DISSOLVING "DEUTSCHLAND AG"- HOW "EMBEDDEDNESS" IN NEW INSTITUTIONAL INVESTOR NETWORKS CONTRIBUTS TO ENVIRONMENTAL REPORTING

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Abstract

The present paper addresses the relationship between a company's embeddedness in an institutional investor network and its environmental disclosure activity. In the first step the paper aims at exploring the capital-interlocking structures of German DAX and MDAX companies via institutional investors (in 2016) and its resulting potential towards fulfilling a corporate governance function. The initial analysis via the methodology of a social network analysis (SNA) is accompanied by another empirical exploration, testing operationalized parameters from the social networks analysis upon a company's environmental disclosure activities via a logit regression model. Testing a company's embeddedness upon the corresponding company specific data from the *Carbon Disclosure Project (CDP)* indicates that institutional investor networks matter for a company's environmental disclosure activity. Companies with a deeper integration within these networks exhibit a higher percentage of positive *CDP* disclosing.

Keywords

Corporate governance, social network analysis, shareholder engagement, environmental reporting, Carbon Disclosure Project, Germany

Table of Content

Abbreviations

AuM	Assets under Management
BAFIN	Bundesanstalt für Finanzdienstleistungsaufsicht (englisch: Federal Financial Supervisory Authority)
CDP	Carbon Disclosure Project
DAX	Deutscher Aktienindex (englisch: German Stock Index)
MDAX	Mid-Cap-DAX
SI	Significant Investment
SNA	Social Network Analysis
WPHG	Wertpapierhandelsgesetz (englisch: German Securities Trading Law)

1. Introduction

A comprehensive company network has been a major feature of the German corporate governance system for more than 100 years. *Höpner and Krempel (2004)* provide a detailed overview of German corporate governance history, in which they show how networks in the form of capital-cross-holding and director-interlocking developed as an integral part of German corporate governance. Companies organized the majority of relationships outside markets *(Beyer 2003, p. 10)* what resulted in various classification names *(Freye 2009, p. 13)* for the German corporate governance system, such as "organized capitalism*" (Höpner 2007)* or "Deutschland AG"[1] *(Beyer 2006, p. 96)*. The mentioned capital-crossholdings in combination with the cooperative structure resulting from the dual board system (including employee representatives) drove companies to a strategic orientation that transcended microeconomic objectives *(Freye 2009, p. 10)*. Compared to an outsider controlled system (Anglo-Saxon model), where market forces and outside mechanisms provide influence and protection for stakeholders, German corporate governance relied/s more on internal mechanisms (or voice) and internal information (in contrast to the importance of public information in an outsider controlled system) *(Hackethal, Schmidt, and Tyrell 2003, p. 666).*

The historical analysis of *Höpner and Krempel (2004, p. 353)* ends in the year 2014 with the conclusion that *"the encompassing company network that provided its core participants with a national perspective now belongs to German economic history."* Within their investigated company sample the number of crossholdings had been reduced by more than 50 percent [compared from 1996 to 2004] *"and the function of capital ties between financial companies and industrial companies had changed dramatically"*. The 16th report of the German Monopoly Commission *(Monopolkomission 2006, pp. 222–24)* mentions the following developments to be supportive of such a change: changed business strategy of German financial institutions towards a more active asset-management, increased demand for liquid capital and a tax reform in 2001 favoring disposal returns. While classical capital-crossholdings between German companies and German financial institutions continue to dissolve, a new investor type seems to be central to evaluating the German corporate governance system. Since 2000, assets under management (AuM) by institutional investors have more than doubled and in 2015 more than 60% of the market capitalization of DAX companies (the stock index within Germany, representing the biggest companies with respect to

[1] AG is an abbreviation for the legal form of a stock company.

market capitalization) is held by institutional investors *(Ipreo and DIRK 2015)*. Those institutional investors often act under the umbrella of fiduciary duty and hold significant ownership-stakes in a diverse portfolio of different companies, classifying them as universal owners *(Hawley and Williams 2007)* with the potential to fulfill corporate governance functions as active owners (e.g. shareholder engagement towards climate change activities).

