Is Busy Really Busy?

Board Governance Revisited*

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ABSTRACT

We investigate the relationship between firm governance and the board's position in the social network of directors. Using a sample of 133 German firms over the period from 2003-2006, we find that well connected boards are associated with lower firm performance. In addition, firms with better connected directors pay their executives significantly more. We interpret these results as evidence for poor monitoring in firms that have important and well connected directors. In both cases, simple measures for busy directors that were used by other studies in the past fail to show any significant pattern. These findings indicate that the importance of additional board seats seems to play a bigger role than simply the number of board appointments. Therefore, our results suggest that calls for a limit of directorships are ill-advised as long as a limitation does not take the quality of these obligations into account.

JEL Classification: G30, G38

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I. Introduction

A growing literature on board characteristics investigates the question of whether directors with multiple board appointments are too busy to perform their monitoring duties. The "busyness hypothesis" suggests that firms with busy directors are associated with weak corporate governance. Fich and Shivdasani (2006) confirm this assertion and show that firms with busy boards exhibit significantly lower market-to-book ratios than firms in which the majority of outside directors hold fewer than three board seats. In contrast to these results, Ferris et al. (2003) find no evidence of a relationship between the number of board appointments and firm performance.

In both cases, the underlying rationale of the busyness hypothesis is that directors who serve on a large number of boards can become overcommitted and might then shirk their responsibility as monitors. In this context, it is crucial to define which directors are busy in order to identify boards that are susceptible to the problem of overcommitted directors. Fich and Shivdasani (2006) argue that the results of Ferris et al. (2003) are driven by an insufficient and noisy measure of whether directors are busy. They propose a metric that is based on the percentage of outside directors who are busy rather than calculating the average number of board seats held by outside directors. Hence, results on the busyness hypothesis seem to be sensitive to the question of how one defines busy directors.

We extend previous papers by combining two strands of research: studies on busy boards (Ferris et al. 2003, Fich and Sivdasani 2006) and the literature on the relationship between social networks and corporate governance (Subrahmanyam 2008, Barnea and Guedj 2008). First and most importantly, we argue that the concept of "busyness" in itself has more than one dimension. Even though previous studies use slightly different definitions of busy boards, the authors generally apply a very similar procedure, which is to count the number of board seats that a director holds and classify boards as busy/not busy based on a predisposed

threshold. However, this methodology misses an important aspect: how important are these other duties, and how time-consuming? Holding several positions in small companies is arguably very different from being a central player in a network of directors of the largest public firms. We use several alternative definitions influenced by the literature on social network analysis and show in a multivariate panel framework that firms with board members who are central players in the social network exhibit weaker firm governance. Second, previous papers in this area are limited to the U.S., where (inside) firm governance is based on the one-tier system. The literature therefore focuses on outside directors under the premise that inside directors do not monitor management (Fich and Shivdasani 2006). However, in the one-tier setting management might have a preference to appoint directors from the same social circle to the board (Barnea and Guedj 2008, Mace 1986). As a consequence, network measures do not only capture how well connected an outside (i.e. monitoring) director is, but also how connected management is. This complicates the interpretation of a relationship between network variables and firm governance since members of the board might just be more "lenient" towards management because they reciprocate or position themselves for other board seats (Wade et al. 1990), and not because they are overcommitted. We use data from Germany, a country where governance structures are based on the two-tier system with an independent supervisory board. Most importantly, German law explicitly forbids executives from nominating candidates for the supervisory board.[1] This legal environment allows us to examine the effect of a director's[2] position in the social network on firm governance independent from his/her interaction with executives.

Unlike the finance literature, where the topic of social networks has only recently gained importance, sociologists have applied mathematical concepts in assessing network structures

[1] According to paragraph 124(3) of the German Stock Corporation Act (*AktG*), executives are not allowed to nominate members of the supervisory board. Monitoring the executive board it is the main responsibility of members of the supervisory board.

[2] For the ease of notation, the terms director and member of the supervisory board will be used interchangeably throughout the paper. Members of the executive board will be referred to as management or executives.

for many years (see Scott (2000) for an overview). These methods facilitate the assessment of interpersonal relationships and their application to financial data. Barnea and Guedj (2008) generate measures that account for a director's importance in the social network and find that in firms with more connected directors, CEO remuneration is higher, and CEO turnover is less sensitive to firm performance. Subrahmanyam (2008) develops a model that links the optimal number of board memberships to social costs and benefits.

Belonging to a social group and interacting with others is among the most fundamental human needs (Maslow 1968, Baumeister and Leary 1995). As individuals tend to form interpersonal connections with others who have a similar social status or background (McPherson et al. 2001, Munshi 2003), board members might establish a social network that builds heavily on their connection with other directors. Useem (1984) characterizes directors of large corporations as members of an 'inner circle' of organizational elites who are accountable only to themselves. Taken together with the fact that members of a supervisory board are usually wealthy individuals, managers of other corporations, or even former executives of the same firm, their social needs might have an influence on how they treat managers (who also belong to the 'inner circle'). Based on the idea that socially connected individuals tend to take care of each other, a more connected board might present a barrier to effective corporate governance. In addition, it is time-consuming to establish and maintain social ties. Mayhew and Levinger (1976) argue that the time that can be allocated to any relation is limited and that the number of contacts an agent can sustain will decline as the size of the network increases. On the other hand, this argument implies that individuals who are important players in the network will have less time for other obligations since other members will use their central position in the network as a communication channel. Taken together, this leads us to hypothesize that directors who are central players in the network of organizational elites might be overcommitted and more forgiving towards their social peers and therefore contribute less time and effort to monitor management. In this sense, it is not only the number of board

appointments that causes a director to be "too busy" or overcommitted, but also the quality of these positions.

We examine this hypothesis by mapping the entire social network of all members of the supervisory boards of the largest 133 German publicly traded firms from 2003 to 2006. In doing so, we map all connections between directors who have – at one point in time – been members of a board in our sample (independently for every year). This means that the data that is used to compute our social network measures is not restricted to the 133 sample firms. A good example is "FC Bayern München AG", through which four directors in our sample are connected, even though the company itself is not part of the sample. This leads to a total of roughly 1,600 directors and about 35,000 connections in our dataset (per year). We then aggregate this data on a firm-level and compute several measures that identify whether a board might be overcommitted.

Using fixed-effects panel regressions we find that firms with better connected supervisory boards show significantly lower values of Tobin's q. In addition, the average remuneration of executives in firms with better connected directors is significantly higher. These results are robust to the use of alternative network measures. In both cases, simple measures for busy directors that were used by other researchers in the past fail to show any significant patterns. We interpret our findings as evidence for weaker governance and poorer monitoring in firms with directors who play an important role in the social network. Our results have important implications for the discussion of limiting the number of directorships: They indicate that merely putting a limit on the number of board appointments that directors are allowed to hold is insufficient at preventing directors from being overcommitted.

The remainder of the paper is organized as follows. The next section provides a brief outline of the literature related to busy directors. Section 3 focuses on the construction of the dataset

and our network measures and presents descriptive statistics. Section 4 contains the multivariate panel data analysis. Section 5 concludes.

II. Literature on Directorships

The literature on directors with multiple board appointments so far has mainly focused on the U.S., and therefore the one-tier board setting. In this environment, corporate boards consist of inside directors who run the firm, and outside directors who are not part of the management team of the company they govern. Fama and Jensen (1983) contend that "outside directors have incentives to carry out their tasks and do not collude with managers to expropriate residual claimants" (p. 315). Hence, an effective monitoring of the management team relies crucially upon outside directors. Fama and Jensen (1983) also argue that multiple board appointments can be a signal of high quality and reputation for outside directors. Based on this argument, outside directorships provide individuals with prestige, visibility, and commercial contacts (Mace 1986) and help directors to develop a reputation as monitoring specialists. Accordingly, several studies use the number of board appointments as a proxy for the director's reputational capital (Brown and Maloney 1999). These arguments suggest that firms that aim at signalling a good quality of their corporate control structures should appoint experienced directors with a large number of directorships. Perry and Peyer (2005) also argue that "sender" firms can benefit from additional directorships since their directors can learn about different management styles or strategies that are used in other firms.

On the other hand, several studies suggest that too many board appointments might lower the effectiveness of outside directors as monitors (Shivdasani and Yermack 1999, Core et al. 1999). The busyness hypothesis, advanced by Ferris et al. (2003) posits that directors with multiple board appointments can become overcommitted and might be too busy to monitor management adequately. Core et al. (1999) find a positive correlation between the percentage of outside directors who serve on three or more boards and the level of executive

compensation, suggesting that busy directors are less likely to engage in close managerial monitoring compared to directors who hold fewer board seats. In line with these results, Shivdasani and Yermack (1999) report that the likelihood of being appointed to a board is higher for busy directors if the CEO (who presumably does not like to be monitored) is involved in the selection of new board members.

