

The market for corporate control in Germany:
Causes and consequences of changes
in ultimate share ownership

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Abstract

Hostile takeovers are rare in Germany. This is often seen as evidence that Germany also lacks a market for corporate control, as it is known for the UK and the US. This study shows that, in contrast to hostile takeovers, friendly takeovers play an important role in Germany. This market for corporate control is large compared with other countries. This study also provides evidence on the causes and consequences of changes in ultimate ownership: Poor performance triggers changes in ultimate ownership, but complex ownership structures based on pyramids and cross-ownership represent an obstacle. Control transfers are followed by increased management and supervisory board turnover, asset restructuring and employee layoffs. Industry-adjusted performance of poorly-performing firms improves, but this result depends on the performance measure chosen.

Keywords: Corporate governance, ownership structure, management turnover

JEL classification: G32, G34, J63

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1 Introduction

The market for corporate control is an important element of corporate governance. Manne (1965) was the first who argued that control of companies is a valuable asset, and hence that there must be a market for corporate control. Shleifer and Vishny (1997) summarize the evidence: Most hostile takeovers act as a disciplining device to replace bad management teams with better ones. Empirical research has shown that there is a market for corporate control in the market-based economies of the US and the UK (Jensen and Ruback 1983, Franks and Mayer 1990). Jensen (1993) argues based on historical evidence that periodically takeovers are necessary to turn over inefficient corporate structures. For the bank-based economies of Continental Europe, however, a market for corporate control based on hostile takeovers is virtually absent (OECD 1998). In Germany, for example, only three attempts of hostile takeovers have been made during the years 1945-1995 (Franks and Mayer 1998). The takeover of Mannesmann by the British company Vodafone in the year 2000 and the outcry of politicians and the media has exemplified that hostile takeovers in Germany are indeed rare and are seen as a threat. Germany's chancellor Schröder after the public takeover bid of Vodafone:

"Hostile takeovers destroy the corporate culture." (Berliner Morgenpost 21.11.1999)

This study describes the market for corporate control in Germany and analyzes its role as a disciplining device. Since hostile takeovers are rare, we also examine friendly takeovers. Schwert (2000) shows for the US that the difference between hostile and friendly takeovers is more semantical than real. He finds that takeovers become hostile if target management opposes a takeover attempt. We address this issue empirically in two steps: First, we analyze whether there is a market for large share stakes in Germany. We track the names of all large investors in almost 1000 German companies over the years 1987-1994. We find that there is such a market, and that it is of significant size compared with other countries. Second, we analyze the causes and consequences of changes in ultimate control. We find that changes in ultimate control are triggered by poor performance, and followed by increased management and supervisory board turnover. Likewise, the new owners engage in asset divestitures and speed up employee layoffs. Under new ultimate ownership, industry-adjusted performance of poorly performing firms improves strongly, irrespective whether performance is measured by productivity, accounting-based returns or market-based returns. Evidence is weaker that industry-adjusted performance improves specifically in firms, which experience a change in ultimate ownership, depending on the performance measure chosen.

We contribute to the literature in two ways: First, we empirically address an element of corporate governance which has only recently been subject of empirical studies. But those studies primarily focus on the US (Bethel et al. 1998, Denis and Kruse 2000) and the UK (Franks et al. 1999). With the exception of Renneboog (1996) for Belgium, there is no study on the market for large share stakes on a Continental European country. One reason might be that the necessary data are not readily available. Any analysis must not be limited to listed companies because the majority of companies in Continental Europe is not listed on the stock exchange. In addition, analysis of the direct owners is not sufficient. In Germany like in most other Continental European countries, ownership structures are highly complex: pyramids, cross-ownership and large conglomerates are wide-spread forms of organizations (La Porta et al. 1999). In consequence, ultimate ownership of firms must be analyzed.

Second, our study is also important from the methodological point of view. Previous empirical studies on corporate governance have often been static in nature, relating performance to elements of corporate governance on the ground of cross-section data.¹ This approach does not allow to exclude spurious correlation of the observed firm characteristics (Börsch-Supan and Köke 2000). Panel data are a precondition to control for unobserved firm heterogeneity. As noted by Himmelberg et al. (1999), if fixed-effects models are applied to control for unobserved heterogeneity, it is assumed that the unobserved variables are constant over time. If this is not the case, estimated coefficients will be biased and inconsistent. Likewise, if panel data on performance are used, but only cross-section data on ownership,² any (unobserved) variation in ownership will be included in the error term. But correlation of the error term with (observed) cross-section data on ownership will cause coefficients to be biased and inconsistent. In this study we document that ownership structures are not stable over time. Hence, results of previous studies using cross-sections of ownership data are likely to be biased.

The study proceeds as follows: Section 2 discusses the theoretical and empirical literature on the market for corporate and generates the hypotheses, which are tested in the empirical analysis. Section 3 describes the data used for this study and lines out the concept of control which is used to identify the ultimate shareholder. Using detailed information on the identity of all large shareholders, section 4 documents that there is a market for corporate control in Germany. Section 5 analyzes the causes and consequences of changes in ultimate control. Section 6 concludes.

2 Literature

In this section we review the evidence on the existence of a market for corporate control. Then we draw together theoretical predictions and empirical evidence on causes and consequences of changes in ownership to formulate hypotheses for our empirical investigation in section 5.

2.1 Evidence on the market for corporate control

Jensen and Ruback (1983: 5) define corporate control as "[...] the rights to determine the management of corporate resources – that is, the rights to hire, fire and set the compensation of top-level managers". Since the right to control a corporation has a value, there must exist a market for corporate control (Manne 1965).

There is an active market for corporate control in the US (Jensen and Ruback 1983, Jarrell et al. 1988) and the UK (Franks and Mayer 1995). Takeovers are often hostile. In contrast, in Germany only three hostile takeovers occurred during the years 1945 and 1995 (Franks and Mayer 1998). Consequently, there is no market for corporate control based on hostile takeovers in Germany. But takeovers can also be friendly: firms are taken over with the consent of target management. Schwert (2000) argues that the distinction between hostile and friendly takeovers is not as clear-cut as often assumed. Comparing both forms of takeovers based on accounting and stock performance data, he finds that hostile deals

¹ See Short (1994) for a review.

² See, among others, Cable (1985), Nibler (1995) and Chirinko and Elston (1996) for Germany.

are not distinguishable from friendly deals in economic terms, but that negotiations are published earlier in hostile transactions.

A broader concept for measuring takeover activity, taking into account both hostile and friendly takeovers, is the analysis of the market for large share stakes. International evidence on this issue is accumulating. For the UK, Franks and Mayer (1990) report that in peak years 1972 and 1988 takeovers amounted to about 4 percent of capital stock. The market for large share stakes is much larger: Franks et al. (1999) find over 300 purchases of blocks larger than 5 percent during the years 1991-1993, corresponding to an annual rate of 9 percent of block purchases. For the US, Bethel et al. (1998) find an annual rate of 6.7 percent. For Belgium, Renneboog (1996) shows that in one forth of sample companies changes in large share blocks occur during the years 1989-1992. This translates into an annual rate of 6.25 percent.

For Germany, Franks and Mayer (1994) analyze a sample of 171 listed German companies in the years 1988 and 1991. They show that in 21.6 percent of the cases a new major shareholder was in place in 1991. Although the analysis is conducted on the basis of direct ownership structures – hence changes in ultimate ownership are neglected – their results suggest strongly that there is a market for large share stakes in Germany. This is confirmed by Franks and Mayer (1990) who report high numbers of friendly takeovers. Based on takeover data collected by the Federal Anti-Trust Office, they find that during each of the years 1980-1988 several hundred partial and full acquisitions have been conducted. According to Franks and Mayer (1990), the number of partial and full acquisitions in 1988 was about two-thirds of that in the UK, although comparability is impaired by the inclusion of overseas acquisitions. Böhmer (2000) analyzes over 700 of these takeover deals and concludes that takeovers increase bidder value, but majority owners provide no clear benefit. In addition, the worst takeovers are completed by firms which are majority-controlled by financial institutions. In sum, Franks and Mayer (1990) and Böhmer (2000) show clearly that in Germany takeovers take place. What is lacking in the literature is an understanding of why ownership changes, and how changes in ownership affect firms.

2.2 Literature on causes and consequences of changes in ownership and resulting hypotheses

In order to structure our thinking about the econometric estimation, we use the existing literature on causes and consequences of changes in ownership to formulate a set of hypotheses. We start with the causes of changes in corporate ownership, and we distinguish between firm-specific characteristics, owner-specific characteristics, and performance.

A host of theoretical studies examine hostile takeovers. Grossman and Hart (1980) argue that hostile takeovers replace inefficient management teams with better ones. A precondition, however, would be that share ownership is concentrated because under a dispersed ownership structure shareholders would prefer to free-ride. In consequence, no takeover would take place in widely-held firms. Scharfstein (1988) and Shleifer and Vishny (1988) support the view of Grossman and Hart (1980) that free-riding on the side of the seller must be impossible for takeovers to be effective. In contrast, Holmström and Tirole (1993) argue that takeovers require low concentration of ownership and, in turn, high market liquidity because only then capital markets will be able to determine the necessity of a takeover. The few cases of hostile takeovers in Germany support Holmström and Tirole: In all cases the shares of the takeover target were widely dispersed. We hypothesize:

H1: Changes in ultimate ownership are less likely in firms with a high concentration of ownership.

Mitchell and Mulherin (1996) argue that economic shocks to an industry can alter the allocation of resources within the firm. In turn, changes in the firm's growth opportunities, leverage, or firm size could make adjustments in ownership necessary. Consistent with this view, Kole and Lehn (1999) report significant changes in the corporate governance structures of US airlines following industry deregulation in 1978. Zingales (1998) reports that following deregulation in the US trucking industry in 1977 firms were confronted with increasing leverage, and this has led to a higher probability of market exit. Hence, the governance role of the corporate capital structure has become more important. We hypothesize:

H2a: Changes in ultimate ownership are more likely in firms which face high financial pressure.

H2b: Changes in ultimate ownership are more likely in firms with low growth opportunities.

On the other hand, firm-specific defensive mechanisms might deter changes in ownership. In the US, employee stock ownership plans, anti-takeover charter amendments, and poison pill announcements are found to reduce firm value.³ In Germany, pyramids (Franks and Mayer 1995) and cross-holding of shares (Wenger and Kaserer 1997) are likely to hinder changes in ownership. Typically the low frequency of hostile takeovers serves as empirical evidence here (Franks and Mayer 1998). We hypothesize:

H3: Changes in ultimate ownership are more likely in firms which are not controlled through pyramids and which are not subject to the influence of cross-owned ultimate shareholders.

Furthermore, firm size might deter changes in control. Shleifer and Vishny (1992) argue that the market for corporate control is less liquid as size increases. Another reason might be that the likelihood of a friendly or hostile takeover will be lower for large firms due to wealth constraints on the side of the buyer. Bethel et al. (1998) and Mulherin and Boone (2000) provide empirical evidence that smaller firms are more likely than larger firms to become takeover targets. Likewise, when private investors are relatively more wealth-constrained, then, given firm size, they should be less likely to purchase large blocks and take over control than institutional investors like banks or pension funds, but also other non-financial firms. We hypothesize:

H4a: Changes in ultimate ownership are more likely in smaller firms.

H4b: Non-private investors are more likely to be buyers of control blocks than private investors.

