	1	97
TURN	2,121,718[b]	4	3	93
EM	3093[a]	6	9	85
EC	1,162,116[b]	6	5	89
TASS	5,688,506[b]	20	3	77

Table 7.23 EASIN + NEIGH clusters statistics

General	BIDc	BODc	BOCc	C1	BIDc	BODc	BOCc
Average	4	4	0.001	Average	1	63	0.016
Min	0	0	0.000	Min	0	6	0.008
Max	209	114	0.025	Max	13	114	0.025
Median	0	1	0.000	Median	0	69	0.016
C2	BIDc	BODc	BOCc	C3	BIDc	BODc	BOCc
Average	104	1	0.000	Average	3	3	0.001
Min	57	0	0.000	Min	0	0	0.000
Max	209	9	0.002	Max	53	34	0.011
Median	95	0	0.000	Median	0	1	0.000

strategic knowledge exploitation through AKE and mostly lie at the periphery of the network: the so-called sinks. The most present countries here are the UK, Italy and France, thus showing that *about 50 EU companies are the biggest preys of strategic knowledge exploitation of (mostly American) predator companies through M2D at*
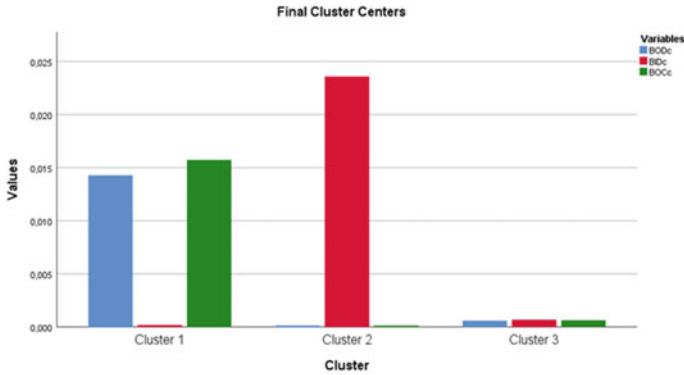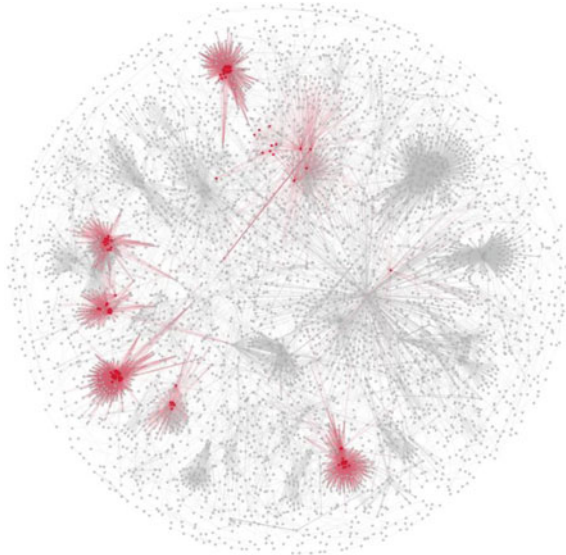
Fig. 7.12 EASIN + NEIGH clusters

Fig. 7.13 Cluster 1 in
EASIN + NEIGH

global level. Sector-wise, they are Manufacturing (C), Professional Activities (M) and Finance (K) (Figs. 7.15 and 7.16).

Cluster 3. This cluster includes all the other 97% of companies, those that have some close and long-distance relationships, both in and out, but are not standing out with them enough to differentiate themselves in any way. They are the large majority of companies, because most companies are weak exploited or exploiters (see next section too). On the graph, they would be the complement to the other two, previous pictures.