Addressing systemic risks such as climate change by investors requires the broadening of the available disclosed data basis via companies, above all extra-financial information *(Schäfer 2016, p. 158)*. According to the mentioned market survey 70 % of the top 100 DAX investors have a medium with high priority towards integrating extra-financial criteria within their investment decision and voting guidelines *(Ipreo and DIRK 2015)*. Research by *Matsumura, Prakash, and Vera-Muñoz (2014)*, who detected positive company value effects between disclosing - and comparable non-disclosing companies, provides a possible explanation for above presented market data. A study by *Schäfer and Hertrich (2013)* who investigated the presence of visible shareholder engagement in Germany concludes that even the dual system of management board and supervisory board is not activist friendly, it can "*be expected that the growing presence of international investors in the shareholder structure of Germany's largest listed companies will lead to more engagement pressure*" *(p. 38)*. In his case study analysis on the factors contributing to effective shareholder engagement, *Gifford (2010)* remarks that the absolute size of an investor's equity stake (excluding particularly large stakes) is not as important as one would expect. Since investors are among the larger shareholders, independent of the size of the stake, they automatically gain influence. The total size of the investor (total AuM) is however likely to have a greater influence on the investor's legitimacy to engage. He furthermore highlights the importance of coalition building among other investors. One important investor coalition, the *Carbon Disclosure Project (CDP)*, seeks to promote company disclosure on climate change, which can be used to understand climate risk, protect investments and seize opportunities. By the end of 2016, *CDP* counted more than 800 signatories, combining AuM of EUR 100 trillion[2]. *Andersson, Bolton, and Samama (2016)* point out how an extensive ecosystem, which is now in place, has put climate change on the agenda of investors. New national laws such as the French Energy Transition Law[3], which requires national asset man-

[2] *Carbon Disclosure Project (2017c)*.
[3] *Principles for Responsible Investment (2017).*

agers and pension funds to disclose the exposure to climate-related risks of the assets in their portfolios, promote this development further. Within a sample of German companies *Cormier, Magnan, and van Velthoven (2005)* analyze the external and internal factors that contribute to the environmental disclosure quality of companies. They find a significant positive relation with increased company risk (measured by beta), its fixed asset age (measured by accumulated depreciation/depreciation expenses), its media exposure and its size (log of total assets). A negative link towards environmental reporting quality was however detected between concentrated ownership (measured by aggregated controlled blocks higher than 5 percent) and foreign ownership (measured by aggregated foreign blockholder shares). The implications of those mentioned negative links towards environmental reporting are discussed with respect to the empirical findings in a later state of the paper.

2. Theory and Hypothesis

Despite the fact that most significant investments (SI)[4] into companies by families/individuals (concentrated ownership), which are still very prevalent in Germany, are not accompanied by another SI of the same investor, several SIs especially by institutional investors (e.g. *Blackrock*, USA) are embedded in a network of other SIs of the same investor.[5] This leads to an institutional investor network of SIs, with the potential of companies being embedded in this network at different magnitudes. Applying the methodology of social network analysis (SNA) in the first part of this paper's investigation provides a detailed analysis of such networks (including valuable visualization and quantifications of network positions via graph theory), and creates a solid grounding for further research. *Hambrick, Werder, and Zajac (2008)* point out, how the consideration of "networks" has developed as one approach for evaluating corporate governance structures: *"A more macro perspective on informal structures (and their potential non-optimality) opens up new questions regarding the roles of key institutional actors in influencing the public corporation. Who are these actors, how are they linked, and with what consequences for firms and for society?" (p. 382).* Above mentioned company's embeddedness in institutional investor networks, raises the question

[4] Defined by an equity stake tied to voting rights in a company larger than 3 percent (author's own definition).

