From Deutschland AG to World, Inc.? Network Analysis of the Capital Linkages of German Listed Companies

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Abstract

This paper investigates whether the global trend of ownership concentration of international financial institutions can also be observed for the Deutschland AG, which is the informal designation for the historically grown and largely isolated network of German stock listed companies. Using network analysis, capital linkages of German HDAX and SDAX companies in both 2006 and 2018 are analysed and the results are compared. The network analysis enables a systematic presentation of the capital linkages and also helps to analyze link strengths and make supposedly hidden relationships visible. This has been made possible in recent years by the further development of powerful IT hardware and the development of corresponding network analysis software. The results show a noticeable increase in the concentration of internationally active investment companies in the ownership structures with a simultaneous decline in the participation rates of German investors in German companies. Therefore, both the trend of ownership concentration of international financial institutions and the erosion of the Deutschland AG can be confirmed.

Keywords

Network analysis, capital linkages, DAX, ownership structures, corporate network, capital market, corporate governance

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1. Introduction

Numerous studies point to an increasing internationalization of ownership structures in companies. However, this trend seems to be driven primarily by the aggressive expansion of a few globally active financial institutions, which have gained a large share of control in the global corporate network and are thus becoming the "power centers of the economy". Although this finding has received considerable attention, especially since the publication of Vitali, Glattfelder & Battiston [9], the influence of country specifics and historically developed capital linkages on the development of this trend remains largely unexplored.

Until the 2000s, there existed within the Federal Republic of Germany a network of capital holdings that was predominantly isolated from foreign countries and referred to in public discussion and literature as the "Deutschland AG" [1, 7, 8, 10, 11, 14, 15]. In addition to mutual financial dependence, the Deutschland AG was characterized by mutual influence in the form of executive board positions and supervisory board seats, which made access significantly more difficult for foreign investors. However, the systematic academic study of the interdependencies of German corporations came to an end at the beginning of the millennium, so that the trend towards internationalization and concentration of ownership received no or only rudimentary attention in the literature.

This paper deals with the question whether the global trend of ownership concentration of international financial institutions can also be observed for the historically grown Deutschland AG. For this purpose, the capital linkages of listed companies in 2018 are analyzed and developments compared to the base year 2006 are shown by the application of network analysis. This has been made possible in recent years by the further development of powerful IT hardware and the development of corresponding network analysis software.

The article is structured as follows: First, there is a presentation of the extant literature on capital linkages and ownership structures. The core of the article is the investigation of capital linkages of listed companies of the HDAX and SDAX, which is carried out by means of network analysis. This is followed by a presentation of the results, which includes an analysis of the overall network as well as an analysis of the development of relevant investor groups and an analysis of the most important individual investors. The study concludes with a summary.

2. Literature Review on capital linkages and ownership structures

Information on the ownership structures of companies and whether there are concentrations of power within a company network is of particular importance for both the management of companies and for shareholders. Even before the application of network analyses, numerous attempts were made to clearly represent and examine capital interdependencies. For example, La Porta, Lopez-de-Silanes & Schleifer [12] analyzed the controlling shareholders of the 20 largest listed companies in the 27 richest economies. Based on voting rights, the authors distinguish between companies in companies held in free float and companies held by individual owners. With the exception of economies with very good shareholder protection, only a few of the companies considered have global linkages. They are more often controlled by shareholder families or by the government. Equity control by specific financial institutions could also not be identified at this stage. However, the study leaves out corporate concentrations and interactions between companies.

Faccio & Lang [5] analyze 5,232 European companies in 13 countries. The ownership structures and the possibilities of control are measured with the help of voting rights. It was found that 36.93% of the firms studied are in free float and 44.29% are family-owned. Financial companies and larger firms are more likely to be free float and non-financial companies and smaller firms are more likely to be family-owned. In contrast to the average values, only 10.37% of the companies in Germany are in free float and 64.62% are family-owned. In contrast to La Porta, Lopez-de-Silanes & Schleifer [12], the authors identify significantly fewer state-controlled companies within each of the 20 largest companies.