In summary, the cluster analysis highlighted that: (1) the extended network is also distributed in a heavy-tail way; (2) membership in clusters is, contrarily to other
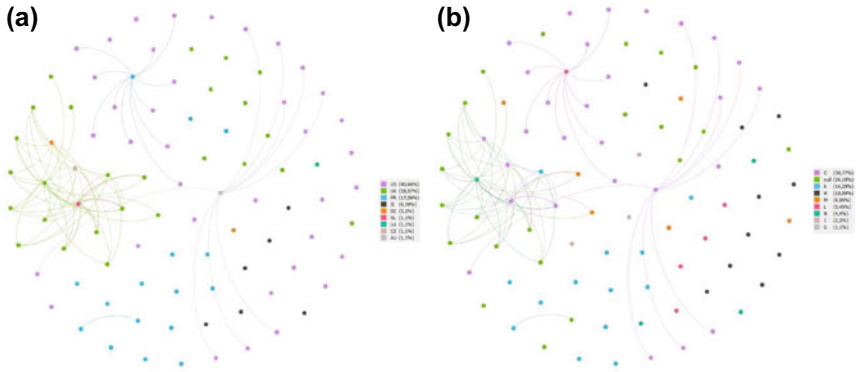
Fig. 7.14 a, b Cluster 1 in EASIN + NEIGH by evidencing countries (**a**) and sectors (**b**)

Fig. 7.15 Cluster 2 in EASIN + NEIGH
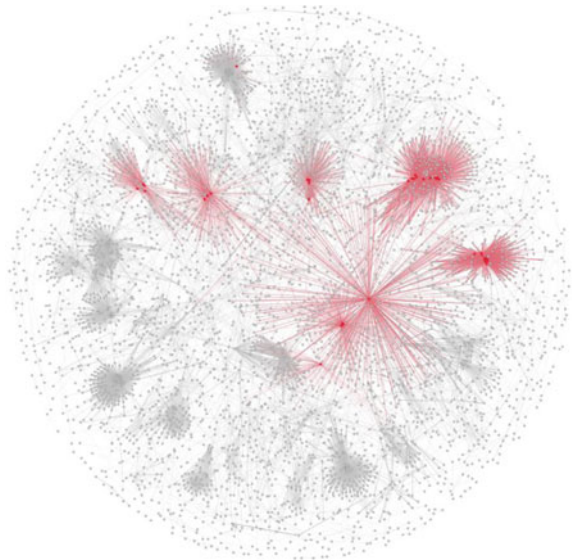
chapters, not dependent on participation in cliques, but rather on their position in star-like structures; (3) there is no strong dependence on the main component, and all clusters have members who are present either in or out of it; (4) extracts of those clusters in large majority are self-referential, meaning that their members present large tendency to relate to others of the same type—either country- or sector-wise, though it happens less than in other types of networks (M2M or D2D); and (5) the main factor that really distinguishes the clusters is their position within stars and direction of their links, combined with TURN size in EASIN.
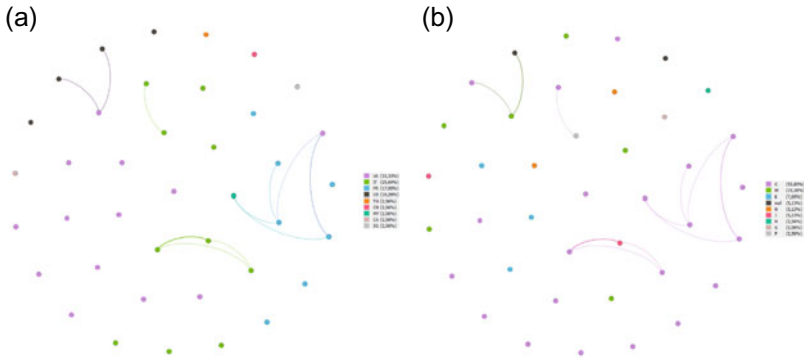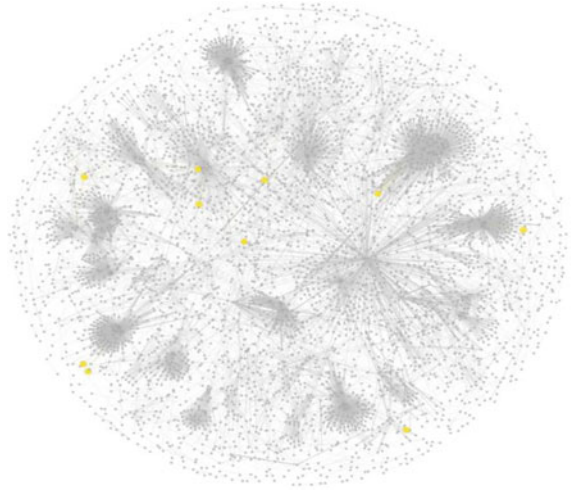
Fig. 7.16 **a**, **b** Cluster 2 in EASIN + NEIGH by evidencing countries (**a**) and sectors (**b**)