[5] The notion "embeddedness" was introduced by the sociologist *Mark Granovetter (1985),* who developed an framework for meeting the concerns that "*economic action is embedded in structures of social relations*" *(p. 481).*

whether those external relational structural parameters have an influence upon the company's behavior (within this research: company's environmental reporting activities). The external factor, ownership structure, has been subject to a diverse range of academic research, which investigated the impact upon topics such as financial performance (a summary of studies can be found at *Demsetz and Villalonga 2001*), innovation *(*e.g. *Ortega-Argilés, Moreno, and Caralt 2005 or Baysinger, Kosnik, and Turk 1991)* or corporate social responsibility (e.g. *Dam and Scholtens 2012* or *Rees and Rodionova 2015*) . However none of those studies have considered the possible "embeddedness in networks" character of ownership parameters via a SNA.

Several SNA research highlights the potential role of networks, with respect to information flows *(Mark S. Granovetter 1973),* since central positions within a network ""*indicate opportunities for access to and forwarding of information. By facilitating, controlling, or inhibiting the flow of information from one site to another in the network, central actors can maintain, create, or prevent the creation of information pathways." (Haythornthwaite 1996, p. 335)*. Due to the above mentioned facts that institutional investors, being classified as universal, have the potential to improve their risk / return profile of their portfolio and fulfil their fiduciary duty by reducing asymmetric information towards their invested companies(demanding for environmental data to be released – engage), the following hypothesis was derived and should be tested within the following research:

A company's voluntary environmental disclosure is positively related to its embeddedness in the institutional-investor network.

A confirmation of this hypothesis could be interpreted as a step towards a more outside oriented (outside information) corporate governance system, driven by institutional investors being aware of systemic risks resulting from climate change and therefore driving company reporting activities towards environmental topics.

3. Research Design

The following research is split up in two separate sections. While the first part of the research concentrates on an analysis of the German corporate governance system, focusing on a quantification of a company's embeddedness in an institutional investor network, the second part of the research utilizes those quantifications for an empirical testing with respect to company's environmental disclosing activities.

3.1. Company's Embeddedness in Institutional Investor Network

Sample Selection: According to the transparency obligations of the German Securities Trading Law (WPHG), all natural and legal persons must report their share of voting rights of any listed company to the Federal Financial Supervisory Authority (BaFin) and to the corresponding listed company, as soon as those voting rights exceed or fall below certain thresholds[6] when being acquired or sold. Even if persons hold voting rights indirectly via another legal person they must be reported nonetheless, allowing a deep investigation based on the actual ownership structure. Due to the limited availability of environmental reporting data (which is crucial for the second part of the investigation), the company sample only contained companies listed in the DAX and MDAX stock index, which consists of the 80 largest German companies listed at the stock exchange with respect to market capitalization.[7]

Methodology: Translating this data into graph theory, each stock company represents a "node" with a connection (called "tie" via voting rights) to an investor (another "node"). The nodes "company" and "investor" represent two different categories (modes), characterizing this network as a two-mode network. After combining the most important investors of the same source (e.g. *Capital Group International, Inc.* / *Capital Research and Management Company,* both being part of the *Capital Group*), an adjacency matrix was generated, with companies being displayed on the vertical- and investors on the horizontal axis of the matrix, representing a [or no] tie (significant voting rights, above 3 percent) via the numbers "1" [or "0"]. In the following example "Investor 1" owns more than 3 percent of voting rights of companies 1 and 3, but no voting rights of company 2.

Table 1: Affiliation Matrix Example

	Investor 1	Investor 2	Investor 3	*Investor n*
Company 1	1	0	1	…
Company 2	0	1	0	…
Company 3	1	0	0	…
Company n	…	…	…	…

Source: Own Example

[6] Those thresholds are: 3%, 5%, 10%, 15%, 20%, 25%, 30%, 50% or 75%.
[7] Data was extracted from the BaFin Website on 21.12.2016.