The largest network analysis to date with global company data was presented by Vitali, Glattfelder & Battiston [9]. In this analysis, the ownership structures of 43,060 companies are examined in order to assess the strength of control of the individual actors. The authors are able to show that a large part of the control in this corporate network is exercised by a few financial institutions. 40% of the network is held by 147 firms, three quarters of which are financial firms. This core is described by the authors as an "economic super entity", from which follows an inherent systematic risk for the financial sector. The study also shows that most companies are not only connected to each other via the large network, but also organize themselves in sub-networks. In another study, Vitali & Battiston [16] showed that such sub-networks exist and are strongly characterized by geography, whereas the industry does not play a decisive role for the composition.

However, criticism has also been voiced of the Vitali, Glattfelder & Battiston [17] and Vitali & Battiston [16] studies. Faust [6] criticizes the conclusion that control can be exercised through the 147 companies, since these institutional investors do not necessarily pursue the same interests. Thus, in fact, there is no superpower, but only a potential for control. Furthermore, the author points out that national differences, e.g. rules of corporate governance, are not considered in this analysis. Thus, although such global analyses provide an overview, country-specific evaluations should be prepared for detailed descriptions. This would make it possible to show more precisely who the financial investors are in detail and what control these investors can actually exercise.

Brancaccio et al. [4] use network analysis to examine the evolution of the centralization of network control over the period from 2001 to 2016. In line with the previously mentioned studies, they find that global network control is highly centralized. Moreover, the authors show that the largest holders, who cumulatively hold 80% of the global economic value of the network, do not exceed a 2% share level for individual holdings. This suggests a significant shift in global investment strategies. There no longer seems to be a quest for controlling majorities but the funds are being widely spread. Thus, the actual decisions of investors empirically contradict the findings of classical studies on shareholder concentration.

In their study, Glattfelder & Battiston (2019) examine how the global economic network evolves over time and how it was affected by the 2008 financial crisis. Furthermore, they show possible explanations why a global economic shock has only a marginal impact on exist-ing power structures.

Bajo et al. (2020) recently study the impact of the centrality of institutional blockholders on the value of a firm in a sample of U.S. firms. In doing so, the authors use network metrics based on social network theory and find that companies owned by central, prestigious, and highly connected institutional blockholders have a higher valuation in terms of Tobins' Q. The authors attribute this to the fact that network centrality allows conclusions to be drawn about reputation and status, which leads to a certification advantage for one's own firm.

With the so-called Deutschland AG, a large corporate network existed in Germany until the turn of the millennium, which was also widely discussed in public. Höpner & Krempel [10] describe the historical process of how the numerous capital linkages came about. Deutsche Bank and Allianz are at the center of the historical development. In the 1920s, the conversion of non-performing loans into company shares led to numerous equity investments by financial groups. The authors examine the years 1996 and 2000, for each of which a company network was created using data from the Monopolies Commission . The analysis already revealed an erosion of the Deutschland AG. The authors show that the number of capital links has fallen significantly and cite various takeover and merger activities as well as various restructuring measures as reasons.

Based on Höpner & Krempel [10], Krempel [11] conducted further network analyses. At intervals of two years, network visualizations were created for the period from 1996 to 2006. Within the framework of this analysis, a strong erosion of the Deutschland AG over time becomes clear. For a long time, the diverse capital holdings among German blue chips were considered a special case in international comparison. However, it was found that the number of equity investments has decreased significantly. A reason for the erosion is essentially seen in the internationalization of the capital markets. In this process, a system of financial market-oriented control mechanisms has been developed in which the focus is on the relationship between owner and management.

Faust & Thamm [7] criticise the results of Höpner & Krempel [10] and Krempel [11]. Above all, the Monopolies Commission's database is seen as problematic and the starting date of 1996 is criticized, since the number of companies had its historical peak at that time. Furthermore, it is criticized that the companies from the above-mentioned database only account for a small part of Germany's total value added. Furthermore, this data has a constantly changing sample of companies. In addition, the Monopolies Commission switched to a database provider in 2012 that provides significantly more data, so that comparability of the periods before and after the change of provider is not given here either. In principle, however, the thesis of the erosion of the Deutschland AG through progressive unbundling was confirmed.