Owner-specific characteristics can also be important determinants of large block trades. High insider ownership may reduce the likelihood of a change in ownership. According to Jensen and Meckling (1976) incentives are better aligned in firms where managers own large blocks of shares. Then outside investors would have little opportunity to improve on performance. However, managers might also become entrenched when owning too large blocks (Fama and Jensen 1983). Irrespective whether insider ownership is good or bad for shareholders, we hypothesize:

H5: Changes in ultimate ownership are less likely in firms with high insider ownership.

³ See Bethel et al. (1998) for a review of the literature and an empirical application

Finally, poor firm performance can induce block purchases. If managers diverge from the interest of shareholders and performance suffers, the market for corporate control as well as internal control mechanisms may act as disciplining devices (Jensen 1988, Shleifer and Vishny 1997). Denis and Sarin (1999) and Maksimovic and Phillips (2000) provide empirical evidence for the US. Irrespective of the causes of bad performance, we hypothesize:

H6: Changes in ultimate ownership are more likely in firms with poor performance.

Turning to the consequences of changes in ownership, we discuss three aspects: the impact on firm-specific governance arrangements, the impact on corporate restructuring, and the impact on firm performance.

According to Jensen (1993: 863) the board of directors has the aim to "[...] provide an early warning system to put the organization back on track before difficulties reach a crises". For the US, Hermalin and Weisbach (1998) show that appointments of outsiders to supervisory boards increase after bad performance. For Germany, Kaplan (1995) finds for the largest 42 German firms in the 1980s that turnover in management and supervisory boards increases after poor stock performance. Kaplan and Minton (1994) find analogous results for the bank-based economy of Japan. But Jensen (1993) argues that reaction by the board is often late and not sufficient; he attributes this to the large size of boards which makes them ineffective monitors. Yermack (1996) and Agrawal and Knoeber (1996) support this empirically: For US firms, board size has a negative impact on firm value.

The empirical evidence suggests that changes in board and ownership structure are strongly related to top executive turnover and prior performance. Denis and Sarin (1999) show for US firms that management turnover increases after poor performance. Kole and Lehn (1999) show for the US airline industry that following deregulation ownership concentration increases, board size decreases, CEO pay increases and management turnover increases. Likewise, new entrants have smaller boards with greater representation of outsiders. They explain these results with adaption to optimal governance structures. While performance seems to be related to managerial disciplining via shareholder action in the US, Franks and Mayer (1995) cannot confirm an analogous impact of the market for large share stakes for the UK. But based on evidence from the US we hypothesize:

H7: Changes in ultimate ownership are followed by increases in management and supervisory board turnover and a reduction in board size.

Corporate restructuring as a consequence of changes in control has received some empirical investigation. Bethel et al. (1998) show for US corporations that following purchases of large blocks, asset divestitures increase, the frequency of mergers and acquisitions is lower, share repurchases increase, and profitability improves.⁴ Likewise, Denis and Kruse (2000) find for the US that following performance decline, there is a substantial amount of corporate restructuring. They report that about two-thirds of those poor-performing firms restructure their assets, layoff employees, or initiate major cost-cutting efforts. On average, stock market reaction to this restructuring is positive. But Denis and Kruse also show that restructuring occurs both during an active and a less active takeover period. Hence, also other corporate governance mechanisms like friendly takeovers might act as control devices. This is confirmed by Denis and Sarin (1999): Changes in board and

⁴ Summarizing the evidence for the UK, Franks and Mayer (1995) confirm that the market for corporate control has a strong impact on restructuring.

ownership structure, preceded by poor performance, are followed by asset restructuring. Hence, we hypothesize:

H8: Changes in ultimate ownership are followed by asset restructuring, layoffs and cost cutting when performance was poor before.

One remaining question is whether asset restructuring and changes in the governance environment of the firm have a positive impact on performance. For the US, Bethel et al. (1998) and Denis and Kruse (2000) provide evidence on this issue. Bethel et al. (1998) show that industry-adjusted operating profitability rises in firms which experience activist block purchases, whereas it falls in firms which do not experience a block purchase. Likewise, activist block purchases are accompanied by share price increases. Denis and Kruse (2000) find for a sample of firms, which experienced a large performance decline, that industry-adjusted operating performance improves significantly in combination with major asset restructuring. Announcement of this asset restructuring is met with a positive stock price reaction, indicating that restructuring is perceived as a value-enhancing event. We hypothesize:

H9: Changes in ultimate ownership are followed by improvements in performance.

3 Data and measurement issues

The sample used for this analysis is based on firm-level data for the years 1987-1994. It contains firms with their headquarters located in Western Germany, and after 1990 also in Eastern Germany. Contrary to previous empirical studies on corporate governance in Germany (e.g. Becht and Böhmer 1999, Böhmer 1999, Gorton and Schmid 2000, Lehmann and Weigand 2000) we do not exclusively analyze large firms listed on the stock exchange, but also medium-sized and/or non-listed firms. This is important because focusing only on listed firms might cause a selection bias (Börsch-Supan and Köke 2000). Also in contrast to previous studies, the sample encompasses firms from a broader range of industries, including manufacturing, construction and trade.

3.1 Sample selection

The analysis of the market for corporate ownership as a potentially important governance device places several major requirements on the data set to be used. First, the firms in the sample need to face the classical agency problem (Jensen and Meckling 1976). This is the case when the manager of a firm is not fully identical with its owner. Otherwise no separation of ownership and control would exist, and agency costs would be zero by definition. To meet this requirement we select only larger German companies because we expect agency problems to be the most severe there.

Second, to assess the performance of firms we obtain balance sheet data and capital market data. Taking into account both accounting and capital market data is important because theory provides little guidance of which performance measure is best. Therefore, we use a range of performance measures, at least for robustness checks.

Third, ownership data are a crucial element of the data set. As shown by Böhmer (1999/2000), Köke (2000) and Wenger and Kaserer (1997), ownership structures of large German firms are complex. Often firms are owned by large pyramids of shareholders

or cross-shareholdings. Therefore, the analysis of direct ownership (Gorton and Schmid 2000) must be extended to the analysis of ultimate ownership.

Fourth, any consequences of changes in ownership should be most visible from changes in management and the supervisory board or corporate restructuring activity. As outlined in section 2, this is also what previous research focuses on. Therefore, data on board structures, asset sales and employment are an important component of the database.

In total, we have data for 946 firms (4882 firm-years) for the years 1987-1994. A large part of sample firms are not listed on the stock exchange. The sample is fairly representative for the universe of large German firms. Coverage is high in particular for firms listed on the stock exchange, but coverage is also good for non-listed public companies with limited liability (AG and KGaA) and total sales exceeding 100 million DM. In addition, the sample includes a broad range of industries. Industry coverage is sufficiently representative for manufacturing industries. But there is also a significant number of firms operating in other industries, for example wholesale trade and construction.⁵

3.2 Concept of control

A major problem of early empirical studies on the relation of ownership and performance has been to define corporate control. More specifically, following Berle and Means (1932) researchers have tried to classify companies into two groups: manager-controlled or owner-controlled.⁶ This classification is usually quite arbitrary and can be avoided when continuous ownership variables are used. This works when direct ownership of firms is considered. Since ownership structures in Germany are much more complex, for example due to several layers of ownership, analysis of the direct ownership structure is not sufficient. But when analyzing indirect ownership structures, a criterion must be defined for whether a shareholder in a given control chain is also a controlling shareholder.

Consider the example of Dornier Aeronautics GmbH, a non-listed medium-sized firm in the aeronautics industry (Figure 1). In the year 1992 it was 100 percent owned by Dornier GmbH, which in turn was owned by Deutsche Aerospace AG (57.6 percent), and by the Dornier family (42.4 percent).⁷ This firm was part of the Daimler-Benz AG conglomerate structure, being owned with 83.0 percent by the automobile giant. Daimler-Benz AG itself was in the hands of Deutsche Bank AG (28.2 percent), Mercedes Automobil-Holding AG (25.2 percent) and the Emirate of Kuwait (14 percent). The rest of the shares was dispersed.

Clearly, Dornier GmbH is the *direct owner* of Dornier Aeronautics GmbH. The question is if Dornier GmbH is also the *ultimate owner*. As argued by Köke (2000), it is both theoretically and empirically difficult to identify the ultimately owner. Theoretically, one possibility would be to go along each ownership chain, multiply the individual share blocks, and compare the shareholders at the end of each control chain by size of the product of the ownership blocks in each control chain. In case of Figure 1, this would imply that Dornier Aeronautics GmbH is ultimately owned by the Dornier family (42.4 percent), Deutsche Bank AG (13.5 percent), Mercedes Automobil Holding AG (12.0 percent) and the Emirate

⁵ See the appendix for more details on sample selection, data sources used and sample characteristics.

⁶ See Short (1994) for a review.

⁷ According to Hypobank, Deutsche Aerospace AG controlled an even larger fraction of the votes (87.5 percent).

of Kuwait (6.7 percent) and many small shareholders. Hence, Dornier Aeronautics GmbH would have at least four ultimate owners, each controlling Dornier Aeronautics GmbH with a certain probability. On the other hand, one might assume that shareholders on higher levels of the ownership structure cannot influence decisions at the base level at all, for example due to too high information asymmetries or transaction costs. In this case Dornier GmbH would be the single ultimate owner.

But also from the perspective of data collection it is problematic to assign each firm several ultimate owners. This would require to have information on the complete control chains of all direct shareholders. Generally, this information is available only for the largest shareholders. Hence, a concept of control based on several ultimate owners is severely limited by data availability.

Due to these theoretical and empirical problems, this study uses a concept of control which assigns each sample firm exactly one or none ultimate owner. A shareholder is defined as being a *controlling shareholder* if he owns 50 percent or more of the shares and no other shareholder owns 50 percent, or if he owns 25 percent or more, and all other shareholder own less than 25 percent. This concept of control is applied on each level in the ownership hierarchy. And a shareholder, which is not controlled by any other shareholder, is defined as the *ultimate owner*.⁸ In case of Figure 1, Daimler-Benz AG is identified as the ultimate owner of Dornier Aeronautics GmbH.

Table 1: List of most important controlling shareholders

Ultimately controlling shareholder	Controlled firm-years
Allianz AG	108
VEBA AG	97
Mannesmann AG	90
Thyssen Beteiligungsverwaltung GmbH	90
Daimler-Benz AG	85
Deutsche Bank AG	78
Bayerische Hypotheken- und Wechsel-Bank AG	68
Ruhrkohle AG	67
Hoechst AG	65
RWE AG	64
No controlling shareholder	575

Notes: Calculated based on concept of control. See the appendix for a detailed description.

For further illustration, consider the firms in Table 1. They are identified as the most important ultimate owners in the sense that they ultimately control many of our sample firms. Table 1 shows that out of 4882 firm-years, 575 do not have any ultimate owner (11.8 percent). In the respective year, these firms have either no shareholder owning more than 25 percent, or several shareholders owning more than 25, but less than 50 percent, or two shareholders owning exactly 50 percent of the shares. The most frequent ultimate owner is Allianz AG, the largest German insurance company (108 cases). Then follow: VEBA AG (97 cases), a large energy conglomerate, recently merged with VIAG AG to E.ON Energy AG; Mannesmann AG and Thyssen Beteiligungsverwaltung GmbH (each 90 cases), two large conglomerates, the former recently purchased by Vodafone plc. in a hostile takeover; and the automobile giant Daimler-Benz AG (85 cases). The bank with the most companies under ultimate control is Deutsche Bank AG (78 cases).

