Executive Attributes, Director Attributes, and Firm Performance

Erik Fernau[*]

[*] University of Mannheim, Finance Area, L 9, 1-2, 68161 Mannheim, Germany; tel. +49 621 181 1526; fax +49 621 181 1518; e-mail: fernau@uni-mannheim.de

November 2013

Executive Attributes, Director Attributes, and Firm Performance

First version: October 2012

This version: November 2013

ABSTRACT

This paper investigates the impact of individual executives and directors on firm performance. In the German two-tiered system of corporate governance the tasks of running and monitoring the firm can be clearly assigned to the members of the executive and the supervisory board. My study is based on a comprehensive panel data set of 889 German firms covering the period 1993-2011. I find that fixed effects of individual executives and directors are equally important in explaining firm performance and explain as much of the variation in firm performance as observable board, manager and firm characteristics. The results further indicate that transitions of former executives to the supervisory board are not a cause of concern for shareholders. Moreover, only the aggregate sum and not the dispersion of the executive and director fixed effects between or within the executive and supervisory boards has an impact on firm performance. As studies about the relation between board characteristics and firm performance implicitly assume a link between board characteristics and board actions, my results suggest that the inclusion of director fixed effects could be important for other topics in corporate finance as well.

1. Introduction

Monitoring by the board of directors is of key importance for the protection of shareholders' interests. From the perspective of agency theory, a more effective monitoring of executives should lead to higher firm performance (Fama, 1980). Consequently, empirical studies related to the board of directors focus primarily on the monitoring function of the board of directors (Adams et al., 2010). In most studies the monitoring function is related to observable board characteristics like the size of the board or the proportion of outside directors on the board. In contrast to this, prior research neglected the impact of unobserved heterogeneity of managers[1] with monitoring tasks on firm performance. However, combining aspects of the agency and resource dependence theory (Pfeffer and Salancik, 1978) as done by Hillman and Dalziel (2003) implies that the effectiveness of monitoring should depend on both the incentives and the skills of the board. The skills of the board may be determined by unobservable and time invariant characteristics of individual directors (e.g. experience, expertise, reputation) that require the estimation of director fixed effects.

What complicates the analysis of the relation between the individual impact of managers with monitoring tasks and firm performance, though, is the dual role of the board of directors in the one-tier-board system. As emphasized by Adams and Ferreira (2007) boards have a dual role as advisor and monitor of executives in the one-tier board system. Thus, relating firm performance to individual managers with monitoring tasks requires the assignment of these tasks to individual managers. An assignment of the monitoring and advisory tasks to individual managers would also allow assessing the importance of the monitoring task for firm performance relative to the leadership/advisory task.

In this paper, I distinguish between individual managers with different tasks by analyzing a data set of German firms – an economy with a two-tiered board system consisting of an executive and a supervisory board. For German firms, the tasks of running and monitoring the firm can be clearly assigned to the members of the executive and the supervisory board, respectively. My

---

[1]The German Stock Corporation Act prescribes a two-tiered board structure with an executive board and a supervisory board. I use the term "executives" for the members of the executive board, the term "directors" for the members of the supervisory board and the term "managers" as generic term for executives and directors. Further details about the two-tiered board structure are given in Section 2.

study is based on a comprehensive panel data set of 889 German listed firms for the period 1993-2011. In the empirical analysis, I use manager fixed effects which allows me to estimate the impact of individual managers on firm performance and to control for unobserved heterogeneity of managers. Manager fixed effects are estimated with the AKM method and are net of match effects as well as a wide array of board, firm and manager characteristics that have been identified as determinants of firm performance by the previous literature.

My results suggest that not only executive, but also director fixed effects explain a significant proportion of the variation in firm performance. Even though firm fixed effects explain an even higher proportion of the variation in firm performance on the manager-firm-year-level (47-50%), manager fixed effects (22-23%) are as important as observable board, manager and firm characteristics in explaining firm performance. Splitting the sample into executive- and director-firm-years shows that director fixed effects explain as much of the variation in firm performance as executive fixed effects. When manager fixed effects are estimated over a pre-period (1993-2002) and are used as proxy of skills for newly appointed managers in a post-period (2003-2011), I find a significant positive impact of manager fixed effects on firm performance suggesting an active impact of managers on firm performance. Using the manager fixed effects estimated by regressions on the manager-firm-level indicates that the aggregate sum of manager fixed effects has an impact on firm performance, but not the distribution of these fixed effects within or between the executive and supervisory board. Furthermore the AKM method is applied to reinvestigate changes of CEOs[2] to the supervisory board of the same firm upon retirement on the level of individual persons. The results corroborates the finding in the study by Andres et al. (2013b) that transitions of former executives to the supervisory board are not a cause of concern for shareholders. Finally, the comparison of coefficient estimates between models with and without manager and match fixed effects reveals an omitted variable bias. For instance, the coefficient of free float changes by approximately 37% when manager or manager and match fixed effects are included.

The separation of managers with monitoring and advisory tasks would be much more complicated in the one-tier board system. Several factors in the one-tier board system complicate the separation of managers with different tasks: On the one hand, Coles and Li (2012) report that

---

[2]It may be incorrect to translate "chairman of the executive board" as "CEO". However, for expositional efficiency, I stick to the term CEO. For further details, see Footnote 1 of Chapter 2 (p. 10).

33% of the five highest paid executives in ExecuComp firms are also members of the respective board of directors. For this proportion of managers, their leadership task due to their position as executive and their advisory/monitoring task due to their membership on the board of directors cannot be distinguished. Consequently, studies focusing on the differences between the leadership/advisory and the monitoring task would need to exclude the corresponding managers. A related problem refers to the assignment of these tasks to single board members. Due to their higher degree of independence from the CEO, outside directors are often considered to be better monitors (Fama and Jensen, 1983). On the other hand, inside directors usually possess better firm-specific information (Raheja, 2005; Ravina and Sapienza, 2010) qualifying them for the monitoring of executives.[3] Similarly, Faleye et al. (2011) provide evidence for an adverse effect of independent directors who primarily focus on their monitoring tasks. This implies that board effectiveness could be improved if independent directors allocate their time to both advising and monitoring responsibilities. Moreover, Coles et al. (2008) find that the advisory role of outside directors is more important for complex firms. For all these reasons, a separation of managers with monitoring and managers with advisory tasks is difficult for the one-tier board system.

In contrast to this, these two tasks are separated in the two-tiered board system, which can be found in Germany and several other European countries. The two-tiered board system formally assigns the advisory function to the members of the executive and the monitoring function to the members of the supervisory board. Thus, the two-tiered board system allows the cleanest separation (Adams and Ferreira, 2007) of the leadership/advisory and monitoring task and the assignment of these tasks to the individual members of the two boards.

This paper is related to a growing body of the literature that investigates the impact of individual managers on firm performance. Most of the studies consider the impact of executives and most importantly CEOs on firm performance. Studies using CEO deaths (e.g. Johnson et al., 1985; Fee et al. 2013) or CEO hospitalization events (Bennedsen et al., 2012) as exogenous shocks on CEO's actions, suggest a meaningful impact of individual CEOs on firm performance. Starting with the seminal paper by Bertrand and Schoar (2003), several studies draw on manager fixed effects to estimate an impact of individual executives on firm performance. Leadership style

---

[3]See also Masulis and Mobbs (2011), who question the assumption of inside directors as a homogenous group and build upon the opposing views concerning the role of inside directors according to agency and optimal contracting theory.

(Bertrand and Schoar, 2003) and reputation (Chemmanur and Paeglis, 2005) are just two of many examples for unobservable and time invariant characteristics that can be proxied by manager fixed effects and could explain the impact of individual executives on firm performance.

The impact of individual managers presumed to have monitoring functions (i.e. outside directors) received less attention by the prior literature. Analyzing the stock price reactions to first-time director appointments, Fich (2005) finds significantly positive cumulative abnormal returns for appointments of the CEOs of other companies as directors. Nguyen and Nielsen (2010) also draw on sudden deaths as an exogenous source of variation. They find a significant drop in firm value following the sudden deaths of independent directors. In further robustness tests they also consider director fixed effects and find that the adjusted R^2 of their regression model with the stock price reaction around sudden deaths of directors as dependent variable increases by about 50 percentage points. However, their identification of director fixed effects hinges on multiple directorships and variation in the degree of independence within individual director observations. This reduces their sample size to 30 directors and 74 directorships and thus only provides a first indication of the importance of unobserved director heterogeneity such as skills or ability. Moreover, all papers alluded to above focus on either the impact of individual managers with leadership *or* monitoring tasks, but do not analyze their relative importance.

The paper further builds upon the progress in the adequate estimation of manager fixed effects. The relative importance of managers with leadership and monitoring tasks can be estimated by manager fixed effects. One important method for the estimation of manager fixed effects is the mover dummy variable (henceforth MDV) method by Bertrand and Schoar (2003). This method requires the change of a manager between firms in order to separately identify the manager and the firm fixed effect. Thus, by using this method, the sample size decreases dramatically and complicates the interpretation of the results. Recently, Graham et al. (2012) introduce the method by Abowd, Kramarz, and Margolis (henceforth AKM) (1999) to the corporate finance (specifically executive compensation) literature. This method allows the estimation of manager fixed effects based on a considerable larger sample of managers. The use of manager fixed effects allows to control for unobserved heterogeneity of managers and thereby to deal with one important source of endogeneity – the omitted variable bias. Omitted variable bias problems could also result from the non-consideration of match effects. Match effects allow controlling for the fit between an individual manager and the respective firm, which is a potentially important

determinant in explaining firm performance. Woodcock (2011) derives a match effects model and shows that match effects explain a considerable proportion of wage dispersion in the US and allow a more precise estimation of manager fixed effects.

My study contributes to the literature in several important respects. First, and most importantly, to the best of my knowledge, this is the first study that focuses on the role of the unobserved heterogeneity of managers with monitoring tasks in explaining firm performance and the first study that simultaneously includes executive and director fixed effects.[4] This allows a separation of the fixed effects of individual managers with leadership/advisory and monitoring tasks as well as an evaluation of their relative importance in explaining firm performance. Since this study also controls for match effects, manager fixed effects can be estimated more precisely. According to Hermalin and Weisbach (2003) studies about the relation between board characteristics and firm performance implicitly assume a link between board characteristics and board actions. As my results suggest that director fixed effects are as important as executive fixed effects in explaining firm performance, director effects potentially explain a high proportion of the variance in certain board actions such as CEO turnover and executive compensation as well.

Second, the inclusion of director fixed effects allows the reexamination of the relation between board structure and firm performance. My results show that only a small part of the variance in firm performance is explained by observable board characteristics. Furthermore, the size and the significance of some board characteristics changes in regressions accounting for manager or manager and match fixed effects. Unobservable and time-invariant characteristics of individual directors (e.g. skills, motivation or reputation), i.e. director fixed effects, appear to be more important for the relation between board structure and firm performance than observable board characteristics.

Third, my results provide insights into the working of the two-tiered board system. The costs and benefits of changes from executives to the supervisory board upon retirement have been discussed controversially. Previous empirical studies have investigated this issue on the firm-level. When manager fixed effects are interpreted as proxy for skills the empirical setting of this study allows the reinvestigation of this issue on the level of individual managers. Furthermore,

---

[4]Gantenbein and Volonte (2011) consider director fixed effects for listed firms in Switzerland. However, they do not examine executive fixed effects. Moreover, as they only consider cross-sectional observations for the year 2008, they cannot control for firm fixed effects.

the AKM method enables the estimation of the fixed effects of all managers in firms with at least one mover, which allows the analysis of the impact of the skill mix (based on the most common interpretation of manager fixed effects) within and across the two boards on firm performance.

This paper proceeds as follows. Section 2 provides an overview of the institutional setting in Germany. In Section 3, different methods for the estimation of executive and director fixed effects are discussed. Section 4 presents the sample and descriptive statistics. The results on the manager-firm-level are discussed in Section 5. Section 6 contains the results of the analysis on the firm-level, and Section 7 concludes.

2. Institutional setting

This section briefly describes those aspects of the institutional environment of German firms which are particularly important for the empirical analysis.

The German Stock Corporation Act (*Aktiengesetz*, *AktG*) requires setting up an executive board (*Vorstand*) and a supervisory board (*Aufsichtsrat*). According to § 105 AktG a person cannot be a member of both boards simultaneously.

The main task of the executive board is to run the firm (§ 76 (1) AktG). Furthermore, the executive board represents the firm in judicial and extra-judicial matters (§ 78 (1) AktG). Even though running the firm is the joint responsibility of the entire executive board, the chief executive officer (CEO) takes a prominent position and coordinates the work of the executive board members (executives).[5]

The main task of the supervisory board is the monitoring of the executive board (§ 111 (1) AktG). In particular, the members of the supervisory board (directors) are responsible for the appointment, dismissal and compensation of executives. Moreover, the supervisory board is involved in decisions of fundamental importance.[6] According to the Codetermination Act *(Mitbestimmungsgesetz*, *MitbestG)*, the supervisory board has to elect a chairman (§ 27 MitbestG). The chairman of the supervisory board plays an important role as he is in most cases

---

[5]The election of a CEO is not mandated by law (§ 84 (2) AktG). However, the election of a CEO is intended in almost all articles of incorporation (see also section 4.2.1 of the German Corporate Governance Code. See the foreword of the code).

[6]See section 5.1.1 of the German Corporate Governance Code.

the chair of the compensation committee (section 5.2 of the German Corporate Governance Code) and is attributed a double-voting right in firms subject to parity codetermination. Codetermination is a peculiarity of the German corporate governance system and describes the allocation of control rights to employees through seats on the supervisory board. The fraction of employee representatives on the supervisory board depends on the number of employees. Firms with more than 500 (2,000) employees are subject to one-third (parity) codetermination.[7] The size of the supervisory board depends on the size of the firm. The maximal number of supervisory board members increases steadily with firm size.[8]

The personal qualifications for the election to the supervisory board are regulated in § 100 AktG. Members of the supervisory board must not hold more than 10 supervisory board seats, whereby positions as chairman of the supervisory board are double-counted. Supervisory board members are also not allowed to be a member of an executive board, where an executive - who is supposed to be monitored - sits on the supervisory board.

Many of the recent regulatory changes concerning the personal qualifications for a supervisory board seat are related to the efforts to improve the corporate governance of German firms and finally the appeal of Germany as a financial centre. In order to obtain this objective, Germany introduced the German Corporate Governance Code (hereafter "the code") in 2002. The code is revised regularly and contains recommendations and suggestions, inter alia, concerning the executive and supervisory board and the cooperation between the executive and the supervisory board. The compliance with the recommendations and suggestions is not binding, though. However, the code is based on the "comply-or-explain principle", whereby deviations from the recommendations need to be published in an annual declaration of conformity.

The recommendations concerning the supervisory board are mainly aimed at improving the effectiveness of the monitoring of the executive board. For instance, the legal limit of 10 simultaneous supervisory board seats is further restricted by section 5.4.5 of the code. According to this recommendation, directors should ensure to have sufficient time to perform their tasks as supervisory board members by not holding more than three simultaneous supervisory board seats.

---

[7]Different regulations apply to firms in the coal and steel industry. At least half of the members of the supervisory boards of firms in these industries and with more than 1,000 employees must represent employees.

[8]The supervisory board of firms with a share capital of up to 1,500,000 Euro can consist of up to 9, with a share capital of up to 10,000,000 Euro of up to 15 and with a share capital larger than 10,000,000 Euro of up to 21 members (§ 95 AktG).