The sample adjacency matrix consists of 72 companies[8] (mode 1) and 450 investors (mode 2), providing space for 32.400 hypothetical (!) relations. Since the analysis focused only on universal owners and their potential to act as active investors with respect to climate change concerns, all investors of the adjacency matrix with only one tie were deleted in the next step, reducing the number of investors to 38. Non-ordinary institutional investors (e.g. other DAX / MDAX companies [with significant stakes in other companies], states [such as Germany or Kuwait] or the *Else Kröner-Fresenius Foundation*) were excluded from the network.

Transformations of two-mode networks to a one-mode network allow further investigation of the network, including quantifications of structural network parameters. A transformation of the network to a one-mode network (with companies being displayed on the horizontal and vertical axis) was therefore undertaken and now represents ties between companies, if they share a common investor (see Investor 1 and Investor 3 in above example). Multiple ties between the same companies were normalized to 1 (dropping the effect of the magnitude of a tie [relation]).

The primary measure to quantify a network position are centrality measures of the network. Beside centrality measures such as *degree centrality* (counting the absolute number of connections of a node), *closeness centrality* considers the distance of each node from each other (defined as "1") in the network (the mean of the shortest paths). Due to normalization within the calculation of this measure an increased value of the measure *closeness centrality* represents a shorter average distance to all other nodes in the network. Based on the assumption that information travels the shortest path in the network, nodes with a high *closeness centrality* score have a higher probability of receiving information flows sooner *(Borgatti 2005, p. 59)*. *Closeness centrality* following the *Freeman (1978)* definition was computed for each company using the software Pajek (Version 4.10).

3.2. Company's Embeddedness and Environmental Disclosing Activities

Sample selection: The above stated *closeness centrality* measures of the companies became the key explanatory variable (predictor) for a binary logistic regression model, aiming to explain a company's *CDP* disclosing activities. *CDP* asks all DAX and MDAX companies to answer a comprehensive questionnaire regarding the topic "climate change" on a voluntary yearly basis. Based on

[8] Eight companies were dropped, since they had not been part of DAX or MDAX for a least two years (2015 and 2016) or were headquartered outside Germany.

the scorings in different categories such as "Disclosure", "Awareness", "Management" and "Leadership", companies receive a ranking, indicating their progress made towards climate protection. The category "Disclosure" measures the completeness of the company's response, therefore indicating how transparent (independent of performance) a company is regarding climate change.[9] Companies that did not participate (denying response or not answering) or that failed to meet at least 75 percent[10] of the category "Disclosure" were coded with a "0".[11] All other companies, meeting at least 75 percent of the "Disclosure" obligations, were coded with a "1".

Methodology: This binary coded variable (which indicates the transparency with respect to climate change) served as the dependent variable, investigating the relationship towards the key independent (explanatory) variable - *closeness centrality*. Company size (measured by a company's total assets was integrated in the model via ln-transformation) and binary dummy variables controlling for industry sector affiliation were included within the model. Since none of the companies of the real estate sector participated or scored at least 75 percent of the points within the "Disclosure" category of the *CDP* and all companies of the transportation and utilities sectors did, those three sectors where included as dummy variables in the model. While linear regression is suitable for explaining continuous dependent variables, logistic regression considers the discrete quality of dependent variables. Instead of minimizing the sum of the squares of the differences between the continuous observations (ordinary least squares), logistic (also called logit) regression aims at optimizing the probability (maximum likelihood estimation) of a discrete outcome variable (in this case a binary variable). The following logit regression output was computed using the software *R*.

4. Findings and Arguments

Appendix 1 provides a detailed visualization of the institutional investor network. The importance of certain institutional investors such as *Blackrock*, *Capital Group*, *Sun Life* or the *Norwegian state* (through its pension fund), can be detected easily.[12] The central position of companies such as

[9] Explanation for the CDP Methodology can be found here: *(Carbon Disclosure Project 2017b)- Climate Change Scoring Methodology.*

[10] Meeting at least 75 percent of the points of the category "Disclosure" qualifies for being rated in the next category ("Awareness") within the CDP Rating.