Based on these arguments, it is not a priori obvious whether the possible disadvantages of serving on a large number of boards outweigh the advantages that arise from the reputation and experience of these directors. Ferris et al. (2003) examine the question of whether multiple board appointments by directors harm firm performance using a cross-section of U.S. firms in 1995. They fail to detect any evidence of the negative relation predicted by the busyness hypothesis and conclude that monitoring by busy boards is as effective as monitoring by non-busy boards. In contrast to these results, Fich and Shivdasani (2006) find that firms with busy directors have significantly lower market-to-book ratios. They argue that limitations in the research design used by Ferris et al. (2003) prevent them from detecting a significant relationship. Among other things, Ferris et al. (2003) use a single cross-section and do not control for the presence of omitted firm-specific variables, which leads to biased OLS-estimates. In addition, the definition of busy boards used by Fich and Shivdasani (2006) differs from Ferris et al.'s (2003) definition. With respect to outside directors, Ferris et al. (2003) calculate the average number of sample firm directorships held by the directors of a firm. Fich and Shivdasani (2006) use several alternative definitions and focus exclusively on outside directors. They consider directors busy if they hold directorships in three or more firms and find that firms in which the majority of outside directors is busy have market-to-book ratios that are about 4.2% lower. In a closely related study, Jiraporn et al. (2009) examine the relationship between director busyness and board committee memberships. In support of the busyness hypothesis, they find that individuals who hold more outside

directorships tend to serve on fewer board committees. However, this relation seems to be non-linear and negative only up to a certain point.

In sum, the empirical evidence concerning the question of whether sitting on numerous boards has a negative impact on the ability to perform monitoring tasks effectively is ambiguous. On a theoretical basis, the busyness hypothesis stands in contrast to the reputation hypothesis. This alternative hypothesis suggests that multiple directorships can add value by allowing directors to establish a network that can be useful for the firm. Given these conflicting ideas, it is surprising that the pertinent empirical literature focuses exclusively on the number of board appointments held by a director. If possible advantages of multiple directorships are related to the idea of building networks, empirical tests should also take this dimension of additional board memberships into account.

In our paper, we follow this reasoning using different concepts from the literature on social network analysis.

III. Dataset and Network Measures

A. Sample Selection

The sample for this investigation is based on all companies that were part of the three largest German stock indices as of December, 31 2002. This results in 150 firms comprised of 30 DAX, 70 MDAX and 50 SDAX constituents.[3] We follow these firms over four years and exclude all companies that abandon their listing status during the period from 2002-2006, leaving us with a balanced panel of 133 firms, or 532 firm-year observations.[4] Accounting data is obtained from Datastream and Hoppenstedt Aktienführer,[5] information on the

[3] The DAX (largest firms), MDAX (mid caps), and SDAX (small caps) are the three major indexes of Deutsche Börse for firms from the classic sectors.
[4] The majority of firms terminate their listing following a squeeze-out by the dominant shareholder (10 firms). Only four firms drop out of the sample due to insolvency.
[5] The Hoppenstedt Aktienführer is a yearly publication that provides detailed information (e.g., ownership structure, balance sheet information) on German listed firms.

composition of the supervisory board is manually collected from the annual reports of our sample firms. Panel A of Table 1 presents descriptive statistics of several firm characteristics.

B. Measurement of Multiple Directorships

According to paragraph 125 of the German Stock Corporation Act (*AktG*) publicly traded firms have to disclose all directorships that members of their supervisory board hold in other (for-profit) firms. We therefore count all directorships in public and non-public firms.[6] This information also allows us to detect all connections between directors in our sample that lie beyond the 133 sample firms.

As stated above, the German corporate board system is two-tiered. In this system, members of the supervisory board oversee the actions of the executive board, i.e. management. Among other duties, members of the supervisory board appoint and dismiss executives, approve managements' decisions, and set their remuneration.[7] Depending on the number of staff, employees are allocated control rights through the supervisory board by several codetermination laws. These codetermination laws apply to both public and private companies as soon as they reach a minimum of 500 employees. Simply put, firms with more than 500 but less than 2,000 staff have to allocate one-third, firms with more than 2,000 staff one-half of the supervisory board seats to employee representatives.[8] Employee representatives are often union members (and in the case of large firms often high rank union officials), but in general the staff can elect any employee to the supervisory board. In theory, this implies that employees and shareholders run the company cooperatively, in particular in companies in which one-half of the supervisory board seats are allocated to employee representatives. However, in practice, the influence of employees is somewhat limited. In

[6] We exclude board appointments in non-profit organizations, trusts, and charitable organizations.
[7] See the German Stock Corporation Act (*AktG*) for a comprehensive description of the rights and duties of the supervisory board.
[8] See Gorton and Schmid (2004) for a more detailed description of the system of codetermination and the legal background.

companies with one-half representation, shareholders' representatives can overrule employees with the help of the chairman's tie-breaking vote. In our sample, about 55% (25%) of the firms are subject to one-half (one-third) representation, 20% do not have employee representatives on their supervisory boards. Due to the limited influence of employee representatives (even in 50:50 boards), the analysis in this paper focuses primarily on directors who represent the interests of the suppliers of capital, i.e. shareholder representatives. As a robustness test, all regressions are repeated using variables that are based on data for the whole board. The results are robust to this alternative definition.

Following Ferris et al. (2003) and the alternative methodology used by Fich and Shivdasani (2006) we construct three variables that classify boards as busy/not busy based on the number of board appointments held by members of the supervisory board. In line with these papers and consistent with prior work by Core et al. (1999) we consider directors busy if they hold three or more board appointments. Based on this definition, 52.44% (excluding employee representatives) and 33.07% (including employee representatives) of the directors are classified as busy. In Panel B of Table 1 we report data regarding the frequency of multiple board appointments for our sample.

[Insert Table 1 about here]

The median board in our sample consists of 13 directors, seven of which are shareholder representatives and six are employee representatives. On average, directors hold 3.49 (excluding employee representatives) and 2.72 (including employee representatives) directorships. In line with Fich and Shivdasani (2006) we construct a dummy (0,1) variable that is set to one if 50% or more of the board's shareholder representatives are busy. According to this measure, about 47% of the firms are governed by "busy boards". In contrast to Ferris et al. (2003) we do not find a positive correlation between multiple directorships and firm size.

C. Social Network Measures

Any social network consists of several agents who are connected with each other through social relations such as direct contacts, group attachments, or meetings (Scott, 2000). The members of a network and their connections can be visualized as a structure of *nodes* and *ties*. In our analysis, *nodes* are the individual directors within the network, and *ties* are the relationships between these directors. Two directors are connected if they serve on the same supervisory board. For each firm and each year in our sample, we collect data on all directors who serve on a firm's board. This leads to a database with about 1,600 *nodes* and roughly 35,000 *ties*. We then build an annual social matrix, in which each director is represented by a column and a row. Whenever two directors *i* and *j* serve on the same board, the value of the intersection point, i.e. cell (*i,j*) is 1, otherwise it is 0. Since relationships are always bilateral (director *i* knows director *j*, which implies that *j* must know *i*), this procedure results in a symmetric matrix, with the diagonal (the relation between *i* and *i*) being 0 by definition. Figure 1 visualizes the entire network of directors for the year 2003.[9] Each of the clusters that are visible on the border of the figure represents a firm whose directors are not connected to the core of the network. Moving closer to the centre of the figure, it is hardly possible to identify clusters. This also makes sense intuitively since directors at the core of the network hold many board positions and cannot be assigned to a single cluster.

[Insert Figure 1 about here]

The concept of "centrality" is used in social network research in order to determine the relative importance of a person within a network. We use three different well established measures that all rest on the notion that central agents in the network have better access to

[9] The Organizational Risk Analyzer (ORA) sofware v1.9.0, which was developed by CASOS (2008) at Carnegie Mellon is used to visualize the social network.

resources within the network (e.g. information). Therefore, centrality in the network can be regarded as an equivalent to importance and popularity.