⁸ This concept of control is described in detail in the appendix.

Our definition of control is based on ownership rights which do not need to coincide perfectly with voting rights. For example, some shares might have voting caps, others might carry multiple voting rights. Even worse, the corporate charter might specify that a particular owner (e.g. the founder) has special voting rights (e.g. the selection of a new CEO). In addition, the German proxy voting system provides banks with a potentially powerful voting tool (Baums 1993). Hence, ultimate share ownership – as identified with our rule for corporate control – might determine ultimate control incorrectly.

However, we would argue that biases caused by tracking along the wrong ownership chains are unlikely. First, although legal during 1987-1994, limitations on voting rights⁹ do not seem to be widespread. Gorton and Schmid (2000) report that 14 of the largest German firms listed on the stock exchange had voting rights restrictions. They also note that these restrictions have been introduced in the 1970s when countries from the Middle East started to invest their petro dollars in Western firms. To find out if and when these companies had abolished their voting rights restrictions, we contacted all 14 companies by telephone. Four of them said they had abolished restrictions during our sampling period, and all others except one (Volkswagen AG) ceased to exist in the 1990s. To comply with this problem, we have used voting rights instead of ownership rights for the few cases in which Hypobank reports the distribution of voting rights.

Table 2: Size distribution of largest ownership blocks

Percentile	25th	50th	75th	90th	99th
Listed firms	87.4%	70.4%	40.8%	24.5%	10.9%
Non-listed firms	98.9%	94.5%	76.0%	68.3%	58.1%

Notes: Average size of largest block during 1987-1994. Measures refer to direct level of ownership.

Second, the largest voting block is usually very large. However, there are significant differences between listed and non-listed firms. Table 2 shows that the largest shareholder owns at least 25 percent of outstanding shares in over 87 percent of listed firms. And in over 70 percent of listed firms, the largest shareholder owns the majority of ownership rights. In non-listed firms these figures are even higher: In about 58 percent of non-listed firms, the largest shareholder owns at least 99 percent of outstanding shares.

Köke (2000) confirms this concentration of ownership for a large sample of German manufacturing firms observed during the years 1994-1998. In addition, he shows that the distribution of the largest share blocks has significant peaks at the levels of 25, 50 and 75 percent. This result also holds for the present data set. As Köke (2000) argues, these levels of ownership rights correspond to specific legal rights formulated in the German Civil Law (HGB). But if shareholders tend to hold stakes at exactly these legally specified levels of ownership, then it is very likely that (observable) ownership rights indeed correspond with (mostly unobservable) voting rights. Furthermore, this large size of ownership blocks generally can also be found at higher levels in the ownership structure (Köke 2000). But if an investor holds over 50 percent of the ownership rights, it seems unlikely that this investor does not hold the majority of voting rights as well.

Concerning proxy voting rights of banks, Baums and Fraune (1995) have shown that this is a significant phenomenon among the largest listed German firms. But only few German companies have a widely dispersed shareholder base – the precondition for strong bank

⁹ The Law on Control and Transparency (1998) specifies that they are illegal from the year 2000 on.

voting power based on proxy rights. As shown above, most of the firms in our sample are closely held. Below, we will calculate an upper limit for the influence of banks by treating dispersed shares as bank-controlled. We recognize, however, that the investors (at higher levels in the ownership structure) identified as ultimate shareholders might also be subject to proxy voting by banks.

4 Evidence on changes in ownership structures

In this section, we analyze whether high concentration in corporate ownership corresponds to high persistence in ownership structures over time, or whether there is significant trading in ownership stakes. In the following we first look at aggregate measures of ownership structures. In a second step, we look whether aggregate measures mask significant changes in individual shareholders.

4.1 Evidence from concentration measures

Before we turn to our concept of control, it is useful to consider other measures for corporate control that have been proposed in the literature. A widely-used measure is simply the size of the largest block, or the sum of the three largest blocks. Another measure originally used in the industrial organization literature is the Herfindahl index. This index is calculated as the sum of squares of all ownership blocks. Cubbin and Leech (1983) propose a measure of voting power which takes into account minority shareholders. It approximates the probability that the largest shareholder can win a vote given that small shareholders might oppose. The sum of the largest blocks as well as the Herfindahl index range between zero and one. The Cubbin and Leech measure as well as the measure based on our own concept of control are dummy variables. For all of these measures, a value of one indicates that a company is under full control of a single shareholder, and a value of zero that the company is not under control of shareholders.

To put these measures into perspective, Table 3 reports average shareholder concentration over the years 1987-1994 using all of these concentration measures.

Table 3 shows that shareholder concentration is large, irrespective of the concentration measure applied. The average value of our measure of control lies in between the value of those suggested by Cubbin and Leech calculated for confidence levels of 95 percent and 99 percent. As can be seen from the last row, all measures except the sum of the three largest stakes show a high positive correlation with our measure of control.

What is also evident from Table 3 is that shareholder concentration has been increasing rapidly during the years 1987-1994. While the average size of the largest block was 63.2 percent in 1987, it constantly increased to 78.6 percent in 1994. This increase in concentration is reflected in all measures used here. We checked whether this increase is driven by better coverage of non-listed firms over time which typically show higher ownership concentration (see Table 2). But concentration increases significantly for both listed and non-listed firms. We take this result as a first indication that ownership structures are not constant over time.

This increase in concentration might reflect a secular trend or a specific category of shareholders gaining influence over time. To check this, we define shareholder categories following the empirical literature: individuals, financial firms (banks, insurance companies

Table 3: Comparison of concentration measures

	Size of largest block	Sum of 3 largest blocks	Sum of all large blocks	Herfindahl index	Cubbin- and-Leech index (95)	Cubbin- and-Leech index (99)	Control
1987	63.2%	66.1%	66.1%	0.52	0.85	0.77	0.82
1988	69.5%	71.8%	71.8%	0.60	0.88	0.82	0.86
1989	71.3%	73.4%	73.4%	0.62	0.89	0.84	0.87
1990	71.6%	73.6%	73.7%	0.62	0.90	0.85	0.88
1991	72.6%	74.6%	74.6%	0.63	0.90	0.85	0.88
1992	74.3%	76.0%	76.1%	0.65	0.91	0.86	0.89
1993	75.6%	77.3%	77.3%	0.66	0.91	0.86	0.90
1994	78.6%	80.6%	80.7%	0.71	0.92	0.88	0.91
Average	73.1%	75.2%	75.2%	0.64	0.90	0.85	0.88
Correlation with Control	0.64	-0.15	0.56	0.51	0.59	0.49	1.00

Notes: Concentration measures are calculated at the direct level of ownership as averages across all sample firms in any one year. See the appendix for definitions of all measures.

and investment funds), non-financial firms, as well as the government.¹⁰ In addition, we distinguish between individuals that are executive or non-executive directors (insiders) because they play a particular role in governing a corporation as opposed to individuals not related to the firm. Privately-held firms are included in the category 'individuals' because in Germany the managers of those firms are usually identical with their owners. Hence no additional agency problem exists.

Table 4: Share ownership by shareholder category over time

	Individuals		Financial firms	Non-financial firms	Government	Dispersed shares	Total
	total	insiders					
1987	27.3%	14.7%	11.4%	30.9%	2.1%	28.3%	100.0%
1988	28.4%	15.6%	9.1%	36.3%	2.4%	23.5%	100.0%
1989	29.3%	15.8%	8.8%	37.3%	2.6%	22.0%	100.0%
1990	28.1%	15.2%	9.0%	38.4%	2.6%	21.9%	100.0%
1991	28.7%	16.0%	8.7%	38.9%	2.8%	21.0%	100.0%
1992	29.5%	16.2%	8.7%	38.9%	3.0%	19.8%	100.0%
1993	29.5%	15.5%	9.1%	39.7%	3.2%	18.5%	100.0%
1994	27.0%	n.a.	9.7%	41.8%	5.8%	15.7%	100.0%
Average	28.5%	15.6%	9.2%	38.5%	3.3%	20.5%	100.0%

Notes: The table shows the sum of all blocks aggregated by shareholder category. The size of blocks refers to the direct level of ownership, shareholder identity to the ultimate level. For the year 1994, separation of individuals into insiders and individuals not related to the firm is not possible.

Table 4 shows that non-financial firms are the dominant group of owners. On average,

¹⁰ Based on the assumption that members from one family are likely to form voting coalitions, share stakes of individuals with identical last names are aggregated and assigned to only one individual under the common family name.

non-financial firms own 38.5 percent of the shares in our sample firms. The second largest group is individuals owning 28.5 percent of the shares, with executive directors owning 8.5 percent and non-executive directors owning 7.2 percent (not separately tabled). Table 4 aggregates them as insiders. The German government or other state authorities own only a small share of about 3 percent. Financial firms own, on average, less than 10 percent. Among financial firms, banks are more important shareholders than insurance companies with 6.3 percent and 2.8 percent, respectively (not tabled). The role of investment and pension funds is insignificant with only 0.1 percent what might be due to the fact that most German investment and pension funds are subsidiaries of banks. Dispersed shares amount to about 21 percent.

The role of banks as ultimate shareholders appears to be limited compared to the central role they are often assumed to play in corporate Germany. But as argued in section 3.2, the influence of banks might be hard to capture only on the basis of shares owned by banks. The system of German depositary voting potentially enhances their influence. An upper limit of bank voting power can be calculated by attributing all dispersed shares to banks: In case of Table 4, this would enable German banks to cast their vote on about 27 percent of all shares of our sample firms.

Regarding the question whether a particular category of shareholders is gaining influence over time, we see from Table 4 that the fraction of dispersed shares declined steadily from 28.3 percent in 1987 to less than 16 percent in 1994. The fraction of shares owned by individuals, the government as well as financial firms varies only slightly over time.¹¹ It is non-financial firms that become much more important as corporate owners: The average share block increased in size from 30.9 percent in 1987 to almost 42 percent in 1994. Among non-financial firms, holding companies increase their average share block from 2.5 percent to 4.8 percent (not tabled).

In sum, concentration of share blocks increases considerably during the years 1987-1994, and this increase might be a result of the growing importance of non-financial firms as a specific category of shareholders. In this process, trading of shares at least takes place when non-financial companies purchase free-floating shares, thereby reducing the fraction of dispersed shares.

4.2 Evidence from changes in individual shareholders

In contrast to evidence based on ownership changes *in shareholder categories*, as presented in Table 4, this subsection focuses on ownership changes *within shareholder categories*. To generate evidence on this issue, we compared the names of all individual shareholders year by year for each sample firm. In a second step, we aggregated annual changes in individual shareholders to three categories: (1) the increase of shares held by new shareholders, (2) the increase of shares held by old shareholders, and (3) the decrease of shares held by old shareholders.

For better illustration, consider the following example: In the year 1990, Boge AG, a large

¹¹ The major increase in government-owned shares in 1994 is caused by the State of Bavaria becoming a major shareholder (25.1%) of VIAG AG, after it had sold its majority stake in Bayernwerk AG to VIAG AG.

non-listed firm in the rubber industry, is owned by four large shareholders.¹² Applying the concept of control, we identify Carlo de Benedetti as the ultimate owner of Boge AG. In the year 1991, Mannesmann AG becomes the new ultimate owner of VDO Adolf Schindling AG, a shareholder of Boge AG. For Boge AG this implies a decrease of 20.1 percent by an old shareholder (the Schindling-Rheinberger family), and an increase of 20.1 percent by a new shareholder (Mannesmann AG). Note that De Benedetti remains the ultimate owner of Boge AG. In the year 1992, Mannesmann AG acquires almost all shares of Boge AG, becoming its new ultimate owner. This implies a decrease of 74.3 percent by old shareholders, and an increase of 80.4 percent by an old shareholder.

