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Corporate Governance and Internal Capital Markets

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Corporate Governance and Internal Capital Markets

Abstract

We exploit an exogenous shock to corporate ownership structures created by a recent tax reform in Germany to explore the causal link between corporate governance and internal capital markets. We find that firms with more concentrated ownership are less diversified and have a less active but more efficient internal capital market. Our findings provide direct evidence in support of Scharfstein and Stein's (2000) model, which suggests that internal capital misallocations are partly a result of poor corporate governance. We also provide evidence of a channel through which the benefits of ownership concentration outweigh its costs.

1. Introduction

Corporate governance and internal capital markets are two of the topics that have received most attention from corporate finance scholars over the past 10 to 15 years. The two topics are in fact closely intertwined in theoretical research; agency problems—which corporate governance mechanisms seek to mitigate in a variety of ways—are at the heart of every theory of inefficient internal capital markets (see Stein (2003) for a review). Surprisingly, very few empirical studies have looked into the actual link between corporate governance and internal capital markets. This paper seeks to fill the gap by examining the impact of corporate ownership and board structures on the size and efficiency of firms' internal capital markets.

The few studies that have explored the link between the two topics suggest that this can be a fruitful avenue for research. For instance, Lins and Servaes (1999), who find a significant diversification discount in Japan and the U.K. but not in Germany, also find that concentrated ownership in the hands of insiders enhances the value effect of diversification in Germany but not elsewhere—suggesting that international differences in corporate governance affect the impact of diversification on shareholder wealth. Anderson, Bates, Bizjak and Lemmon (2000) show that firms that are more diversified provide less incentive-based compensation to their CEOs but have more outsiders on the board. Durnev, Morck and Yeung (2004) find a positive association between the informativeness of a firm's stock prices and the efficiency of its capital budgeting, and attribute the relation to the mediating role of corporate governance. Ozbas and Scharfstein (2007) show that the investment behavior of conglomerates is more inefficient if management has small ownership stakes. Relatedly, Datta, D'Mello, and Iskandar-Datta (2008) show that equity-based compensation (but not stock options) is associated with more efficient internal capital markets.

These studies show that explicit tests of the impact of corporate governance on internal capital markets can contribute significantly to our understanding of both topics. However, none of these studies are exempt from at least one of the problems that have undermined much of the empirical literature on both topics: endogeneity and measurement error in Tobin's Q.¹

In this paper, we take advantage of a unique opportunity for a natural experiment provided by a recent tax change in Germany to explore the causal link between corporate governance and internal capital markets. In 2002, the prevailing 52% corporate tax on capital gains from investments in other corporations was repealed, thus eliminating a significant barrier to changes in ownership structures. The tax repeal affected most large shareholders in German corporations since, in addition to companies, banks, and other financial institutions that are commonly organized in corporate form, most wealthy individual and family shareholders in Germany hold their shares through intermediate corporations (La Porta, López de Silanes, and Shleifer (1999); Franks and Meyer (2001); Faccio and Lang (2002)). Indeed, the tax change gave rise to a significant reshuffling of corporate ownership structures. This exogenous shock allows us to overcome or at least mitigate concerns about the endogeneity of ownership in estimating its effect on internal capital markets' size and efficiency.

Other studies have exploited changes in law as exogenous events to overcome the endogeneity of corporate governance variables. Such papers include Bertrand and Mullainathan (2003) who study changes in anti-takeover laws, and Chhaochharia and Grinstein (2007) as well as Hochberg, Sapienza, and Vissing-Jorgensen (2007) who exploit the Sarbanes-Oxley Act as a

¹ Demsetz and Villalonga (2001) show that, after correcting for the endogeneity of corporate ownership, its alleged effect on firm value disappears. Campa and Kedia (2002) and Villalonga (2004a) show that, after correcting for endogeneity or self-selection biases in corporate diversification, the diversification discount disappears or even turns into a premium. Whited (2001) and Colak and Whited (2007) show that the evidence of internal capital markets' inefficiency is largely an artifact of measurement error in Tobin's Q.

quasi-natural experiment. The closest to our paper is Giannetti and Laeven (2008), who use a pension reform in Sweden to identify the effects of institutional ownership on performance.