Andres, Betzer & van den Bongard [1] describe the changes in the Deutschland AG and its capital links in the period from 1998 to 2006. In this study, the 150 largest listed companies, consisting of DAX, MDAX and SDAX companies, were analyzed as of 31 December 2002. The ownership structures as well as the capital links around the financial services firms Deutsche Bank, Commerzbank, Allianz, MunichRE and the Bayerische Hypovereinsbank were examined. It was found that there is an overall decline in capital holdings within the network and that there has been a dissolution of the complex shareholding structures of the financial services firms in particular.

Fehre, Rapp, Schwetzler & Sperling [8] did not carry out a network analysis, but an analysis of block trades, in which at least 5% of the shares change hands. The authors analyze the companies listed in the DAX in the period from 1997 to 2006 and observed an increase in the free float from 65% in 1997 to 75% in 2006, mainly due to the sale of government and financial companies. Furthermore, it could be shown that individuals and German industrial companies are guarantors for stable ownership structures. Furthermore, it could be shown that the number of block trades is significantly higher if the company has a foreign investor as owner.

On the basis of the available literature, the need for a network analysis with national reference and current data described at the beginning arises. This paper aims to close this research gap.

3. Sample and Methodology

The sample of this empirical study contains only companies that were listed on the HDAX and SDAX as of 31 December 2018. The survey is carried out for the years 2006 and 2018 on the reporting date of 31 December in each case, since largely complete ownership information is available for these dates. Nevertheless, 53 companies had to be removed from the sample due to incomplete data records. These are mainly companies that either did not exist in 2006 or were not yet publicly listed. In the end, 107 companies remained in the sample. All shareholders owning at least 1% of the shares of each company in the sample were surveyed. The 1% threshold is the smallest size that makes it possible to influence a company [12]. In the following, therefore, a linguistic distinction is also made between sample companies and investors, although many companies can of course hold both roles.

The Refinitiv Eikon database serves as the data basis. For the analysis, the name of the investor, the number of shares held, the number of shares issued and the investor type were collected. The number of shares held is then set in relation to the number of shares issued in order to determine the percentage of share per investor. The percentage of shares held by investors forms the basis for the network analysis.

The methodology of network analysis, which has been used since 1930 mainly for research purposes in the social and behavioral sciences, was used to investigate and visualize the capital linkages [3]. Network analyses enable a clear representation of individual interdependencies as well as their connection strengths within a network, whereby possibly hidden relationships can also be identified and examined. Due to the increasing complexity and interconnectedness of the global economy, network analyses are also finding increasing application and relevance in the economic sciences [3]. Networks are represented by actors and their connections. Actors are in turn referred to as nodes and connections as edges [13]. Nodes and edges are prepared in the form of an adjacency matrix. An adjacency matrix is a square matrix with the column and row names as the nodes of the network. A connection is represented by a number between 0 and 1, which represents the percentage of shares in the respective company.

4. Results

4.1. Development of the overall network

The results show clear differences between the 2006 and 2018 networks. This finding is already visually apparent in Fig. 1 in that the network for 2018 is significantly denser compared to 2006. The basic statistics are shown in Table 1.

In 2006, investors holding more than 1% of a company's shares owned a total of 41.88% of the total shares of all companies. In 2018, this share increased to 49.75%. This trend suggests that in 2018 there are either more investors holding shares of more than 1% in the companies or the existing investors hold more shareholdings overall within the sample. Indeed, compared to 2006, the number of investors increased by 7%. The number of shareholdings, on the other hand, increased much more sharply by 75% from 557 to 974. This means that today investors hold an average of 2.22 holdings, while in 2006, this number was at only 1.37 holdings per investor. Along with this, the amount of the average percentage of shares of an investor has also fallen from 7.94% to 5.47%.

Overall, the results point to a greater concentration of the share capital of investors holding more than 1% of the shares - their number has increased [see also 15]. While in 2006 the maximum number of investors holding shares in a company was 14, this value increased to 20 in 2018. Particularly strong changes can also be observed in the maximum number of shareholdings of a single investor. Here, the maximum number of holdings by a single investor has increased by 190% from 29 holdings (Fidelity International) in 2006 to 84 holdings (The Vanguard Group Inc.) in 2018.