The *Degree* centrality (C_D) is based on the number of direct links (or contacts) incident on a *node* (i.e. director). Under this definition, a central director assumes a structural (not necessarily important) position in the network and serves as source or distributor of information and resources. Even though this measure is very intuitive and comparatively easy to implement, its explanatory power is limited to the first level of the network. This means that two directors who have the same number of direct connections will get assigned the same value $C_D(n_i)$, irrespective of how well connected their contacts are. Theoretically, this measure should be closest to the variable "busy board" as it only captures the number of connections. *Degree* centrality is defined as follows:

$$C_D(n_i) = d_i(n_i) = \sum_{j=1}^{g} x_{ij} = \sum_{j=1}^{g} x_{ji} \tag{1}$$

where g is the total number of directors or *nodes* n_i. The variable is further normalized by dividing (1) by the number of possible connections of director n_i with the other *g-1 nodes* in the network:

$$C_D^S(n_i) = \frac{d_i(n_i)}{(g-1)} \tag{2}$$

The underlying idea of our second measure, *Betweenness* centrality (C_B), is that an agent who is situated on many geodesic paths[10] between any two *nodes* is a central and important player (Freeman 1979). In other words, the concept of *Betweenness* measures the extent to which an agent can act as a "gatekeeper" and control the flow of information between two other agents. In our context, a director with a comparatively high *Betweenness* centrality will most likely

[10] The shortest path between any particular pair of points in the network is called "geodesic" (Scott 2000).

devote much of his time and attention to his network. As Mayhew and Levinger (1976) argue, maintaining social ties is generally time-consuming. It will most likely demand even more attention the more important the "gatekeeper" is. An agent in such a position can also demand a commission for his role as an intermediary (Scott 2000). The commission will most likely come about in the form of non-pecuniary benefits (e.g. invitation to sports events, etc.) or other personal benefits. However, it is unlikely that the "gatekeeper" will share these benefits with the companies in which he acts as member of the supervisory board.

Mathematically, *Betweenness* centrality can be defined as follows, where $p_{ik}(n_i)$ is the number of geodesic paths between *j* and *k* that run through *i*:

$$C_B(n_i) = \sum_{j<}^{g} \sum_{k}^{g} \frac{1}{p_{jk}} * p_{jk}(n_i), \quad for\ i \neq j \neq k \tag{3}$$

Compared to *Degree*, the *Betweenness* measure is better capable of measuring the importance, and thus the commitment, of directors. The measure also has a drawback, since it will always be 0 if a director does not have any connections outside of "his" board. This holds true for about 70% of the directors if employee representatives are included.

The third measure, *Connectiveness* or Eigenvalue centrality (C_C), has been developed by Bonacich (1972, 1987) and uses weighted scores. Bonacich argues that the "quality" of connections should be taken into account when assessing the centrality of an agent. This means that the extent to which a director is connected to other well connected directors is captured by the *Connectiveness* measure. Whenever a director gets connected to another well connected agent, this will not only boost his own centrality, but also the centrality of other directors who are connected to him. Formally, the individual centrality of each director is computed as follows:

$$C_C(n_i) = \frac{\sum_{j=1}^{g} W_{ij} C_C(n_j)}{\lambda_{\max}} \quad (4)$$

W_{ij} stands for the intersection of row *i* and column *j* in the social matrix discussed above. Bonacich (1972) shows that there exists a positive Eigenvalue λ for every Matrix *W* that results in a corresponding Eigenvector C_C that only consists of positive values or 0. This condition is met for the largest positive Eigenvalue. Like *Degree* centrality, our variables *Betweenness* and *Connectiveness* are normalized.

As stated above, the disclosure requirements of the German Stock Corporation Act (§125 *AktG*) allow us to map the entire network of directors beyond our sample firms. Thus, it is captured in our database if two directors who serve on two different boards of our sample firms both hold a directorship in another (public or private) firm that is not part of our sample. We construct social matrices for each year between 2003 and 2006 in order to document changes in the network. Whenever a director leaves the board, we assume that he knows his successor, i.e. that there is a connection between the two of them.

Our network measures are computed with the help of the UCINET software package v6.171. Our choice is based on Huisman and van Duijn (2005) who compare different software packages used for social network analysis. Table 2 lists the ten most central directors for each measure and year of our sample period. Figures in the table are computed relative to the size of the network to facilitate the comparability of data over different years.

[Insert Table 2 about here]

As can be seen from Table 2, the *Degree* measure is comparatively stable over time. The number of directorships does not seem to change dramatically among the best connected directors. Taking a closer look at the *Degree*, it becomes apparent that the best connected directors are mostly chairmen of large DAX companies. *Betweenness*, as a measure of the

extent to which an agent can control the flow of information, exhibits a different structure. For example, Manfred Schneider, chairman of Bayer AG, has the highest or second highest *Degree* in each year of the sample period due to his board positions at Daimler AG, Linde AG, Metro AG and RWE AG. However, his *Betweenness* is comparatively low since these links lack uniqueness, which means that other agents can use alternative paths between these large companies. In contrast, Thomas Otto, a union offical of IG Metall, reaches a higher *Betweenness* score in 2005 even though he only holds three relevant directorships in MAN AG, TA Triumph Adler AG, and SMS GmbH (a private firm). Although these companies are a lot smaller and the number of Mr. Otto's directorships lower, the geodesic paths Mr. Otto is situated on are much more unique. As a result, he is among the ten best connected directors in 2005 despite the comparatively low number of 42 direct connections.

Connectiveness, our third measure, puts an emphasis on the quality of connections. This approach can be illustrated with the example of Henning Schulte-Noelle (chairman of Allianz AG). In 2003, Mr. Schulte-Noelle is among the best connected directors with respect to *Degree* and *Connectiveness*. In 2004, he gave up several directorships and lost over 50 direct connections. As a result, Mr. Schulte-Noelle dropped out of the list with the highest *Degree*. Even though his *Connectiveness* also decreased, he is still among the best connected directors in the years 2004-2006 since he kept his positions at well connected firms like E.ON AG and ThyssenKrupp AG.

In a last step, the data on individual directors is aggregated on a firm level. This allows us to draw conclusions concerning the extent to which members of the supervisory board – and thus the board as a whole – might be busy or overcommitted. Table 3 presents descriptive statistics (in percent) for our centrality measures.

[Insert Table 3 about here]

We also test for the correlation of the firm-level centrality measures with firm characteristics. Notably, the highest correlation between a centrality measure and firm size amounts to only 0.42.[11] This implies that being on the board of a large firm does not necessarily mean that directors are well connected or that the board as a whole has a high centrality.

IV. Multivariate Analysis

Our main hypothesis rests on the assumption that individuals who are overcommitted might shirk their responsibilities as directors. In the previous literature, the "busyness" of a director has been derived based on the number of directorships. We argue that this might be too simplistic a measure since it does not capture the "quality" of these other obligations and propose an alternative approach based on measures from social network research.

In this section, we examine the effect of overcommitted boards on firm performance (measured by Tobin's q) and executive remuneration in a multivariate panel regression framework.

A. Multiple Directorships and Firm Performance

In a first step, we apply the methodology used by Ferris et al. (2003) and Fich and Shivdasani (2006) to our dataset. More specifically, we estimate firm fixed-effects models using market-to-book value as the dependent variable.[12] These models assume that agency costs (which arise due to poor monitoring by overcommitted directors) are reflected by a lower market-to-book ratio. The market-to-book ratio is used as a proxy for Tobin's q. It is calculated as market value of equity at the end of the year plus book value of debt divided by the book value of assets at the end of the year. As explanatory variables, we include the three alternative measures for "busy boards" used by Fich and Shivdasani (2006) and variables that

[11] These correlations are not reported but available upon request.
[12] Ferris et al. (2003) use a cross-section of 1995 data; Fich and Sivdasani (2006) analyze data from 1989-1995 using fixed-effects regressions.

control for corporate governance and financial characteristics. We control for firm size using the natural logarithm of total assets. According to the results of Yermack (1996) and Fich and Shivdasani (2006) board size has a negative and significant effect on firm performance. We therefore control for board size using the log of the number of directors. We also include control variables for the level of employee representation on the board. In a study of German codetermination, Gorton and Schmid (2004) find that market valuation decreases with the number of employee representatives on the supervisory board. In addition, several studies have shown that ownership characteristics play an important role in the German system of corporate governance (Franks and Mayer 2001, Andres 2008). In the absence of an active takeover market, large blockholders often act as the main monitors of a firm. We therefore include the free float (all outstanding shares minus shares held by blockholders > 5%) as a control variable. The regressions further contain controls for accounting performance (return on assets), firm age (natural logarithm of years since incorporation), risk (return volatility, measured as the standard deviation of share price returns for the previous 36 months), capital structure (leverage, defined as book value of total debt divided by book value of total assets), and sales growth. Lastly, all models include year and industry dummies. Tests for correlation between the explanatory variables and variance inflation factors (not reported) indicate that our regression models do not suffer from a multicollinearity bias.[13]

The results of the multivariate panel regressions are reported in Table 4. In models (1)-(3) all variables that measure the extent to which boards are busy are based on directors that represent the interests of shareholders (i.e. excluding employee representatives). Regressions (4)-(6) are based on all directors, including employee representatives. We do not find signs of a significant relationship between busy directors and firm performance in any model specification. The coefficients for *busy board* (a dummy that is set to one if 50% or more of

[13] The only exception is a comparatively high correlation between the variables size and board size, which might be too high (0.67). We therefore estimate all regressions without board size as a robustness test. The results are not influenced by the correlation between the two variables.

the directors hold three or more directorships) and *percentage of busy directors* (both used by Fich and Shivdasani 2006) are negative but insignificant. The variable *average number of directorships* (used by Ferris et al. 2003) shows positive, yet insignificant coefficients. These findings indicate that the number of board appointments that a directors holds does not seem to have an influence on firm performance in Germany. Compared to U.S. studies, the results are in line with Ferris et al. (2003) but stand partly in contrast to Fich and Shivdasani (2006).