The significant changes in ownership structures that resulted from the German tax reform offers an additional advantage from an econometric point of view: It creates a longitudinal variation that is unusual in ownership studies and which, combined with the already-large cross-sectional variation in German ownership structures, allows us to identify the effects of ownership changes and structure with much greater statistical power than what could be obtained from U.S. data (see Zhou (2001) for a related criticism of the literature).

In addition, German corporations disclosed segment information during our sample period, which allows us to compute measures of internal capital market size and efficiency similar to those used by other researchers on U.S. data.

We find that firms with more concentrated ownership are less diversified and have a less active but more efficient internal capital market. These findings are consistent with the theoretical arguments in Bolton and Scharfstein (1998) and Scharfstein and Stein (2000), which suggest that capital misallocations are partly a result of poor corporate governance. Our paper thus contributes to the internal capital markets literature by providing direct evidence of the effect of governance structures on how these markets work.

In addition, our paper also contributes to the corporate governance literature by providing new evidence about the benefits and costs of ownership concentration. Ownership concentration as a governance mechanism can be a double-edged sword, since it can mitigate the agency problem between minority shareholders and managers (due to large shareholders' greater incentives to monitor the managers) but it can bring about another agency problem, between large and small shareholders (Burkart, Panunzi and Shleifer (2003) provide a formal model of

this tradeoff). Because corporate diversification also has benefits and costs, our finding that firms with more concentrated ownership are less diversified and have a less active internal capital market can be interpreted in one of two ways. If diversification is overall value-destroying and internal capital markets are inefficient, corporate diversification can be seen as the outcome of an agency problem where either managers or controlling shareholders lead their companies to diversify to make up for their lack of personal diversification or extract other private benefits at the expense of minority shareholders, who only bear the costs. Under this view of diversification, our results would thus suggest that the agency benefits of ownership concentration outweigh its agency costs, since large shareholders successfully prevent self-interested managers from engaging in value-destroying diversification. On the other hand, if the net benefits of diversification and internal capital markets are positive, our results would suggest that the net benefits of ownership concentration are negative.

Given Lins and Servaes (1999) finding of no diversification discount in Germany, our results imply that the benefits and costs of ownership concentration just offset each other. However, our own finding that more concentrated ownership leads to more efficient allocation of internal resources suggests that the net benefits are in fact positive.

Our results have significant policy implications. To the extent that the German tax reform was meant to improve minority investor protection in the country, our results suggest that the reform may have in fact been counterproductive. The broader policy implication is that lawmakers and regulators should be cautious when trying to harmonize corporate governance systems across countries with different institutional contexts and different governance mechanisms in play.

The rest of the paper is organized as follows. In Section 2, we derive a set of hypotheses on the link between corporate governance and internal capital markets. Section 3 provides background information on the governance structures in Germany, the tax change we exploit, and segment reporting in Germany. The data set, sample characteristics, and variable definitions are provided in Section 4. Section 5 discusses the empirical results and Section 6 summarizes and concludes.

2. Main Hypotheses

We test three related hypotheses concerning the link between corporate governance and internal capital markets. We start by looking at a coarse measure of diversification and the complexity and scope of a firm's internal capital market: the number of operating segments. We then study two more elaborate measures of the size of capital reallocations inside firms (i.e., how active is the internal capital market?) and finally analyze two alternative measures of the efficiency of firms' internal capital markets. In all three cases, the null hypothesis posits that corporate governance structures play no role for internal capital markets.

Of all possible governance measures, we focus on ownership concentration as our key independent variable, for two reasons. First, from a theoretical standpoint, ownership concentration is a particularly interesting governance mechanism because it is at the heart of what Burkart, Panunzi, and Shleifer refer to as “the twin conflicts essential to understanding corporate governance: that between the manager and the outside shareholders, and that between the large shareholder and the minority shareholders” (2003, p. 2170). Unlike many other governance mechanisms which protect minority investors from the abuses of either managers or large shareholders (e.g. an active market for corporate control, cumulative voting, etc.), concentrated ownership offers the benefit of mitigating the former conflict at the cost of

exacerbating the latter. We therefore do not take a stance about whether concentrated ownership structures are a “better” or “worse” governance mechanism than widely held structures, and instead leave it to the data to tell us. Second, ownership measures are the most directly affected by the German corporate capital gains tax repeal of 2002, which we use as an exogenous shock to infer causality from the relations we observe between corporate governance and internal capital markets. We also use measures of supervisory board structure, which were also affected by the tax repeal since the composition of this board in Germany typically mirrors the firm’s ownership structure (cite??). However, the impact of the tax change is more indirect, and hence it is a weaker instrument for this measure.