Table 1

Basic statistics

	2006	2018	Δ
Maximum number of investors in a single company	14	20	43%
Maximum number of holdings of a single investor	29	84	190%
Average amount of participation	7,94%	5,47%	-32%
Standard deviation of the participations	13,18%	9,75%	-26%
Number of nodes	407	437	7%
Number of edges	557	974	75%

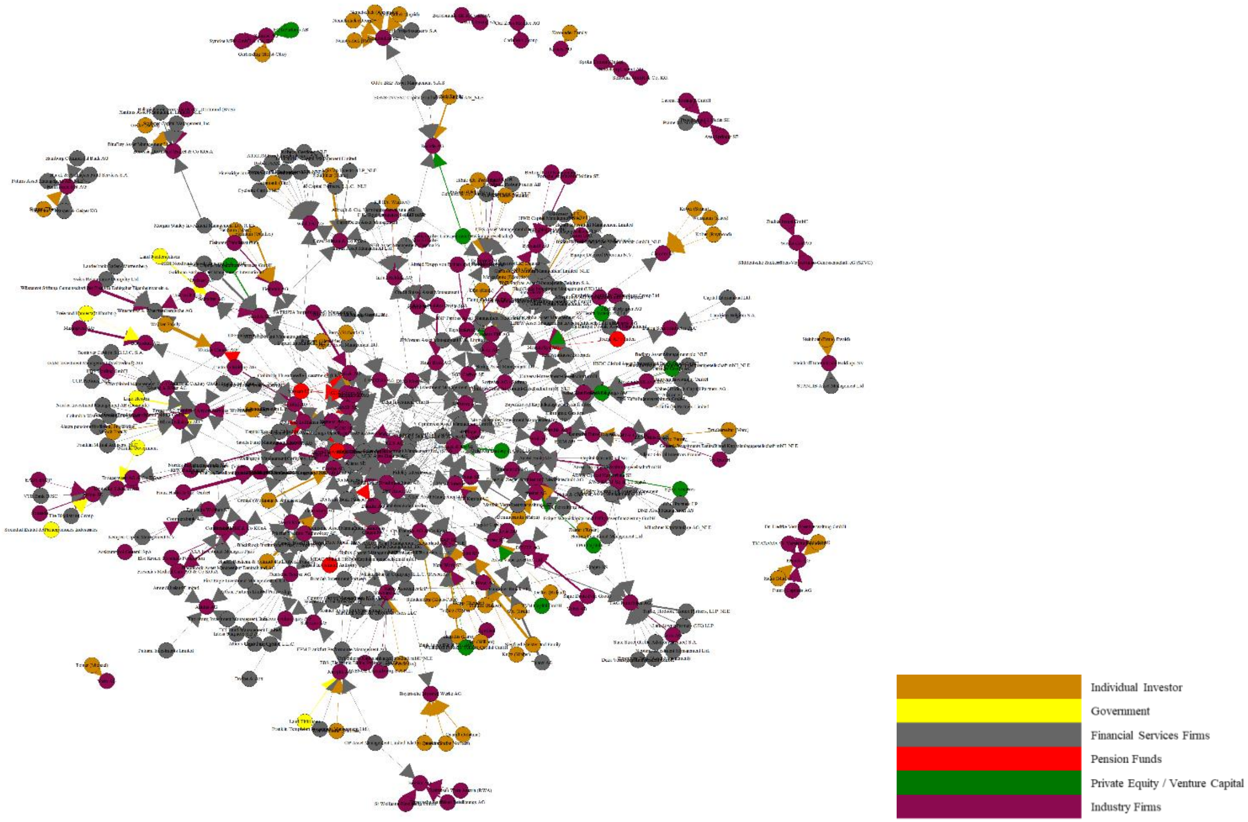

Figure 1: Business network in 2006

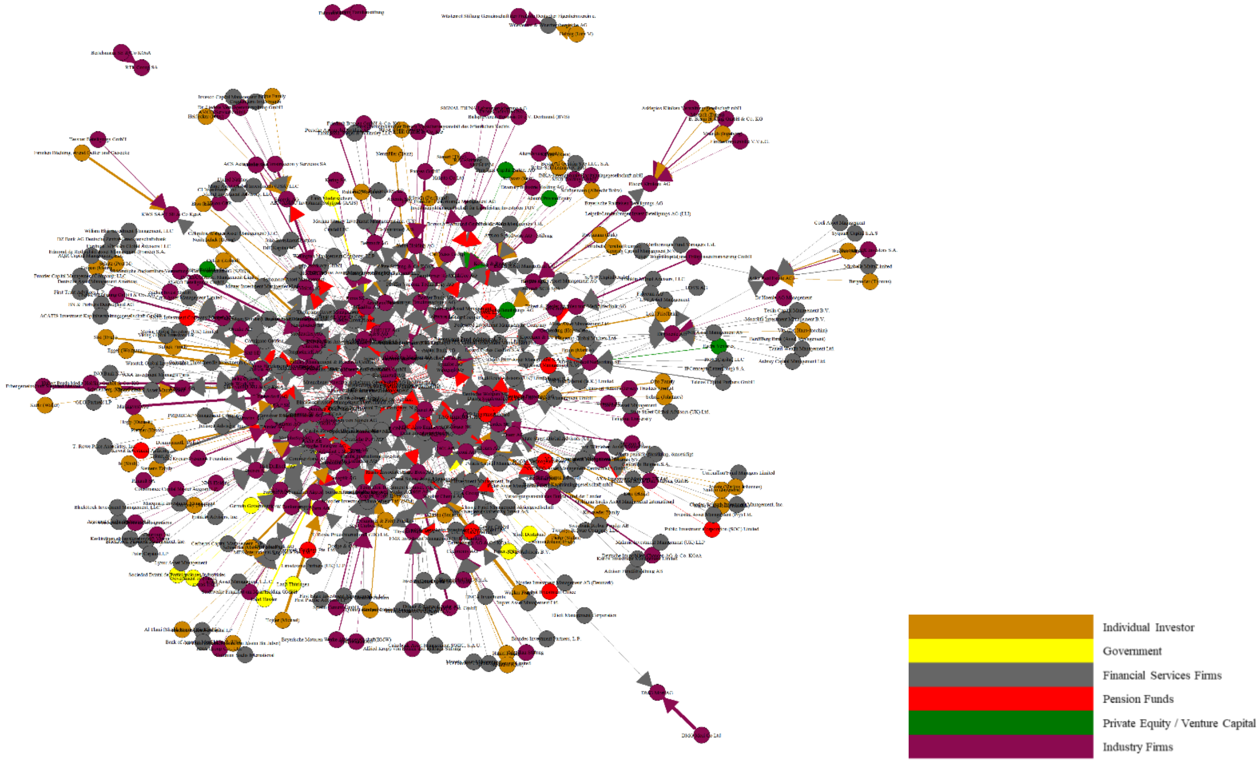

Figure 2: Business network in 2018

4.2. Development of the relevant investor groups

For detailed analysis, the actors in the network were divided into six groups, which can be seen in Table 2. Significant changes can also be seen in the individual investor groups.

Table 2

Overview of the investor groups involved in the network (* figures include companies in the sample)

	2006		2018	
	Number	Average share	Number	Average share
Banks, insurance companies, investment firms *	176	4,04%	186	3,01%
Industrial firms *	156	22,35%	168	21,83%
Individual investors	54	18,02%	59	16,40%
Pension funds	4	3,87%	11	2,57%
Government	6	16,17%	8	13,71%
Private Equity/Venture Capital*	11	15,57%	5	9,43%

Banks, insurance companies and fund management companies form the largest group of institutional investors in the network. However, the shareholdings of Münchener Rückversicherungs AG (in Allianz SE) and Allianz SE (in Fresenius SE & Co. KGaA and Heidelberger Druckmaschinen AG) were completely sold in 2018 or are no longer held in the respective company. The decrease in capital links between the financial and industrial companies supports the hypothesis that there has been an erosion of Deutschland AG. At both survey dates, institutional investors are the most strongly represented in the network with 176 and 186 actors, respectively, with the comparatively low shareholding ratio declining significantly from 4.04% to an average of 3.01% of shares between 2006 and 2018. Influence in terms of share ownership, on the other hand, increased: in 2006, institutional investors already had a large influence with 15.57% of shares and were able to increase this to 20.44% of shares in 2018. This means that the group of institutional investors has the largest shareholding.