[Insert Table 4 about here]

B. Director Networks and Firm Governance

The preceding results do not support the hypothesis that busy boards are associated with poor firm performance. This view is based on the notion that too many board assignments might detract from the ability of directors to act as vigilant monitors of management; directors might become overcommitted and as a result they might not have the time and attention required for their monitoring duties. As discussed above, several research papers have tested the hypothesis that serving on multiple boards has a negative impact on corporate performance. In these studies, boards are classified as busy/not busy based on the number and percentage of directorships per director. However, these measures will be noisy if they do not adequately capture the extent to which directors are really busy and overcommitted. Take the example of two directors in our sample: Mr. Schulte-Noelle, who holds only four board appointments in 2006, and Michael Busch, director at Washtec AG (a producer of vehicle washing equipment), who serves on seven boards in the same year. Based on the number of board appointments, Mr. Busch is busier. On the other hand, he serves on the boards of comparatively small firms, some of them small holding companies. Mr. Schulte-Noelle is chairman at Allianz AG and director at Siemens AG, ThyssenKrupp AG, and E.ON AG, some of the most important German companies with connections to politics, media, and sports. In other words, he is among the best connected directors and sits at the heart of the

'inner circle' of organizational elites (Useem 1984). Most likely, he will be busier with his other obligations, heavily lobbied, and closer to being overcommitted than Mr. Busch; not necessarily because of the (direct) duties associated with these directorships, but because of the indirect obligations that stem from his central position in the network. Since simple measures such as the number of board seats and other closely related measures fail to detect this dimension of additional board seats, we propose using alternative measures from social network analysis. The variables *Degree, Betweenness* and *Connectiveness*, (aggregated on a firm level) are employed in order to measure the extent to which a firm's directors are overcommitted.

We first examine the effect of directors' importance in the social network on firm performance. Table 5 reports the results of fixed-effects regressions with Tobin's q as dependent variable. In models (1)-(3) we use the network measures as substitutes for the *busy board* variables included in section IV.A. Model specifications (4)-(6) contain the busy dummy as an additional control variable. As network measures, we use the average normalized *Degree, Betweenness* and *Connectiveness* for every firm and year.[14] All other control variables are equal to the regressions above.

[Insert Table 5 about here]

Concerning the influence of the number of directorships (captured by the variable *busy board*) on Tobin's q, the results in Table 5 confirm the preceding findings and show insignificant coefficients in all model specifications. In contrast, we find negative and significant coefficients (at the 0.05-level) on the variables *Degree* and *Connectiveness.* This indicates that having directors who are comparatively central in the network is associated with poor firm performance. Even though well connected directors could theoretically be beneficial for

[14] As a robustness test we use the median of the normalized values. These specifications are not reported as they do not materially change the results.

the firm (e.g. access to financial resources), the directors' commitment to other obligations seems to have a negative impact on the firm.

In order to investigate the effect on firm governance further, we examine the relationship between network centrality and the level of executive compensation. Prior academic research suggests that weak monitoring and poor governance are positively related to executive compensation. The underlying theory is based on the notion that in firms with weak corporate governance structures and insufficient monitoring, executives successfully influence their compensation committees. Core, Holthausen and Larcker (1999), for example, find that CEO compensation is higher when the board is large, and when the CEO holds the position of chairman of the board. Yermack (1997) presents related evidence by showing that the CEO's success in receiving stock options at favourable times depends significantly on his influence on the board. Cyert, Kang and Kumar (2002) show, both theoretically and empirically, that top-management compensation is influenced by the board's structure. In line with Core, Holthausen and Larcker (1999), they find CEO compensation to be higher when the CEO is also chairman of the board. Lastly, Sapp (2008) shows that measures for weaker boards are related positively to the level of CEO compensation.

According to Shleifer and Vishny (1986), the presence of a large shareholder leads to closer monitoring of the managements' performance. Bertant and Mullainathan (2001) find that in firms that lack a large external blockholder, CEO compensation is less dependent on managerial effort. They find that in better governed firms, CEOs are less likely to be rewarded for luck. Hartzell and Starks (2003) examine the relationship between ownership concentration and executive compensation and find higher pay-performance sensitivities and lower executive compensation the more concentrated institutional ownership is. Related to the literature on busy boards, Shivdasani (1993) finds evidence of a positive relation between CEO compensation and the number of directorships that each director holds.

All in all, these papers provide strong support for the view that executive compensation is an important component of corporate governance and show that poor governance is associated with comparatively high levels of executive pay. Following the hypothesis that overcommitted directors spend less time and effort monitoring management, we investigate the relationship between the directors' centrality in the network and the level of executive compensation. As dependent variable, we compute the average per-capita executive compensation (total compensation, including options etc.) for each firm and year.[15] Among the set of explanatory variables, we include the average normalized *Degree*, *Betweenness* and *Connectiveness*.[16] Since the *busy board* variable does not seem to detect the extent to which directors are overcommitted, we only include it as a control variable in specifications (4)-(6).[17] One of the stylized facts of compensation research is the positive relationship between firm size and executive pay. It is well documented in the empirical literature that large firms pay their executives more (see e.g. Murphy 1985, Ryan and Wiggins 2001). We therefore include firm size (logarithm of total assets) as a control variable. With regard to board characteristics, we include the type of employee representation (one-third vs. one-half) as controls. As argued above, ownership characteristics potentially lead to closer monitoring, which is why we include the free float (as an inverse measure of ownership concentration) among the explanatory variables. Even though most firms use some form of equity-based compensation as part of their executive compensation packages, pay-performance sensitivities are generally found to be low (e.g. Jensen and Murphy 1990). Nevertheless, we control for past operating (return on assets) and stock price performance (we use the CDAX performance

[15] Until recently, German companies were not required to disclose executive remuneration on an individual basis. However, disclosure of the *aggregate* executive remuneration is mandated by the German Commercial Code. We combine the information on aggregate compensation with information on the number of executives to compute the average per-capita remuneration for all sample firms. From 2007 onwards, publicly listed firms are required by law to disclose executive compensation on an individual basis (if the shareholders' meeting does not grant an exemption from the disclosure requirement).

[16] As in the preceding regressions, we use the median of the normalized network measures as a robustness test. The results are quantitatively and qualitatively similar to those reported in the text.

[17] We also run all regressions with executive compensation as dependent variable using the three measures for busy boards that are derived from the number of directorships per director (not reported). The coefficients on these measures are negative, but insignificant in all regressions.

index to adjust stock returns over the past 12 months). Capital structure (leverage) is also included as a control variable (John and John 1993). Lastly, we include dummy variables to control for year and industry fixed effects.[18]

The results of fixed-effects panel regressions with executive compensation as dependent variable are presented in Table 6. As hypothesized, we find a positive and significant relationship between the network measures and the level of executive compensation. The coefficients on *Degree, Betweenness*, and *Connectiveness* are all positive and highly significant (at the 0.01- and 0.05-level). This finding implies that firms in which members of the executive board are more central in the network of German directors pay their executives more. Since the regressions also control for size and performance, these results can be interpreted as supporting evidence of the hypothesis that directors who are better connected are associated with poor monitoring. Concerning the other control variables, the coefficients on *busy board* are positive, but insignificant in all model specifications. In line with the literature, we find a significantly positive relationship between firm size and executive compensation. In addition, remuneration seems to be positively influenced by the stock price performance of the past 12 months.

[Insert Table 6 about here]

In sum, the results of the regression analysis provide evidence that high levels of director centrality are associated with low firm performance and high levels of executive compensation. The results further indicate that social network measures yield explanatory power beyond simple measures of director busyness. We interpret our findings as evidence for weaker governance and poorer monitoring in firms with directors who are central players in the social network.

[18] As in the previous regressions, we compute variance inflation factors and cross-correlations. The test statistics (not reported) confirm that the coefficients obtained in our compensation regressions are not biased by multicollinearity.