Fig. 7.17 Bridging companies in EASIN + NEIGH

7.7 Bridging Companies as Key-Players

There are only ten companies that in the extended network have a bridging centrality index major then zero,[10] because only 55 have a Bc > 0. This is due to the almost total fragmentation of the extended network, which in turn is due to its largely prevalent composition based on dyads and transitive triads, two "motifs" in which all nodes have Bc = 0. The ten bridging companies come from the US, the UK, Italy and Finland (Fig. 7.17). Sector-wise (Fig. 7.18), they are from Manufacturing (C), Finance (K) and Wholesale (G).
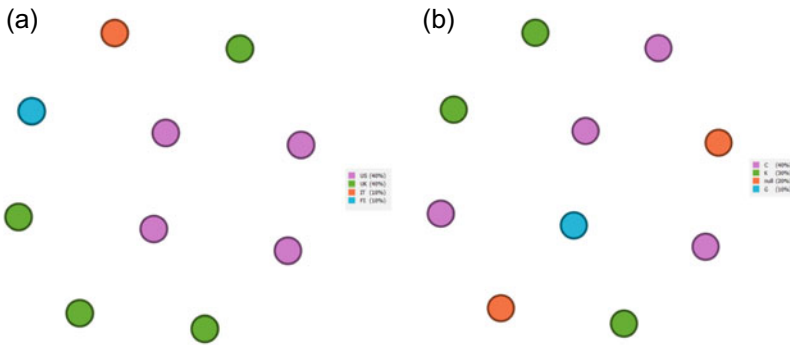
---

[10] In EASIN, they are only 4.

Fig. 7.18 **a**, **b** Bridging companies in EASIN + NEIGH evidenced by countries (**a**) and sectors (**b**)

7.8 Heavy-Tail Scale-Free Analysis

EASIN. Here, the economic variables have very mild heavy-tail (HT) shape (see Figs. 7.1 to 7.13 in Data Appendix), meaning that, though rather heterogeneous, companies do not differ in size so much as it happens for BINTs or DINTs. Conversely, with the exception of components and cliques, all topological parameters are highly shaped as HT. Hence, it holds the same tripartite categorization of the extended network: few intensive "predators" or "preys", and most low-intensive ones.

EASINT. When focusing on the 429 EASINT companies, the feature of being only exploiter or exploited still holds, because only about 5% of companies plays both role, while most (60%) companies are exploited and the minority (35%) only exploiters (see Table 7.24). Consistently, the net amount of AKE is 2175 HINTs in which a manager is placed into EASINT companies' boards, thus representing 73% of all connections. In weighted terms, this unbalance appears even bigger, because out of the about 4000 shared positions, 88% corresponds to strategic AKE. Though part of it occurs within EASINT, most of it is due to NEIGHs, as will be shown in Sect. 8.2 of Chap. 8. Therefore, *EASINT is an exploited land*.

   EASIN + NEIGH. In the extended network, all economic variables are distributed in a remarkable HT shape (see Sect. 7.4 in Data Appendix, Figs. 7.14 to 7.30), which is even higher for the topological parameters, especially clique distribution and, interestingly because it rarely happens in the other coordination networks, also for LORC and LIRC distributions. It means that *few companies are directly or indirectly able to acquire large amounts of strategic knowledge from many others through the AKE mechanism.* Out of top 10 country-wise, they come mostly from France, then the US and the UK; sector-wise, they are mostly from the Manufacturing and then Professional Activities. The same happens on the side of exploited companies, some of which are particularly "plundered". The top 10 country-wise come also from the US, the UK and few other European countries; sector-wise, they all come