The second largest group of the network comprises industrial companies, of which 104 players are in the sample. However, these companies often do not hold stakes in other companies in the sample - i.e. no stakes in other German listed companies. Only the following companies held stakes of more than 1% in other companies in the sample in 2006: BASF (in K+S AG), Deutsche Lufthansa AG (in Fraport AG), Fresenius SE & Co. KGaA (in Fresenius Medical Care AG & Co. KGaA), RWE (in Hoch-Tief AG and Heidelberger Druckmaschinen AG) and Thyssenkrupp AG (in Bertrandt AG). In 2018, only the investments of Fresenius SE & Co. KGaA and Deutsche Lufthansa AG remain. In addition, further investments were added by United Internet AG (in 1&1 Drillisch AG), Salzgitter AG (in Aurubis AG) and freenet AG (in Ceconomy AG). The small number of holdings by large German companies in other large German companies can also be seen as an indicator of the continuing erosion of the Deutschland AG. Looking at the influence of the group of industrial companies within the network, it can be seen that this group is an influential group with 15.46% of the shares in 2006. The influence remains at a high level in 2018 with 15.91% of the shares.

The group of individual investors includes both private individuals and families and represents the third largest group of investors in the network. The number of individual investors increased only slightly from 54 in 2006 to 59 in 2018. This development suggests a high degree of consistency in investments with a strategic, long-term background. In addition, this investor group is characterized by a comparatively high average participation rate. In 2006, individual investors held an average stake of 18.02%. In 2018, this figure is 16.40% and is thus at a comparatively high level. It should also be noted that the influence of individual investors has remained almost constant, with a total of 9.26% of the total shares in 2006 and 9.50% in 2018.

The group of pension funds describes companies that offer mostly insurance-like benefits for old-age provision for all occupational groups and invest the contributions made by the insured persons on the capital market. With four pension funds in 2006 and eleven pension funds in 2018, this group contains comparatively few players and forms a rather small group of the network. The already low participation rates of pension funds seem to be on a downward trend. For example, the average participation rate fell by around one third between 2006 and 2018, from 3.87% to 2.57%. The influence of the total shares held is relatively low at 0.40%. Although this share rises comparatively strongly to 2.26% of the shares by 2018, the influence of this group remains relatively low. The low participation rates can certainly be explained by a rather diversification-oriented investment strategy of the pension funds.

The governmental organizations - consisting of municipalities, federal states or states - represent only a small part of the investors within the network. Only six or eight actors are present in the period under review. However, the average participation of an investor here, at 16.17% in 2006 and 13.71% in 2018, is significantly above the overall average of all investor groups. These holdings can be assumed to have a strategic or historical rationale, which is confirmed, for example, by the German government's 15.41% stake in Deutsche Telekom AG. Overall, the influence of this investor group is relatively low, both in 2006 with 1.06% and in 2018 with 1.28% of the total shares.

The Private Equity / Venture Capital group describes investors who provide equity capital for companies. With eleven players in 2006 and five players in 2018, the group of these investors is also only a small part of the entire network.

It can be seen that the average holdings are at a high starting level compared to other financial investors, with 15.57% in 2006, but this drops to 9.43% in 2018. The influence of this group is already comparatively low at 1.60% of the shares in 2006 and drops to 0.35% of the shares in 2018. Thus, this investor group has hardly any influence on the overall network.

4.3. Development of individual investors

Table 3 shows the development of the top five shareholders from 2006 to the current year under review, 2018. It is striking that these are exclusively fund management companies that predominantly offer actively managed funds for private and institutional investors.