Table 5: Market for large share stakes

	Increases of new shareholders	Increases of old shareholders	Decreases of old shareholders
1987	7.4%	1.3%	7.6%
1988	3.3%	1.4%	3.6%
1989	6.6%	1.5%	6.8%
1990	6.1%	1.3%	7.5%
1991	3.3%	1.3%	3.6%
1992	3.4%	1.6%	4.3%
1993	2.0%	1.0%	2.4%
1994	5.7%	1.3%	6.8%
Average	4.5%	1.3%	5.2%

Notes: Average fraction of shares (across all firms) purchased by new shareholders (column 1), purchased by old shareholders (column 2), and sold by old shareholders (column 3) in any given year. Measures are calculated as the sum of year-by-year changes in size or ultimate ownership of large blocks, aggregated over all individual shareholders.

Table 5 shows that, on average in any given year, 4.5 percent of shares is purchased by new shareholders during 1987-1994. Old shareholders increase their investment by 1.3 percent, and old shareholders decrease their investment by over 5 percent.¹³ Hence, there is a significant market for large share stakes in Germany. And this market is large in comparison with Belgium (Renneboog 1996) and the US (Bethel et al. 1998).

An interesting feature of this market is that there is significant variation over time (Table 5). During the period of observation, boom times of large share trading were the years 1987, 1989, 1990 and 1994. This variation is reflected both in increases by new shareholders and decreases by old shareholders. Therefore it is unlikely to be driven by variation in the fraction of dispersed shares. One reason for increased transaction activity is privatization. In 1990, the year of German reunification, privatization of formerly state-owned enterprises accounts for about 10 percent of the transactions. But also the purchase of large conglomerates with many subsidiaries is important: When Feldmühle Nobel AG was acquired by VEBA AG in a hostile takeover during the year 1989, VEBA AG also became

¹² There is a fifth direct shareholder (Scamperdale AG), but this company is a Swiss subsidiary of VDO Adolf Schindling AG. Hence, the Schindling-Rheinberger family is its ultimate owner. For simplicity, the direct stake of Scamperdale AG in Boge AG is not shown separately in Figure 2, but integrated into the stake of VDO.

¹³ The sum of increases of old and new shareholders needs not to be equal to the decreases of old shareholders because free-floating shares are not counted as held by a blockholder.

the ultimate owner of another four non-listed firms in our sample. And when Metallgesellschaft AG came in trouble in 1993, it had to sell five subsidiaries contained in the sample to other industrial companies.

An interesting feature of this market for large share stakes is that share trading is not higher in listed firms, as might be expected. On average, 4.7 percent of shares in non-listed firms is purchased by new shareholders during 1987-1994, and 4.4 percent in listed firms. Statistically, the difference is not significant. The variation of trading activity over time even has a higher amplitude for non-listed firms. In the year 1990, for example, new shareholders increase their holdings by on average 7.4 percent in non-listed firms, but only by 5.0 percent in listed firms. The difference in variance is significant at the 1-percent level.

In the remaining part of this section we go beyond these aggregate figures in two ways. First, we analyze the frequency of large block transactions by number and the size distribution of purchased blocks. Second, we examine block trading with respect to the identity of block traders, i.e. the frequency of different shareholder categories being involved.

Number and size of large blocks traded

During the years 1987-1994, there are 4882 firm-years for which block trading could take place. In 431 cases (8.8 percent on average in any given year) a new shareholder comes in, in 612 cases (12.5 percent) an old shareholder increases his stake, and in 817 cases an old shareholder sells his block (16.7 percent). In other words, the likelihood of a shareholder to purchase a large block in a firm, in which he owned no share stakes before, was on average 8.8 percent in any given year through the 1987-1994 period.

Note that the likelihood of block trading is much larger for each of the three states (new shareholder coming in, old shareholder increasing or decreasing block size) than suggested by the average size of blocks traded (Table 5). This reflects the fact that traded blocks are generally smaller than 100 percent.

As noted in section 3, control rights in Germany are legally connected with ownership rights. Therefore, besides the average size of traded blocks, also the size of individual traded blocks is of interest (Table 6).

We see from Table 6, that among 431 firm-years which experienced block purchases by new shareholders during 1987-1994, the purchased block is equal or exceeds 50 percent in 226 cases (52.4 percent). In 85 cases, the new shareholder purchased 25 percent or more but less than 50 percent. Hence, in 311 cases (72.2 percent), an incoming shareholder acquired a stake of 25 percent or more. This strongly suggests that new shareholders come in *because* they want to take over control of the respective company. The time pattern shows that control issues seem to play an important role throughout the period of observation.

As exemplified by the case of Boge AG (Figure 2), the purchase of a large block does not need to be associated with taking over control, for example because a new shareholder purchases a large stake, but the majority of shares remains in the hands of the ultimate owner. To correct for this problem we check whether the name of the shareholder being in control changes (Table 7). This includes companies which do not have a controlling shareholder in one year, but come under control in the following year.

Table 7 shows that a change in control takes place in 343 cases (7.0 percent on average

Table 6: Size distribution of blocks purchased by new shareholders

	All increases by new shareholder	Minimum size of purchased block							
		5 percent		10 percent		25 percent		50 percent	
		total	%	total	%	total	%	total	%
1987	37	1	2.7%	3	8.1%	5	13.5%	28	75.7%
1988	34	2	5.9%	7	20.6%	9	26.5%	16	47.1%
1989	64	1	1.6%	15	23.4%	12	18.8%	36	56.3%
1990	63	3	4.8%	14	22.2%	7	11.1%	39	61.9%
1991	50	2	4.0%	11	22.0%	15	30.0%	21	42.0%
1992	43	2	4.7%	6	14.0%	11	25.6%	23	53.5%
1993	35	1	2.9%	14	40.0%	6	17.1%	13	37.1%
1994	105	5	4.8%	27	25.7%	20	19.0%	50	47.6%
Total	431	17	3.9%	97	22.5%	85	19.7%	226	52.4%

Notes: Column 1 shows the number of block purchases by new shareholders. Columns 2, 4, 6 and 8 disaggregate these purchases into four size classes. Columns 3, 5, 7 and 9 relate the disaggregate number of blocks to the number of all block purchases by new shareholders (column 1).

in any given year) during the years 1987-1994.¹⁴ In peak years (1987, 1989, 1990) the likelihood for changes in control is larger than 10 percent. This is considerably higher than suggested by the average size of blocks traded (Table 5), but lower than suggested by the number of blocks traded. This confirms that not all block purchases lead to control transactions, but that a large part does.

Type of block traders

To see whether a particular category of shareholder dominates block trading we examine trading partners of control blocks. Table 8 shows the category of selling and buying shareholders in block trades which lead to a change in control. As a reference, Table 8 also gives the distribution of controlling shareholders over all shareholder categories (4882 firm-years).

Table 8 shows that non-financial firms are the most active sellers and buyers of control blocks. Changes in control are caused by non-financial firms selling blocks in 144 cases (42.0 percent), and by non-financial firms buying blocks in 169 cases (49.3 percent). In 69 cases (20.1 percent) a change in control occurs because a control block is accumulated from previously dispersed shares, and in 49 cases (14.3 percent) a controlling block is dissolved and shares become dispersed.

Individuals are the second most active trader of control blocks. In 79 cases (23.0 percent) a change in control results from individuals selling blocks, and in 71 cases (20.7 percent) from individuals buying blocks. But individuals trade much less often than non-financial firms. An F-test confirms that the blocks purchased by individuals as new shareholders are, on average, significantly smaller than those purchased by non-financial firms (12.9 percent versus 28.7 percent). This supports Hypothesis 4b: Private investors are much less likely to be buyers of control blocks than non-private investors.

If we compare the distribution of selling investors across shareholder categories with the distribution of investors in the sample, then the government emerges as the most active seller of control blocks (Table 8). Over 7 percent of sold control blocks are sold by the

¹⁴ For the frequency of control changes per firm see the appendix.

Table 7: Number of companies with a change in control

	Firms with potential change in ultimate control	Firms with change in ultimate control	
		total	in percent
1987	327	37	11.3%
1988	518	32	6.2%
1989	559	57	10.2%
1990	579	58	10.0%
1991	640	31	4.8%
1992	673	37	5.5%
1993	705	24	3.4%
1994	881	67	7.6%
Total	4882	343	7.0%

Notes: Column 1 is the total number of firms in a given year. Column 2 is calculated based on the concept of control as described in detail in the appendix. Column 3 relates the number of firms with a change in control to the number of all firms (column 1).

government; but the government is the ultimate owner in only 3.4 percent of all sample firms. This result reflects recent privatization efforts of the German government.

5 Causes and consequences of changes in ultimate ownership

In the following, we analyze the causes and consequences of changes in ultimate ownership. The aim is to test the hypotheses lined out in section 2.

5.1 Causes of changes in ultimate ownership

To identify the causes for changes in ultimate ownership we use two approaches: In a first step, we compare firms, which experience a change in ultimate ownership, with firms, which do not experience such a change in any of the sample years, based on measures of ownership structure, capital structure, performance, and other firm-specific measures. Specifically, we compare the mean and median values of all relevant firm characteristics. In a second step, we make use of a logit model to explain changes in ultimate ownership.

Univariate analysis

Tables 9 and 10 give the mean and median values of each firm characteristic, separately for firms with (columns 1 and 3) and without (columns 2 and 4) a change in ultimate ownership. Three consecutive years are considered: the year when the change in ultimate ownership occurs (year 0), and the two years before this change (year -1 and year -2).

Table 9 shows that ownership concentration, as measured by the size of the largest block, is considerably larger in firms which experience a change in ultimate ownership. On average, the largest shareholder owns about 56 percent in the two years before the ultimate owner changes; in contrast, in firms without a change in ultimate ownership the largest

Table 8: Type of selling and buying shareholder in control transactions

Shareholder category	Seller		Buyer		All ultimate shareholders	
	total	%	total	%	total	%
Individuals	80	23.3%	72	21.0%	1654	33.9%
Financial firms	25	7.3%	25	7.3%	431	8.8%
Bank	20	5.8%	17	5.0%	295	6.0%
Insurance	3	0.9%	6	1.7%	133	2.7%
Investment fund	2	0.6%	2	0.6%	3	0.1%
Non-financial firms	144	42.0%	169	49.3%	2054	42.1%
Government	25	7.3%	28	8.2%	168	3.4%
Dispersed shares	69	20.1%	49	14.3%	575	11.8%
Sum	343	100.0%	343	100.0%	4882	100.0%

Notes: Columns 1 and 3 split traded control blocks into the categories of selling and buying shareholders. Column 5 splits all sample firms into the categories of their ultimate owners. For 575 firm-years there is no ultimately controlling shareholder (see Table 1).

shareholder owns about 76 percent. This difference is statistically significant at the 1-percent level.¹⁵ Hence, there is strong empirical support for Hypothesis 1: Firms which experience a change in ultimate control, have lower ownership concentration.