Table 7.24 Binary and weighted In_Dc and Out_Dc of early 20 companies in EASIN

Ordered according to WIDc abs				Ordered according to WODc abs			
BIDc	BODc	WIDc	WODc	BIDc	BODc	WIDc	WODc
82	9	404	16	82	9	404	16
162	0	258	0	0	14	0	14
141	0	228	0	0	13	0	13
80	0	146	0	0	11	0	11
52	1	132	1	0	11	0	11
129	0	129	0	0	11	0	11
121	0	122	0	0	10	0	10
102	0	103	0	0	3	0	10
101	1	101	2	0	9	0	9
95	4	95	6	0	8	0	9
94	4	94	4	0	8	0	8
84	0	84	0	0	8	0	8
82	0	82	0	0	8	0	8
34	6	80	6	4	7	8	7
29	0	79	0	0	5	0	7
25	0	71	0	0	7	0	7
68	0	68	0	95	4	95	6
23	1	46	1	34	6	80	6
10	0	40	0	0	6	0	6
35	3	35	3	0	5	0	6

from Manufacturing, out of which 4 companies are from EASIN. Therefore, the extended network is particularly polarized between few powerful companies with a high LORC value and a few exploited companies with high LIRC value, and in the middle, *most companies adopt this coordination form only in triadic or dyadic structures*, as it is confirmed also by the clique analysis done in Chap. 4 and cluster analyses done in the previous section.

Because AKE is the peculiar trait of this form of coordination and it occurs in a dyadic relationship, we now deepen the analysis of Dc of the extended network. The following findings appear particularly interesting:

- In the whole network, only 8% of the 4414 companies are both exploiters and exploited, showing that *the large majority has a marked identity as exploiter or exploited*, namely 53% of companies are only exploiters and 39% only exploited. Therefore, *the roles are very marked, showing a clear strategic intent and an asymmetric "exploitation power"*;
- If we take both groups as blocks, we see that they are two large groups, but that of exploiters is significantly bigger. This fact suggests that *it is much harder to*

exploit than to be exploited: it is possible to exploit only few, while it is relatively easy to be exploited by many[11];

- Moreover, if we rank in decreasing order the companies connected in terms of Out_Dc or In_Dc, regardless of the presence of links pointing at the opposite direction (Table 7.25), we see that: (1) *the largest exploiters have a number of directors' shared positions obtained with their managers that is much lower (about one third) than the number of directors' shared positions issued by the 20 most exploited companies*; (2) the early 20 largest stars ordered by weighted In_Dc (left part of the tab), only 3 shared positions are out-edges, with respect to hundreds in-edges. In other words, those 20 are almost purely exploited companies, which at best will have some shared managers or directors with their own exploiters or with others. Very analogously, though not so purely and extremely, it happens for the early 20 exploiters;

- Though the 372 companies that are at the same time exploiters and exploited are divided about 50% between who is more exploiting and who is more exploited, the total net value of shared positions is negative ($-$ 731), meaning that *the number of shared positions as board members overcome that of managers appointed to that aim.* Therefore, *the companies playing the double role are more exploited than exploiters*, suggesting that they are subordinate actors of large exploitation clusters and confirming what argued right before.

7.9 Assortativity

The extended (E+N) network is moderately disassortative ($-$ 0.36) for the OUT-IN association, because a company with a given out-degree tends not to be connected to a company with a similar level of in-degree. In fact, as we have seen in previous sections, there are more exploiters than exploited and most companies play only one of the two roles. Therefore, most exploiters are connected with only exploited. This association lowers a bit to $-$ 0.29 when considering also the weights of links (see Sect. 8.2 in Chap. 8). Noteworthy, the value of such correlations is higher when focusing only the MC, where actually occurs 90% of coordination and where the most important companies reside, meaning that *when the most important Aerospace- and geographically related companies are involved, the most powerful companies in exploiting the AKE coordination employ it with companies not delivering the same amount of knowledge, albeit of the strategic type.* This effect also means that *large exploiters drain strategic knowledge from many source companies.* Interestingly, the other three combinations are substantially uncorrelated, including the IN–OUT,

---

[11] The big numbers should not surprise too much because, as said in other parts of the book and especially in the Methodological Appendix, few people can coordinate many companies and a given "target" company can be connected with them. The result is that in the target company there are not, of course, let say 625 directors, but rather a few of people can embody/implement a large number of shared positions. Put differently, one single person can be appointed by dozens of companies into the same target company.