Moreover, transfers of CEOs of German corporations to the supervisory board of the same company upon retirement have been subjected to ongoing criticism. Opponents of this practice argue that former executives monitor their former colleagues leniently and hamper the criticism of managerial decisions during their own tenure (Andres et al., 2013b). In 2009, a "cooling-off period" has been introduced as another personal qualification of supervisory board members. According to the "cooling-off-period" the election of former executives to the supervisory board must be preceded by two years following the retirement from the executive board; however, an exception from the ban allows the immediate change of former executives to the supervisory board. This exception requires a quorum of 25% of the shareholders' votes.[9]

These qualifications refer to information that is observable for the econometrician. In addition to that, the initial version of the code in 2002 has already contained a provision recommending that the supervisory board is composed in such a way, that their members "have the required knowledge, abilities and expert experience to properly complete their tasks and are sufficiently independent".[10] Knowledge, abilities and experience are examples for time-invariant unobservable factors that can be captured by director fixed effects.

3. Empirical methodology

My empirical analysis is based on the following regression model:

$$y_{ijt} = X_{ijt}\beta + M_{ijt}\gamma + \rho_i + \theta_j + \tau_t + \varepsilon_{ijt} \tag{1}$$

The dependent variable is measured for firm i and manager j at year t. X_{ijt} denotes observable and time-variant firm and board characteristics and M_{ijt} observable and time-variant manager characteristics. ρ_i represents firm fixed effects, θ_j manager fixed effects and τ_t year fixed effects. In this model, θ_j is assumed to be constant over time and across all firms at which the respective manager has been employed. Since executives as well as directors potentially have an impact on

---

[9]This exception was introduced to serve the interests of family firms whose founders or other family members should be able to monitor executives after they step down as executive board members. The cooling-off-period concerning the transfer of former executives to the supervisory board upon retirement was preceded by a provision recommending that the former CEO or a former executive should not generally become the chairman of the supervisory board, which was added to the code in 2005. However, this recommendation had little practical effect (Andres et al., 2013b).

[10]For a detailed discussion on the tasks, the conditions for an effective work and current deficits of supervisory board members see Cahn (2011).

firm performance, both are considered here. The main problem for the estimation of equation (1) refers to the perfect collinearity between θ_j and ρ_i for those managers, who have been employed in only one firm during the sample period ("stayers"). In the literature several methods are discussed to deal with this problem.

The MDV method is based on Bertrand and Schoar (2003). This method has been used by several other papers in the field of corporate finance (e.g. Fee et al., 2013; Graham et al., 2012). Using this method, only those managers are considered who have been employed in at least two firms during the sample period ("movers"). Thus, θ_j and ρ_i can be disentangled for the group of movers. Equation (1) is then estimated only for the group of movers by the least square dummy variable (henceforth LSDV) method. Three problems are associated with this method: Depending on the degree of mobility, i.e. the frequency of managerial changes within the sample, the sample size could decrease considerably. On the other hand, this method could give rise to a sample selection bias, as movers are likely to be different from stayers (e.g. with respect to their skills or risk aversion) (Graham et al., 2012). A further disadvantage of the MDV method is that considerable computer memory is required which could make the application computationally infeasible in large data sets (Andrews et al., 2006).[11]

Several studies analyzing wage differences use the spell method (e.g. Abowd et al., 1999; Munch and Skaksen, 2008; Cornelissen and Hübler, 2011).[12] These studies try to control for unobserved heterogeneity on the firm- and manager-level that otherwise would result in an omitted variable bias. A spell S denotes a unique combination of manager j and firm i. Equation (2) can then be displayed as follows:

$$y_{ijt} = X_{ijt}\beta + M_{ijt}\gamma + S_{ij} + \tau_t + \varepsilon_{ijt} \qquad (2)$$

where S_{ij} represents the manager-firm-combination ij. Since manager-firm-combinations can be generated for each manager-firm-year, the sample size is not affected by the spell method and a

---

[11]In a model with N person years, K firms and J observable regressors, the storage of a matrix with dimension N*(K+J) is required. Assuming memory requirements of 8 byte for each matrix element, the memory requirements for this data set consisting of 95,477 manager-firm-years, 889 firms and 39 regressors already amounts to 0.78 GB (see Cornelissen, 2008).

[12]The spell method is also used by several studies in the field of corporate finance. For instance, Frank and Goyal (2010) consider manager fixed effects as determinant of capital structure, whereas Graham et al. (2012) study the role of manager fixed effects in executive compensation.

sample selection bias can be avoided. However, using the spell method, θ_j and ρ_i cannot be disentangled.

The AKM method based on Abowd et al. (1999) allows for a separate identification of θ_j and ρ_i without decreasing the sample size as much as under the MDV method. The authors use this method in order to investigate the role of unobserved heterogeneity of French employees in explaining wage differences. For the first time, Graham et al. (2012) apply this method to an issue in the field of corporate finance.[13] As demonstrated by Abowd et al. (1999), using the LSDV method with the entire set of dummy variables and the following transformation and estimation of equation (1) are identical: First, the within transformation is applied to the level of each individual manager j:

$$y_{ijt} - \overline{y_j} = (X_{ijt} - \overline{X_j})\beta + (M_{ijt} - \overline{M_j})\gamma + \sum_{i=1}^{N} \rho_i (F_{jt}^i - \overline{F_j^i}) + \varepsilon_{ijt} \tag{3}$$

The AKM method involves then the estimation of equation (3) by the LSDV method. The AKM method allows the identification of θ_j and ρ_i for all firms with at least one mover − i.e. the same firms as under the MDV method. However, in contrast to the MDV method, the fixed effects of not only the movers, but of all managers employed in these firms can be identified (Graham et al., 2012). Using the AKM method, the fixed effects of firms and managers can be compared within one "group". A group thereby consists of firms and managers connected by at least one mover.[14] Since the fixed effects within one group are only identified relative to a benchmark, ρ_i cannot be identified for the firms without any mover manager. In general, the comparison of θ_j and ρ_i is possible, albeit difficult, across groups by using a normalization procedure.[15] Since the application of the AKM method on the subset of movers and the MDV method are equivalent within one group, the restriction to the largest group allows me to apply the AKM method on the

---

[13]Graham et al. (2012) investigate the impact of unobserved manager heterogeneity on the determinants of executive compensation. Further examples of papers that analyze the impact of individual executives on firm policy or performance include Frank and Goyal (2010) (capital structure) or Chevalier and Ellison (1999) (mutual fund performance). Hillier et al. (2013) investigate the role of unobservable time-invariant individual characteristics in explaining the performance of corporate insider trading. Coles and Li (2012) apply the AKM method to numerous issues in corporate finance (executive compensation, financial policy, payout policy, firm performance, corporate control, board structure and investment policy).

[14]See Abowd et al. (2002) for a detailed description of the underlying algorithm.

[15]The normalization procedure used by Cornelissen (2008) describes the fixed effects θ_j and ρ_i as deviations from their means. As pointed out by Graham et al. (2012), such normalization changes the relative level and variation of the fixed effects θ_j and ρ_i across the different groups; the MDV method leads to the same groups and for this reason to the same problems.

subset of movers as a robustness check. Hence, problems with the memory requirements as under the MDV method can be avoided.

The assumption that the manager fixed effect θ_j is constant across time and all firms, in which the manager has been employed during the sample period, is modified in my study as follows: First, I take into account that the same skills or attributes of one person could have a different impact on firm performance depending on whether the person is a member of the executive or the supervisory board. Therefore, I add two fixed effects for each person who has been employed as executive and as director of at least one firm (not necessarily the same firm) in the sample. One fixed effect is added for all observations in the supervisory board and the other fixed effect refers to all observations in the executive board.

Furthermore, the model is modified such that the same manager (executive or director) could have a different impact in different firms on firm performance depending on the quality of the match between the manager and the firm (hereafter match quality). In this context, a better match quality should lead to a higher firm performance for a given manager with individual fixed effect θ_j. In equation (1), the match effect is absorbed into the error term. Leaving out match effects leads to upward biased coefficients (Woodcock, 2011). Based on the match effects model of Woodcock (2011), one match effect S_{ij} is added to each manager-firm-combination in equation (1); equation (1) can then be rewritten in the following way:

$$y_{ijt} = X_{ijt}\beta + M_{ijt}\gamma + \rho_i + \theta_j + \tau_t + S_{ij} + \varepsilon_{ijt} \tag{4}$$

If equation (4) is expressed as deviations from match specific means, match effects, manager fixed effects and firm fixed effects can be eliminated (Baltagi, 2008). Ferreira (2009) shows that $\hat{\beta}$ can be estimated by means of this transformation. Assuming that match effects are orthogonal to manager fixed effects and firm fixed effects, the remaining parameters can be determined as follows: $\hat{\rho}_i$ and $\hat{\theta}_j$ can be estimated by equation (1) – i.e. the equation without match effects. The match effects S_{ij} equal the residuum from the following equation:

$$\hat{S}_{ij} = \left(\sum_{t=1}^{T_{ij}} \frac{y_{ijt} - x_{it}\hat{\beta}}{T_{ij}} \right) - \hat{\rho}_i - \hat{\theta}_j \tag{5}$$

In my analysis, models with match effects are considered in addition to the previously discussed models based on the AKM and MDV method.[16]

4. Data and descriptive statistics

4.1. Sample selection

My study is based on a comprehensive data set consisting of all German firms listed at least once in "Amtlicher Handel" or "Geregelter Markt" during the sample period 1993-2011. Of these 1131 firms, all firm-years associated with a listing on at least one of the eight German stock exchanges are considered. Firm-years, where the firm is declared insolvent or bankrupt or firm-years with missing information concerning the executive and supervisory board composition, are excluded. This results in a sample of 13,059 firm-years and 134,731 manager-firm-years. Missing observations for firm characteristics further reduces the sample to 99,429 manager-firm-years. These manager-firm-years can be subdivided into 27,782 executive-firm-years and 71,647 director-firm-years and correspond to the observations under the spell method (hereafter full sample).[17] Table 1 presents the number of firms, managers (executives/directors) and manager-firm-years (executive-firm-years/director-firm-years) for each year of the sample period.

[Insert Table 1 about here]

The composition of the executive and the supervisory board including the respective position of their members and information on the ownership structure were hand collected from the *Saling/Hoppenstedt Aktienführer*.[18] All other information was gathered from Datastream. The choice of manager, board and firm characteristics aims to control for a wide array of observable characteristics with a potential impact on firm performance and is based on prior literature and the institutional setting for German listed firms (e.g. Adams and Ferreira, 2009; Andres et al., 2013a; Dherment-Ferere et al., 2001; Fauver and Fuerst, 2006; Fich and Shivdasani, 2006).

---

[16]Woodcock (2011) also considers other assumptions regarding the relation between manager fixed effects, firm fixed effects and match effects. However, these assumptions are based on random effects and therefore not applicable in this context.

[17]23,467 (34%) of director-firm-years refer to employee representatives. In a robustness test (see Section 5.3), these observations are excluded.

[18]The *Saling/Hoppenstedt Aktienführer* is published on a yearly basis and additionally provides information about shareholdings, balance-sheet items and the profit and loss account on German listed firms.

Overall, the set of control variables encompasses nine board characteristics (average tenure of the executive board, average tenure of the supervisory board, size of the supervisory board, ratio of the supervisory to the executive board size, codetermination, former CEO as chairman of the board, busy board, board with interlocking relations and women representation), five manager characteristics (tenure of a director, tenure of an executive, board position, busyness of a director and interlocking relation) and seven firm characteristics (firm size, operating performance, firm age, ownership structure, capital structure, cash flow volatility and sales growth). The definition of the respective variables is provided in the appendix of this chapter.

Panel A in Table 2 reports the distribution of movers and stayers within the full sample. 2,461 manager (12.51%) can be classified as movers.[19] Only about one third of all movers (33.40%) have worked for more than two firms. Dividing managers into executives and directors, it is apparent that the share of movers among directors is considerably larger than among executives (14.55% vs. 8.32%). Panel B summarizes the groups which arise from the changes of managers between the sample firms, where "group 0" consists of those firms that have not employed any mover during the sample period and are thus not connected to other firms. Following the exact definition of a group, the 92 firms in "group 0" comprise 92 separate groups each consisting of just one firm (Cornelissen, 2008). The share of firms in "group 0" amounts to 9.29% and the share of the corresponding manager-firm-years to only 3.57%. Comprising 889 firms (i.e. 89.80% of all firms) and 96.00% of all manager-firm-years, group 1 is by far the largest group of the sample. By contrast, the remaining four groups with at least one mover account for only 0.90% of all firms and 0.40% of all manager-firm-years.[20] As mentioned in Section 3, the sample size decreases when the MDV or AKM method is used. Panel C presents the size of the sample for the different estimation methods. Using the AKM method, the data set corresponds exactly to group 1. It would be possible to also include groups 2 to 5 in the analysis. However, since fixed effects across groups can be compared only under restrictive assumptions and group 1 represents

[19]Due to this identification strategy, this data set suffers from the limitation to changes within the sample (as every other employee-employer data set). By including almost all listed German firms in the data set, I try to keep this limitation as low as possible.

[20]The share of the largest group relative to all groups with movers is considerable larger than in Graham et al. (2012) (65%). Graham et al. (2012) only consider the five highest paid executives per firm covered by ExecuComp for the sample period 1992-2006. One reason for the higher share of the largest group in this sample is the additional consideration of directors and thereby a larger number of managers per firm. On the other hand, my investigation partly falls within the period of the so called "Deutschland AG" that was characterized by a high amount of interrelations on a personal level by means of supervisory board seats.

a very large share of the entire sample (93% of all firm-years and 96% of all manager-firm-years), I restrict the analysis to the largest group.[21] Using the MDV method, all manager-firm-years are also taken from group 1 and the firms are the same as under the AKM method. However, only manager-firm-years referring to movers are considered. Thereby, the amount of manager-firm-years decreased by 68.96% relative to the AKM method and corresponds to 29.80% of the full sample.

[Insert Table 2 about here]

4.2. Representativeness and descriptive statistics

As the sample size decreases when the MDV or AKM method is applied, the representativeness of the MDV and AKM sample for the full sample is questionable.

To address this issue, I follow the methodology by Brav et al. (2005), which has also been used by Graham et al. (2012). In this approach, the means of the indicator variables and the quintiles of the continuous variables in the entire sample are compared with the corresponding values in the AKM and MDV sample. For the continuous variables, the proportion of observations in the AKM and MDV sample within the quintiles of the full sample is considered. In case of a perfectly representative AKM and MDV sample, these proportions would equal 20%. For the indicator variables, the percentages of the values 0 and 1 are compared for the different samples.