C. Robustness Tests

The findings presented above potentially suffer from the problem of endogeneity: As a result of bad performance, firms might seek to appoint well connected directors - who have built experience and reputation - to their boards in order to improve corporate performance. This reversed causality would imply that performance is not worse due to better connected boards: It could be the case that only bad firms seek the advice of better connected directors and therefore boost their boards' network centrality through the appointment of well connected directors. We test the causality of our results by estimating regression models of the relation between past performance and changes in network centrality. Similar to the methodology used in Yermack (1996) we take the total annual change in the network measure (from t=-1 to t=0) as the dependent variable. As explanatory variables, we include the abnormal stock price performance (raw stock price return minus the return of the CDAX index) during the same year (t=-1 to t=0) and in the previous year (t=-2 to t=-1). If companies indeed appointed well connected directors as a result of poor performance, either the performance in the year of the board change or in the previous year (and hence the coefficients of these two variables) should show some level of significance. As additional control variables, we include the change in Tobin's q and the change in firm size (log of total assets).

Table 7 contains the results of these OLS-regressions. The models do not provide any evidence that firms change the centrality of their boards in response to poor performance. In other words, we do not find evidence of a reversed causality as well connected directors do not seem to be appointed as a response to bad performance. We obtain qualitatively similar results if lagged changes in Tobin's q (i.e. from t=-2 to t=-1) are added as additional control variables. There is weak evidence that the centrality measures *Degree* and *Betweenness* tend to decrease in response to (positive) changes in firm size.

[Insert Table 7 about here]

As an additional robustness test, we identify the top and bottom deciles with regard to the 2003 abnormal stock price returns. We then compute the average (and median) annual change in network measures for these groups. As argued above, if the findings presented in section IV.B are indeed the result of a reversed causality, companies should appoint well connected directors following poor performance. Table 8 contains the average change in network centrality for the deciles with the best and worst abnormal stock performance during 2003. In this table, the longest possible interval (2003-2006) is displayed. This is the most conservative measure since changes in the board usually take time, and the 4-year time window theoretically allows for the replacement of the whole board (tenure can be only up to 5 years). It can be seen that all network measures decrease for these groups over the period from 2003-2006, which is not surprising given the breakup of the so-called "Deutschland AG" with its strong inter-firm connections (Dittmann et al. 2010). However, changes in the network measures are almost indistinguishable (and statistically insignificant) between the best and worst performers. Similar calculations for other periods, which relate the top/bottom performance deciles in terms of abnormal stock price performance and changes in Tobin's q to subsequent changes in the boards' network centrality yield similar results.[19] This can be regarded as supporting evidence that the main finding of a negative relationship between firm performance and board centrality is not the result of a reversed causality.

[Insert Table 8 about here]

In the empirical corporate finance literature, Tobin's q is a widely used proxy for firm performance in general and for the success of corporate boards in minimizing agency costs in particular (e.g. Ferris et al. 2003, Fitch and Shivdasani 2006, Yermack 1996). Nevertheless, it is by definition a measure that captures the assessment of market participants which may differ from a firm's "true" profitability. In addition, even though we control for sales growth,

[19] Tables for these computations are not reported as they are qualitatively similar to the results in Table 8. They are available upon request.

growth opportunities might have an impact on our estimates. We therefore conduct additional robustness tests in which we employ accounting based profitability measures as the dependent variable. Specifically, return on assets (ROA, defined as EBITDA over total assets) and return on equity (ROE, defined as net income over book value of equity) are used as dependent variables. The set of controls is similar to the performance regressions presented in Tables 4 and 5 (except for the explanatory variable return on assets). The main results of our analysis remain qualitatively unchanged (results are not presented in a table). In these fixed-effects regressions, the coefficients of the network measure *Degree* are negative and significant at the 0.01-level (ROA) and 0.10-level (ROE). Also, similar to the results presented above, the explanatory power of *Betweenness* is limited, showing negative but insignificant coefficients, while coefficients on *Connectiveness* are again negative and significant (at the 0.10-level). Coefficients of the variable *busy board* are negative but insignificant, which confirms our earlier finding of a limited influence of variables that simply count the number of board appointments. These results are not directly comparable to Ferris et al. (2003) as these authors only use market-to-book as performance measure. However, they stand in contrast to the results of Fich and Shivdasani (2006) who find a negative relationship between ROA and the busy board indicator variable (the authors do not use ROE as an alternative measure).

In sum, the analysis in this section can be regarded as strong support for our finding of a negative relationship between measures of network centrality and firm performance. Our main results seem to be robust to endogeneity concerns and point in the same direction when operating performance measures are used instead of Tobin's q.

V. Conclusion

Following a number of corporate scandals, governance structures have recently become a subject of public debate in many countries. Shareholder activists and organizations that defend the interests of minority shareholders often criticize firms for appointing directors who

hold several directorships in other firms. This view is based on the argument that serving on too many boards will place a heavy burden on directors. As a result, directors might become overcommitted and shirk their responsibility as monitors of management. Corporate governance policy advocates have therefore called for limits on the number of directorships that a director should hold.

The debate has also spurred empirical research that investigates whether busy directors are indeed associated with poor governance. So far, empirical evidence is scarce and limited to the U.S. Most importantly, previous papers only look at the number of directorships in order to classify directors as (not) busy. In this manner, the metric used fails to grasp the importance and quality of additional board seats. We propose an alternative approach based on measures from the social network literature. By measuring the centrality of directors, it is possible to assign weights to different board seats based on the centrality in the corporate network.

We examine a sample of 133 German firms over four years, leading to a network of about 1,600 directors and 35,000 connections. Aggregated on a firm level, we use this data to investigate the relationship between firm governance and the directors' importance in the network. Our results show that well connected boards are associated with lower firm performance (as measured by Tobin's q). In addition, firms with better connected directors pay their executives significantly more. We interpret these findings as evidence for poor monitoring in firms that have important and well connected directors.

These findings have direct policy implications. They suggest that calls for a limit of directorships are ill-advised as long as a limitation does not take into account the quality of these obligations. Our results also imply that it might not be optimal for shareholders to base their decision to vote for a particular director solely on his/her reputation, since the most reputable directors will most likely be those who are already present on several boards and therefore have to balance the interests of many parties. Having a large number of important

directors on the board can thus be counterproductive as it might lead to an overcommitted board.

References:

Andres, C. (2008): Large Shareholders and Firm Performance - An Empirical Examination of Founding-Family Ownership, *Journal of Corporate Finance*, 14, 431-445.

Barnea, A. and I. Guedj (2008): Director Networks and Firm Governance, working paper. Available at: www.usc.edu/schools/business/FBE/seminars/papers/AE_4-25-08_GUEDJ.pdf.

Baumeister, R. and M. Leary (1995): The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychological Bulletin*, 117, 497-529.

Bertrand, M. and S. Mullainathan (2001): Are CEOs Rewarded for Luck? The Ones Without Principals Are, *Quarterly Journal of Economics*, 116, 901-32.

Bonacich, P. (1972): Factoring and Weighting Approaches to Status Scores and Clique Identification, *Journal of Mathematical Sociology*, 2, 113-120.

Bonacich, P. (1987): Power and Centrality: A Family of Measures, *American Journal of Sociology*, 92, 1170-1182.

CASOS (2008): Organizational Risk Analyzer v1.9.0, Carnegie Mellon University, School of Computer Science, http://www.casos.cs.cmu.edu/projects/ora/

Core J., Holthausen, R. and D. Larcker (1999): Corporate Governance, Chief Executive Officer Compensation, and Firm Performance, *Journal of Financial Economics*, 51, 371-406.

Cyert, R. M., Kang, S. H. and P. Kumar (2002): Corporate Governance, Takeovers, and Top-Management Compensation: Theory and Evidence, *Management Science*, 48, 453-469.

Dittmann, I., Maug, E. and C. Schneider (2010): Bankers on the Boards of German Firms: What they do, what they are worth, and why they are (still) there, *Review of Finance*, 14, 35-71.

Ferris, S. P., Jagannathan, M. and A. C. Pritchard (2003): Too Busy to Mind the Business? Monitoring by Directors with Multiple Board Appointments, *Journal of Finance*, 58, 1087-1111.

Fich, E. M. and A. Shivdasani (2006): Are Busy Boards Effective Monitors? *Journal of Finance*, 61, 689-724.

Franks, J. and C. Mayer (2001): Ownership and Control of German Corporations. *Review of Financial Studies*, 14, 943-977.

Freeman, L. C. (1979): Centrality in Social Networks: Conceptual clarification, *Social Networks*, 1, 215-239.

Gorton, G., and F.A. Schmid (2004): Capital, Labor, and the Firm: A Study of German Codetermination, *Journal of the European Economic Association*, 863-904.

Hartzell, J. C. and L. T. Starks (2003): Institutional Investors and Executive Compensation, *Journal of Finance*, 58, 2351-2374.

Huisman, M. and M. A. J. van Duijn (2005): Software for Social Network Analysis, in: P. J. Carrington, J. Scott and S. Wasserman (eds.), *Models and Methods in Social Network Analysis*, Cambridge University Press, New York, NY, 270-316.