Table 7.25 Binary and weighted In_Dc and Out_Dc of early 20 companies in EASIN + NEIGH

Ordered according to BIDc abs				Ordered according to BODc abs			
BIDc	BODc	WIDc	WODc	BIDc	BODc	WIDc	WODc
209	0	392	0	9	114	9	114
209	0	625	0	0	105	0	111
188	0	334	0	0	102	0	102
162	0	258	0	7	96	8	96
145	0	211	0	0	96	0	97
141	0	228	0	0	96	0	97
137	0	189	0	0	96	0	96
132	0	132	0	0	95	0	95
130	0	130	0	0	94	0	94
129	0	129	0	3	88	3	88
121	0	122	0	3	88	4	90
119	1	236	1	1	88	1	89
117	0	153	0	1	88	2	88
102	0	103	0	3	86	3	86
101	1	101	2	3	85	3	85
100	0	101	0	0	85	0	85
100	0	100	0	5	84	5	84
99	0	99	0	0	84	0	89
97	0	97	0	0	83	0	84
95	4	95	6	0	83	0	83

meaning that *exploited companies are engaged by companies with any kind of out-degree centrality.*

Moving the attention to EASIN only, we find a rather different picture: the disassortative (binary and weighted) OUT-IN correlations here become assortative (positive), but with lower values with respect to the extended network: 0.22 and 0.29, respectively. Therefore, *the AKE mechanisms of coordination are employed, to some extent, among the same companies.*[12] What also differ here is the existence of a low but non-irrelevant positive OUT-OUT correlation, meaning that, *to some extent, companies form chains of hybrid coordination.* In fact, above we already noticed that there are no reciprocal connections of this type because the degree of reciprocity is zero (Table 8.3 in Chap. 8), and indeed, a reciprocal AKE would be rather strange. Otherwise, why employing this defensive-offensive and advantageous coordination if we left it available also to our partner? A shared director, eventually doubled with

---

[12] We should remind that the size of EASIN is very small: 112 versus 4414 of the extended network. We notice also that the detailed analysis of out- and in-degree centrality done in Sect. 7.9 was concerning EASINT, not EASIN, which has 429 companies. Being composed by only 10 companies, the MC of EASIN is not so relevant and we skip the corresponding comment.

a shared manager if also operative knowledge had to be exchanged, would be much more effective than a double bind through an AKE. In Sect. 8.3 of Chap. 8, we will see a confirmation of this argument when discussing the results of the overlapped types of coordination, because while many links are overlapped between D2D and M2M, and also between M2D and M2M, only a few are overlapped between D2D and M2D. Actually, a company appointing its manager as a director in the other company could accept to reinforce operative coordination by sharing another manager, but will hardly accept to share a director, if not for reinforcing its control over the other's board.

7.10   Summary

In Europe, the most important countries in this kind of strategic coordination are the UK, Italy, then France, Spain and Belgium. Although the most companies come from the UK, it is France that has the largest ones of them in terms of the economic attributes. In EASINT, the number of companies grows from 112 to 429. Once again among neighbors, the most companies in Europe come from the UK and within the rest of the world from the US. In terms of Financial sector companies, the most of them come actually from France. In general, the European Financial neighbors make up 80% of the economic attributes of that entire group.

Companies with large size tend to be associated with the capacity to exploit not only their direct neighbors, but also (through them) the rest of the network. Conversely, the large companies that are exploited by AKE suffer it only from their direct neighbors. With some sporadic exception, such correlations hold only for EASIN and not for the neighbors.