Table 3 depicts the results of this procedure. The AKM sample is highly representative for most of the included board, manager and firm characteristics. This is particularly true for the firm characteristics. The proportion of none of the eight characteristics deviates by more than five percentage points from 20% within each quintile. As the AKM sample covers 96% of the manager-firm-years of the full sample, the deviations regarding the board and manager characteristics are also minor. Larger deviations only concern the size of the supervisory and executive board, which is higher for the AKM sample on average. In general, the deviations between the MDV and the full sample are larger than the deviations between the AKM and the full sample. For instance, the average size of the executive and the supervisory board is even higher for the MDV sample. The different board sizes follow naturally from the construction of

---

[21]See Cornelissen (2008) for a discussion about the comparison of fixed effects across groups. He concludes "It is […] preferable to correlate only effects of the same group" (p. 185).

the AKM and MDV sample. The larger the board size, the more likely a firm is to employ at least one mover ceteris paribus, which is the identifying assumption for a firm to be included in the AKM sample. Similarly, movers are more likely to acquire a board seat elsewhere, when more board seats are available, i.e. when the board size is larger. Furthermore, the average tenure of directors is higher and the average tenure of executives is lower for the MDV sample. Other deviations between the MDV and the full sample can also be traced back to the restriction to movers in the MDV sample. This concerns in particular interlocking relations[22], i.e. at least one executive and one director are joint members of another supervisory board (Hallock, 1997) – and busy directors, i.e. directors, who hold three or more directorships in German listed firms. Both interlocking relations and busy directors are more frequently found in the MDV sample. The proportion of women and employee representatives is also higher for the MDV than for the AKM and the entire sample.

For the sake of brevity, only descriptive statistics of the AKM sample are presented in the following. The average tenure of an executive (a director) amounts to 4.6 (4.7) years. Based on the definition of Fich and Shivdasani (2006), 12.2% of all directors can be classified as busy directors. An interlocking relation exists for 6.2% of all executives and directors. 6.3% of all executives and directors are female.

The former CEO is the chairman of the supervisory board in 11.1% of all firm-years. The average (median) women representation equals 6% (3%) in both boards. On average, there are 1.00 interlocking relations between the executive and supervisory board. The average (median) supervisory board consists of 11.12 (12) members and is thereby substantially larger than the (average) median executive board consisting of 3.93 (3) members. The different board sizes are also reflected in the size of the supervisory board relative to the aggregate size of the executive and the supervisory board. The average (median) for this ratio amounts to 0.72 (0.75). The average proportion of employee representatives on the supervisory board - i.e. the average degree of codetermination – amounts to 33%. Based on the definition of Fich and Shivdasani (2006), only 2.0% of all supervisory boards can be classified as busy boards.

---

[22]A more direct form of an interlocking relation – namely two persons serve on the supervisory boards on two different firms and monitor each other in his/her role as executive is prohibited according to § 100 (2) Nr. 3 AktG.

Tobin´s Q as measure for firm performance is on average 0.96.[23] The average (median) operative performance (measured as return on assets (ROA)) equals 4% (5%). The concentrated ownership structure of German firms (Franks and Mayer, 2001) is also reflected in this sample, as the average (median) share of free float (sum of shareholdings lower than 5%) amounts to only 37% (31%).

[Insert Table 3 about here]

5. Manager-level-analysis

The analysis on the manager-firm-year-level proceeds in four steps: First, I examine how the explanatory power of regressions model changes when manager fixed effects are considered (Section 5.1). Section 5.2 analyzes to what extent executive and director fixed effects contribute in explaining the variance in firm performance relative to other components. Subsequently, the robustness of the results with respect to different samples and different performance measures is tested (Section 5.3). Finally, based on the estimated manager fixed effects I analyze the relative importance of different types of executives and directors for firm performance in more detail in Section 5.4.

5.1. Explanatory power of regression models

To investigate the importance of executive and director fixed effects in explaining the variation in firm performance, equation (1) is estimated by using the manager, board and firm characteristics as described in Section 4.2. Unless otherwise stated, Tobin's Q is used as measure for firm performance in this section and the following sections.

Table 4 presents the results for the AKM sample.[24] I consider five regression models to examine the proportion of the variance in firm performance explained by unobserved manager fixed, firm

---

[23]Please note that the descriptive statistics are based on the manager-firm-level. For this reason firms with a large executive and/or supervisory board are overrepresented relative to firms with a small executive and/or supervisory board (which are smaller in terms of firm size as well). The mean value of Tobin's Q amounts to 1.10 when the firm-level is considered. This value is more in line with descriptive statistics of other studies for the German market (e.g. Andres et al., 2013b; Fauver and Fuerst, 2006).

[24]The robustness of these results to ROA as another measure of firm performance and the MDV sample is tested in Section 5.3.

fixed and match effects. The first four regression models are based on Graham et al. (2012). Column (1) neither includes firm fixed effects nor manager fixed effects. This model is estimated as pooled OLS (OLS model). In column (2), firm fixed effects are added to the OLS model (firm fixed model), whereas the model in column (3) includes executive and director fixed effects in addition to the OLS model (manager fixed model). The AKM method is used in column (4) and allows to separately identify and control for manager fixed and firm fixed effects (AKM model). In column (5), match effects are added to the AKM model (AKM + match effects model).

The model R-squared varies considerably depending on the regression model. The adjusted R-squared in column (1) amounts to 10.7%. Adding firm fixed effects in column (2) increases R-squared by 52 percentage points to 62.7%, whereas including executive and director fixed effects leads to an increase in R-squared by 48.9 percentage points to 59.6%. When both firm fixed and manager fixed effects are added to the OLS model, the model R-squared increases by 66.3 percentage points to 77.0%. The finding for the model R-squared in column (4) is similar to the result in Coles and Li (2012), who find a model R-squared of 74%. However, they only consider the five highest paid executives per firm. The explanatory power of the firm fixed and manager fixed model in their study is closer to the explanatory power of the AKM model (they find values of 70% and 71%, respectively). Finally, including match effects in addition to firm and manager fixed effects leads to a further increase in the model R-squared by 3.3 percentage points to 80.3%. The different values for the adjusted R-squared in the models with firm and/or manager fixed effects indicate the importance of firm and manager fixed effects in explaining firm performance. On the other hand, the increase in the explanatory power is comparatively low, but not negligible, when match effects are considered in addition to firm fixed and manager fixed effects.

Table 4 also reports the estimated coefficients and significance levels. However, the coefficients for the board and firm characteristics are biased as board and firm characteristics of firms with a large supervisory and/or executive board are overrepresented. Therefore, I analyze the dependence of coefficients and significance levels on firm fixed, manager fixed and match effects on the firm-year-level in Section 6.

[Insert Table 4 about here]

5.2. Relative importance of executive and director fixed effects

Based on the results presented so far, the relative economic importance of executive and director fixed effects compared to firm fixed effects and other observable manager, board and firm characteristics remains unanswered. To explore the relative importance of these components, I add match effects to the decomposition of the model R-squared used by Graham et al. (2012).

The adjusted R-squared can then be written as sum of the following components:

$$R^2 = \frac{Cov((y_{it}),(\hat{y}_{it}))}{Var(y_{it})} = \frac{Cov((y_{it}),(X_{it}\hat{\beta} + M_{ijt}\hat{\gamma} + \hat{\rho}_i + \hat{\theta}_j + \hat{S}_{ij} + \hat{\tau}_t))}{Var(y_{it})}$$

$$= \frac{Cov((y_{it}),(X_{it}\hat{\beta}))}{Var(y_{it})} + \frac{Cov((y_{it}),(M_{ijt}\hat{\gamma}))}{Var(y_{it})} + \frac{Cov((y_{it}),(\hat{\rho}_i))}{Var(y_{it})} + \frac{Cov((y_{it}),(\hat{\theta}_j))}{Var(y_{it})}$$

$$+ \frac{Cov((y_{it}),(\hat{S}_{ij}))}{Var(y_{it})} + \frac{Cov((y_{it}),(\hat{\tau}_t))}{Var(y_{it})} \tag{6}$$

For models without match effects the fifth component on the right-hand side is equal to zero. The decomposition of the model R-squared allows interpreting the normalized covariances (i.e. the covariances of each component with Tobin's Q divided by the variance of Tobin's Q) as fractions of the model sum of squares attributable to the respective component (Graham et al., 2012).

Table 5 depicts the results of this decomposition. Column (1) presents the results for the decomposition of the model in column (4) of Table 4 (AKM model) and column (2) presents the results for the AKM + match effects model of column (5). The normalized covariances amounts to 0.190 (24.76%) for observable firm characteristics, 0.001 (0.07%) for observable board characteristics, 0.175 (22.78%) for manager fixed effects, 0.384 (49.83%) for firm fixed effects and 0.010 (1.32%) for year fixed effects. F tests indicate that manager fixed effects, firm fixed effects, year fixed effects and observable firm characteristics are significantly different from zero, whereas observable board and manager characteristics are not. Coles and Li (2012) report similar results for the normalized covariance relative to the explained variance of the model for observable manager characteristics (0.36%), and for firm fixed effects (43.74%), but a lower ratio for observable manager and board characteristics (altogether 5.22%) and a considerable higher ratio for manager fixed effects (48.24%).

The relative economic importance of executive and director fixed effects is examined by splitting the samples used in the AKM and AKM + match effects model into executive- and director-firm-years. Note that splitting the sample into executive-firm-years and director-firm-years reduces both the number of observations and the number of explanatory variables (due to a reduced number of manager fixed effects). Therefore the explanatory power of the manager fixed effects in the subsample could either increase or decrease relative to the entire sample. This decomposition leads to very similar results for the various components. Overall, the comparison between the variance in firm performance explained by executive and director fixed effects indicates a very similar impact of these two types of managers on firm performance. The proportion of the variance explained is only slightly higher for executive (24.36%) than for director fixed effects (22.06%).

Controlling for match effects, the proportions of the variance explained by each component change only marginally. The fraction of the model R-squared attributable to match effects amounts to 4.25%. This fraction corresponds approximately to the decrease in the fraction of the variance explained by firm fixed effects (2.33%) and by manager fixed effects (0.83%). The model without match effects therefore overestimates the explanatory power of firm fixed effects and, to a smaller extent, of manager fixed effects. Decomposing the sample into executive- and director-firm-years shows that accounting for match effects is more important for director- than for executive-firm-years. Match effects account for 5.67% in explaining the variance in firm performance for director-firm-years, whereas this proportion amounts to only 1.01% for executive-firm-years.

[Insert Table 5 about here]

5.3. Robustness tests

The results presented so far are based on Tobin's Q as a measure for firm performance. However, Tobin's Q is often criticized as measure of firm performance as it could also reflect growth opportunities and is based on cash-flow expectations rather than on realized operating efficiency (Dybvig and Warachka, 2012). Thus, I test the robustness of the results to return on assets (ROA) as an accounting based profitability measure. The results are very similar to the base model with Tobin's Q as performance measure. Using ROA as a measure of firm performance, the

explanatory power increases considerably relative to model (1) when firm fixed effects or manager fixed effects are included (from 7.9% to 45.5% or 43.2%, respectively). In line with the results presented in Table 4 the explanatory power increases by a far larger extent when both firm fixed and manager fixed effects are considered (to 60.6%), whereas the additional inclusion of match effects increases the explanatory power only slightly relative to the model with firm and manager fixed effects. The decomposition of the model R-squared leads to similar results with respect to the explanatory power of manager fixed effects. The proportion of the variance in ROA explained by manager fixed effects amounts to 24% and is also slightly higher for the subsample of executive-firm-years (28% compared to 22-23% for the subsample of director-firm-years).

The previous results are based on the AKM sample. The following robustness checks alter the number and types of managers included. In general, these robustness checks reduce the number of manager-firm-years and potentially affect the relative explanatory power of each of the observable and unobservable components.

Using the AKM sample, the information for the identification of the fixed effects of non-movers is ultimately based upon the changes of movers between the sample firms. This could produce a biased estimation regarding the correlation between firm fixed effects and manager fixed effects – the so-called limited mobility bias (Abowd et al., 2004; Andrews et al., 2008). In a robustness check, I restrict the analysis to movers only and consider the MDV sample. In accordance with the results reported in Table 4, the explanatory power increases considerably relative to model (1) when firm fixed effects or manager fixed effects are included (from 11.0% to 55.0% or 38.8%, respectively). Confirming the results for the AKM sample, the explanatory power increases by a far larger extent when both firm fixed and manager fixed effects are considered (by 57.6 percentage points to 68.6%). However, in contrast to the AKM sample, the explanatory power increases significantly more relative to model (4) when match effects are included (by 8.9 percentage points).

The greater importance of match effects for the MDV relative to the AKM sample can be attributed to the fact that every manager in the MDV sample has been employed in at least two sample firms. The higher importance of match effects is also reflected in the values for the normalized covariances (relative to the explained variance of the model). These values amount to 0.133 (11.60%) for managers, 0.088 (7.97%) for the subsamples of executives and 0.138

(12.02%) for the subsample of directors. Including match effects is accompanied by a decrease in the proportion of the variance explained by firm fixed effects (by 6.2 percentage points) and – to a lesser extent – by manager fixed effects (2.7 percentage points). The comparison between the AKM and MDV sample shows that director fixed effects account for a far higher proportion of the variance explained in firm performance than executive fixed effects. Whereas the proportion of variance explained is slightly higher for executive fixed effects in the AKM sample, the proportion of the variance explained by director fixed effects is considerably higher in the MDV sample (24-27% compared with 7-8% for executive fixed effects). As the AKM method might exaggerate the explanatory power of manager fixed effects (Graham et al., 2012), the high explanatory power of director fixed effects even in the MDV sample clearly indicates the importance of accounting for director fixed effects.

Furthermore, the results could depend on the number of years a manager has worked for a firm. Following Bertrand and Schoar (2003), I assume that a manager has to have worked for at least three years for a firm to possibly affect firm performance and include only those managers in a further robustness test. This procedure results in a decrease of manager-firm-years to 87,122 and in an increase of the proportion of the variance explained by manager fixed effects to 25-26%. The decomposition in executive-firm-years and director-firm-years continues to indicate the importance of director fixed effects. Whereas the proportion of the variance explained by executive fixed effects amounts to 26%, director fixed effects accounts for an only slightly lower proportion (24%).

Previous studies (e.g. Bertrand and Schoar, 2003; Graham et al., 2012) only consider the five highest paid executives per firm. In order to facilitate the comparison with these studies, I only include the five most important executives within a firm in a further robustness check. The classification of the importance of executives based on their compensation is not applicable in the German context as the law only requires the individualized disclosure of the compensation of the members of the executive board from 2006 onward. Initially, the following five executives are considered as most important executives: the CEO, his deputy and the three other executives with the longest tenure. In case of two or more executives with the same tenure, I consider the executive with the highest number of supervisory board seats in the respective year as most important. When both the tenure and the number of supervisory board seats of two or more executives are identical, their importance is assigned randomly. Considering only the five most

important executives per firm, the number of manager-firm-years decreases considerably to 24,515, whereas the proportion of the variance explained by executive fixed effects increases considerably to 58%.

Alternatively, with respect to the importance of the supervisory board for the German corporate governance system, I include the CEO, his deputy, the chairman of the supervisory board as well as one additional executive and director based on the criteria above as the five most important managers per firm. Using this classification of the most important managers, the number of observations decreases to 37,647. The proportion of the variance explained by manager fixed effects increases and amounts to 38-39%; the higher proportion for the subsample of director-firm-years (40%) again corroborates the importance of including director fixed effects.