2.1 Corporate governance and diversification

We begin our analysis by looking at the relation between a firm’s ownership and board structures and the extent of its diversification. There are theoretical arguments to justify either a positive or a negative relation, depending on which of the two agency problems is assumed to matter most, and on whether diversification is assumed to be good or bad, which is a much-debated question (see Villalonga (2003) for a review of the debate). Figure 1 summarizes the four possible scenarios.

If diversification is assumed to be “good,” i.e., value-creating for all shareholders (because of efficient internal capital markets as in Gertner, Scharfstein and Stein (1994) or Stein’s (1997) models, economies of scope, or other reasons), a positive relation between ownership concentration and the firm’s number of segments will be a direct reflection of which agency problem dominates. If the conflict between owners and managers is more costly, ownership concentration will mitigate the problem (i.e., be “good”), and will be positively associated to value-creating diversification (Scenario 1). If the more costly conflict is the one

between large and minority shareholders, ownership concentration will only exacerbate it (and hence be “bad”) and NPV-positive diversification projects will not be undertaken (Scenario 2).

On the other hand, if diversification is assumed to be “bad,” i.e., value-destroying for the firm as a whole (because of information or agency problems), managers or controlling shareholders may still be able to derive private benefits from it (e.g., because of empire-building preferences (Jensen (1986); Stulz (1990), risk reduction (Amihud and Lev (1981)) or other reasons). The predicted relations between ownership concentration and number of segments will then reverse. If the conflict between owners and managers is the most worrisome, ownership concentration will help curb managers’ penchant for costly diversification (i.e. be “good”), and will hence be negatively associated to it (Scenario 3). If large shareholders are the primary beneficiaries of diversification at the expense of minority shareholders (“bad”), we will see a positive association (Scenario 4).

The two scenarios in the diagonal of the matrix shown in Figure 1 (scenarios 1 and 4) yield a common prediction:

Hypothesis 1: Firms with more concentrated ownership structures are more diversified.

The two off-diagonal scenarios in Figure 1 (scenarios 2 and 3) yield the opposite prediction:

Alternative Hypothesis 1: Firms with more concentrated ownership structures are less diversified.

2.2 Corporate Governance and the Size of Internal Capital Markets

Our second set of predictions concerns the link between governance structures and the size of internal capital markets. An internal capital market is considered to be large if a firm is

very active in reallocating funds across segments (see Stein (1997) or Billet and Mauer (2003)). At this point, we do *not* study to what extent these capital reallocations are efficient but purely look at their size and how it relates to the firm's governance structure. This relation is interesting in itself because both governance structures and internal capital markets are mechanisms that aim at ensuring that good investment projects are chosen. Therefore we want to know whether the two mechanisms work as substitutes or complements toward that end.

Corporate governance structures are set up to ensure that managers choose the right projects so that suppliers of finance get a return on their capital (Shleifer and Vishny (1997)). Large blockholders, in particular, have greater incentives than small shareholders to conduct active monitoring and have the ability to interfere, if necessary, to make sure that the right investments are undertaken. Likewise, large internal capital markets aim at finding and choosing good investments through what Stein (2003) calls the "smarter-money effect": active reallocations of capital imply an intra-firm competition for funds which can lead to better investment decisions (compared to firms where all segments can only invest what they have generated themselves). More specifically, in a firm with a very active internal capital market, large resources are shifted around from one segment to another in the form of subsidies and transfers. Competition for funding from the headquarters then creates an interdependency of otherwise unrelated investment projects. Stein (1997) shows that an active internal capital markets can therefore provide a mechanism that helps finding good investment projects.