The structure of both EASIN and EASIN + NEIGH M2D networks is made by a huge number of AKE clusters, the largest among whom are true (centrifugally or centripetally oriented) pyramids. Seldom, they can have also an inter-board connection, while more often add also an inter-department connection. All this configures a strongly asymmetric relationship behind the AKE, which indeed appears as the clue of a more general subordination of the company that shares its board. AKE clusters are made essentially by open or transitive triples, where a "knowledge exploiter" is not exploited on its own, and vice versa, thus acquiring an AKE advantage that is supposed to generate a truly competitive advantage.

AKE clusters tend to be very inter-sectoral. The Manufacturing sector is the leader, and the Financial sector activates this form of coordination more than 4 times intensively than EASINT companies. Further, horizontal are much less diffused than vertical hybrid interlocks when EASINT is the "victim of exploitation", while they are only a little bit more diffused when EASINT is the exploiter. There is a clear subordination of EASINT with respect to the Anglo-American geographical block. Though the Professional Activities sector, the Financial sector and EASIN are AKE exploited more than exploiters, they have anyway a high capacity to access strategic knowledge produced by other sectors with AKE forms. AKE advantages are not

transferred across AKE clusters: by keeping them "entrapped" into each cluster, "exploiters companies" are very attentive to not share such competitive advantages with others.

There is a clear sign of the strategic choice of banks and other Financial operators to access the very crucial information residing into the board of the most important institutions giving in exchange only operative knowledge (or maybe just nothing else). The Financial sector is relatively lowly interested to employ this coordination form to access EASINT's strategic knowledge, at least through direct relationships.

Only about 50% of EU28 countries are involved in this type of coordination mechanism, and especially when considering weighted values, France and the UK appear to be the key countries in both direct and indirect access to the strategic knowledge flowing through it, which actually does not circulate easy, because of a remarkable reluctance of countries' companies to transfer AKE across their countries' clusters.

Through the AKE mechanism, in both EASIN and EASIN + NEIGH networks, few companies are directly or indirectly able to acquire large amounts of strategic knowledge from many others and few are heavily plundered by releasing their knowledge to many others, while most companies can implement it only in triadic or dyadic structures. The large majority of companies has a very marked role as exploiter or exploited, thus showing a clear strategic intent and an asymmetric "exploitation power". The group of exploiters is significantly bigger than the other, thus suggesting that it is much harder to exploit than to be exploited: it is possible to exploit only few, while it is relatively easy to be exploited by many. This holds also when concerning the companies that are exploiters and exploited at the same time: they too are more exploited than exploiters. The top 100 exploiters in direct AKE are mostly American companies, which are also the nearest to all others, thus in the best position to acquire knowledge from all companies. Conversely, the group of top 50 heavily exploited companies are mostly European and located at the periphery of the M2D extended network. As well peripheral are those 97% of companies that are weak exploiters or weakly exploited.

The prey role played by EASIN (indeed, EASINT) is confirmed by both network and cluster analysis. In fact, EASINT companies show an impressive 88% of prevalent outflow of strategic knowledge due to AKE in "compensation" of as well inflow of operative knowledge.

In the extended network, and especially when the most important companies are involved, the most powerful companies in exploiting the AKE coordination employ it with companies not delivering the same amount of knowledge, albeit of the strategic type. This effect also means that large exploiters drain strategic knowledge from many source companies, while it does not happen in the reverse direction, meaning that exploited companies are engaged by companies with any kind of exploiting capability. Conversely, in EASIN, the AKE mechanisms of coordination are employed, to some extent, among the same companies, which can also form chains of hybrid coordination.

References

Bojanowski, M., Corten, R., & Westbrock, B. (2012). The structure and dynamics of the global network inter-firm R&D partnerships 1989–2002. *The Journal of Technology Transfer, 37*, 967–987.

Cepeda, F. F., Gamboa, C. L., & Rincón, H. (2017). The evolution of world trade from 1995 to 2014: A network approach. Bank of the Republic Working Paper Series, 985, Chap. 1 updated on 01.07.2022.

Daisuke, F., Umeno, S. Y., & Tatsuro, S. (2017). The dynamics of inter-firm networks and firm growth. RIETI Discussion Paper Series, 17-E-110.

Newman, M. E. J. (2010). *Introduction to networks.* Oxford University Press (Reprint 2016).