As already mentioned in Section 2, the chairman of the supervisory board is attributed a double-voting right in firms subject to parity codetermination. For this reason employee representatives might have a limited impact on supervisory board decisions even in the case of a one-half codetermination. Therefore, I test the robustness of the results to the exclusion of employee representatives from the AKM sample. Excluding employee representatives from the sample reduces the sample size to 72,010 manager-firm-years. In accordance with the results in Table 6 and a limited impact of employee representatives on supervisory board decisions and thus on firm performance, the proportion of variance explained by manager (executive/director) fixed effects increases to 26-27% (26%/27-28%). This suggests that measuring the impact of manager fixed effects on firm performance by including all members of the executive and supervisory board underestimates the impact of shareholder representatives on the supervisory board.[25]

5.4. The importance of different types of executives & directors for firm performance

The results presented so far imply a high importance of executive and director fixed effects in explaining the variance in firm performance. These fixed effects have been modeled as unobservable and time-invariant characteristics. However, it remains unclear which characteristics are reflected in manager fixed effects. For instance, executive fixed effects could

---

[25]For the robustness tests that vary the number and type of managers included, the relative increase in the explanatory power in models with firm fixed effects, manager fixed effects and match effects is very similar to the results in Table 4.

represent leadership style, assertiveness or reputation and director fixed effects could reflect intrinsic motivation, time management or expertise. However, according to the most prevalent interpretation, manager fixed effects proxy for skills (e.g. Abowd et al., 2002; Abowd et al., 2003; Ferreira, 2009; Graham et al., 2012; Iranzo et al., 2008). I follow the previous literature in interpreting the manager fixed effects as proxy for the skills of an individual executive or director, respectively.[26,27]

Figure 1 shows the distribution of the manager fixed effects estimated in Table 4 (5) (AKM + match model) as well as the distribution of the subsamples of executive and director fixed effects. Since fixed effects can only be estimated relative to a benchmark, the mean of the manager fixed effects is normalized to zero. The respective graphs indicate that manager as well as executive and director fixed effects are approximately normally distributed, but slightly skewed to the right.

Panel A in Table 6 depicts descriptive statistics based on Figure 1. The standard deviation of manager fixed effects equals 0.706. This implies a considerable variation in the impact of managers on firm performance. Executive fixed effects are on average slightly higher than director fixed effects (0.006 vs. -0.003) and have a slightly higher standard deviation (0.805 vs. 0.654).

[Insert Figure 1 about here]

[Insert Table 6 about here]

As stated before, the CEO and the chairman of the supervisory board are expected to have a larger impact on firm performance than ordinary executive or supervisory board members. Moreover, the double-voting right of the chairman of the supervisory board in firms with one-half codetermination suggests a limited influence of employee representatives on supervisory board decisions. Therefore, the standard deviations of the fixed effects of the CEO and the chairman of the supervisory board should be higher than the standard deviations of the fixed

---

[26]Studies that analyze if manager fixed effects can be explained by observable personal characteristics such as education, gender or age usually find that these characteristics only explain a very small proportion of the model R-squared. However, Graham et al. (2012) also find that education which is commonly interpreted as proxy for skills is significantly and positively related to manager fixed effects in executive compensation. Due to sparse information regarding the educational background of executives and directors of German firms, I did not gather data on their educational background.

[27]Note that even if manager fixed effects do not represent skills they are still correlated with firm performance and therefore at least proxy for unobservable and time-invariant characteristics of managers with an impact on firm performance.

effects of the respective ordinary board members. Given their limited impact on supervisory board decisions, the standard deviation of the fixed effects of employee representatives should be closer to zero than the standard deviation of the fixed effects of shareholder representatives.

Panel B and C in Table 6 reports descriptive statistics for the individual fixed effects of different types of managers based on the estimation results in Table 4 (5) (AKM and AKM + match model). Since the position of an individual manager could change over time (e.g. an ordinary member of the executive board is promoted to the CEO of the firm) these results are restricted to managers with only one type of position (chairpersons, CEO, chairman of the supervisory board (Panel B) and ordinary board members, executive board member, shareholder representative, employee representative (Panel C)) over time. In general, the results suggest a considerable larger impact of chairpersons than of ordinary board members. The respective standard deviation of the manager fixed effects of chairpersons (either the CEO or chairman of the supervisory board) is almost twice as high as the standard deviation of the manager fixed effects for ordinary board members (either an ordinary executive board member, shareholder representative or employee representative) (1.217 vs. 0.644). A closer analysis of the different positions on the executive and supervisory board reveals a higher impact of the CEO and the chairman of the supervisory board relative to ordinary executive and supervisory board members. Whereas the standard deviation of CEO fixed effects is almost twice as high as the standard deviation of ordinary executive board members, the standard deviation of the chairman of the supervisory board fixed effects is only slightly higher than the standard deviations of shareholder representative fixed effects (0.920 vs. 0.771). In accordance with a limited impact of employee representatives on board decisions, the standard deviation of the fixed effects of employee representatives is far lower (0.358) than for the other types of board positions. Even though the CEO seems to matter the most for firm performance, the standard deviation of shareholder representatives' fixed effects exceeds the standard deviations of ordinary executive board members fixed effects and corroborates the importance of director fixed effects.

As mentioned in Section 3, the empirical analysis allows manager fixed effects to vary within one person across her/his executive and supervisory board positions. Focusing on those persons serving only on the executive and supervisory board within one firm allows the reinvestigation of changes from executives to the supervisory board of the same firm upon retirement. The costs and benefits of such transitions in terms of firm performance have been discussed controversially

(Andres et al., 2013b; Bermig and Frick, 2010; Grigoleit et al., 2011). The study by Andres et al. (2013b) indicates that the stock market considers the announcement of a CEO transition as good news. In addition to that, Andres et al. (2013b) find largely insignificant effects on operating performance and Grigoleit et al. (2011) find no significant relation between former executives on the supervisory board and different measures of firm performance. In contrast to this, the study by Bermig and Frick (2010) partially supports a negative effect. All these studies compare the performance of firms with and without former executives (or CEOs) on the supervisory board. However, they do not consider the characteristics of the corresponding executives in more detail. Interpreting the manager fixed effects as proxy for the skills of an individual former executive allows the investigation of this issue on a person-specific level.

To analyze the performance implications of transitions of former executives to the supervisory board, I compare the skills of former executives as supervisory board members with those of other supervisory board members. Panel A in Table 7 reports descriptive statistics for the director fixed effects of former executives, former CEOs and other board members. In order to distinguish the fixed effects of former executives from the fixed effects of executives serving on the supervisory board of at least one additional firm, only former executives serving on the supervisory board of the same, but of no other firm in the sample are considered. Since the position of an executive on the executive board could change over time, former executives are classified as former CEOs if they served as CEO for the last during their tenure on the executive board.[28]

In line with Andres et al. (2013b) the results suggest that former CEOs as monitors are not a cause of concern for shareholders. Their estimated average director fixed effect amounts to 0.129 (76th percentile). The difference between the average director fixed effects of former CEOs and other board member is positive and statistically significant at the 5% level, which indicates above average skills of former CEOs as monitors. On a more general level, the average director fixed effect of former executives (including former CEOs) is significantly higher compared to the

---

[28]In additional analyses, former executives are classified as former CEOs if they served for the majority of years on the executive board as CEO or if they served for all years on the executive board as CEO. Furthermore, I re-estimate Table 7 based on the manager fixed effects estimated in the regression model with ROA as dependent variable. These robustness checks lead to qualitatively similar results. If former CEOs are defined as executives serving as CEO for all years on the executive board the difference to the executive fixed effects of other executives is less evident.

average director fixed effect of other supervisory board members. The estimated value of 0.071 corresponds to the 68th percentile meaning that more than two thirds of other supervisory board members have a lower director fixed effect. In addition to that, Panel A in Table 7 also includes the executive fixed effects of former executives (CEOs) and of all other executives. The results indicate that the executive fixed effects of former executives are significantly higher (70th percentile) compared to other executive board members. This also holds true for the subgroup of former CEOs for which the estimated average executive fixed effect (75th percentile) and the difference to the executive fixed effects of other executives are even more pronounced. Overall, the results in Panel A in Table 7 indicate that only executives who performed well during their tenure are offered a seat on the supervisory board and that these executives perform well in their role as monitor, too.

However, the control group in Panel A in Table 7 includes all remaining executives and directors. Thereby the control group also consists of executives and directors without the dual experience as executive and director. In order to compare the monitoring skills of former executives of the same firm with executives serving on the supervisory board(s) of (a) different firm(s), the control group in Panel B in Table 7 includes director and executive fixed effects of executives serving on at least one supervisory board of another, but not the same firm. On a general level, the director fixed effects of directors with experience as executive at another firm are still above average, but not as high as the director fixed effects of former executives of the same firm. Furthermore their estimated average executive fixed effect is lower compared to the executive fixed effects of former executives of the same firm. This also holds true for the subgroup of CEOs.

[Insert Table 7 about here]

6. Firm-level-analysis

In this section, the estimation results for executive and director fixed effects in Section 5 are used to construct measures for board quality and skill dispersion within and between the two boards (Section 6.1). Subsequently, I investigate the impact of these measures on firm performance (Section 6.2). Finally, Section 6.3 discusses the causal relation between manager fixed effects and firm performance.

6.1. Measures of board quality & skill dispersion

Apart from their aggregate amount, the dispersion of executive and director fixed effects within the firm could also have an impact on firm performance. One could assume that an executive board consisting of managers with low skills (e.g. caused by entrenchment) needs to be monitored more closely, which is likely to be performed by a supervisory board consisting of directors with relatively high skills. At the same time, monitoring by the supervisory board should be less important, if the executive board mainly consists of executives with high skills. A close monitoring of the executive board, especially an executive board consisting of executives with high skills, might even have a negative impact on firm performance as the monitoring imposes constraints on the executives' freedom to generate shareholder value (Brennan, 2006). Therefore, it may be expected that a higher dispersion between the quality of the executive and the supervisory board leads to a higher firm performance for a given aggregate quality of both boards. I measure the aggregate quality of the two boards and the quality of each board as the average fixed effect of their respective members. The dispersion between the qualities of the two boards is then calculated as the standard deviation between these estimated qualities.

The effectiveness of the executive and supervisory board could also depend on the distribution of skills within these boards. To the best of my knowledge, the relation between the distribution of the skills within these two boards and firm performance has not been previously tested. However, papers in the field of labor economics investigate a comparable issue, namely the relation between the skill mix of employees and firm performance (Iranzo et al., 2008). Depending on the business model of the firm, either high skills of a few workers ("dispersed skill distribution") or equally distributed skills of the majority of workers ("concentrated skill distribution") are favorable (Milgrom and Roberts, 1990). Another strand of the literature related to the distribution of skills within the executive and supervisory board refers to the performance of teams. There is no consensus whether heterogeneous or homogeneous teams lead to higher firm performance. For instance, positive effects of heterogeneous teams could be attributed to workers with higher skills, who instruct lower skilled workers leading to higher productivity (Hamilton et al., 2003). However, Dess (1987) argues that homogeneous teams agree upon a common strategy more

easily.[29] I measure the heterogeneity, i.e. skill dispersion, of the executive (supervisory) board as standard deviation of the corresponding executive (director) fixed effects estimated in Table 4 (AKM and AKM + match model).

Panel A in Table 8 contains descriptive statistics on the board quality, the quality of the executive and the supervisory board and the dispersion of skills within the executive and the supervisory board and between the two boards. As before, the mean of the individual manager fixed effects is normalized to zero. For the measures that do not control for match effects the quality of the executive and the supervisory board exhibit a positive mean (0.022 and 0.019, respectively) and a negative median (-0.024 and -0.023, respectively) indicating a positive skewness. The measures for the dispersion of skills within each board and between the two boards are also positively skewed. The dispersion of skills between is higher than within the executive and the supervisory board. The descriptive statistics are very similar for the measures based on estimation results controlling for match effects.

Panel B in Table 8 reports the correlation between the measures for the quality of the boards and the dispersion of skills within and between the executive and the supervisory board. As some of the measures are interrelated with each other, some of these correlations are quite high. The correlations between the average quality of all members in both boards and the quality of the executive and supervisory board are considerably high (between 0.88 and 0.97). Furthermore, the dispersion between the qualities of all managers in both boards is highly positively correlated with the dispersion of the quality between the executive and the supervisory board and the dispersion of skills within the supervisory board (0.89 and 0.92, respectively). All other measures are also, albeit to a lesser extent, positively correlated (0.11-0.71). The correlations for the measures based on estimations controlling for match effects are very similar.[30]

[Insert Table 8 about here]

---

[29]For a comprehensive overview on studies about work group diversity, see Jackson et al. (2003). For a recent study that incorporates several dimensions of work group diversity and tests its impact on the performance for a large sample from the U.S. mutual fund industry, see Bär et al. (2007).

[30]Additional summary statistics based on the manager fixed effects estimated with ROA as dependent variable lead to qualitatively similar results.

6.2. Determinants of firm performance

The impact of the distribution of skills within the executive and the supervisory board and between the two boards on firm performance is analyzed using regression models on the firm-level. In addition to the board and firm characteristics described in Section 4.2, the dispersion of skills between and the dispersion within the executive and the supervisory board are included in three models. Moreover, these three models control for the aggregate quality of the executive and the supervisory board.[31] The coefficient estimates and the explanatory power are compared for overall five models. Model (1) does not include firm fixed effects or measures based on manager fixed effects (OLS model). In model (2), firm fixed effects (firm fixed model) and in model (3) measures based on manager fixed effects are added to the OLS model (manager fixed model). Models (4) and (5) include firm fixed effects and measures based on manager fixed effects. In contrast to model (4) (manager fixed + firm fixed model), model (5) controls for match effects (manager fixed + firm fixed + match model).

The results depicted in Table 9 show again that including firm fixed effects or measures based on manager fixed effects increases the explanatory power by more than 30 percentage points (in (2) by 42.4 and in (3) by 32.5 percentage points). However, the explanatory power increases significantly more when both firm fixed effects and measures based on manager fixed effects are included. In this case, the explanatory power increases by more than 70 percentage points (to 82.2%). The results regarding the dispersion of quality within the executive and supervisory board and between the two boards differ considerably depending on whether firm fixed effects are included. The results in (3) indicate a significantly positive impact of the dispersion within and between the executive and supervisory board on firm performance. However, these coefficient estimates are biased as the executive and director fixed effects in Table 4 (4) and (5) are estimated controlling for firm fixed effects. The results in models (4) and (5) suggest that the aggregate quality of both boards is the key factor in explaining the impact of manager fixed effects on firm performance. This effect is positive and significant on the 1% level, whereas the coefficients for the dispersion of skills within and between the two boards are insignificant in models (4) and (5).

---

[31]The choice of these variables is driven by the high correlations between some of the measures of Panel B in Table 8.

The results regarding the board and firm characteristics also depend on whether executive and director fixed effects are included. For the sake of brevity, I only compare model (2) – the most commonly used model in the literature – with models (4) and (5). The coefficient estimates of the board characteristics in the models (2) and (4) are very similar. However, the significance levels differ for the average tenure of the executive, the size of the supervisory board, the dummy variable for a former CEO as chairman of the supervisory board and for women representation. The coefficients for the average tenure of the executive, the size of the supervisory board and women representation are not statistically significant at conventional levels for model (2) and significant on the 1%, 5% and 10% level for model (4), respectively. The coefficient estimate for the dummy variable for a former CEO as chairman of the supervisory board changes from significance on the 10% level in model (2) to insignificant in model (4). Concerning the firm characteristics, only the coefficient for the cash flow volatility turns from insignificant to significant (on the 1% level). For free float, the size of the coefficient changes by 37%. The differences and the directions in the changes of the coefficients suggest that highly skilled managers are more likely to work in firms with a more concentrated ownership structure.[32] Similar conclusions can be drawn for the comparison of models (2) and (5) (manager fixed + firm fixed + match model). In sum, the comparison between the results in model (2) and models (4) and (5) suggests an omitted variable bias in model (2) – the model that does not control for executive or director fixed effects.[33]

[Insert Table 9 about here]

6.3. Causality

The regression models presented in the previous sections are very useful in addressing one source of endogeneity – the omitted variable bias, that is the main endogeneity issue considered in this study. In this section, I examine the causality between manager fixed effects and firm performance to address a potential other source of endogeneity – reversed causality. The

---

[32]Bertrand and Schoar (2003) also find a positive relation between manager fixed effects in performance and the fraction of shares held by large shareholders. They interpret this finding as evidence that firms with better corporate governance are more likely to select managers with performance-enhancing styles.