Regarding the measures of capital structure, we find that firms which experience a change in ultimate control are likely to face significantly higher financial pressure from creditors. Firms in which the ultimate owner changes, have an average debt-to-assets ratio of 46.8 percent in year -1, compared with a ratio of 40.6 percent in firms without a change. This difference is significant at the 1-percent-level.¹⁶ This is strong empirical support for Hypothesis 2a: Firms which experience a change in ultimate ownership face higher financial pressure.

Regarding growth opportunities, we look at two proxies: the growth rate of sales and the market-to-book ratio, which is available only for listed firms. Table 9 shows that the growth rate of sales is lower in the year when the ultimate owner changes (significant at the 10-percent level). The market-to-book ratio, as reported in Table 10, is measured relative to the median firm in the same 2-digit industry using the European NACE code. This ratio is lower in the year of change (significant at 1-percent level) for firms in which ultimate ownership changes. These results provide weak empirical support for Hypothesis 2b: Changes in ultimate ownership are more likely in firms with low growth opportunities.

Turning to pyramids and cross-ownership, we find that the level on which the ultimate controller is important. It is significantly lower in firms, which experience a major change in ownership, but significantly higher after the change (Table 9). Vice versa, this means that firms which are controlled through pyramids are less likely to experience a change in ultimate ownership; but firms which experience such a change are more likely to be controlled through a pyramid afterwards. To identify the effect of cross-ownership, we

¹⁵ This result is robust when other measures of ownership concentration are used: the Herfindahl index, the Cubbin-and-Leech index, and the index based on our concept of control.

¹⁶ This result is robust when other measures of financial pressure are used: interest coverage, defined as earnings before interest and taxes (EBIT) relative to interest payments, and the borrowing ratio (Nickell et al. 1997), defined as interest payments relative to earnings before interest, depreciation and taxes (EBITDA).

Table 9: Causes of change in control

		Mean		Median	
		No change in ultimate ownership	Change in ultimate ownership	No change in ultimate ownership	Change in ultimate ownership
Largest block	year -2		55.8%***		50.1%***
	year -1		56.5%***		50.1%***
	year 0	76.0%	61.2%***	90.0%	54.6%***
Debt-to-assets ratio	year -2		46.0%***		44.0%***
	year -1		46.8%***		45.6%***
	year 0	40.6%	45.4%***	39.4%	44.3%***
Growth rate of sales	year -2		8.1%		3.9%
	year -1		8.3%		3.6%
	year 0	7.6%	3.2%*	4.1%	3.5%**
Level of control	year -2		1.5***		1.0***
	year -1		1.5***		1.0*
	year 0	1.7	1.8*	1.0	2.0**
Sales (in mio. DM)	year -2		1,600***		343*
	year -1		1,660***		328*
	year 0	3,064	1,768***	470	345**
Insider ownership	year -2		14.0%**		0.0%
	year -1		12.4%***		0.0%
	year 0	18.0%	7.0%***	0.0%	0.0%***
Number of observations		2945	246	2945	246

Notes: In case of a change in ultimate ownership, mean/median statistics are calculated for the two years preceding the change (year -1 and year -2) and the year of change (year 0). In case of no change in ultimate ownership during the whole period of observation, mean/median statistics refer to the whole period of observation. All variables are defined in the appendix. The test statistics are heteroskedastic t-tests of equal means and Wilcoxon rank-sum tests of equal medians. *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively.

created an indicator variable: It has the value of one for firms, which are ultimately controlled by a firm from the well-known web of financial and non-financial German firms as depicted for example by Wenger and Kaserer (1997), zero otherwise.¹⁷ The results on cross-ownership suggest that firms, which experience a change in ultimate ownership, are less likely to be under ultimate control of a cross-held firm (not tabled). However, the difference is not statistically significant. Taken together, there is strong support for Hypothesis 3 concerning the role of pyramids, but no support concerning the role of cross-ownership. And there is also evidence that firms are likely to become integrated in pyramid structures after changes in ultimate ownership.

Firms which experience a change in ultimate ownership are significantly smaller than firms without a change in ultimate ownership (Table 9). Firms in which the ultimate owner changes or leaves, report total sales of on average 1.6 billion DM in the two years prior to the change, compared to sales of 3 billion DM in firms without a change. Hence,

¹⁷ The web includes the five largest commercial German banks, tow large insurance companies, but also large non-financial firms like Linde AG, Siemens AG and VIAG AG. See the appendix for the exact definition.

firms in which the ultimate owner does not change are about 50 percent larger in terms of sales.¹⁸ This is strong support for Hypothesis 4a: Changes in ultimate ownership are more likely in smaller firms.¹⁹

Concerning the role of insider ownership, insiders (executive and non-executive directors) own a significantly lower fraction of shares in firms which experience a change in ultimate ownership. In addition, insider ownership falls considerably when ultimate ownership changes: It drops from about 12 percent to 7 percent. An F-test shows that the difference is statistically significant at the 5-percent level. This indicates that insiders tend to sell out in control transactions. Hence, there is strong evidence for Hypothesis 5: Firms with high insider ownership are less likely to experience a change in ultimate ownership.

Table 10: Industry-adjusted performance as cause of change in control

		Mean		Median	
		No change in ultimate ownership	Change in ultimate ownership	No change in ultimate ownership	Change in ultimate ownership
Total factor productivity	year -2		-13.5%***		-18.9%***
	year -1		-10.1%*		-12.8%*
	year 0	-3.4%	-11.5%**	-5.9%	-11.3%*
Return-on-assets	year -2		0.4%		0.4%
	year -1		-0.1%**		0.2%**
	year 0	1.2%	0.0%	0.9%	0.1%**
Return-on-equity	year -2		0.5%		-0.1%
	year -1		0.3%		-0.2%
	year 0	2.1%	-1.3%	0.9%	-0.7%*
Return-on-sales	year -2		0.3%***		0.3%
	year -1		1.1%**		0.2%**
	year 0	4.7%	5.6%	0.6%	0.4%
Market-to-book ratio	year -2		18.1%		0.4%
	year -1		14.4%		-0.4%
	year 0	21.5%	8.2%***	1.3%	1.3%
Stock market return	year -2		3.8%		4.4%*
	year -1		2.9%		3.9%
	year 0	-0.5%	-0.1%	-0.1%	1.3%
Number of observations		2945	246	2945	246

Notes: In case of a change in ultimate ownership, mean/median statistics are calculated for the two years preceding the change (year -1 and year -2) and the year of change (year 0). In case of no change in ultimate ownership during the whole period of observation, mean/median statistics refer to the whole period of observation. All variables are defined in the appendix. The test statistics are heteroskedastic t-tests of equal means and Wilcoxon rank-sum tests of equal medians. *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively. The number of observations for the market-based measures is 1112.

The last issue we consider is performance. As a matter of better robustness, we analyze

¹⁸ Analogous differences are found when using total assets and the number of employees as measures of firm size.

¹⁹ When we use firm size in logs, firms experiencing a change in ownership are only significantly smaller in terms of total assets.

several measures of performance: total factor productivity, return on equity (ROE), return on assets (ROA), return on sales (ROS), and annual stock market returns. All these measures are relative measures. Total factor productivity is corrected for mean industry productivity in the same 2-digit industry, accounting measures are corrected for median industry return;²⁰ and stock market returns are corrected for the return of the DAFOX, the size-weighted return of all listed German firms.

Table 10 shows that industry-adjusted total factor productivity is significantly lower during the year, when a change in ultimate ownership occurs, compared with firms without a major change in ownership. It is also significantly lower two years before this change. Industry-adjusted ROA is also lower for firms, which experience a change in ultimate control. For example, one year before the change occurs, average industry-adjusted ROA is -0.1 percent. This is significantly less than the 1.2 percent for firms, which do not experience a change in ownership. Also industry-adjusted ROE and ROS are lower in the years preceding a change in ultimate ownership, although the difference to firms without a change in control is not in all years significant. For the subsample of firms, which we have stock market data for, we find that stock market returns relative to the market index DAFOX are not significantly lower during the years preceding a change in ultimate ownership. But when the market-to-book ratio is used as another market-based indicator of performance, it is significantly worse in the year of change in ownership. In sum, there is evidence supporting Hypothesis 6: Performance, defined as productivity, accounting-based returns or market-based returns, is worse in firms which experience a change in ultimate ownership. However, the strength of this result varies with the performance measure chosen. It is stronger for productivity and accounting-based returns, but weaker for market-based returns.

Multivariate analysis

To provide further evidence on the causes of changes in ultimate ownership, we estimate logit models relating the likelihood of a change in ultimate ownership to a set of financial and governance variables. We attempt to test the hypotheses lined out in section 2.

Specifically, we include: the size of the largest block as a measure of ownership concentration, interest coverage as a measure of financial pressure from creditors, the length of the control chain as a measure of how complex the firm-specific governance structure is, the logarithm of total assets as a measure of firm size, the fraction of shares owned by executive and non-executive directors as a measure of insider control, and return-on-assets (ROA), adjusted for the median ROA in the same 2-digit industry. Finally, we include a dummy indicating whether a firm is listed on the stock exchange or not. All explanatory variables enter the regression with a one-year lag.

The logit results are reported in Table 11. For the pooled sample (column 1), we find that a change in ultimate ownership is less likely when shareholder concentration and insider ownership are high and firm size is large. This supports Hypothesis 1, Hypothesis 4a and Hypothesis 5. But a change is more likely in firms with poor performance, and more likely in firms, which are controlled through pyramids. This confirms Hypothesis 6, but contradicts Hypothesis 3. In addition, a change in ultimate ownership is not significantly more or less likely to occur in firms listed on the stock exchange. This confirms the results

²⁰ We also calculated accounting returns relative to the median return in the same accounting year. The obtained results suggest a stronger effect of poor performance on changes in ultimate ownership than the results given in Table 10.

from the descriptive analysis in section 4.2: In Germany, the frequency of trading in ownership rights is similar for listed and non-listed firms.

Table 11: Logit and OLS regression results

	Probability of change in ultimate ownership		Size of large block purchased by new and old shareholders	
	pooled sample	fixed effects	pooled sample	fixed effects
Largest block	-1.550*** (0.212)	-1.754*** (0.251)	-5.863*** (1.028)	-11.933*** (1.500)
Interest coverage	-1.547 (1.602)	-1.518 (1.664)	-4.747 (5.312)	-4.035 (6.339)
Level of control	0.156** (0.075)	0.175** (0.084)	0.691** (0.350)	1.131** (0.473)
log (total assets)	-0.096*** (0.030)	-0.105*** (0.036)	-0.395*** (0.145)	-0.514** (0.230)
Insider ownership	-0.538** (0.247)	-0.562** (0.272)	-2.707*** (0.944)	-2.240* (1.317)
Ind.-adj. return-on-assets	-1.330** (0.619)	-1.360** (0.665)	-5.548** (2.817)	-5.338* (3.206)
Listing (Y/N)	0.530 (0.134)	0.039 (0.154)	-0.901 (0.613)	-2.504*** (0.976)
Intercept	0.116 (0.640)	0.188 (0.762)	17.600*** (3.133)	24.515*** (4.864)
Number of observations	4635	4635	4635	4635

Notes: Standard errors in parentheses. *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively.

To check the robustness of our results, we estimate the same model using random-effects to control for unobserved firm heterogeneity (column 2). Qualitatively, the results from pooled sample estimation are not altered. As another check of robustness, we explain the absolute size of all large blocks purchased in a given year in each firm (columns 3 and 4). The endogenous variable is the sum of increases in large blocks by old and by new shareholders. These measures have already been subject of the descriptive section 4.2.²¹ The exogenous variables are the same as in the logit models.