Jensen, M. C. and K. J. Murphy (1990): Performance Pay and Top-Management Incentives, *Journal of Political Economy*, 98, 225-264.

Jiraporn, P., Singh, M. and C. I. Lee (2009): Ineffective corporate governance: director busyness and board committee memberships, *Journal of Banking and Finance*, 33, 819-828.

John, T. A. and K. John (1993): Top-Management Compensation and Capital Structure, *Journal of Finance*, 48, 949-974.

Mace, M. L. (1986): Directors: Myth and reality. 2nd edition, Harvard Business School Press, Boston.

Maslow, A. H. (1968): Towards a Psychology of Being. John Wiley & Sons, New York.

Mayhew, B. H. and R. L. Levinger (1976): Size and Density of Interaction in Human Aggregates, *American Journal of Sociology*, 82, 86-110.

McPherson, M., Smith-Lovin, L. and J. Cook (2001): Birds of a Feather: Homophily in Social Networks, *Annual Review of Sociology*, 27, 415-444.

Munshi, K. (2003): Networks in the Modern Economy: Mexican Migrants in the U.S. Labor Market, *Quarterly Journal of Economics*, 118, 549-597.

Murphy, K. J. (1985): Corporate Performance and Managerial Remuneration – An Empirical Analysis, *Journal of Accounting and Economics*, 7, 11-42.

Perry, T. and U. Peyer (2005): Board Seat Accumulation by Executives: A Shareholder's Perspective, *Journal of Finance*, 60, 2083-2123.

Ryan, H. E. and R. A. Wiggins, R. A. (2001): The Influence of Firm-and Manager Specific Characteristics on the Structure of Executive Compensation, *Journal of Corporate Finance*, 7, 101-123.

Sapp, S. G. (2008): The Impact of Corporate Governance on Executive Compensation, *European Financial Management*, 14, 710-746.

Scott, J. P. (2000): Social Network Analysis – A Handbook. 2nd edition, Sage Publications, London.

Shleifer, A. and R. Vishny (1986): Large Shareholders and Corporate Control, *Journal of Political Economy*, 94, 461-488.

Shivdasani, A. (1993): Board Composition, Ownership Structure and Hostile Takeovers, *Journal of Accounting and Economics*, 16, 167-198.

Shivdasani, A. and Yermack, D. (1999): CEO involvement in the selection of new board members: An empirical analysis, *Journal of Finance*, 54, 1829-1853.

Subrahmanyam, A. (2008): Social Networks and Corporate Governance, *European Financial Management*, 14, 633-662.

Useem, M. (1984): The Inner Circle: Large Corporations and the Rise of Business Political Activity. Oxford University Press.

Wade, J. B., O'Reilly, C. A. and I. Chandratat (1990): Golden Parachutes: CEOs and the exercise of social influence, *Administrative Science Quarterly*, 35, 587-603.

Yermack, D. (1996): Higher Market Valuations of Companies With a Small Board of Directors, *Journal of Financial Economics*, 40, 185-221.

Yermack, D. (1997): Good Timing: CEO Stock Option Awards and Company News Announcements, *Journal of Finance*, 52, 449-476.

Figure 1
Network of all directors

This graphic shows connections between all directors of 133 German firms for the year 2003. The total number of directors is 1,654, the number of connections is 35,106.

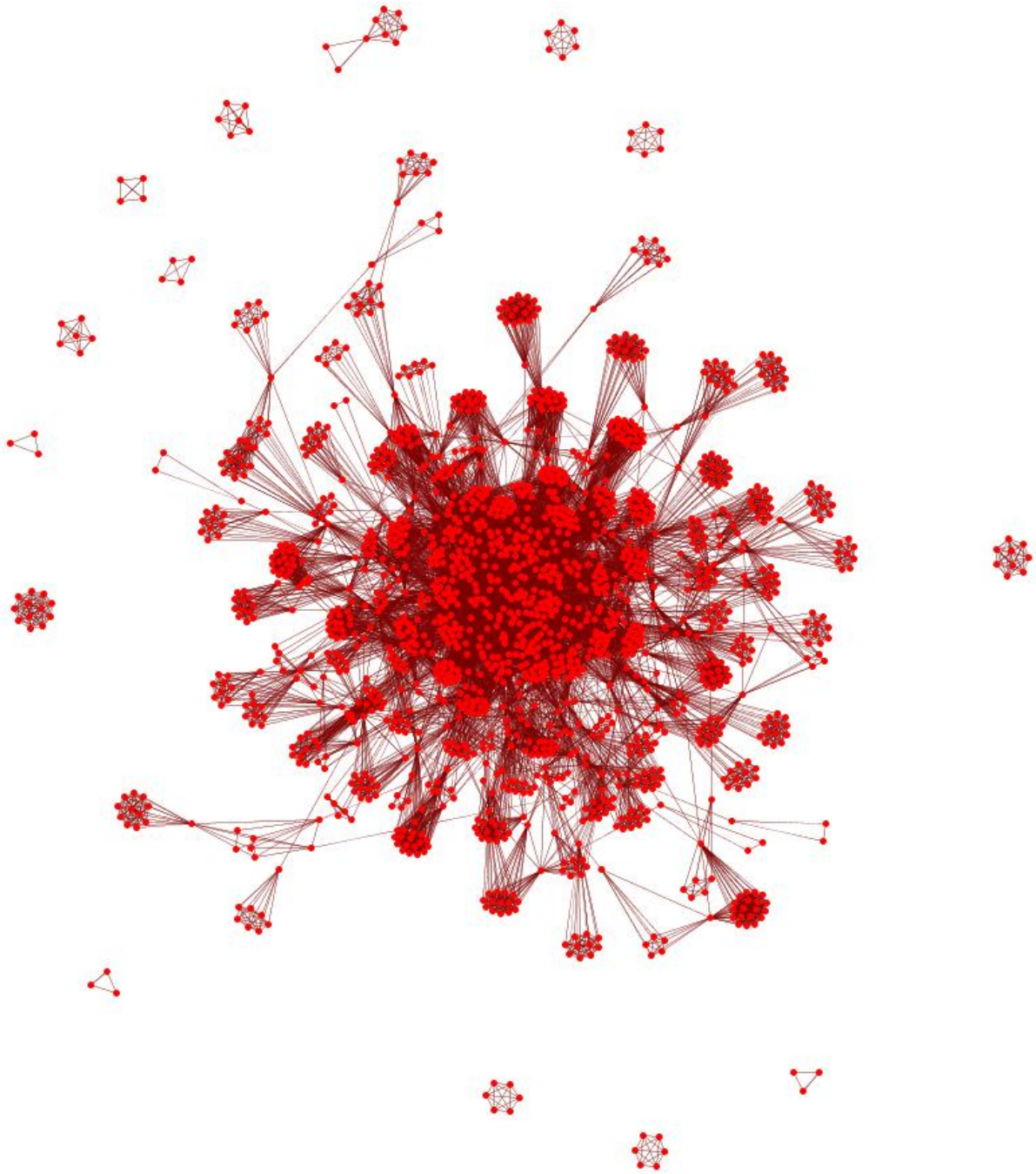

Table 1
Data Description

This table contains descriptive statistics for 532 annual observations of 133 German firms for the period from 2003-2006. Leverage is defined as book value of total debt divided by book value of total assets. Tobin's q is calculated as market value of equity at the end of the year plus book value of debt divided by the book value of assets at the end of the year. Executive remuneration is the average per-capita executive remuneration per year. Panel B provides data on 1,654 directors.

Panel A			
Variable	Mean	Median	SD
Market value of equity (Mio. €)	5,382	759	11,490
Book value of assets (Mio. €)	35,602	1,317	25,167
Leverage	0.66	0.68	0.18
Tobin's q	1.48	1.16	1.03
Age (years since incorporation)	79.54	78.50	56.05
Listing age (in years)	29.74	13.00	36.76
Return on assets	3.82%	3.07%	7.04%
Executive remuneration (1,000 €)	1,100.4	820.8	970.0
Without options (1,000 €)	1,009.4	765.5	817.0

Panel B			
Variable	Mean	Median	SD
Board size	13.58	13	6.06
Ordinary board members	7.78	7	2.51
Employee representatives	5.80	6	4.71
Number of directorships	3.49	3.17	1.70
Including employee representatives	2.72	2.40	1.29
Percentage of busy directors	52.44		
Including employee representatives	33.07		
Percentage of busy boards	46.78		
Including employee representatives	19.36		

Table 2
Most Central Directors

This table contains a list of the ten most central directors in the network of German firms subdivided into *Degree (C'_D), Betweenness (C'_B),* and *Connectiveness (C'_C)* centrality measures for the period from 2003-2006. Employee representatives are marked with an asterisk.