If, on the contrary, a firm's internal capital market is *inactive*, funds are not shifted across segments and segments can keep the funds they have generated fully for their own investments. In such firms, internal capital markets are not in place as mechanisms that help finding good investment opportunities.

Given the interplay of governance structures and internal capital markets, we first hypothesize that firms with more active (i.e., larger) internal capital markets are more difficult to monitor and therefore require more concentrated ownership. Demsetz and Lehn (1985) refer to this type of need for large shareholder monitoring as a firm's "control potential." According to this hypothesis, corporate governance structures and internal capital markets act as complementary mechanisms. Under our alternative hypothesis, we posit that concentrated ownership in firms is associated with less active (i.e., smaller) internal capital markets (see Bolton and Scharfstein (1998) or Stein (1997)). This prediction assumes that both internal capital markets and corporate governance structures work as substitute mechanisms. Our two hypotheses can hence be summarized as follows:

Hypothesis 2: Firms with more concentrated ownership structures have more active internal capital markets (complements hypothesis).

Alternative Hypothesis 2: Firms with more concentrated ownership structures have less active internal capital markets (substitutes hypothesis).

2.3 Corporate Governance and the Efficiency of Internal Capital Markets

Our third set of hypotheses relates to the link between governance structures and the overall efficiency of a firm's internal capital allocations. An internal capital market is defined as being efficient if it allocates funds across the firm so as to maximize shareholder wealth (Shin and Stulz (1998)). This implies that units with better investment opportunities have priority in the allocation of funds and should receive funds from less promising units. It is important to examine this link in addition to the relation between corporate governance and the size of internal capital markets because of the potential "dark side" of these markets (Scharfstein and Stein (2000)).

Our first hypothesis posits that firms with more concentrated ownership structures operate better capital allocation processes and hence have more efficient internal capital markets. This hypothesis is a direct implication of the agency model by Scharfstein and Stein (2000). Their analysis suggests that capital misallocations are at least in part due to agency problems at the top of the organization. Inefficiencies arise if ineffective corporate governance structures allow the CEO to misallocate corporate resources to enjoy private benefits, e.g. by over-investing in segments with pet projects, or to satisfy rent-seeking divisional managers, instead of allocating them to the best investment opportunities (Rajan, Servaes, and Zingales (2000); Scharfstein and Stein (2000); Wulf (2008)).

Alternatively, one can also formulate the hypothesis that firms with less concentrated ownership (and hence more powerful managers) have better internal capital markets. As suggested in Stein (2003), internal capital markets are likely to add value in situations where investor protection is low due to weaknesses in governance structures. We can therefore summarize the two hypotheses as follows:

Hypothesis 3: Firms with more concentrated ownership structures have more efficient internal capital markets.

Alternative Hypothesis 3: Firms with more concentrated ownership structures have less efficient internal capital markets.

In the remainder of the paper, we empirically test these three sets of hypotheses.

3. Background Information

3.1 Corporate Governance in Germany

Germany offers a unique environment in which to analyze issues related to internal capital markets and corporate governance and allows conclusions to be drawn that go well

beyond the German financial system. Apart from being one of the largest and richest economies with major industrial conglomerates, the German corporate governance system provides a very rich set of different and time-varying ownership and control structures.²

Compared with the rather dispersed ownership structures in the U.S. and U.K., German companies show relatively high levels of ownership concentration with important ownership stakes being held by other corporations, banks, insurance, families, and the government (see La Porta, López-de-Silanes, and Shleifer (1999), Franks and Mayer (2001), and Faccio and Lang (2002)). Most interestingly, as we will describe later, ownership structures of German firms vary not only a great deal in the cross-section but also within-firms across time. This time-series variation, which allows us to identify the effects of changes in ownership structures, is usually not observed for U.S. firms (e.g. Zhou (2001)). Furthermore, the large heterogeneity in ownership structures provides us with the possibility to study the effects of different owner-types on the functioning of internal capital markets.

Traditionally, banks have significant amounts of direct and indirect control over German companies. Apart from being large providers of corporate debt, German banks hold ownership stakes in a wide range of corporations and conduct proxy voting on behalf of their retail customers. Through the process of proxy voting, banks frequently have more voting power than their direct holdings would suggest. Historically, corporate holdings for banks and also insurance firms were relatively stable over the last decades and dated back to equity received in lieu of cash payments from financially-constrained industrial firms following World War II (see Edwards, Lang, Maydew, and Shackelford (2004)).