The results from the OLS model confirm the results from the logit model (column 3): Shareholder concentration, insider ownership and firm size negatively affect increases in large blocks, poor firm performance positively, and purchases of large blocks are larger in firms which are controlled by pyramid structures. These results hold when random effects are introduced into the OLS model (column 4). Interestingly, the random effects model suggests that block purchases are significantly larger in non-listed firms.

5.2 Consequences of changes in ultimate ownership

In the following we analyze consequences of changes in ultimate ownership. We compare firms, which experience a change in ultimate ownership, with firms, which do not expe-

²¹ See Table 5.

rience such a change in any of the sample years. Effects on management and supervisory board turnover are reported in Table 12, effects on asset restructuring and cost-cutting in Table 13, and consequences for performance in Table 14.

Changes in governance

Table 12 describes how management and supervisory board turnover as well as size of the supervisory board evolve in firms, which experience a change in ultimate ownership. All figures are calculated for the year of change in ultimate ownership (year 0) and the two years following the change (year 1 and year 2). To put these figures into perspective, we also report the respective statistic for one year prior to the change (year -1).

Table 12: Management and board turnover following changes in ultimate ownership

		Mean		Median	
		No change in ultimate ownership	Change in ultimate ownership	No change in ultimate ownership	Change in ultimate ownership
Turnover of CEO	year -1		10.9%		0.0%
	year 0	14.0%	20.6%**	0.0%	0.0%**
	year 1		20.0%**		0.0%**
	year 2		21.2%**		0.0%**
Turnover of chairman of the supervisory board	year -1		20.6%***		0.0%***
	year 0	12.3%	34.5%***	0.0%	0.0%**
	year 1		24.8%***		0.0%**
	year 2		21.2%***		0.0%**
Turnover of executive directors	year -1		11.2%		0.0%
	year 0	11.7%	19.2%***	0.0%	11.1%***
	year 1		17.9%***		11.1%***
	year 2		17.1%***		0.0%***
Turnover of non-executive directors	year -1		14.5%**		8.3%*
	year 0	11.7%	20.8%***	5.0%	16.7%***
	year 1		16.9%***		12.5%***
	year 2		14.0%		8.3%*
Size of supervisory board	year -1		9.9		9.0
	year 0	9.9	10.1	9.0	9.0
	year 1		10.1		9.0
	year 2		10.1		9.0
Number of observations		1823	165	1823	165

Notes: In case of a change in ultimate ownership, mean/median statistics are calculated for the year preceding the change (year -1), the year of change (year 0) and the two years after the change (year 1 and year 2). In case of no change in ultimate ownership during the whole period of observation, mean/median statistics refer to the whole period of observation. All variables are defined in the appendix. The test statistics are heteroskedastic t-tests of equal means and Wilcoxon rank-sum tests of equal medians. *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively.

In firms which experience a change in ultimate ownership, CEO turnover increases from 10.9 percent in the year preceding the change to 20.6 percent in the year of change (Table 12). This turnover rate is significantly above average CEO turnover in firms, which do not

experience any major change in ownership. And CEO turnover rates are also significantly higher in the two years following the change in ownership. This increase in management turnover is consistent with Denis and Sarin (1999): US firms which experience large increases or decreases in share ownership of officers and directors show CEO turnover rates of 15-20 percent. But in contrast to Germany, firms with only small changes in ownership show turnover rates of only 8 percent annually.²²

Likewise, turnover of the chairman of the supervisory board is much higher in firms which experience a change in ultimate ownership. Compared with an annual turnover rate of 12.3 percent in firms without any major change in ownership, turnover is 10 to 20 percentage points higher in firms, which experience a major change in ownership, in the year of change as well as in the year before and two years after the change. This difference is significant at the 1-percent level.²³ The analysis of turnover of all members of the management and supervisory board reveals similar results: In the year of change in ultimate ownership and the year after, turnover rates are significantly above those in firms without any change in ultimate ownership.

As a last issue we consider the size of the supervisory board. Although widely discussed in the theoretical and empirical literature for the US, board size does not seem to be of particular relevance for the new owner in German companies. At least this is suggested by Table 12: Board size is slightly higher in firms which experience a change in ultimate ownership; but this difference is not significant. German law prescribes a minimum board size, depending on industry and firm size. But in praxis board size often exceeds these requirements. Hence, new owners do not seem to require supervisory boards to shrink, for example to achieve higher efficiency in monitoring the managers.

Taken together, we find strong evidence supporting Hypothesis 7: Changes in ultimate control are followed by management and supervisory board turnover. Board size, however, does not change significantly following changes in ultimate ownership.

Corporate restructuring

One possibility to restructure a company is to sell part of its assets. We analyze this issue for total fixed assets and total financial assets. There is also information on four specific asset classes: real estate and housing, machinery, equity holdings, and other securities. Table 13 shows, for each of the six categories, mean and median sales in a particular asset class as a percentage of the stock of that asset at the beginning of the respective year. In addition to asset restructuring, we also analyze how employment and labor costs evolve after a change in ultimate ownership.

Table 13 shows that a change in ultimate ownership is typically followed by a significant increase in asset divestitures. Firms which experience a change in ultimate ownership, sell 6.7 percent of total fixed assets in the year preceding the change, but about 8 percent in the year of change and the two following years. This is significantly above the respective figure for firms, which do not experience a change in ultimate ownership. When considering two different kinds of fixed assets, real estate and machinery, we see from Table 13 that after a change in ultimate ownership sales of machinery and sales of real estate increase; but the difference to firms without a change in ultimate ownership is significant only for the sale of machinery.

22 Partially this difference might be explained by CEOs leaving the board voluntarily. Unfortunately, for Germany no consistent data are available on voluntary or forced management resignation.

23 Two years before the change in ownership, turnover rates are not significantly different and are around 11 percent.

Similar to sales of fixed assets, sales of financial assets increase following a change in ultimate ownership. Table 13 shows that sales amount to 20.5 percent annually in the year following the change, compared with an average of 16.0 percent in firms in which no major change in ownership takes place. Regarding sales of other securities, this difference is larger in absolute terms, but not significant: Firms experiencing a change in ultimate ownership sell, on average, 18 percent of their equity holdings in the year of change, compared to only 10.3 percent annually in firms without a major change in ownership.

Another possibility to restructure a company is to lay off employees or to cut down on labor costs. Table 13 shows that employment increases more slowly after a change in ultimate ownership (1.6 percent annually) compared with an average of 2.8 percent in companies, which do not experience a change in ultimate ownership. And two years after the change in ultimate ownership, the average growth rate of employment is even negative (-1.9 percent). In contrast, there is no evidence that average labor costs per employee decline after a major change in ownership. On the contrary, labor costs per employee are even significantly higher in the first year after a change in ownership.

Taken together, empirical evidence supports Hypothesis 8: Changes in ultimate ownership are typically followed by asset restructuring. Both, sales of fixed and financial assets increase significantly after a change in ultimate ownership. Employee layoffs also increase, but only in the second year following the change in ownership. This time lag suggests that adjustment costs play an important role in reorganizing a firm. Interestingly, labor costs per employee do not decline, but increase after a major change in ownership. This suggests that the new owner is working to improve incentives for employees.

Effects on performance

As a last issue, we examine whether changes in ultimate share ownership have an impact on performance. If there is any impact, then it should be most visible in firms which experienced a decline in performance before. We proceed in two steps. First, we compare performance of firms, which perform worse than their industry peers in year -1 and experience a change in ultimate ownership in year 0, with median industry performance. Table 14 reports the difference in performance, starting with the year of poor performance (year -1), through the three following years, separately for all poorly performing firms experiencing a change in control in year 0 (column 1), and for those of them being under tight control after the change in ultimate ownership (column 2). Second, we compare performance of firms, which perform worse than their industry peers in year -1 and experience a change in ultimate ownership in year 0, with those, which also perform worse than their industry peers in year -1 but did *not* experience a change in ownership in year 0. Table 14 reports the difference in performance, starting with the year of poor performance (year -1), through the three following years, separately for all poorly performing firms experiencing a change in control in year 0 (column 3), and for those of them being under tight control after the change in ultimate ownership (column 4).

As a check of robustness, various performance measures are used. But common to all measures is that poor performance is defined as the respective measure being below its median in the same 2-digit industry in year -1.²⁴

24 In case of total factor productivity, the benchmark is *mean* industry productivity.

Table 13: Corporate restructuring following changes in ultimate ownership

		Mean		Median	
		No change in ultimate ownership	Change in ultimate ownership	No change in ultimate ownership	Change in ultimate ownership
Sales of fixed assets	year t=-1		6.7%		4.0%***
	year t=0	6.0%	7.8%*	3.6%	4.4%***
	year t=1		7.6%**		4.9%***
	year t=2		7.6%*		4.7%
Sales of machinery	year t=-1		6.5%		2.9%
	year t=0	5.4%	5.6%	2.6%	3.2%**
	year t=1		7.6%*		3.6%***
	year t=2		6.8%		3.6%***
Sales of real estate	year t=-1		7.0%		1.4%
	year t=0	6.5%	7.8%	1.3%	1.4%
	year t=1		7.0%		1.0%
	year t=2		8.2%		2.0%
Sales of financial assets	year t=-1		15.2%		6.4%
	year t=0	16.0%	20.5%**	7.4%	7.9%
	year t=1		18.6%		7.4%
	year t=2		17.3%		7.6%
Sales of equity holdings	year t=-1		12.4%		0.0%
	year t=0	10.3%	11.9%	0.0%	0.0%
	year t=1		10.7%		0.0%
	year t=2		9.3%		0.0%
Sales of other securities	year t=-1		16.2%		1.4%
	year t=0	13.4%	18.0%	1.0%	0.5%
	year t=1		17.4%		0.5%
	year t=2		17.9%		2.5%
Growth rate of employment	year t=-1		3.8%		-0.3%
	year t=0	2.8%	3.3%	0.0%	0.0%
	year t=1		1.6%		-1.2%*
	year t=2		-1.9%**		-1.3%***
Growth rate of labor costs	year t=-1		4.7%		4.0%
	year t=0	5.1%	5.2%	4.2%	3.8%
	year t=1		10.6%**		5.1%***
	year t=2		5.1%		4.7%
Number of observations		1823	165	1823	165

Notes: In case of a change in ultimate ownership, mean/median statistics are calculated for the year preceding the change (t=-1), the year of change (t=0) and the two years after the change (t=1 and t=2). In case of no change in ultimate ownership during the whole period of observation, mean/median statistics refer to the whole period of observation. All variables are defined in the appendix. The test statistics are heteroskedastic t-tests of equal means and Wilcoxon rank-sum tests of equal medians. *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively.

Table 14 shows that industry-adjusted total factor productivity is, by definition, negative in year -1 (-37.7 percent). During the three years following the change in ultimate ownership, productivity remains below the industry mean. But as evident from Table 14, productivity improves compared with the year before the change. This improvement in productivity is significant at the 1-percent level from year 1 onwards (not tabled). Analogous results are found for accounting-based returns as measures of performance: Performance improves significantly from the year after the change in ownership onwards, in many cases adjusts to median industry performance, but never exceeds it. Concerning market-based returns, performance adjusts to median industry performance when measured by annual stock market returns, but not when measured by the market-to-book ratio. The market-to-book ratio remains significantly negative. Nevertheless, it improves significantly in year 0 and year 1 compared with the year of poor performance. The timely reaction in both market-based returns are an indicator that the capital market positively values the change in ownership. Qualitatively, all these results are similar for firms, which are under tight control after the change in ownership. Hence, following changes in ultimate ownership performance improves strongly, but it never exceeds the industry benchmark.