Panel A: Top 10 *Degree, Betweenness* and *Connectiveness* for 2003 in Percent

No.	Name	C'_D	Name	C'_B	Name	C'_C
1	Schneider, Manfred	9.56	Wolf, Gerhard	4.41	Cromme, Gerhard	26.32
2	Kohlhaussen, M	9.01	Hülse, Günther	4.36	Schulte-Noelle, H.	23.89
3	Cromme, Gerhard	8.83	Strube, Jürgen	3.90	Baumann, Karl-H.	23.34
4	Baumann, Karl-H.	8.59	Schneider, Manfred	3.61	Schneider, Manfred	21.78
5	Hartmann, Ulich	8.29	Winkelhaus, Hans-D.	3.36	Voss, Bernd W.	21.52
6	Schulte-Noelle, H.	7.99	Breuer, Rolf-E.	3.27	Hartmann, Ulrich	21.05
7	Voss, Bernd W.	7.74	Walter, Bernhard	3.25	Breuer, Rolf-E.	20.19
8	Walter, Bernhard	7.74	Weber, Jürgen	3.09	Kohlhaussen, Martin	20.16
9	Breuer, Rolf E.	7.68	Georgi, Andreas	3.02	Diekmann, Michael	17.09
10	Schinzler, Hans-J.	7.56	Zühlsdorff, Peter	2.98	Strube, Jürgen	16.82

Panel B: Top 10 *Degree, Betweenness* and *Connectiveness* for 2004 in Percent

No.	Name	C'_D	Name	C'_B	Name	C'_C
1	Cromme, Gerhard	8.91	Walter, Bernhard	4.57	Cromme, Gerhard	28.11
2	Schneider, Manfred	8.85	Strube, Jürgen	3.99	Schneider, Manfred	23.42
3	Hartmann, Ulrich	8.52	Kley, Max Dietrich	3.88	Hartmann, Ulrich	22.79
4	Walter, Bernhard	8.00	Reich, Hans, W.	3.75	Kuhnt, Dietmar	21.47
5	Kuhnt, Dietmar	7.60	Wössner, Mark	3.47	Baumann, Karl-H.	20.93
6	Baumann, Karl-H.	7.21	Hülse, Günther	3.45	Kohlhaussen, Martin	20.10
7	Kohlhaussen, Martin	7.21	Zühlsdorff, Peter	3.44	Schulte-Noelle, H.	19.37
8	Strube, Jürgen	6.49	Kuhnt, Dietmar	3.34	Pierer, Heinrich von	19.18
9	Reich, Hans W.	6.42	Eichler, Bertin*	3.28	Neuber, Friedel	19.04
10	Kley, Max Dietrich	6.36	Schneider, Manfred	3.23	Walter, Bernhard	18.23

Panel C: Top 10 *Degree, Betweenness* and *Connectiveness* for 2005 in Percent

No.	Name	C'_D	Name	C'_B	Name	C'_C
1	Schneider, Manfred	8.98	Walter, Bernhard	5.81	Cromme, Gerhard	26.56
2	Cromme, Gerhard	8.40	Reich, Hans W.	3.78	Pierer, Heinrich von	25.69
3	Pierer, Heinrich von	8.27	Kohlhaussen, Martin	3.64	Schneider, Manfred	23.30
4	Hartmann, Ulrich	8.08	Otto, Thomas*	3.59	Hartmann, Ulrich	21.97
5	Walter, Bernhard	7.95	Kley, Max Dietrich	3.52	Kohlhaussen, Martin	20.78
6	Kohlhaussen, M.	7.18	Schipporeit, Erhard	3.47	Schulz, Ekkehard D.	19.78
7	Schulz, Ekkehard D.	6.93	Schulz, Ekkehard D.	3.41	Schulte-Noelle, H.	18.48
8	Reich, Hans W.	6.35	Schneider, Manfred	3.35	Baumann, Karl-H.	17.63
9	Kuhnt, Dietmar	6.16	Eichler, Bertin*	3.09	Walter, Bernhard	17.43
10	Kley, Max Dietrich	6.09	Hartmann, Ulrich	3.02	Weber, Jürgen	17.19

Panel D: Top 10 *Degree, Betweenness* and *Connectiveness* for 2006 in Percent

No.	Name	C'_D	Name	C'_B	Name	C'_C
1	Schneider, Manfred	9.31	Schipporeit, Erhard	4.18	Cromme, Gerhard	26.27
2	Cromme, Gerhard	8.67	Schulz, Ekkehard D.	4.12	Schneider, Manfred	25.14
3	Hartmann, Ulrich	8.41	Schneider, Manfred	3.51	Schulz, Ekkehard D.	23.36
4	Schulz, Ekkehard D.	8.29	Reich, Hans W.	3.44	Hartmann, Ulrich	22.86
5	Pierer, Heinrich von	7.00	Hartmann, Ulrich	3.40	Kuhnt, Dietmar	20.03
6	Kuhnt, Dietmar	6.74	Profumo, Alessandro	3.12	Weber, Jürgen	19.30
7	Kohlhaussen, Martin	6.62	Strube, Jürgen	3.06	Pierer, Heinrich von	18.67
8	Reich, Hans W.	6.42	Grünberg, Hubertus	2.95	Kohlhaussen, Martin	18.58
9	Grünberg, Hubertus	6.23	Vassiliadis, Michael*	2.83	Schulte-Noelle, H.	16.52
10	Strube, Jürgen	5.97	Kohlhaussen, M.	2.78	Grünberg, Hubertus	15.97

Table 3
Normalized Firm Centrality in Percent

This table contains descriptive statistics of the network centrality measures *Degree*, *Betweenness*, and *Connectiveness* for a balanced sample of 133 German market listed firms for the period from 2003-2006.The total number of firm-year observations is 532. All figures are normalized and aggregated on a firm-level.

Variable	Mean	Median	Lowest decile	Highest decile	SD
Average Degree	1.259	1.034	0.321	2.647	0.876
Average Betweenness	0.263	0.165	0	0.622	0.232
Average Connectiveness	1.947	0.473	3.74×10^{-28}	6.851	2.911
Avg. Degree (w/o empl.)	1.630	1.237	0.388	3.572	1.222
Avg. Betweeness (w/o empl.)	0.446	0.288	0	1.067	0.397
Avg. Connectiveness (w/o empl.)	3.235	0.927	0	11.178	4.570
Aggregated Degree	10.324	6.818	0	27.273	10.307
Aggregated Betweenness	0.771	0.210	0	2.318	1.166
Aggregated Connectiveness	8.395	4.695	0	23.263	8.947
Median Degree	0.868	0.786	0.302	1.573	0.520
Median Betweenness	0.020	0	0	0.070	0.054
Median Connectiveness	1.079	0.138	1.89×10^{-29}	3.997	1.839
Min Degree	0.796	0.770	0.262	1.413	0.452
Min Betweenness	0	0	0	0	0
Min Connectiveness	0.978	0.128	0	3.704	1.642
Max Degree	3.459	2.523	0.321	8.519	2.957
Max Betweenness	1.779	1.506	0	3.612	1.367
Max Connectiveness	7.208	3.147	8.26×10^{-28}	23.301	8.739

Table 4
Multiple Directorships and Firm Performance

This table contains results of fixed-effects regressions of market-to-book value on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). Percentage of busy directors is the percentage of directors (per firm) who hold three or more directorships. In specifications (1)-(3) these variables are computed based on shareholder representatives only, the board variables in models (4)-(6) are based on all directors (including employee representatives). One-third (one-half) representation is a dummy that is set to one if 33% (50%) of the supervisory board members are employee representatives. Leverage is defined as book value of total debt divided by book value of total assets. Free float is calculated as the fraction of voting equity that is not held by large shareholders. Large shareholders are shareholders who hold more than 5% of the voting equity. Return volatility is measured as the standard deviation of share price returns for the previous 36 months. Sales growth is defined as the nominal growth rate of revenues over the past fiscal year. All regressions include year and industry dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