Table 3

Top 5 shareholders in 2006 and their shares in 2018

	2006		2018	
	Number	Average participation rate	Number	Average participation rate
Fidelity International	29	3,42%	7	2,01%
Union Investment Privatfonds GmbH	25	2,04%	17	3,34%
Cominvest Asset Management GmbH	23	2,49%	0	0,00%
Deka Investment GmbH	22	1,87%	14	2,83%
Capital Research & Management Company	15	3,54%	0	0,00%

Basically, it can be seen from the data that the number of participations of all five actors has decreased significantly in the period under review. With regard to the average participation rate, however, there is no uniform picture. While Union Investment Privatfonds GmbH and Deka Investment GmbH significantly increased their average participation rates, the average participation rates of the other players fell over the same period. It must be considered here that one of the largest market participants is no longer active due to the acquisition of Cominvest by Allianz Global Investors in 2009. In addition, Capital Research & Management Company became part of The Capital Group Companies, as a result of which business in Germany is no longer conducted through the above-mentioned company, but through other companies such as Capital International or Capital Research Global Investors. This also applies to Fidelity International, which conducts most of its activities in Germany through Fidelity Management & Research Company.

Table 4 sheds light at the top five shareholders from 2018 and shows their developments compared to the base year 2006. All five companies, with the exception of Norges Bank Investment Management, the management company of the Norwegian Pension Fund, are asset managers.

Table 4

Top 5 shareholders in 2018

	2018		2006	
	Number	Average participa-tion rate	Number	Average participa-tion rate
The Vanguard Group Inc.	84	2,07%	0	0,00%
Norges Bank Investment Man-agement	79	2,40%	0	0,00%
BlackRock Institutional Trust Company N.A.	51	4,07%	5	2,96%
DWS Investment GmbH	47	2,63%	8	4,63%
Dimensional Fund Advisors	37	2,24%	0	0,00%

First, it is important to note that none of the top five shareholders from 2006 can be found among the top five shareholders from 2018. Rather, three of the top five actors of 2018 did not hold any shares in companies in the sample in 2006. In contrast, those actors who already held company shares in 2006 increased the number of their shareholdings by a minimum of approximately 550%. An examination of the average participation rate shows a comparably growing trend. Only DWS Investment GmbH has significantly reduced its shareholding since 2006 from 4.63% to 2.63%. It is also worth noting that, compared to the DAX, the largest shareholder is not BlackRock Institutional Trust Company (51 holdings), but Vanguard with 84 holdings. Both companies are active on the capital market exclusively as passive investors with so-called ETFs (Exchange Traded Funds). Norges Bank Investment Management invests the money generated from Norwegian oil reserves in a very diversified manner and is therefore the second largest shareholder in 2018 with 79 holdings. DWS and Dimensional Funds Advisors are fund companies that mainly offer actively managed funds.

Finally, it should be noted that both the average number of holdings of the largest shareholders in 2018 and their average shareholding ratios are significantly higher compared to the top five players in 2006. Whereas the top five players in 2006 only held stakes in 22.8 companies on average, the top five players in 2018 hold stakes in 59.6 companies on average. The average shareholding ratio, however, has hardly changed, but remains constant at an average of about 2.6% of the company shares.

5. Summary and Conclusion

This article examines the question of whether the global trend of ownership concentration of international financial institutions can also be observed for the historically evolved Deutschland AG. As a central research tool, the network analysis carried out not only allows for a systematic presentation of capital linkages, but also contributes to analyzing the strength of connections and making supposedly hidden shareholdings visible. The present results allow the conclusion that the global trend of ownership concentration of international financial institutions can certainly be observed for Deutschland AG, which is rather isolated from abroad. The analysis of capital links in 2018 shows an ownership landscape dominated by internationally operating fund companies for the large German companies under consideration. Compared to the baseline year, internationally operating fund companies are investing in significantly more companies while maintaining their average shareholding at a constant level, which is why there is undoubtedly a progressive concentration of ownership for large German companies. The erosion of the Deutschland AG is expressed above all by a low number of holdings by German financial institutions and large companies in other large German companies in 2018. Comparatively recent disposals by German financial institutions also lead to the conclusion that this trend, which has been ongoing for years, will continue in the future.

The paper is currently limited to a German sample. Although international investors were included in the modeling of the firm network, stakes in foreign firms were not considered.

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