[11] Data was extracted from the *Carbon Disclosure Project (2017a) - Climate Change Report 2016 – DACH 350+ Edition.*

[12] The different distances of the nodes to each other are chosen to improve the view of the picture and have no meaning.

Lanxess (5 institutional investors with a significant stake) within this network is noteworthy. Computed centrality measures for each company can be seen in Table 2 and operationalize the observable differences within the magnitude of *closeness centrality* amongst different companies.

Table 2: Centrality Measures for each Company

Company	Closeness Centrality	Company	Closeness Centrality	Company	Closeness Centrality
Beiersdorf	0.00	Gerresheimer	0.40	Munich_Re	0.58
Continental	0.00	Leoni	0.41	RWE	0.58
Covestro	0.00	Wacker Chemie	0.41	SAP	0.58
Evonik Industries	0.00	Dt_Pfandbriefbank	0.43	Siemens	0.58
Fielmann	0.00	Stroeer	0.43	ThyssenKrupp	0.59
Fraport	0.00	KION GROUP	0.44	Bayer	0.60
Hannover Rueck	0.00	Aurubis	0.46	LEG Immobilien	0.60
Hella	0.00	Aareal Bank	0.47	Linde	0.62
Henkel	0.00	Norma	0.48	Rheinmetall	0.62
Jungheinrich	0.00	MTU Aero Engines	0.52	Vonovia	0.62
Stada	0.00	Allianz	0.58	Commerzbank	0.62
Suedzucker	0.00	BASF	0.58	Dt Wohnen	0.62
Talanx	0.00	BMW	0.58	GEA Group	0.62
Volkswagen	0.00	Daimler	0.58	Heidelberg Cement	0.62
Zalando	0.00	Dt_Bank	0.58	Infinion	0.62
KRONES	0.32	Dt_Boerse	0.58	ProSieben Sat1	0.62
Axel Springer	0.36	Dt_Euroshop	0.58	TAG Immobilien	0.63
Bilfinger	0.37	Dt_Post	0.58	Adidas	0.64
Duerr	0.38	Dt_Telekom	0.58	Merck	0.64
Fuchs Petrolub	0.38	E.ON	0.58	Osram	0.64
Lufthansa	0.38	Fres_Med_Care	0.58	Brenntag	0.65
Metro	0.38	Fresenius	0.58	Symrise	0.65
Salzgitter	0.39	HOCHTIEF	0.58	Hugo Boss	0.67
CTS_Eventim	0.40	K+S	0.58	Lanxess	0.69

Source: Own calculation via Software Pajek

As can be seen in Table 3, companies belonging to the institutional investor network have a higher probability of positive *CDP* disclosure. Since *closeness centrality* measures the potential information flow within the network, the logit regression sample however did not include the companies outside the network (having closeness centrality measures of 0 and being defined as isolates).

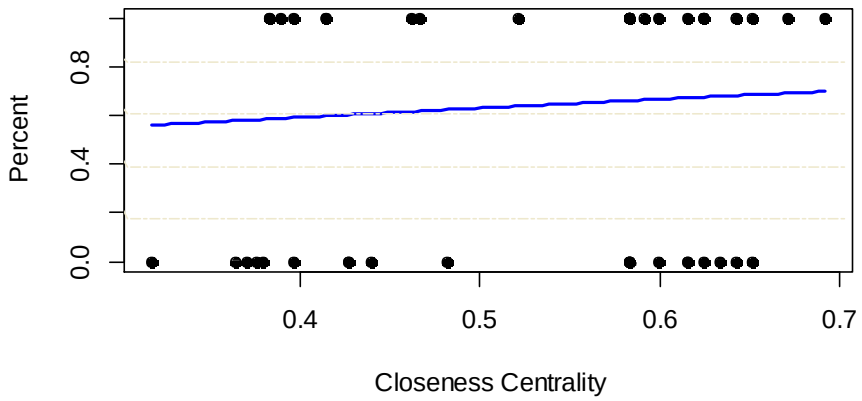
Table 3: Distribution of positive CDP disclosure according to institutional investor network affiliation