	Excluding employee representatives			All directors		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Busy board	-0.049			-0.068		
	(-0.65)			(-0.71)		
Percentage of busy		-0.035			-0.045	
directors		(-0.15)			(-0.15)	
Average number of			0.037			0.047
directorships			(0.88)			(0.77)
Firm size	-0.289	-0.295	-0.289	-0.295	-0.296	-0.290
(log of total assets)	(-1.33)	(-1.34)	(-1.32)	(-1.35)	(-1.35)	(-1.32)
Board size	0.043	0.058	0.087	0.066	0.059	0.081
(log of # of directors)	(0.29)	(0.40)	(0.61)	(0.48)	(0.41)	(0.57)
One-third	-0.054	-0.052	-0.059	-0.046	-0.049	-0.060
representation	(-0.49)	(-0.42)	(-0.59)	(-0.44)	(-0.43)	(-0.58)
One-half	0.192	0.189	0.181	0.193	0.190	0.189
representation	(2.59)**	(2.43)**	(2.50)**	(2.51)**	(2.47)**	(2.59)**
Leverage	0.507	0.503	0.481	0.467	0.502	0.484
	(0.67)	(0.66)	(0.63)	(0.61)	(0.66)	(0.64)
Free float	-0.141	-0.136	-0.125	-0.133	-0.138	-0.121
	(-0.82)	(-0.79)	(-0.71)	(-0.78)	(-0.78)	(-0.69)
Return on assets	1.317	1.311	1.282	1.290	1.308	1.284
	(1.00)	(0.98)	(0.97)	(0.97)	(0.98)	(0.97)
Return volatility	0.000	0.000	0.000	0.000	0.000	0.000
	(1.69)*	(1.65)*	(1.69)*	(1.65)	(1.65)*	(1.67)*
Sales growth	0.152	0.157	0.163	0.167	0.157	0.166
	(0.73)	(0.74)	(0.78)	(0.81)	(0.74)	(0.81)
Firm Age	0.596	0.608	0.613	0.608	0.609	0.612
	(1.50)	(1.53)	(1.54)	(1.54)	(1.54)	(1.54)
R-squared	0.157	0.156	0.160	0.157	0.156	0.159
F-statistic	4.66	4.12	4.44	4.46	4.11	4.22
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 5
Director Networks and Firm Performance

This table contains results of fixed-effects regressions of market-to-book value on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. Degree, Betweenness, and Connectiveness are measures for the centrality of a firm's directors in the social network. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). One-third (one-half) representation is a dummy that is set to one if 33% (50%) of the supervisory board members are employee representatives. Leverage is defined as book value of total debt divided by book value of total assets. Free float is calculated as the fraction of voting equity that is not held by large shareholders. Large shareholders are shareholders who hold more than 5% of the voting equity. Return volatility is measured as the standard deviation of share price returns for the previous 36 months. Sales growth is defined as the nominal growth rate of revenues over the past fiscal year. All regressions include year and industry dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Degree	-0.429			-0.425		
	(-2.12)**			(-2.16)**		
Betweenness		-0.291			-0.292	
		(-1.23)			(-1.42)	
Connectiveness			-0.070			-0.070
			(-2.04)**			(-2.07)**
Busy board				0.059	0.068	0.067
				(0.69)	(0.73)	(0.73)
Firm size	-0.290	-0.296	-0.283	-0.290	-0.295	-0.282
(log of total assets)	(-1.35)	(-1.35)	(-1.30)	(-1.35)	(-1.35)	(-1.30)
Board size	0.359	0.086	0.128	0.360	0.091	0.131
(log of # of directors)	(1.56)	(0.49)	(0.86)	(1.62)	(0.65)	(0.88)
One-third	-0.120	-0.035	-0.095	-0.119	-0.035	-0.095
representation	(-1.40)	(-0.35)	(-1.07)	(-1.39)	(-0.36)	(-1.07)
One-half	0.085	0.206	0.124	0.086	0.206	0.124
representation	(1.12)	(2.78)***	(1.86)*	(1.14)	(2.78)***	(1.82)*
Leverage	0.390	0.515	0.402	0.363	0.485	0.373
	(0.51)	(0.68)	(0.53)	(0.47)	(0.64)	(0.49)
Free float	-0.127	-0.143	-0.123	-0.125	-0.140	-0.120
	(-0.74)	(-0.84)	(-0.72)	(-0.73)	(-0.82)	(-0.70)
Return on assets	1.286	1.304	1.230	1.280	1.291	1.249
	(0.97)	(0.98)	(0.95)	(0.96)	(0.97)	(0.94)
Return volatility	0.000	0.000	0.000	0.000	0.000	0.000
	(1.70)*	(1.67)*	(1.52)	(1.70)*	(1.67)*	(1.52)
Sales growth	0.172	0.168	0.172	0.179	0.176	0.181
	(0.82)	(0.79)	(0.82)	(0.88)	(0.85)	(0.88)
Firm Age	0.744	0.625	0.651	0.741	0.622	0.648
	(1.87)*	(1.59)	(1.64)	(1.86)*	(1.58)	(1.63)
R-squared	0.173	0.159	0.165	0.160	0.161	0.166
F-statistic	13.02	26.28	11.22	12.36	26.30	11.39
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 6
Director Networks and Executive Compensation

This table contains results of fixed-effects regressions of average per-capita executive remuneration on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. Degree, Betweenness, and Connectiveness are measures for the centrality of a firm's directors in the social network. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). One-third (one-half) representation is a dummy that is set to one if 33% (50%) of the supervisory board members are employee representatives. Leverage is defined as book value of total debt divided by book value of total assets. Free float is calculated as the fraction of voting equity that is not held by large shareholders. Large shareholders are shareholders who hold more than 5% of the voting equity. All regressions include year and industry dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Degree	256.9			233.8		
	(2.69)***			(2.78)***		
Betweenness		378.7			381.52	
		(2.57)***			(2.59)***	
Connectiveness			47.48			47.44
			(2.05)**			(2.15)**
Busy board				68.64	72.86	66.92
				(1.19)	(1.17)	(1.16)
Firm size	333.1	320.1	306.1	335.5	325.3	311.1
(log of total assets)	(2.14)**	(1.97)*	(1.90)*	(2.12)**	(2.01)**	(1.93)*
One-third	3.086	-125.8	13.51	1.649	-115.9	23.52
representation	(0.02)	(-0.84)	(0.09)	(0.01)	(-0.81)	(0.17)
One-half	95.89	-76.89	97.83	95.07	-79.89	102.7
representation	(1.59)	(-1.23)	(1.48)	(1.58)	(-1.26)	(1.56)
Leverage	98.17	-24.64	129.52	73.11	-52.55	99.47
	(0.25)	(-0.06)	(0.33)	(0.18)	(-0.13)	(0.25)
Free float	-98.99	-94.29	-96.30	-96.75	-91.91	-94.19
	(-0.57)	(-0.55)	(-0.56)	(-0.55)	(-0.54)	(-0.55)
Stock Price	90.94	87.61	86.91	91.02	87.68	86.53
Performance	(2.83)***	(2.81)***	(2.77)***	(2.85)***	(2.82)***	(2.81)***
Return on assets	352.5	267.42	366.89	342.9	256.1	357.1
	(0.74)	(0.56)	(0.77)	(0.72)	(0.53)	(0.75)
Firm Age	68.97	7.146	-7.322	83.11	21.44	4.935
	(0.18)	(0.02)	(-0.02)	(0.22)	(0.06)	(0.01)
R-squared	0.415	0.430	0.437	0.415	0.427	0.436
F-statistic	6.90	5.57	6.55	6.41	5.03	5.95
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 7
Effect of Past Performance on Network Centrality

This table contains results of ordinary least square regressions of changes in network centrality on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. Degree, Betweenness, and Connectiveness are measures for the centrality of a firm's directors in the social network. The abnormal stock return is computed as raw stock return during the current year minus the return of the CDAX-index. The change in size is measures by the log of total assets. All regressions include year and industry dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. The total number of observations is 399. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

Dependent Variable	Change in Degree	Change in Betweenness	Change in Connectiveness
Variable	(1)	(2)	(3)
Abnormal stock return	0.023	0.002	0.241
(current year)	(0.51)	(0.06)	(1.17)
Abnormal stock return	0.004	0.018	-0.002
(previous year)	(0.18)	(0.90)	(-0.04)
Change in Tobin's q	-0.038	-0.005	-0.298
	(-0.96)	(-0.26)	(-1.58)
Change in size	-0.00	-0.00	-0.00
	(-1.66)*	(-1.97)**	(-0.15)
Industry dummies	yes	yes	yes
Year dummies	yes	yes	yes
R-squared	0.021	0.047	0.032
F-statistic	1.81	1.79	1.65
(p-value)	(0.03)	(0.03)	(0.06)

Table 8
Top and Bottom Performance Decile 2003 and Network Centrality

This table contains changes in the network measures over the period from 2003 to 2006 for firms that were the best and worst performing companies in 2003. Performance is defined as abnormal stock price performance (raw stock price return minus the return of the CDAX index) during the first year of the sample period (2003).

	Bottom Performance Decile	Top Performance Decile	Difference in Means (T-Values)
2003			
Average abnormal stock returns	- 40.65%	+152.32%	9.33***
Degree	1.035	1.070	0.09
Betweenness	0.295	0.291	0.03
Connectiveness	1.237	0.967	0.28
2003 – 2006 change in			
Degree	-0.247	-0.142	0.73
Betweenness	-0.070	-0.067	0.04
Connectiveness	-0.235	0.229	1.12