However, the observed improvement in performance needs not to be caused by a change in ultimate ownership. It might just be due to mean reversion. If this is the case, performance should also improve in firms, which performed poorly in year -1, but did *not* experience a change in ultimate ownership in year 0. To check this we calculate the difference in improvement of industry-adjusted performance between firms, which experience a change in ultimate ownership in year 0, and those which do not. Table 14 shows that in firms, which experience a change in ownership, industry-adjusted ROA exceeds performance in firms, which do not experience a change in ownership, by 1.7 percent in the first year after the change. This difference is significant at the 10-percent level.

Analogous results emerge when considering ROE and total factor productivity, but not when looking at ROS, stock market returns or the market-to-book ratio. The improvement in relative performance is stronger in firms, which are under tight control after the change in ownership: In year 1 and year 3, ROA is more than 2 percentage points larger compared with firms with no change in ownership, and ROE is 3.6 percentage points larger. Annual stock market return is even 9 percentage points larger, but this difference is not statistically significant.

Taken together, there are quite a few indications that support Hypothesis 9: Firms experiencing a change in ultimate ownership catch up to median industry performance when performance was bad before. The improvement in performance is not simply due to mean reversion. Rather, performance improves specifically in firms which are under tight control after the change in ultimate ownership.²⁵

25 In light of different outcomes depending on the performance measure used, focusing on just one performance measure (Bethel et al. 1998, Denis and Kruse 2000) might be problematic to evaluate the effect of governance changes.

Table 14: Industry-adjusted performance following poor performance

Performance measure		Relative to zero		Relative to performance of firms without a change in ultimate ownership	
		all	tight control	all	tight control
Total factor productivity	year -1	-37.7%***	-37.1%***	8.4%*	9.0%*
	year 0	-33.1%***	-32.9%***	6.9%	7.2%
	year 1	-24.8%***	-24.7%***	11.3%*	11.3%*
	year 2	-18.9%***	-18.9%***	13.7%**	13.7%**
	year 3	-16.6%***	-17.5%***	11.2%*	10.2%
Return-on-assets	year -1	-4.3%***	-4.3%***	1.2%	1.2%
	year 0	-1.7%	-2.0%	1.8%	1.4%
	year 1	-1.2%	-0.7%	1.7%*	2.2%**
	year 2	-0.9%	-0.2%	1.7%	2.5%
	year 3	-0.5%	0.2%	1.7%	2.3%**
Return-on-equity	year -1	-8.1%***	-8.7%***	2.4%	1.8%
	year 0	-6.3%*	-7.6%**	0.7%	-0.6%
	year 1	-2.8%**	-2.3%*	3.1%**	3.6%***
	year 2	-5.0%***	-4.4%***	1.0%	1.6%
	year 3	-2.3%	-1.5%	2.8%*	3.6%**
Return-on-sales	year -1	-3.2%***	-3.1%***	1.6%**	1.7%**
	year 0	-0.7%	-1.0%	2.1%	1.9%
	year 1	-1.4%*	-1.2%	0.3%	0.5%
	year 2	-1.2%	-1.0%	-0.4%	-0.2%
	year 3	0.6%	1.0%	1.2%	1.6%
Market-to-book ratio	year -1	-28.2%***	-30.3%***	-6.1%	-8.2%
	year 0	-19.6%***	-21.6%***	-0.4%	-2.4%
	year 1	-19.9%***	-22.1%***	-3.1%	-5.3%
	year 2	-23.3%***	-25.7%***	-8.0%*	-10.4%*
	year 3	-24.8%***	-25.4%***	-10.5%**	-11.1%*
Stock market return	year -1	-15.4%***	-15.1%**	5.6%	5.9%
	year 0	-11.3%	-9.3%	-9.6%	-7.6%
	year 1	-0.6%	5.9%	2.5%	9.0%
	year 2	-8.6%*	-13.5%**	-1.5%	-6.4%
	year 3	-14.4%**	-14.9%*	-2.8%	-3.3%

Notes: Mean industry-adjusted performance of firms, which perform poorly in year -1 and which experience a change in ultimate ownership in year 0, but not in years -1, 1, 2 and 3, relative to zero (columns 1 and 2). Mean industry-adjusted performance of firms, which perform poorly in year -1 and which experience a change in ultimate ownership in year 0, but not in years -1, 1, 2 and 3, relative to mean industry-adjusted performance of firms, which perform poorly in year -1 and do not experience a change in ultimate ownership in year 0 (columns 3 and 4). Poor performance is defined as negative industry-adjusted performance. Firms under tight control have a strong ultimate shareholder after the change in ownership. The test statistics are t-tests of being equal to zero (columns 1 and 2) and heteroskedastic t-tests of equal means (columns 3 and 4). *, **, *** indicates significance at the 10, 5, 1-percent levels, respectively.

6 Conclusions

This paper sheds light on the market for corporate control in Germany. It provides evidence on the size of this market, as well as the causes and consequences of changes in corporate control. We find that there is significant trading in large share blocks of German companies, and that the vast majority of these transactions concerns blocks, which are likely to carry control rights. On average, we observe an annual rate of 7.0 percent of control changes over the years 1987-1994. This compares to annual rates of 6.3 percent for Belgium (Renneboog 1996), 6.7 percent for the US (Bethel et al. 1998) and 9 percent for the UK (Franks et al. 1999).

The most active traders of control blocks are non-financial firms and individuals. But non-financial firms buy control blocks much more often than individuals. Taking into account that these types of shareholders, on average, also hold the largest fraction of shares, the government becomes the most active seller of control blocks, reflecting recent privatization efforts in Germany.

The analysis shows that transactions of control blocks are more likely to occur in smaller firms with low concentration of ownership, high financial pressure, low insider ownership, low growth opportunities and poor performance. The likelihood of a change in ultimate ownership is significantly lower in firms, which are controlled through complex ownership structures like pyramids. Taken together, these results suggest that the market for corporate control represents a potentially important governance device in Germany to correct performance failure.

Changes in ultimate ownership are followed by increased management and supervisory board turnover as well as the respective chairmen, asset restructuring and employee layoffs. In contrast, there is no evidence of cost cutting: Labor costs per employee even increase after a change in control. Under new ultimate ownership, industry-adjusted performance improves strongly, irrespective whether performance is measured by productivity, accounting-based returns or market-based returns. When firms are under tight control after the change in ownership, this improvement is even larger. This stresses the importance of one dominant shareholder. But evidence is weaker that industry-adjusted performance improves specifically in firms, which experience a change in ultimate ownership, depending on the performance measure chosen. Table 15 summarizes the empirical evidence gathered in this study.

This study has particular policy implications. First, in Germany control transactions occur more frequently than often assumed. The analysis has shown that their frequency is equally high among listed and non-listed firms. But this implies that the new Law on Takeovers, at least in the form proposed by the German government in the year 2000, will not cover a large part of control transactions. In light of the significant number of non-listed companies this should be corrected, for example by extending this law to all large German firms, whether listed or not. Second, the analysis has shown that friendly takeovers can appropriately address corporate governance problems. This implies that the market for corporate control should be promoted. The German capital markets have already shown that a more liquid market in share stakes is highly welcome: Just before Christmas 1999 the German Finance Minister has announced that corporations with limited liability (Kapitalgesellschaften) will be allowed to sell their substantial stakes in other companies without taxation of the realized profits. The reaction of the capital markets was an immediate turn-up in the market value of insurance companies and banks – the firms

Table 15: Hypotheses and empirical results

Changes in ultimate ownership are...		
Hypothesis 1	...less likely in firms with a high concentration of ownership	strongly confirmed
Hypothesis 2a	...more likely in firms with high financial pressure	weakly confirmed
Hypothesis 2b	...more likely in firms with lower growth opportunities	weakly confirmed
Hypothesis 3	...more likely in firms which are controlled through pyramid structures and are not under control of cross-owned ultimate shareholders	strongly confirmed don't know
Hypothesis 4a	...more likely in smaller firms	strongly confirmed
Hypothesis 4b	Non-private investors are more likely to be buyers of ultimate control blocks than private investors	strongly confirmed
Hypothesis 5	...less likely in firms with high insider ownership	strongly confirmed
Hypothesis 6	...more likely in firms with poor performance	weakly confirmed
Changes in ultimate ownership are followed by...		
Hypothesis 7	...increases in management and supervisory board turnover and a reduction in board size	strongly confirmed don't know
Hypothesis 8	...increases in asset divestitures, employee layoffs, and cost cutting	weakly confirmed strongly confirmed strongly rejected
Hypothesis 9	...improvements in performance	weakly confirmed

with the largest firm portfolios. This supports another finding of this study: Complex ownership structures still limit the functioning of the market for corporate control.

A Data appendix

A.1 Data sources and sample selection

The starting point of data selection is Hoppenstedt's Balance Sheet Database (BSD). An important feature of this data source is that it contains information on a significant number of large listed and non-listed firms, both in the legal form of AG and GmbH (see section A.2). We take 1986 as the starting year because a change in disclosure rules hinders comparability of the annual reports before and after the year 1986.²⁶ The last year of our investigation is 1994 because our series of ownership data ends in this year. For the period 1986-1994, BSD contains 5222 firms (22,732 firm-years) for which consolidated balance sheet data are available. We eliminate firms from the utility, traffic and telecommunications industries because they were still predominantly government-owned during the period of observation. As a matter of better comparability, we also eliminate firms which primarily operate in the banking and insurance business, but only little in non-financial activities (1752 firm deletions). Further, we drop firms with less than three continuous observations in time because our analysis requires at least three years of financial data in sequence (569 firm deletions).

The number of firms in the data set is reduced further because not for all firms ownership data are available. Data on ownership structures are obtained from annual reports published by former Hypobank. These reports contain ownership information on all listed German companies, but also on a range of large non-listed firms. Hypobank reports the size and the name of a direct owner when the size of the ownership block exceeds 5 percent, in very few cases also smaller ownership blocks. However, ownership information from Hypobank cannot readily be used in our analysis for three reasons. First, ownership information from Hypobank only refers to the *direct* level of owners. We therefore identified the *ultimate* owner of all large blocks held in each company (see section A.3). Second, Hypobank does not directly reveal ownership information on medium-sized non-listed firms. Other commercial data sources are also of little help because during our period of observation, non-listed firms generally have not been subject to strictly enforced disclosure requirements. Therefore, we constructed the relevant ownership structures by searching the information on investments in subsidiaries and affiliated companies which is given in the appendix to each company in Hypobank. In addition, we searched the Mannheim Company Database (MUP) located at the ZEW in Mannheim. Thereby we obtained ownership structures on many medium-sized non-listed firms, mainly in the legal form of private companies with limited liability (GmbH). Third, we tracked all sample firms through the years 1986-1994 to obtain a panel on ownership structures, merging firm-years on the basis of the name of each company. A problem was that some firms in our sample changed their names during the period of observation, for example following takeovers or restructuring of conglomerates. Since changes in ownership are crucial to the data collection procedure, we searched Hypobank and MUP for information on changes in names or takeovers.