	All companies N=72 *(100 percent)*	**Isolates** N=15 *(21 percent)*	**Network** N=57 *(79 percent*)
Companies with positive CDP disclosure score	44 *(61 percent)*	8 *(53 percent)*	36 *(63 percent)*

Source: Own

The following Table 4 on the next page provides an overview of the logit regression models. As can be seen in model 1 and 2 there is a significant relation between company size and positive *CDP* disclosure. Adding the explanatory variable *closeness centrality* within model 2 increases the explanatory power compared to model 1 by 4 percent points (McFadden R^2). The variable *closeness centrality* is significant at a 10 percent level, allowing to assume a positive link between those two variables. Figure 1, also on the next page, plots the probability of a company, according to its *closeness centrality*. This relation seems to be in line with the findings of *(Cormier, Magnan, and van Velthoven 2005),* who detected a negative relationship between concentrated ownership and environmental disclosure quality. The inexistence of concentrated ownership leaves space for institutional investors with significant investments, therefore a higher potential to be embedded into an institutional investor network and resulting increased demand for external information regarding climate change (also due to its systemic risk character and the consequences towards a broad portfolio of institutional investors). Nevertheless the SNA visualizations and the logit regression did not control for a negative link between foreign concentrated ownership and positive *CDP* disclosure. However it is remarkable, that beside the two big institutional investors *Deutsche Bank Investors*, *Allianz Investors* and two institutional investors with only two ties, namely *Deka Bank* and *Versorgungsanstalt von Bund und Ländern*, all other institutional investors are foreign investors.

Figure 1: Trend of probability to disclose, based on companies closeness within the institutional investor network



Source: Own calculation via Software R

Table 4: Logit Model Output

	Model 1		Model 2	
	Estimate	**Std. Error**	**Estimate**	**Std. Error**
Coefficients				
(Intercept)	-9.0663**	3.862	-9.7403**	3.8953
log (company size)	0.5991**	0.2406	0.4504*	0.2518
Real Estate[a]	-19.1214	2840.0277	-19.6378	2862.5439
Transportation[a]	17.2527	4611.2928	17.7245	4326.9624
Utilities[a]	16.6512	4606.1471	16.6284	4608.9425
Closeness Centrality			5.8653*	3.3863
Number of Observations	57		57	
Degrees of freedom	52		51	
McFadden R^2	30%		34%	
Hosmer–Lemeshow stat	1.91		3.24	
p-value	0.98		0.92	
Annova (Comparison Models)				
Resid. Dev	52.687		49.496	
Improvement			3.1911	
Pr(>Chi)			0.07404*	

a) All companies within the following industry sectors have either all - (Transportation, Utilities) or none of them (Real Estate) a positive CDP disclosure.

** significant at 5% or * 10% level

Source: Own calculation via Software R

5. Conclusion

This research contributes to already existing literature dealing with company behavior towards disclosing environmental data. Considering the external environment, respectively its embeddedness within it, extends the external perspective of a company (investigating solely unrelated external factors/data) to a network perspective with relational data.

The investigation of German DAX/MDAX companies highlights that investigated companies differ in their magnitude of embeddedness within an institutional investor network. While investigating the consequences towards companies *CDP* disclosure, the SNA approach of institutional investors networks allows further investigations (e.g. with respect to financial performance).

Since this research investigates only a static moment within the network structure and company's embeddedness, future similar research could be enriched with time series data of the network. This could countervail the limitation of reverse causality of the logit model outcome, since one could also expect that institutional investors show a higher willingness to invest in companies with a higher transparency towards climate change.

This research also highlights how the corporate governance landscape has changed towards decreased influence by crossholdings and more influence by capital markets (respectively institutional investors). Developing from an insider - towards an outsider system raises increased awareness for solving asymmetric information problems via increased reporting demands by institutional investors.