[33]As a robustness test, I re-estimate Table 9 based on the manager fixed effects estimated with ROA as dependent variable. This robustness check leads to qualitatively similar results and lends further support to the notion of an omitted variable bias in model (2).

causality between manager fixed effects (as proxy for skills) and firm performance may go either way. On the one hand, highly-skilled managers could have an active and positive impact on firm performance. According to another interpretation, managers with high manager fixed effects sort into companies with high performance. The estimated high manager fixed effects could then be the result of a better human capital development of managers in firms with higher firm performance (Graham et al., 2009).

To investigate the causality between manager fixed effects and firm performance, I split the sample into the periods 1993-2002 and 2003-2011. Manager fixed effects are estimated for the period 1993-2002 as well as for the entire sample period. For the period 2003-2011 all firm-years are considered for which at least one manager fixed effect estimated over the period 1993-2002 can be assigned to a manager, who was newly appointed during the period 2003-2011. As the results of the regression models on the firm-year-level have shown, it is important to control for the aggregate quality of the executive and supervisory board. However, as this measure contains managers with the manager fixed effects estimated over the period 1993-2002, I exclude these managers for the calculation of a variable, which I refer to as net board quality. Net board quality is defined as the average fixed effects of all managers net of the manager fixed effects of newly appointed managers during the period 2003-2011 (with information about manager fixed effects estimated over the period 1993-2002). The variable net board quality is included in the regression models of Table 10 in order to adequately control for the aggregate board quality of the executive and supervisory board.[34]

Under the hypothesis of an active impact of managers on firm performance, one would expect a positive and significant impact of the manager fixed effects estimated over the period 1993-2002 on firm performance for the subsequent period (2003-2011). The impact of manager fixed effects on firm performance is captured in three different ways (resulting in the three models displayed in Table 10). The three regression models include the same set of observable board and firm characteristics as the regression models in the previous section and controls for net board quality and firm fixed effects. Model (1) includes the sum of manager fixed effects of newly appointed managers during the period 2003-2011 with information about manager fixed effects estimated over the period 1993-2002. In models (2) and (3) the respective manager fixed effects estimated

---

[34]All measures based on manager fixed effects in Table 10 are measured net of match effects.

over the period 1993-2002 are interacted with dummies variables for the board positions of the corresponding managers in the respective firm-year. Model (2) includes interactions with dummy variables for positions as chairperson (either CEO or chairman of the supervisory board) and ordinary board member (executive or supervisory board member), whereas model (3) includes interactions with dummy variables for any position on the executive or supervisory board. The coefficient for manager fixed effects is positive and significant (at the 5% level) in model (1). The results in models (2) and (3) indicate that the coefficient estimates are also significantly positive for the different types of positions on the executive or supervisory board in the respective firm-year. Overall, the results provide strong evidence in favor of an active impact of managers (executives and directors) on firm performance. [35]

7. Conclusion

The impact of individual executives on firm performance has been investigated in many studies in the recent past and continues to gain in importance as research topic. Apart from individual executives, many studies also investigate the impact of the board of directors on firm performance. Previous studies related to the impact of the board of directors rely on observable board characteristics and do not consider director fixed effects.

By using a data set of German firms, the impact of individual managers with different tasks on firm performance can be distinguished. The two-tiered board in Germany allows the unambiguous assignment of the tasks of running and monitoring the firm to the members of the executive and the supervisory board. This study analyzes the absolute and relative importance of executive and director fixed effects compared to observable board, manager and firm characteristics as well as year and firm fixed effects. Using the AKM method allows to take into account a considerable larger number of managers as under the MDV method and to separately identify the manager and firm fixed effects as opposed to the spell method. In addition to that, I also include match effects allowing a more precise estimation of manager fixed effects.

---

[35]As a robustness test, manager fixed effects are estimated based on the regression model with ROA as dependent variable. In line with the results presented in Table 10 the coefficient of manager fixed effects has a positive sign in four out of five cases. However, the coefficient is only statistically significant for positions on the supervisory board in model (3). This corroborates the evidence in favor of the importance of director fixed effects.

I find that executive and director fixed effects are almost equally important in explaining the variance in firm performance. The proportion of the variance in firm performance explained amounts to 24% for executive fixed effects and 21-22% for director fixed effects, which is less than the corresponding proportion for firm fixed effects, but comparable to the proportion jointly explained by observable board, manager and firm characteristics (24-27%) when the AKM method is used. This proportion is even higher for director fixed effects under the MDV method. The results further suggest, that changes of former CEOs to the supervisory board of the same firm upon retirement do not seem to be a concern for shareholders as only executives who performed well during their tenure are offered a seat on the supervisory board and as these executives perform well in their role as monitor, too. Comparing the coefficient estimates of models with and without manager fixed effects suggests that models without manager fixed effects suffer from an omitted variables bias. The results also provide strong evidence in favor of an active impact of managers (executives and directors) on firm performance.

Using fixed effects in order to control for unobserved managerial heterogeneities does not answer the question of the source of these heterogeneities. When one follows the most common interpretation of manager fixed effects as a proxy for the skills of an individual manager, the analysis on the firm-level shows that the impact of manager fixed effects on firm performance can be attributed to the aggregate quality of the executive and the supervisory board, but not to the dispersion of skills within or between the two boards.

The high explanatory power of director fixed effects in explaining firm performance suggests at least two interesting areas for future research. Future research could focus more closely on the impact of specific types of directors such as former executives, bank representatives or employee representatives on firm performance. Prior studies have investigated these issues on the firm-level.[36] In contrast to this, the manager fixed dummy variable approach allows to reinvestigate these topics on the level of individual persons. As studies about the relation between board characteristics and firm performance implicitly assume a link between board characteristics and board actions (Hermalin and Weisbach, 2003), the investigation of the absolute and relative

---

[36]For studies about the impact of codetermination on firm performance, see among others, Fauver and Fuerst (2006) and Gorton and Schmid (2004). For a study about the impact of bank representatives on firm performance, see among others, Dittmann et al. (2010).

importance of director fixed effects in explaining certain board actions such as executive compensation and CEO turnover is another interesting field for future research.

References

Abowd, J. M., Creecy, R. H. and Kramarz, F., 'Computing person and firm effects using linked longitudinal employer-employee data', *Working Paper* (Cornell University, U.S. Census Bureau, CREST-INSEE, 2002).

Abowd, J. M., Kramarz, F., Lengermann, P. and Perez-Duarte, S., 'Are good workers employed by good firms? A test of a simple assortative matching model for France and the United States', *Working Paper* (Cornell University, U.S. Census Bureau, IZA, Federal Reserve Board, 2004).

Abowd, J. M., Kramarz, F. and Margolis, D. N., 'High wage workers and high wage firms', *Econometrica*, Vol. 67, 1999, pp. 251-333.

Abowd, J. M., Lengermann, P. and McKinney, K. L., 'The measurement of human capital in the U.S. economy', *Working Paper* (Cornell University, U.S. Census Bureau, Federal Reserve Board, 2003).

Adams, R. and Ferreira, D., 'A theory of friendly boards', *Journal of Finance*, Vol. 62, 2007, pp. 217-250.

Adams, R. and Ferreira, D., 'Women in the boardroom and their impact on governance and performance', *Journal of Financial Economics*, Vol. 94, 2009, pp. 291-309.

Adams, R., Hermalin, B. and Weisbach, M. S., 'The role of boards of directors in corporate governance: A conceptual framework and survey', *Journal of Economic Literature*, Vol. 48, 2010, pp. 58-107.

Andres, C., van den Bongard, I. and Lehmann, M., 'Is busy really busy? Board governance revisited', *Working Paper* (WHU - Otto Beisheim School of Management, University of Mannheim, University of Bonn, 2013a).

Andres, C., Fernau, E. and Theissen, E., 'Should I stay or should I go? Former CEOs as monitors', *Working Paper* (WHU - Otto Beisheim School of Management, University of Mannheim, Center for Financial Studies (Frankfurt) and Centre for Financial Research (Cologne), 2013b).

Andrews, M., Gill, L., Schank, T. and Upward, R., 'High wage workers and low wage firms: negative assortative matching or limited mobility bias?', *Journal of Royal Statistical Society*, Vol. 171, 2008, pp. 673-697.

Andrews, M., Schank, T. and Upward, R., 'Practical fixed-effects estimation methods for the three-way error components model', *Stata Journal,* Vol. 6, 2006, pp. 461-481.

Baltagi, B. H., *Econometric Analysis of Panel Data*. (John Wiley & Sons Ltd, 2008).

Bär, M., Niessen-Ruenzi, A. and Ruenzi, S., 'The impact of work group diversity on performance: Large sample evidence from the mutual fund industry', *Working Paper* (Center for Financial Research (CFR), University of Cologne, 2007).

Bennedsen, M., Perez-Gonzalez, F. and Wolfenzon, D., 'Estimating the value of the boss: Evidence from CEO hospitalization events', *Working Paper* (INSEAD, Stanford University, Columbia University, 2012).

Bermig, A. and Frick, B., 'Board size, board composition and firm performance: Empirical evidence from Germany', *Working Paper* (University of Paderborn, 2010).

Bertrand, M. and Schoar, A., 'Managing with style: The effect of managers on firm policies', *Quarterly Journal of Economics*, Vol. 118, 2003, pp. 1169-1208.

Brav, A., Graham, J. R., Harvey, C. R. and Michaely, R., 'Payout policy in the 21st century', *Journal of Financial Economics*, Vol. 77, 2005, pp. 483-527.

Brennan, N., 'Board of directors and firm performance: Is there an expectations gap?' *Corporate Governance: An International Review*, Vol. 14, 2006, pp. 577-593.

Cahn, A., 'Professionalisierung des Aufsichtsrats', *Working Paper* (Institute for Law and Finance, 2011).

Chemmanur, T. J. and Paeglis, I., 'Management quality, certification, and initial public offerings', *Journal of Financial Economics*, Vol. 76, 2005, pp. 331-368.

Chevalier, J., and Ellison, G., 'Are some mutual fund managers better than others? Cross-sectional patterns in behavior and performance', *Journal of Finance*, Vol. 54, 1999, pp. 875-899.

Coles, J. L., Daniel, N. D. and Naveen, L., 'Boards: Does one size fit all?', *Journal of Financial Economics*, Vol. 87, 2008, pp. 329-356.

Coles, J. L. and Li, Z. F., 'An empirical assessment of empirical corporate finance', *Working Paper* (Arizona State University, University of Western Ontario, 2012).

Cornelissen, T., 'The Stata command felsdvreg to fit a linear model with two high-dimensional fixed effects', *Stata Journal*, Vol. 8, 2008, pp. 170-189.

Cornelissen, T. and Hübler, O., 'Unobserved individual and firm heterogeneity in wage and job duration functions: Evidence from German linked employer-employee data', *German Economic Review*, Vol. 12, 2011, pp. 469-489.

Dherment-Ferere, I., Köke, J. and Renneboog, L., 'Corporate monitoring by blockholders in Europe: empirical evidence of managerial disciplining in Belgium, France, Germany, and the UK', *Working Paper* (University of Toulon, University of Mannheim, Tilburg University, 2001).

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

Dybvig, P. H. and Warachka, M., 'Tobin's Q does not measure firm performance: Theory, empirics, and alternative measures', *Working Paper* (Olin School of Business, Singapore Management University, 2012).

Faleye, O., Hoitash, R., and Hoitash, U., 'The costs of intense board monitoring', *Journal of Financial Economics*, Vol. 101, 2011, pp. 160-181.

Fama, E. F., 'Agency problems and the theory of the firm', *Journal of Political Economy*, Vol. 88, 1980, pp. 288-307.

Fama, E. F. and Jensen, M. C., 'Separation of ownership and control', *Journal of Law and Economics*, Vol. 26, 1983, pp. 301-325.

Fauver, L. and Fuerst, M. E., 'Does good corporate governance include employee representation? Evidence from German corporate boards', *Journal of Financial Economics*, Vol. 82, 2006, pp. 673-710.

Fee, C., Hadlock, C. and Pierce, J., 'Managers with and without style: Evidence using exogenous variation', *Review of Financial Studies*, Vol. 26, 2013, pp. 567-601.

Ferreira, P., 'Returns to job mobility: The role of observed and unobserved factors', *Working Paper* (University of Essex, 2009).

Fich, E. M., 'Are some outside directors better than others? Evidence from director appointments by Fortune 1000 firms', *Journal of Business*, Vol. 78, 2005, pp. 1943-1972.

Fich, E. M. and Shivdasani, A., 'Are busy boards effective monitors?', *Journal of Finance*, Vol. 61, 2006, pp. 689-724.

Frank, M. Z. and Goyal, V. K., 'Corporate leverage: How much do managers really matter?', *Working Paper* (University of Minnesota, University of Hong Kong, 2010).

Franks, J. and Mayer, C., 'Ownership and control of German corporations', *Review of Financial Studies*, Vol. 14, 2001, pp. 943-977.

Gantenbein, P. and Volonte, C., 'Director characteristics and firm performance', *Working Paper* (University of Basel, 2011).

Gorton, G. and Schmid, F. A., 'Capital, labor, and the firm: a study of German codetermination', *Journal of the European Economic Association*, Vol. 2, 2004, pp. 863-905.

Graham, J. R., Li, S. and Qiu, J., 'Managerial attributes and executive compensation', *Working Paper* (Duke University, Wilfried Laurier University, McMaster University, 2009).

Graham, J. R., Li, S. and Qiu, J., 'Managerial attributes and executive compensation', *Review of Financial Studies*, Vol. 25, 2012, pp. 144-186.

Grigoleit, J., Nippa, M. and Steger, T., 'Ökonomische Konsequenzen der Mitgliedschaft ehemaliger Vorstandsmitglieder im Aufsichtsrat: Eine empirische Analyse', *Zeitschrift für betriebswirtschaftliche Forschung*, Vol. 63, 2011, pp. 578-608.

Hallock, K., 'Reciprocally interlocking boards of directors and executive compensation', *Journal of Financial and Quantitative Analysis*, Vol. 32, 1997, pp. 331-344.

Hamilton, B. H., Nickerson, J. A. and Owen, H., 'Team incentives and worker heterogeneity: An empirical analysis of the impact of teams on productivity and participation', *Journal of Political Economy*, Vol. 111, 2003, pp. 465-497.

Hermalin, B. and Weisbach, M. S., 'Boards of directors as an endogenously determined institution: a survey of the economic literature', *Economic Policy Review*, Vol. 9, 2003, pp. 7-26.

Hillier, D., Korczak, A. and Korczak, P., 'Individual heterogeneity and the performance of insider trading', *Working Paper* (University of Strathclyde, University of Bristol, 2013).

Hillman, A. and Dalziel, T., 'Boards of directors and firm performance: Integrating agency and resource dependence perspectives', *Academy of Management Review*, Vol. 28, 2003, pp. 383-396.

Iranzo, S., Schivardi, F. and Tosetti, E., 'Skill dispersion and firm productivity: An analysis with employer-employee matched data', *Journal of Labor Economics*, Vol. 26, 2008, pp. 247-285.