² An overview of the German financial system can be found in Krahnen and Schmidt (2004), Fohlin (2005), or Enriques and Volpin (2007)

German corporate law mandates a two-tier board structure, consisting of an executive board and a supervisory board. While the executive board (*Vorstand*) conducts the day-to-day management of the firm, the supervisory board (*Aufsichtsrat*) appoints, removes and monitors the executive board and decides on major business matters such as takeovers. Members of the executive board can be compared with executive officers in a U.S. corporation, while supervisory board members can be compared with the corresponding non-executive board members. In companies with more than 2,000 employees, the system of co-determination requires that the supervisory board must be composed of equal numbers of shareholder and employee/union representatives. Compared to U.S. firms, German law hence extends significant decision-making rights to employees. In many cases, an executive board member becomes chairman of the supervisory board once he resigns from his executive duties. Frequently, the chairman of the supervisory board holds additional supervisory or even executive board mandates in other corporation, leading in many cases to a significant accumulation of board seats. Due to their direct and indirect control over German companies, banks have traditionally played an important role in German supervisory boards (see Fohlin (2005)).

3.2 The Change in the Tax Law

Effective January 1st, 2002, Germany introduced a new corporate tax law which fully exempted capital gains on shareholdings in other German firms from corporate taxation if the shares have been held for more than one year. (Holdings in foreign firms had been exempted from tax already prior to the reform).³ Until then, the tax rate on corporate capital gains had been 52%, so the new law had a substantial impact on all corporate shareholders. Because wealthy

³ A summary of the tax system before and after the reform can be found in Edwards, Lang, Maydew, and Shackelford (2004).

German families usually hold their ownership stakes through corporate investment vehicles (*Beteiligungsgesellschaften*), their holdings were also affected by the change.

Many commentators considered the change in law a revolutionary step towards breaking up the so-called “Germany Inc” (*Deutschland AG*) with its intercorporate equity holdings (see Keen (2002)). Before the tax reform, about 13% of Germany’s market capitalization was tied in a web of intercorporate equity holdings (Steinborn (2001)). Because many of these holdings dated back to World War II and German equity prices have greatly increased since then, the cost of divesting those holdings prior to the tax reform would have been prohibitive for most owners.

The change in corporate tax rate was part of a wider fundamental tax reform within the Tax Reduction Act of 2000 (which also included changes in personal income taxation). The plan of the tax exemption was first announced by the German government on December 22, 1999 and was made effective on January 1st, 2002.

The corporate capital gains tax repeal indeed caused a significant and largely exogenous reshuffling in the ownership structures of German companies, as we will show later in this paper. The change in the tax law affected the trade-off between costs and benefits of holding blocks in corporations. For a given level of benefits, the tax change increased the opportunity cost of holding a block in a firm and increased the likelihood that a blockholder relinquish control (see Helwege, Pirinsky and Stulz (2007)). This opportunity cost can be particularly high if a block has been held for a long time and accordingly has a low tax base, as was often the case in Germany. These considerations would imply a reduction in ownership concentration after the tax change. However, the tax exemption also applied to newly acquired holdings, thus increasing the incentives for new blockholdings to be formed, (see Enriques and Volpin, 2007). Hence, it is not clear ex-ante whether the tax exemption would lead to an overall increase or decrease in

ownership concentration. In Italy, for example, a similar tax break was followed by an increase in corporate cross-holdings (Bianchi and Bianco, 2006).

The large impact of a tax reform like the German one on corporate ownership structures has precedents elsewhere in the world. Notably, Morck (2005) shows that pyramidal business groups, which Berle and Means (1932) showed were prevalent in the United States prior to the 1930s, largely disappeared from the U.S. corporate landscape as a result of inter-corporate dividend taxation and other tax reforms that rendered them too costly to maintain.