We obtain ownership data for 1512 firms (6394 firm-years). Requiring at least two years of ownership data in sequence to calculate changes in ownership and dropping the start

²⁶ In 1985 several changes were introduced in German corporate law (§289HGB), most of them triggered by the European Community's Fourth Company Law Directive on the harmonization of national requirements pertaining to financial statements.

year of each firm due to missing data on changes in ownership, another 566 firms must be eliminated. The final sample consists of 946 firms (4882 firm-years) for the years 1987-1994. Table 16 summarizes the selection procedure.

Table 16: Data selection procedure

Selection criterion	Firms	Firm-years
Consolidated balance sheet data for the years 1986-1994	5222	22732
Mining, manufacturing, construction and trade	3470	15148
Three years of balance sheet data in sequence	2901	13902
Ownership data	1512	6394
Two years of ownership data in sequence	946	4882

For 46 firms out of these 946 firms, balance sheet data time series end before 1994, the final year of the sample. Non-reporting might be due to a firm exiting its product market by a voluntary or forced shut-down, a firm merging with another entity, or simply a firm not willing to submit balance sheet information any longer to Hoppenstedt although it continues to exist. In case of a merger, this is important information because it alters the ownership structure; in case of market exit, this is also important information because not correcting for firm exit can bias estimation results (Börsch-Supan and Köke 2000). All relevant firms were contacted by telephone to verify information obtained from BSD and MUP databases. Table 17 summarizes the reasons for why firms stopped reporting.

Table 17: Reasons for non-reporting of balance sheet data

Reason	Firms
Non-voluntary liquidation	11
Voluntary liquidation	1
Merger or acquisition	10
No liquidation, no change in owner	24
All	46

We find that 24 out of these 46 non-reporting firms existed further without a major change in ownership, but simply changed their name or quit reporting due to reasons determined within the particular firm (Table 17). In 11 cases production was shut down due to liquidation or bankruptcy. In 10 cases the respective firm was taken over by another entity. And in one case production was shut down voluntarily. To check the robustness of the results, all calculations from section 5 were performed again without these 46 firms. Qualitatively, all results on causes and consequences of changes in ultimate share ownership as reported in section 5 are similar, but also all results on the specifics of the market for corporate control as reported in section 4.

We recognize that the selection procedure of non-listed medium-sized firms does not generate a random sample of non-listed medium-sized German firms. Given that we include only medium-sized firms, which are subsidiaries of conglomerates, our sample might be biased. For example, we lack medium-sized firms which are directly owned by families. But given the advantage of a smaller average firm size in the total sample we regard this as a necessary cost to be incurred. Besides, if agency problems exist, they should be most pronounced in our sample firms.

A.2 Sample characteristics

The sample comprises mainly listed and non-listed large German firms. But it also includes a significant number of medium-sized firms. Taking the year 1992 as an example, Table 18 shows that listed firms are well-covered. In fact, the data base includes all firms listed on a German stock exchange, which do not belong to the financial industry and industries under strict regulation like utility, traffic and telecommunications (see section A.1).

Table 18: Sample composition in 1992: listed and non-listed firms

Listing	Legal form	All German firms	Sample firms	
			total	in percent of all German firms
Yes	AG, KGaA	521	347	66.6%
No	AG, KGaA	1643	228	13.9%
No	GmbH	359358	98	0.03%

Notes: Data on all German firms are obtained from Statistisches Bundesamt, Umsatzsteuerstatistik, Fachserie 14, Reihe 8.

Table 18 also shows that approximately half of the sample firms are not listed. These firms are run under three different legal forms: public companies with limited liability (AG and, to a much smaller extent, KGaA) and private companies with limited liability (GmbH). Coverage of non-listed firms is much weaker, in particular for GmbH firms. This is mainly due to the enormous number of GmbH firms in Germany. Controlling for firm size, we find that the sample contains about 48 percent of all public companies with limited liability and minimum sales of 100 million DM, whether listed or not. And even more than 3 percent of private companies with limited liability and minimum sales of 100 million DM are included. Hence, the sample is representative for large listed and non-listed public companies with limited liability, but much less so for GmbH firms.

The data set encompasses firms from a total of 33 industries (two-digit European NACE code), as shown by Table 19. Most firms operate in manufacturing industries, but there is also a significant number of firms operating in other industries. Table 19 shows that the largest industry in the sample is the machines industry with 161 firms in the year 1992. However, compared with total number of firms in this industry, this industry is not over-represented. It is the chemicals industry which receives the highest sampling coverage with 51.5 percent. Overall, the manufacturing sector is well-covered. Trade and construction are represented to a much weaker extent, although the number of firms, operating for example in wholesale trade, is significant.

An important characteristic of the sample is that changes in ultimate owners are observable. As shown in section 4.2, these changes occur relatively frequently. But they also affect a significant number of firms during the whole period of observation. Out of 946 firms 692 (73.2 percent) do not experience any change in ultimate ownership (Table 20). Hence, for over a fourth of sample firms there is at least one major change in ownership during the years they are included in the sample.²⁷ In about 20 percent of all firms the ultimate owner changes once, in about 6 percent twice. Thus, several changes in ultimate control in sequence are not very likely.

²⁷ On average, each firm contributes 6.7 years to the sample.

Table 19: Sample composition in 1992: industry coverage

Industry (2-digit NACE-code)	All large German firms	Sample firms		
		total	in percent of total	in percent of all large German firms
Mining, energy (10,11)	n.a.	17	2.5%	–
Chemicals, oil (23,24)	103	53	7.9%	51.5%
Synthetics (25)	107	28	4.2%	26.2%
Rock, stone and glass (13, 14, 26)	117	35	5.2%	29.9%
Metals (27,28,37)	216	53	7.9%	24.5%
Machines (29,30,31,34,35)	577	161	23.9%	27.9%
Electronics (32,33,36)	377	31	4.6%	8.2%
Wood, paper, printing (20,21,22)	366	21	3.1%	5.7%
Leather, textiles (17,18,19)	185	33	4.9%	17.8%
Food (15,16)	237	81	12.0%	34.2%
Construction (45)	693	21	3.1%	3.0%
Wholesale trade (51)	785	49	7.3%	6.2%
Retail trade (50,52)	610	14	2.1%	2.3%
Hotel and restaurants (55)	96	2	0.3%	2.1%
Diversified holding firms (74)	n.a.	74	11.0%	–
Total	n.a.	673	100.0%	–

Notes: Diversified holding companies cannot be assigned to a single major industry code. Data on all German firms are obtained from Statistisches Bundesamt, Umsatzsteuerstatistik, Fachserie 14, Reihe 8.

A.3 Concept of control

We use the following rule to detect the ultimate owner of each direct shareholder: starting from the direct level (level 1), we proceed to the next level (level 2) in the ownership structure if the largest shareholder on level 2 owns at least 50 percent of the shares and no other investor owns 50 percent of the shares. If this criterion is not met, the largest shareholder must own at least 25 percent of the shares, with all other shareholders owning less than 25 percent. If both criteria are not met, our stop rule applies and we do not pursue any ownership chain further. This rule guarantees that there exists only one or none ultimate owner for each direct investor. Note that if an investor has split his/her ownership stake in a particular company into several smaller stakes, for example into two blocks of 50 percent held by two subsidiary firms, we combine these smaller stakes.

We select the break-off point 50 percent because in Germany an investor owning 50 percent of all company shares is entitled to appoint management.²⁸ The break-off point 25 percent is selected because an investor owning 25 percent of the shares in a company has a right to veto decisions.

After having identified the ultimate owner of each direct shareholder, we apply the same concept of control to all direct shareholders. This way we identify the shareholder which is

²⁸ A 50 percent majority is sufficient to dismiss management after their regular period of office. But a majority of 75 percent is required to dismiss management during its period of office (§103(1)AktG). But also a share much lower than 50 percent can be sufficient when the rest of the shares is dispersed or the corporate charter limits the voting rights of minority shareholders. Therefore 50 percent is the best proxy available.

Table 20: Number of changes in ultimate ownership

Number of changes	Sample firms	
	total	in percent
0	692	73.2%
1	184	19.5%
2	54	5.7%
3	13	1.4%
4	3	0.3%
Total	946	100.0%

in ultimate control of each sample firm, or whether no single shareholder fulfills the criteria of our concept of control. In the latter case the company has no controlling shareholder.

A.4 Definition of variables

The variables used in this study are defined as follows (Table 21):

Table 21: Definition of variables

<i>Performance:</i>	
Total factor productivity	Residual from OLS estimation of Cobb-Douglas production function, $y = \alpha k + \beta l$, with $y = \ln(\text{total sales})$, $k = \ln(\text{replacement costs of tangible assets})$ and $l = \ln(\text{total number of employees})$. Sales and capital stock are deflated using appropriate price indices.
Return-on-assets (ROA)	EBIT/total assets
Return-on-equity (ROE)	EBIT/total equity
Return-on-sales (ROS)	EBIT/total sales
Market-to-book ratio	Market value of equity/book value of equity
Stock market return	Continuous yearly return $R_t^c = \sum_{w=1}^n \frac{R_w^c}{n} * 52$ with continuous weekly return $R_w^c = \ln(\frac{K_w^p}{K_{w-1}^p})$ with K_w^p performance value in week w on Wednesday of week w. K_w^p is corrected for capital changes, changes of stock's face value, stock splits and dividend payments (Göppl et al. 1996).
<i>Ownership structure:</i>	
Largest block	Size of largest share block (C_1)
Herfindahl index	$H = \sum_{j=1}^n P_j$, with P_{jt} size of individual block
Cubbin and Leech index	$Cubbin = 1$ if probability exceeds 95% (99%) that largest shareholder wins a vote, 0 otherwise: $\alpha = \Phi = \frac{C_1}{\sqrt{H - C_1^2}}$
Control	$Control = 1$ if firm has ultimately controlling shareholder, calculated based on concept of control, 0 otherwise
Insider ownership	Fraction of shares owned by executive and non-exec. directors
Level of control	Level of the end of a control chain in pyramids. For example, $Level = 1$ means that control resides with direct shareholder.
Cross-ownership	$Cross = 1$ if ultimate owner is part of the web of firms identified by Wenger and Kaserer (1997) and if ultimate owner owns share block in itself; 0 otherwise.
<i>Capital structure:</i>	
Debt-to-assets ratio	Total debt to total assets
Interest coverage	EBIT/interest payments
<i>Board structure:</i>	
Turnover of CEO	$CEO_t = 1$ if chairman of managerial board (Vorstand) changes from year $t-1$ to t , 0 otherwise
Turnover of Chairman	$Chair_t = 1$ if chairman of supervisory board (Aufsichtsrat) from year $t-1$ to t , 0 otherwise
Turnover of executive directors	$\frac{J_t + L_t}{E_t + E_{t-1}}$ with J_t (L_t) number of joining (leaving) executive directors and E_t number of executive directors
Turnover of non-executive directors	$\frac{J_t + L_t}{N_t + N_{t-1}}$ with J_t (L_t) number of joining (leaving) non-executive directors and N_t number of non-executive directors
Size of supervisory board	Number of non-executive directors N_t
<i>Restructuring:</i>	
Sales of assets	$s_{jt} = \frac{S_{jt} - S_{jt-1}}{S_{jt-1}}$ with S_{jt} sales of asset category j in year t
Growth rate of employment	$n_t = \frac{N_t - N_{t-1}}{N_{t-1}}$ with N_t total number of employees
Growth rate of labor costs	$c_t = \frac{C_t - C_{t-1}}{C_{t-1}}$ with C_t total labor expenditures

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