Jackson, S. E., Joshi, A. and Erhardt, N. L., 'Recent research on team and organizational diversity: SWOT analysis and implications', *Journal of Management*, Vol. 29, 2003, pp. 801-830.

Johnson, B., Magee, R., Nagarajan, N. and Newman, H., 'An analysis of the stock price reaction to sudden executive death: Implications for the management labor market', *Journal of Accounting and Economics*, Vol. 7, 1985, pp. 151-174.

Masulis., R., and Mobbs, H. S., 'Are all inside directors the same? Do they entrench CEO's or enhance board decision making?', *Journal of Finance,* Vol. 66, 2011, pp. 832-872.

Milgrom, P. and Roberts, J., 'The economics of modern manufacturing: Technology, strategy, and organization', *American Economic Review*, Vol. 80, 1990, pp.511-528.

Munch, J. R. and Skaksen, J. R., 'Human capital and wages in exporting firms', *Journal of International Economics,* Vol. 75, 2008, pp. 363-372.

Nguyen, B. D. and Nielsen K. M., 'The value of independent directors: Evidence from sudden death', *Journal of Financial Economics*, Vol. 98, 2010, pp. 550-567.

Pfeffer, J., and Salancik, G., *The external control of organizations: A resource-dependence perspective* (Harper & Row, 1978).

Raheja, C. G., 'Determinants of board size and composition: A theory of corporate boards', *Journal of Financial and Quantitative Analysis*, Vol. 40, 2005, pp. 283-306.

Ravina, E. and Sapienza, P., 'What do independent directors know? Evidence from their trading', *Review of Financial Studies*, Vol. 23, 2010, pp. 962-1003.

Woodcock, S., 'Match effects', *Working Paper* (Simon Fraser University, 2011).

Variable definitions

This table presents the definitions of the variables used in this paper. Board, manager characteristics and ownership structure are obtained or derived from the *Saling/Hoppenstedt Aktienführer*. All other firm characteristics are obtained from Datastream.

Variable	Definition
Board characteristics	
Board quality	Average fixed effects of all executive and supervisory board members.
Busy board	A dummy variable that equals one if at least 50% of the supervisory board members hold three or more directorships in German listed firms.
Chairman is former CEO	A dummy variable that equals one if the chairman of the supervisory board in the respective year was the CEO of the same company in at least one of the previous years.
Codetermination	Ratio of the number of employee representatives to *supervisory board size*.
Dispersion director skills	Standard deviation of the fixed effects of all supervisory board members.
Dispersion EB-SB quality	Standard deviation of *EB quality* and *SB quality*.
Dispersion executive skills	Standard deviation of the fixed effects of all executive board members.
Dispersion manager skills	Standard deviation of the fixed effects of all executive and supervisory board members.
EB quality	Average fixed effects of the executive board members.
Executive board size	Number of executive board members at the end of the fiscal year.
Interlocking board	A dummy variable that equals one if at least one executive and supervisory board are joint members of another supervisory board.
Net board quality	(Sum of the fixed effects of executive and supervisory board members – the sum of manager fixed effects (1993-2002))/(number of members on the executive and supervisory board – number of managers with non-missing manager fixed effects (1993-2002))
SB quality	Average fixed effects of the supervisory board members.
SB-/(SB+EB)-size-ratio	Ratio of *supervisory board size* to the sum of *supervisory board size* and *executive board size*.
Supervisory board size	Number of supervisory board members at the end of the fiscal year.

Board characteristics (continued)

Tenure supervisory (executive) board	Average tenure of all supervisory (executive) board members. For an individual director (executive), tenure equals one plus the difference between the current year and the first year of the individual on the supervisory (executive) board during the listing period.
Women representation	Ratio of the number of women to (*supervisory board size + executive board size*).

Manager characteristics

Busy director	A dummy variable that equals one if a director is classified as "busy", i.e. holds three or more directorships in German listed firms.
CEO/Chairman	A dummy variable that equals one if the individual is the CEO or the chairman of the supervisory board at the end of the fiscal year.
Chairman is former CEO	A dummy variable that equals one if the individual is the chairman of the supervisory board in the current year and was the CEO of the company in at least one of the previous years.
Employee representative	A dummy variable that equals one if the individual is a supervisory board member and employee representative at the end of the fiscal year.
Female	A dummy variable that equals one if a manager is female.
Interlocking manager	A dummy variable that equals one if an executive and a director are joint members of another supervisory board.
Mover	A dummy variable that equals one if a manager has worked for at least two firms of the sample during the sample period.
Stayer	A dummy variable that equals one if a manager has worked for only one firm of the sample during the sample period.
Tenure director	One plus the difference between the current year and the first year of the director on the supervisory board during the listing period.
Tenure executive	One plus the difference between the current year and the first year of the executive on the executive board during the listing period.

Firm characteristics

Capital structure	Ratio of book value of total debt to book value of total assets.
Cash flow volatility	Standard deviation of share price returns in the previous 36 months.
Firm age	Natural logarithm of the difference between the current year and the year of the incorporation.
Firm size	Natural logarithm of the book value of total assets.
Free float	Fraction of voting equity held by shareholders with less than 5% of the voting equity.

Firm characteristics (continued)

ROA	Ratio of earnings before interest and taxes to total assets.
Sales growth	Nominal growth rate of revenues over the last fiscal year.
Tobin's Q	(Market value of equity + book value of debt)/book value of total assets.

Figure 1: Distribution of manager fixed effects

This figure shows the distribution of manager, executive and director fixed effects. Manager, executive and director fixed effects are estimated based on the regression model in Table 4 (5) and are thus net of match effects. Manager, executive and director fixed effects are estimated relative to the benchmark of the average manager fixed effect of all managers included in the AKM sample, respectively. Panel A presents manager fixed effects, Panel B presents executive fixed effects and Panel C presents director fixed effects.

Panel A: Manager fixed effects
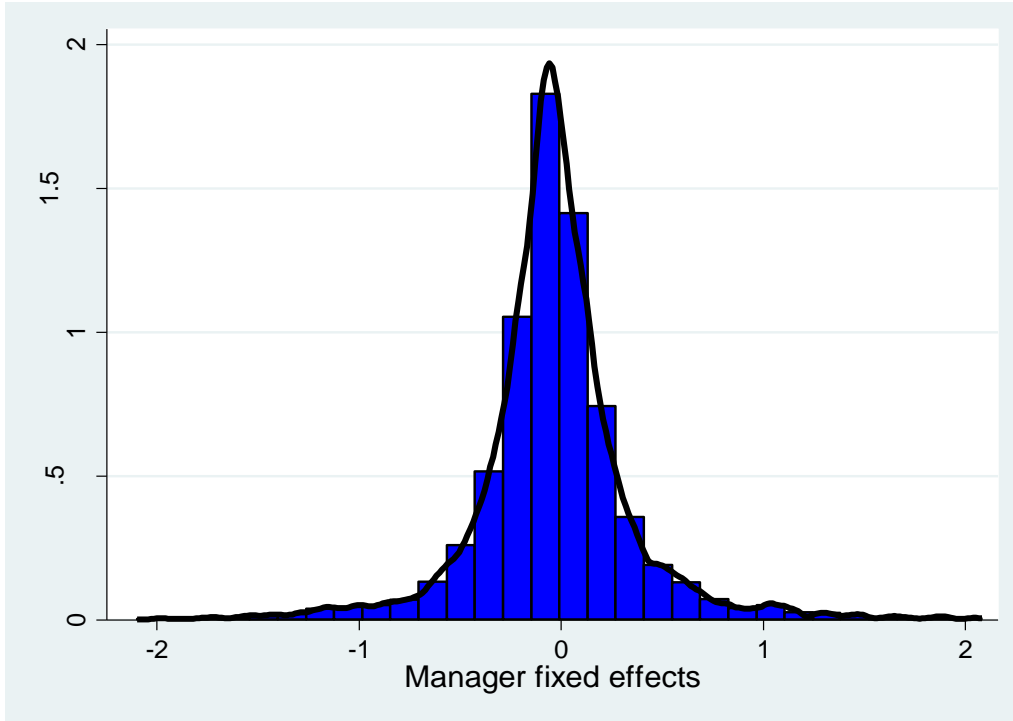
Panel B: Executive fixed effects
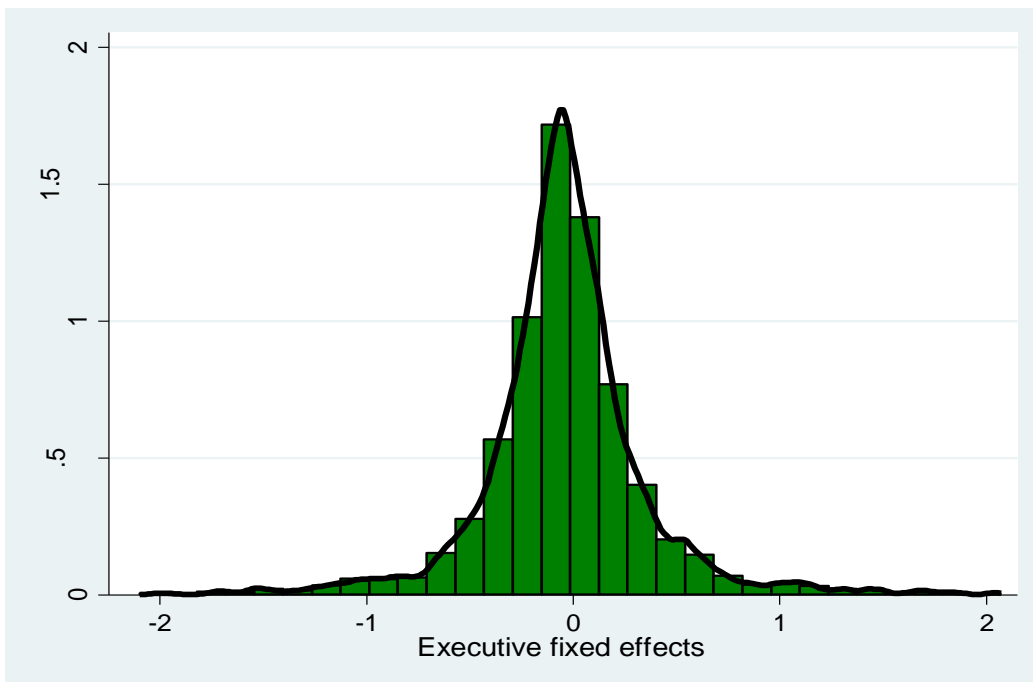
Panel C: Director fixed effects
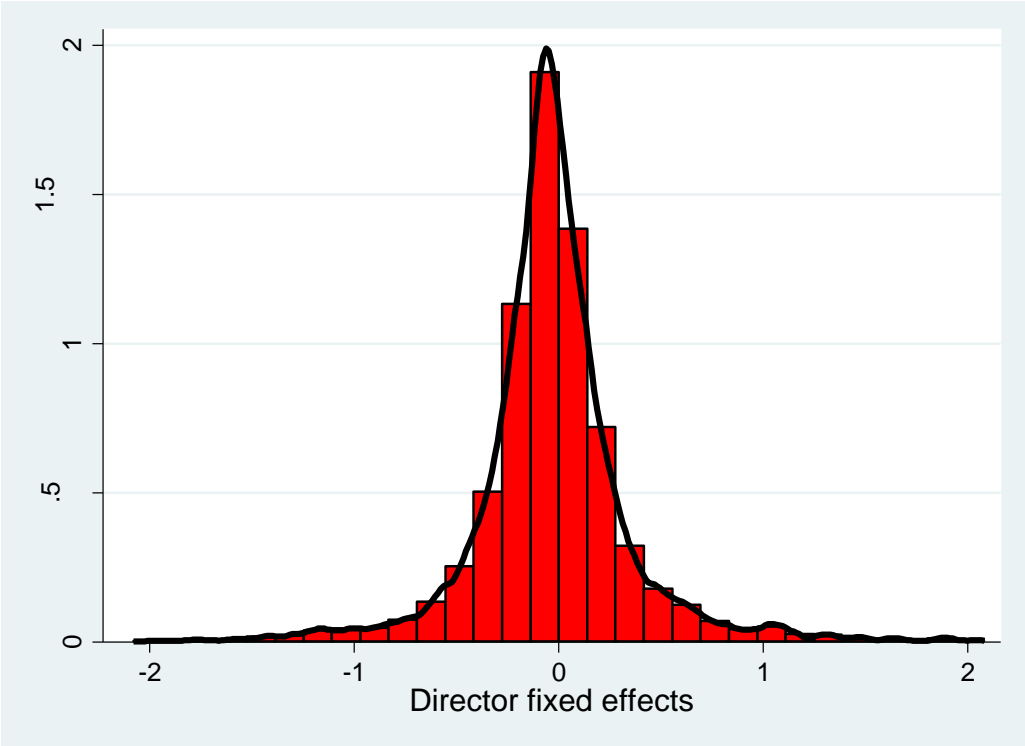
Table 1: Panel data observations

This table shows the distribution of panel data observations for each year based on the full sample. For each year and the entire sample period, the number of firms, persons and managers is provided. Observations of the same individual person in the executive and supervisory board are treated as if they belong to two different managers. In addition, managers and manager-firm-years are subdivided into executives and directors as well as executive-firm-years and director-firm-years. For ease of comparison, this information is also provided for the AKM sample.

Year	Firms	Persons	Manager	Executives	Directors	Manager-firm-years	Executive-firm-years	Director-firm-years
1993	326	3,718	3,843	1,143	2,700	4,381	1,162	3,219
1994	388	4,244	4,388	1,283	3,105	5,003	1,310	3,693
1995	396	4,263	4,411	1,252	3,159	5,011	1,278	3,733
1996	385	4,078	4,220	1,181	3,039	4,771	1,204	3,567
1997	432	4,393	4,551	1,272	3,279	5,186	1,319	3,867
1998	446	4,592	4,762	1,340	3,422	5,397	1,385	4,012
1999	459	4,705	4,877	1,399	3,478	5,522	1,439	4,083
2000	460	4,678	4,838	1,395	3,443	5,470	1,444	4,026
2001	482	4,785	4,960	1,467	3,493	5,544	1,506	4,038
2002	536	5,052	5,217	1,623	3,594	5,744	1,653	4,091
2003	596	5,238	5,399	1,707	3,692	5,901	1,729	4,172
2004	598	5,088	5,237	1,665	3,572	5,728	1,689	4,039
2005	586	4,982	5,112	1,616	3,496	5,572	1,647	3,925
2006	574	4,900	5,024	1,589	3,435	5,454	1,611	3,843
2007	533	4,627	4,727	1,497	3,230	5,111	1,520	3,591
2008	532	4,640	4,750	1,522	3,228	5,126	1,546	3,580
2009	537	4,613	4,715	1,482	3,233	5,052	1,496	3,556
2010	527	4,519	4,618	1,469	3,149	4,939	1,485	3,454
2011	462	4,147	4,234	1,344	2,889	4,517	1,359	3,158
1993-2011 (Full)	990	18,203	19,666	6,432	13,234	99,429	27,782	71,647
1993-2011 (AKM)	889	17,285	18,684	6,071	12,613	95,477	26,379	69,098

Table 2: Mobility, groups & samples

This table contains information about movers and stayers, the composition of groups and the AKM, MDV and full sample. Movers and stayers are defined as in *Variable definitions*. The definition of a group is based on Abowd, Kramarz and Margolis (1999). Panel A shows the distribution of the number and percentage (in parentheses) of sample firms in which managers, executives and directors have been employed during the sample period. Based on the number of firms the manager, executive, director has worked for, he/she is categorized as mover or stayer. Panel B presents the number and percentage (in parentheses) of manager, manager-firm-years, executive-firm-years, director-firm-years, and firms in different groups. Panel C provides information about groups, manager-firm-years, executives, directors, and firm-years included in the AKM, MDV, and full sample.