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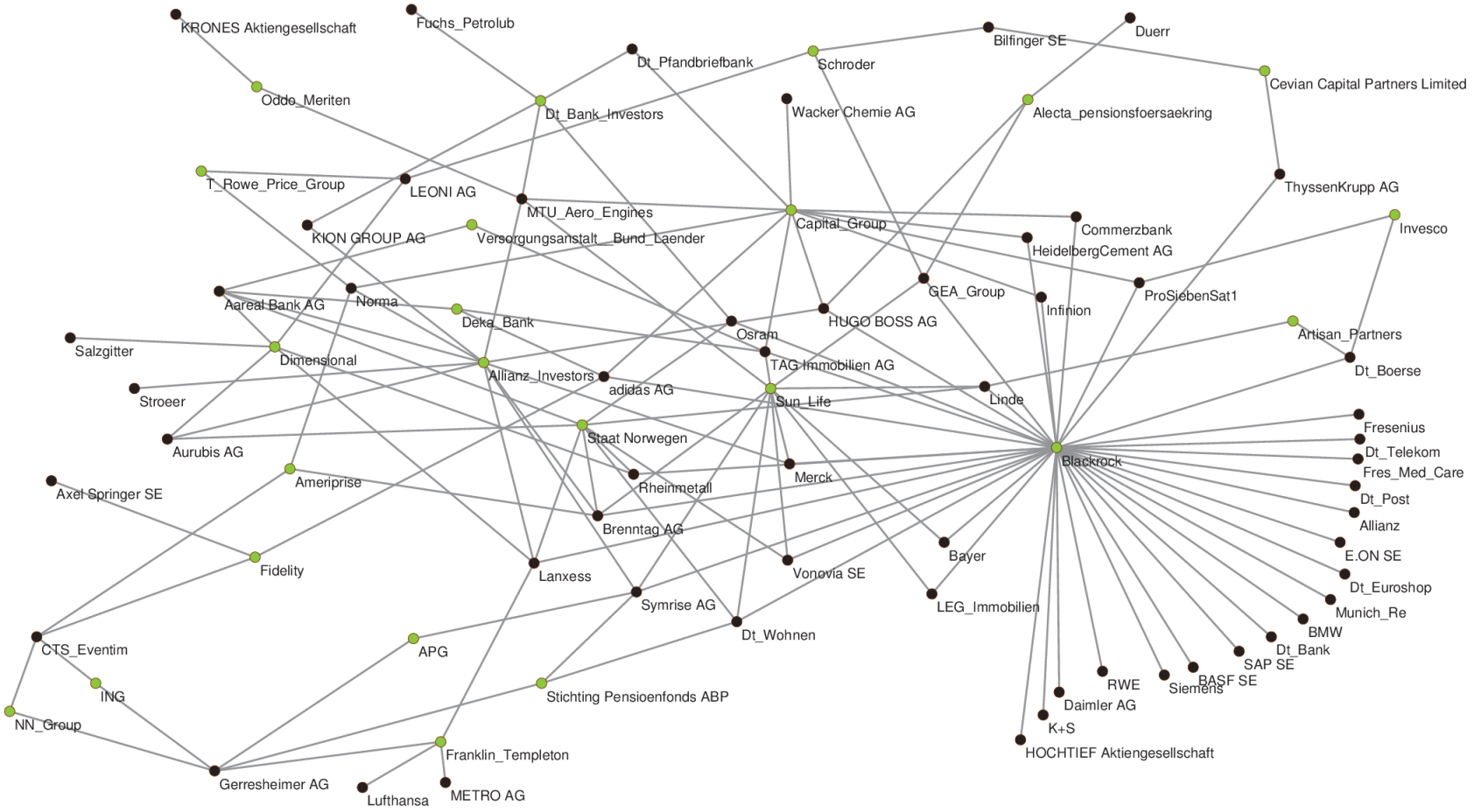
Appendix

Appendix 1: Insitutional Investor Network



Source: Own visualization via Software Pajek