Panel A: Mobility

No. of firms the manager worked for	Number (%) of managers	Number (%) of executives	Number (%) of directors	Mover/stayer
1	17,205 (87.49%)	5,897 (91.68%)	11,308 (85.45%)	Stayer
2	1,639 (8.33%)	456 (7.09%)	1,183 (8.94%)	Mover
3	435 (2.21%)	64 (1.00%)	371 (2.80%)	Mover
4	168 (0.85%)	12 (0.19%)	156 (1.18%)	Mover
5	92 (0.47%)	2 (0.03%)	90 (0.68%)	Mover
6-15	127 (0.65%)	1 (0.02%)	126 (0.96%)	Mover
1-15	19,666	6,432	13,234	Mover/stayer

Panel B: Groups[1]

	Manager		Manager-firm-years		Executive-firm-years		Director-firm-years		Firms	
"0"	889	(4.52%)	3,550	(3.57%)	1,277	(4.60%)	2,273	(3.17%)	92	(9.29%)
1	18,684	(95.00%)	95,477	(94.00%)	26,379	(94.95%)	69,098	(96.44%)	889	(89.80%)
2	23	(0.12%)	163	(0.16%)	55	(0.20%)	108	(0.15%)	2	(0.20%)
3	25	(0.13%)	65	(0.07%)	23	(0.08%)	42	(0.16%)	2	(0.20%)
4	35	(0.18%)	114	(0.11%)	27	(0.10%)	87	(0.12%)	3	(0.30%)
5	10	(0.05%)	60	(0.06%)	21	(0.08%)	39	(0.05%)	2	(0.20%)
0-5	19,666		99,429		27,782		71,647		990	

Panel C: Samples[2]

	Groups	Manager-firm-years	Executives	Directors	Firm-years
AKM	1	95,477 (96.00%)	6,071 (94.39%)	12,613 (96.65%)	8,592 (92.80)
MDV	1	29,633 (29.80%)	531 (8.26%)	1,916 (14.47%)	8,592 (92.80)
Full	All	99,429	6,432	13,234	9,259

---

[1]According to the exact definition of a group, the firms in "group 0" can be categorized into 92 single groups (cf. Cornelissen, 2008).

[2]Using the AKM/MDV method, the fixed effects of all groups apart from "group 0" can be compared. However, comparing the fixed effects between different groups is not without problems. Therefore, only the largest group is considered here.

Table 3: Descriptive statistics and sample representativeness of the AKM and MDV sample

Panel A: Continuous variables

Variable	Sample	Mean	Med.	Stdv.	1st Q	2nd Q	3rd Q	4th Q	5th Q
Supervisory board size	Full	10.85	11.00	6.03	6.00		12.00	18.00	25.00
	AKM	11.12	12.00	5.98	0.38		0.29	0.13	0.20
	MDV	11.83	12.00	6.18	0.34		0.27	0.13	0.25
Executive board size	Full	3.86	3.00	2.24	2.00	3.00	4.00	5.00	16.00
	AKM	3.93	3.00	2.25	0.31	0.21	0.17	0.11	0.20
	MDV	4.11	4.00	2.35	0.29	0.19	0.17	0.12	0.23
SB-/(SB+EB)-size-ratio	Full	0.72	0.75	0.11	0.63	0.71	0.75	0.80	0.95
	AKM	0.72	0.75	0.10	0.18	0.21	0.25	0.16	0.20
	MDV	0.73	0.75	0.10	0.16	0.20	0.25	0.18	0.20
Tenure supervisory board	Full	4.91	4.63	2.18	3.00	4.08	5.15	6.50	16.67
	AKM	4.89	4.60	2.16	0.21	0.19	0.21	0.20	0.20
	MDV	4.86	4.58	2.13	0.20	0.20	0.21	0.20	0.18
Tenure executive board	Full	4.59	4.00	2.41	2.60	3.67	4.75	6.29	19.00
	AKM	4.56	4.00	2.37	0.21	0.21	0.19	0.20	0.19
	MDV	4.46	4.00	2.28	0.21	0.21	0.20	0.20	0.18
Codetermination	Full	0.32	0.33	0.19	0.00	0.33	0.42	0.50	0.71
	AKM	0.33	0.33	0.19	0.21	0.30	0.07	0.39	0.02
	MDV	0.34	0.40	0.19	0.21	0.26	0.07	0.44	0.02
Interlocking board	Full	0.98	1.00	1.18	0.00		1.00	2.00	8.00
	AKM	1.00	1.00	1.19	0.43		0.31	0.15	0.11
	MDV	1.15	1.00	1.28	0.38		0.32	0.16	0.14
Women representation	Full	0.06	0.00	0.08	0.00		0.06	0.13	0.75
	AKM	0.06	0.03	0.08	0.49		0.12	0.22	0.17
	MDV	0.05	0.00	0.07	0.51		0.15	0.21	0.13
Tenure director	Full	4.70	4.00	3.38	2.00	3.00	5.00	7.00	21.00
	AKM	4.69	4.00	3.38	0.31	0.14	0.23	0.14	0.18
	MDV	4.96	4.00	3.50	0.28	0.14	0.23	0.15	0.20
Tenure executive	Full	4.59	4.00	3.28	2.00	3.00	5.00	7.00	20.00
	AKM	4.55	4.00	3.28	0.33	0.14	0.23	0.13	0.17
	MDV	4.07	3.00	3.05	0.39	0.15	0.22	0.12	0.13
Tobin's Q	Full	0.97	0.75	1.06	0.46	0.66	0.86	1.22	59.31
	AKM	0.96	0.75	1.03	0.20	0.21	0.20	0.19	0.20
	MDV	0.93	0.73	1.14	0.22	0.21	0.21	0.18	0.18
Firm size	Full	13.39	13.01	2.55	11.24	12.44	13.71	15.53	21.51
	AKM	13.50	13.13	2.53	0.18	0.20	0.21	0.21	0.21
	MDV	13.94	13.65	2.60	0.14	0.16	0.20	0.22	0.27

Panel A (continued)

Variable	Sample	Mean	Med.	Stdv.	1st Q	2nd Q	3rd Q	4th Q	5th Q
Free float	Full	0.37	0.31	0.29	0.07	0.23	0.41	0.66	1.00
	AKM	0.39	0.31	0.29	0.20	0.19	0.20	0.20	0.20
	MDV	0.39	0.34	0.30	0.18	0.19	0.20	0.20	0.23
Capital structure	Full	0.20	0.15	0.19	0.01	0.09	0.21	0.36	1.00
	AKM	0.20	0.15	0.19	0.22	0.18	0.20	0.21	0.20
	MDV	0.19	0.14	0.19	0.21	0.19	0.21	0.20	0.19
Cash flow volatility	Full	0.11	0.09	0.09	0.06	0.08	0.10	0.14	10.27
	AKM	0.11	0.09	0.09	0.17	0.20	0.19	0.23	0.20
	MDV	0.11	0.09	0.09	0.16	0.21	0.20	0.24	0.19
ROA	Full	0.04	0.05	0.16	0.01	0.04	0.07	0.10	0.98
	AKM	0.04	0.05	0.15	0.23	0.18	0.23	0.16	0.20
	MDV	0.05	0.05	0.14	0.21	0.19	0.24	0.16	0.19
Sales growth	Full	0.26	0.03	8.99	-0.07	0.00	0.06	0.15	1,066.00
	AKM	0.25	0.03	9.02	0.20	0.18	0.21	0.20	0.20
	MDV	0.26	0.03	8.35	0.21	0.18	0.21	0.21	0.20
Firm age	Full	85.60	86.00	66.25	21.00	70.00	102.00	131.00	703.00
	AKM	86.69	87.00	64.93	0.20	0.19	0.21	0.20	0.20
	MDV	91.47	95.00	63.44	0.17	0.17	0.21	0.23	0.22

Panel B: Indicator variables

Variable	Sample	Mean	Med.	Stdv.	Variable	Sample	Mean	Med.	Stdv.
Chairman is former CEO	Full	0.110	0.000	0.313	CEO/Chairman	Full	0.167	0.000	0.373
	AKM	0.111	0.000	0.314		AKM	0.162	0.000	0.368
	MDV	0.122	0.000	0.327		MDV	0.211	0.000	0.410
Busy board	Full	0.019	0.000	0.137	Busy director	Full	0.118	0.000	0.323
	AKM	0.020	0.000	0.139		AKM	0.122	0.000	0.328
	MDV	0.040	0.000	0.196		MDV	0.332	0.000	0.471
Interlocking manager	Full	0.062	0.000	0.241	Mover	Full	0.300	0.000	0.458
	AKM	0.062	0.000	0.242		AKM	0.310	0.000	0.463
	MDV	0.081	0.000	0.273		MDV	1.000	1.000	0.000
Employee representative	Full	0.239	0.000	0.427	Female	Full	0.062	0.000	0.242
	AKM	0.246	0.000	0.430		AKM	0.063	0.000	0.243
	MDV	0.122	0.000	0.327		MDV	0.029	0.000	0.166

This table provides descriptive statistics for the variables in the full, AKM and MDV sample. All variables are defined as in *Variable definitions*. Panel A contains descriptive statistics for the continuous variables. For each variable, it shows the mean, median, and standard deviation. The breakpoints of each quintile are reported for the full sample, and the percentage of observations that fall into each quintile is reported for the AKM and MDV sample. Panel B contains descriptive statistics for the indicator variables. For each variable, it shows the mean, median, and standard deviation.

Table 4: Unobserved managerial heterogeneity and firm performance

This table shows the results of regressions at the manager-firm-year-level with Tobin´s Q as dependent variable, using the AKM sample. Tobin`s Q and all independent variables are defined as in *Variable definitions*. (1) contains neither manager nor firm fixed effects and is estimated as pooled OLS, (2) uses firm fixed effects (FE), (3) uses manager fixed effects (IE), and (4) uses firm and manager fixed effects (FE+IE). (5) includes firm, manager, and match fixed effects (FE+IE+ME). The regression constant in (4) can be interpreted as descriptive statistic for the grand mean; its standard error is not computed. All regressions include year dummies. Each cell shows the estimated coefficient and t-value (in parentheses). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	OLS	FE	IE	FE+IE	FE+IE+ME
	(1)	(2)	(3)	(4)	(5)
Tenure executive board	0.011	0.009	0.007	0.010*	0.008
	(1.11)	(1.24)	(1.12)	(1.67)	(1.36)
Tenure supervisory board	0.008	-0.006	0.008	-0.004	-0.005
	(0.63)	(-0.70)	(1.04)	(-0.70)	(-0.77)
Supervisory board size	0.008	-0.014	0.008	-0.011	-0.011
	(0.87)	(-1.08)	(0.92)	(-0.79)	(-0.69)
SB-/(SB+EB)-size-ratio	-0.300	-0.118	-0.228	-0.154	-0.017
	(-1.33)	(-0.53)	(-1.58)	(-0.88)	(-0.10)
Codetermination	-0.565**	0.247	-0.228	0.194	0.169
	(-2.22)	(0.89)	(-1.58)	(0.77)	(0.64)
Chairman is former CEO	0.114	0.043	0.054	0.023	0.018
	(0.97)	(1.32)	(1.64)	(0.79)	(0.59)
Busy board	0.277	-0.030	-0.177	-0.014	0.007
	(1.55)	(-0.40)	(-1.54)	(-0.26)	(0.15)
Interlocking board	0.001	-0.013	0.003	-0.008	-0.005
	(0.05)	(-1.20)	(0.42)	(-0.88)	(-0.55)
Women representation	1.027***	0.004	0.142	-0.206	-0.215
	(3.55)	(0.01)	(0.69)	(-0.90)	(-0.85)
Tenure director	-0.001	-0.000	0.001	0.004	0.006
	(-0.83)	(-0.19)	(0.19)	(1.08)	(0.71)
Tenure executive	0.001	-0.000	-0.002	0.003	0.005
	(0.75)	(-0.55)	(-0.27)	(0.68)	(0.55)
CEO/Chairman	0.006	0.011**	0.015	0.029*	0.025
	(0.41)	(2.43)	(0.67)	(1.95)	(0.97)
Busy director	0.030	-0.013*	-0.016	-0.001	-0.001
	(1.48)	(-1.77)	(-0.61)	(-0.05)	(-0.03)
Interlocking manager	-0.008	-0.003	-0.030	0.030	-0.003
	(-0.73)	(-0.45)	(-1.57)	(0.24)	(-0.18)
Firm size	-0.093***	-0.259***	-0.162***	-0.289***	-0.315***
	(-4.79)	(-6.57)	(-6.39)	(-5.95)	(-6.23)
ROA	0.772*	0.501***	0.433*	0.424**	0.436***
	(1.72)	(3.22)	(1.81)	(2.49)	(2.57)
Firm age	-0.053	-0.076	-0.001	-0.052	-0.033
	(-1.29)	(-0.77)	(-0.03)	(-0.53)	(-0.31)
Free float	-0.049	-0.221***	-0.106*	-0.199***	-0.203***
	(-0.74)	(-2.82)	(-1.86)	(-3.00)	(-2.88)
Capital structure	-0.266**	0.366***	0.130	0.360***	0.339***
	(-1.97)	(4.28)	(1.47)	(4.10)	(3.71)
Cash flow volatility	0.273	1.267	0.670	1.222*	1.011
	(0.66)	(1.37)	(1.21)	(1.67)	(1.56)
Sales growth	0.003	0.000	-0.005	-0.005	-0.007
	(1.53)	(1.60)	(-0.65)	(-0.69)	(-0.73)
Constant	2.663***	4.760***	3.183***	5.077	5.272***
	(9.38)	(6.86)	(10.94)		(6.30)
Adj. R²	0.107	0.627	0.596	0.770	0.803
Observations	95,477	95,477	95,477	95,477	95,477

Table 5: Relative importance of manager fixed effects in determining firm performance

This table presents the results of the decomposition of the model R-squared in Table 4. The results in (1) are based on Table 4 (4) and the results in (2) are based on Table 4 (5). These components are observable time-variant board characteristics (first block in Table 4), observable time-variant manager characteristics (second block in Table 4) observable time-variant firm characteristics (third block in Table 4), firm fixed effects, manager/executive/director fixed effects, year effects and residuals. Additionally, (2) also contains match effects. For each of these components, the covariance with Tobin's Q (relative to the variance of Tobin's Q) and the percentage of the explained variance of Tobin´s Q (in parentheses) is computed. Panel A is based on all observations in Table 4 (4) and (5). Panel B is based on the subsample of executive-firm-years and Panel C is based on the subsample of director-firm-years.

Panel A: Manager

	(1) No match effects		(2) Match effects	
Observable time-variant board characteristics	0.010	(1.24%)	0.008	(1.02%)
Observable time-variant manager characteristics	0.001	(0.07%)	0.001	(0.07%)
Observable time-variant firm characteristics	0.191	(24.76%)	0.202	(25.20%)
Firm fixed effects	0.384	(49.84%)	0.382	(47.51%)
Manager fixed effects	0.175	(22.78%)	0.176	(21.95%)
Match fixed effects			0.034	(4.25%)
Year effects	0.010	(1.32%)	0.000	(0.01%)
Residuals	0.230	(23.05%)	0.197	(19.66%)
Observations	95,477		95,477	

Panel B: Executives

	(1) No match effects		(2) Match effects	
Observable time-variant board characteristics	0.009	(1.17%)	0.008	(0.96%)
Observable time-variant manager characteristics	0.001	(0.10%)	0.001	(0.10%)
Observable time-variant firm characteristics	0.181	(22.70%)	0.192	(23.82%)
Firm fixed effects	0.403	(50.35%)	0.401	(49.67%)
Manager fixed effects	0.195	(24.36%)	0.196	(24.32%)
Match fixed effects			0.008	(1.01%)
Year effects	0.011	(1.32%)	0.001	(0.12%)
Residuals	0.200	(20.04%)	0.192	(19.22%)
Observations	26,379		26,379	

Panel C: Directors

	(1) No match effects		(2) Match effects	
Observable time-variant board characteristics	0.009	(1.24%)	0.008	(1.02%)
Observable time-variant manager characteristics	0.000	(0.06%)	0.000	(0.05%)
Observable time-variant firm characteristics	0.194	(25.62%)	0.206	(25.72%)
Firm fixed effects	0.376	(49.70%)	0.374	(46.65%)
Manager fixed effects	0.167	(22.06%)	0.168	(20.92%)
Match fixed effects			0.045	(5.67%)
Year effects	0.010	(1.32%)	0.000	(0.03%)
Residuals	0.244	(24.36%)	0.199	(19.86%)
Observations	69,098		69,098	

Table 6: Descriptive statistics on manager fixed effects

This table presents descriptive statistics for manager fixed effects estimated in Table 4 (5). All variables are defined as in *Variable definitions*. For each variable, it shows the number of observations, the mean, 25th percentile, median, 75th percentile, standard deviation and the number of observations. Panel A shows descriptive statistics on manager fixed effects, executive fixed effects and director fixed effects. Panel B describes manager fixed effects for chairpersons (CEO or chairman), CEOs and chairmen, and Panel C contains information about manager fixed effects for managers with ordinary board positions (ordinary executive board members, shareholder representatives, employee representatives). For Panel B and C, only individuals with the same type of board position (CEO, ordinary executive board member, chairman of the supervisory board, shareholder representative, employee representative) (not necessarily in the same firm) during the sample period are considered.

Panel A: Manager, executive and director fixed effects

	Manager fixed effects	Executive fixed effects	Director fixed effects
Mean	0.000	0.006	-0.003
25th percentile	-0.198	-0.217	-0.187
Median	-0.043	-0.047	-0.041
75th percentile	0.124	0.124	0.125
Std. dev.	0.706	0.805	0.654
Observations	18,684	6,071	12,613

Panel B: Manager fixed effects for chairpersons

	Chairperson fixed effects	CEO fixed effects	Chairman fixed effects
Mean	-0.014	0.027	-0.016
25th percentile	-0.287	-0.253	-0.311
Median	-0.050	-0.058	-0.055
75th percentile	0.158	0.143	0.174
Std. dev.	1.217	1.291	0.920
Observations	1,504	1,004	659

Panel C: Manager fixed effects for ordinary board members

	Ordinary board member fixed effects	Ordinary executive board member fixed effects	Ordinary shareholder representatives	Ordinary employee representatives
Mean	-0.002	-0.001	0.017	-0.028
25th percentile	-0.194	-0.208	-0.210	-0.166
Median	-0.038	-0.042	-0.033	-0.048
75th percentile	0.127	0.131	0.157	0.088
Std. dev.	0.644	0.659	0.771	0.358
Observations	13,841	4,302	6,070	4,223

Table 7: Manager fixed effects of managers on the executive and supervisory board of the same and of different firms: Difference-in-differences

This table presents the levels and changes of manager fixed effects for those persons serving on the executive and the supervisory board of only one firm (within firms) or different firms, but not the same firm (between firms). Manager fixed effects are estimated based on the regression model in Table 4 (5). Panel A contains descriptive statistics for the executive and director fixed effects measured for those executives serving on the executive and the supervisory board of only one firm (within firms) and for a control group of other executive (supervisory) board members. CEOs refer to persons serving as CEO during the last year of their tenure on the executive board. For each group, it shows, the mean, median, standard deviation and the number of observations. The superscripts * and ** denote significance at the 10% and 5% level, respectively. Panel B shows the levels and changes of executive and director fixed effects for persons serving on (the) executive and supervisory board(s) using the difference-in-differences methodology. All executives (CEOs) serving on the executive and the supervisory board of only one firm (within firms) are defined as the treatment group, whereas executives (CEOs) serving on the executive and the supervisory board of different firms, but not of the same firm (between firms) are defined as the control group. The third row shows the difference in the director and executive fixed effect. The third column gives the differences between the treatment and control groups for the director and executive fixed effect and the difference between the differences in the director and executive fixed effect for the treatment and control groups. The mean is reported for each table cell. For the third row and third column, t-tests are used to test if the mean difference is significantly different from zero. The superscript * denote significance in differences at the 10% level.

Panel A: Within firms

	Executives	CEOs	Other board members
Executive fixed effects	(1)	(2)	(3)
Mean	0.093*	0.130*	0.001
Median	-0.032	-0.052	-0.047
Std. dev.	1.004	1.069	0.794
Observations	287	127	5,784
Director fixed effects	(1)	(2)	(3)
Mean	0.071*	0.129**	-0.004
Median	-0.034	-0.000	-0.037
Std. dev.	0.724	0.814	0.756
Observations	287	127	12,326

Panel B: Within vs. between firms

	Within firms	Between firms	Difference
Executives on the supervisory board	(1)	(2)	(3)
Executive fixed effects	0.093	-0.017	0.110*
Director fixed effects	0.071	0.031	0.039
Difference	-0.022	0.048	0.071
Observations	287	866	1,153
CEOs on the supervisory board	(1)	(2)	(3)
Executive fixed effects	0.130	0.059	0.070
Director fixed effects	0.129	0.094	0.035
Difference	-0.007	0.035	-0.035
Observations	127	329	456

Table 8: Descriptive statistics on board quality and skill dispersion

This table presents descriptive statistics for several measures of board quality and skill dispersion. All variables are defined as in *Variable definitions*. For each variable, it shows the number of observations, the mean, 25th percentile, median, 75th percentile, standard deviation and the number of observations. The variables in Panel A are based on the estimation of manager fixed effects estimated in Table 4 (4) and (5). Panel B shows the correlation between the variables of Panel A.

Panel A: Board quality and skill dispersion variables

	Board quality	EB quality	SB quality	Disp. EB-SB quality	Disp. manager skills	Disp. executive skills	Disp. director skills
No match effects							
Mean	0.021	0.022	0.019	0.059	0.163	0.101	0.156
25th percentile	-0.173	-0.182	-0.165	0.010	0.059	0.018	0.056
Median	-0.024	-0.024	-0.023	0.025	0.094	0.052	0.091
75th percentile	0.135	0.141	0.130	0.056	0.167	0.108	0.163
Std. dev.	0.731	0.806	0.703	0.183	0.303	0.206	0.281
Observations	8,591	8,591	8,591	8,591	8,591	8,591	8,591
Match effects							
Mean	0.022	0.024	0.021	0.059	0.162	0.101	0.156
25th percentile	-0.173	-0.185	-0.165	0.010	0.059	0.017	0.056
Median	-0.024	-0.022	-0.022	0.024	0.094	0.051	0.091
75th percentile	0.136	0.139	0.130	0.058	0.165	0.109	0.162
Std. dev.	0.735	0.811	0.706	0.185	0.304	0.208	0.282
Observations	8,591	8,591	8,591	8,591	8,591	8,591	8,591

Panel B: Correlation between measures of board quality and skill dispersion

	Board quality	EB quality	SB quality	Disp. EB-SB quality	Disp. manager skills	Disp. executive skills	Disp. director skills
Board quality	1.00/1.00						
EB quality	0.97/0.97	1.00/1.00					
SB quality	0.96/0.96	0.88/0.88	1.00/1.00				
Disp. EB-SB quality	0.49/0.50	0.52/0.53	0.42/0.43	1.00/1.00			
Disp. manager skills	0.51/0.51	0.50/0.50	0.49/0.49	0.89/0.89	1.00/1.00		
Disp. executive skills	0.13/0.13	0.11/0.12	0.14/0.14	0.25/0.25	0.44/0.44	1.00/1.00	
Disp. director skills	0.48/0.48	0.43/0.43	0.51/0.51	0.71/0.70	0.92/0.92	0.31/0.31	1.00/1.00

Table 9: Board quality, skill dispersion, and firm performance

This table shows the results of regressions at the firm-level with Tobin´s Q as dependent variable, using the AKM sample. Tobin`s Q and all independent variables are defined as in *Variable definitions*. (1) contains neither manager nor firm fixed effects and is estimated as pooled OLS, (2) uses firm fixed effects (FE), (3) includes variables which are based on the manager fixed effects estimated in Table 4 (4) (IE'), (4) includes firm fixed effects and variables which are based on the manager fixed effects estimated in Table 4 (4) (FE+IE') and (5) uses firm fixed effects and variables which are based on the manager fixed effects (adjusted for match effects) estimated in Table 4 (5) (FE+IE'+ME'). All regressions include year dummies. Each cell shows the estimated coefficient and t-value (in parentheses). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	OLS	FE	IE'	FE+IE'	FE+IE'+ME'
	(1)	(2)	(3)	(4)	(5)
Board quality			0.340*	1.736***	1.720***
			(1.67)	(8.20)	(8.76)
Dispersion EB-SB quality			1.877***	-0.951	-0.908
			(4.08)	(-0.99)	(-0.98)
Dispersion executive skills			0.978***	0.360	0.406
			(5.09)	(1.41)	(1.48)
Dispersion director skills			0.872***	-0.209	-0.200
			(2.81)	(-0.58)	(-0.54)
Tenure executive board	0.009	0.013	0.024***	0.014***	0.013***
	(0.66)	(0.99)	(2.63)	(3.02)	(2.80)
Tenure supervisory board	0.005	-0.006	0.018	-0.002	-0.002
	(0.32)	(-0.59)	(1.43)	(-0.43)	(-0.35)
Supervisory board size	0.023*	-0.018	0.021**	-0.016**	-0.015**
	(1.72)	(-1.15)	(2.23)	(-2.06)	(-1.98)
SB-/(SB+EB)-size-ratio	-0.440*	-0.097	-0.196	0.115	0.229
	(-1.75)	(-0.33)	(-0.99)	(0.67)	(1.23)
Codetermination	-0.920***	0.099	-0.516***	0.103	0.092
	(-3.35)	(0.40)	(-3.00)	(0.78)	(0.70)
Chairman is former CEO	0.124	0.093*	0.088	0.018	0.010
	(1.11)	(1.67)	(1.28)	(1.22)	(0.67)
Busy board	0.277*	-0.020	0.170	0.016	0.027
	(1.68)	(-0.21)	(1.29)	(0.37)	(0.65)
Interlocking board	-0.002	-0.024	0.004	-0.006	-0.005
	(-0.15)	(-1.08)	(0.26)	(-0.78)	(-0.65)
Women representation	0.778***	-0.088	0.421*	-0.259*	-0.254*
	(2.89)	(-0.29)	(1.89)	(-1.66)	(-1.65)
Firm size	-0.126***	-0.325***	-0.099***	-0.344***	-0.352***
	(-4.13)	(-5.17)	(-4.29)	(-11.67)	(-11.94)
ROA	0.380	0.273	0.354	0.189	0.187
	(1.12)	(1.31)	(1.20)	(1.19)	(1.17)
Firm age	0.010	0.064	-0.036	0.039	0.062
	(0.26)	(0.38)	(-1.25)	(0.58)	(0.90)
Free float	-0.254***	-0.263**	-0.262***	-0.166***	-0.166***
	(-2.57)	(-2.36)	(-3.21)	(-4.05)	(-4.02)
Capital structure	-0.451***	0.283**	-0.096	0.294***	0.272***
	(-3.19)	(2.40)	(-0.96)	(4.14)	(3.81)
Cash flow volatility	0.280	1.950	-0.047	1.684***	1.509**
	(0.66)	(1.27)	(-0.29)	(2.60)	(2.42)
Sales growth	0.003	-0.000	-0.012	-0.012	-0.013
	(1.39)	(-0.40)	(-1.63)	(-1.20)	(-1.28)
Constant	3.072***	4.918***	2.232***	5.047***	4.992***
	(8.13)	(4.57)	(7.16)	(9.62)	(9.30)
Adj. R²	0.086	0.510	0.411	0.822	0.822
Observations	8,591	8,591	8,591	8,591	8,591

Table 10: Causality between manager fixed effects and firm performance

This table shows the results of regressions at the firm-level with Tobin´s Q as dependent variable for the period 2003-2011 with non-missing data about manager fixed effects (1993-2002). All variables are defined as in *Variable definitions*. Manager fixed effects (1993-2002) are estimated for the period 1993-2002 and are based on the regression model in Table 4 (5). All regressions include year dummies and a constant. Each cell shows the estimated coefficient and t-value (in parentheses). The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Manager fixed effects (1993-2002)	0.047**		
	(2.33)		
Chairpersons fixed effects (1993-2002)		0.088*	
		(1.92)	
Board member fixed effects (1993-2002)		0.047**	
		(2.29)	
Executive fixed effects (1993-2002)			0.088***
			(2.67)
Director fixed effects (1993-2002)			0.028**
			(2.10)
Net board quality	0.134***	0.133***	0.145***
	(4.24)	(4.17)	(3.86)
Tenure executive board	0.018**	0.018**	0.018**
	(2.30)	(2.33)	(2.34)
Tenure supervisory board	-0.001	-0.000	-0.001
	(-0.05)	(-0.00)	(-0.12)
Supervisory board size	0.027**	0.027**	0.026**
	(2.31)	(2.31)	(2.27)
SB-/(SB+EB)-size-ratio	-0.453*	-0.465*	-0.411*
	(-1.79)	(-1.81)	(-1.66)
Codetermination	-0.168	-0.172	-0.177
	(-1.08)	(-1.10)	(-1.14)
Chairman is former CEO	0.027	0.031	0.031
	(0.67)	(0.65)	(0.65)
Busy board	-0.230	-0.230	-0.226
	(-1.29)	(-1.28)	(-1.28)
Interlocking board	-0.016	-0.016	-0.017
	(-1.16)	(-1.15)	(-1.23)
Women representation	-0.110	-0.124	-0.101
	(-0.53)	(-0.60)	(-0.48)
Firm size	-0.546***	-0.546***	-0.546***
	(-3.66)	(-3.67)	(-3.68)
ROA	0.040	0.044	0.028
	(0.12)	(0.13)	(0.08)
Firm age	-0.166	-0.166	-0.160
	(-1.03)	(-1.03)	(-1.00)
Free float	-0.243***	-0.244***	-0.239***
	(-3.17)	(-3.21)	(-3.16)
Capital structure	0.599***	0.602***	0.597***
	(3.03)	(3.04)	(3.00)
Cash flow volatility	0.262	0.262	0.286
	(0.38)	(0.38)	(0.42)
Sales growth	-0.010	-0.010	-0.010
	(-0.53)	(-0.53)	(-0.52)
Adj. R²	0.815	0.815	0.815
Observations	3,179	3,179	3,179