4. Sample and Data

4.1 Sample Construction

We constructed our sample by starting with all firms included in the German stock market index CDAX. The CDAX is comparable to the S&P 500 in the U.S. and covers all German firms whose shares were admitted to the Prime Standard and General Standard segments of the German Stock Exchange. We then collected business segment data for all German firms that have been members of the CDAX in 2000. German firms are required to disclose segment-level information since 1998. These data are available from Worldscope and are described in detail in Appendix I. We then dropped from the sample those firms for which we did not have at least one segment data item. Finally, we excluded all financial and real estate firms with SIC codes between 6000 and 6999. Our sample period for all subsequent analyses is the period 2000-2006.

Firms were classified as diversified if the number of operating segments (financial or non-financial) in different two-digit SIC codes was greater than one. All other firms were classified as focused, including (i) firms with only one operating segment, (ii) firms with more

than one operating segment which all operate in the same two-digit SIC code industry, and (iii) firms without any business segment information.

Table 1 reports descriptive statistics for the sample firms. It shows that the size of the firms in the sample is relatively skewed, with the mean (median) firm having a market capitalization of EUR 1,7 billion (EUR 79 million). The median firm reports data for three business segments, of which two are true operating segments (as opposed to holding entities or accounting segments constructed, for instance, to reflect consolidation adjustments).

4.2 Corporate Governance Measures

As a next step, we collected extensive data on the ownership and board structures of all firms with segment data. German companies are required to report the holdings of all shareholders that own more than 5%. We hand-collected this information from annual reports and, if available, from SEC Forms 20-F.⁴ Based on this information, we construct three widely used ownership measures. First, *block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm.^{5, 6} Second, *ownership concentration* is the Herfindahl index of the individual ownership stakes. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. Third, *top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). For comparison with other studies, e.g. La Porta, López-de-Silanes, and Shleifer (1999), we also report the fraction of firms that are widely held, *WH20* and *WH10*. According to this definition, a firm is widely held if there is no controlling shareholder who owns more than 20% (10%) of the shares of a firm. Whenever

⁴ Forms 20-F contain information on major shareholdings and need to be filed with the U.S. Securities and Exchange Commission (SEC) by German firms that are cross-listed in the United States.

⁵ Employee holdings are not aggregated; thus, the only employees that are considered blockholders are those who individually hold more than 5%.

⁶ Whenever firms have ADR programs, the shareholdings of the trustees were not considered as a block (the trustee issues certificates which are rights on the shares and which are held by other investors).

there was a difference between voting rights and cash-flow rights, we used the voting rights for the calculation of our ownership measures.

We also use our hand-collected ownership data to trace the exact identity of all shareholders that hold more than 5%. Based on this information, we group all shareholders into one of the following categories: bank, insurance, corporation, institutional investor, insider, government, and others (e.g. non-profit foundations). Institutional investors include pension funds, mutual funds, hedge funds or private equity firms. Insiders include executives of the firm, family members of the founders of the firm, and in a small number of cases private individuals. We cannot differentiate between executives and founding family members because often (especially in small firms) only the sum of the two was often reported. We are also unable to observe the proxy voting rights that banks exercise on behalf of their customers. Our variable for bank ownership should therefore be considered as a lower bound.

We use the biographical information about the supervisory board members reported in annual reports and 20-F forms to construct a wide range of variables capturing the supervisory board characteristics of German firms. *Outside directors* measures the percentage of members on the supervisory board who are outsiders. Outsiders are defined as individuals that are neither top executives, retired executives, former executive, or employees of the firm nor union representatives, and who do not have other consulting or advisory links with the firm for which they are compensated. *Chairman is former executive* is a dummy that is set equal to one if the Chairman of the supervisory board is a former executive board member of the firm. *Chairman's other mandates* reflects the number of companies in which the chairman of the supervisory board also serves as member of the supervisory or executive board.

Table 2 presents summary statistics for our governance variables. According to all measures, ownership is relatively concentrated. The mean (median) *block ownership*, for example, is 44.9% (40.9%) per firm-year, and only 22% (36%) of the firms can be considered widely-held according to the *WH10* (*WH20*) measure. Figure 2 shows the distribution of *block ownership*. A separation of *block ownership* into different owner-types reveals that German firms are owned mainly by insiders (mean ownership of 23.1%), other corporations (10.1%), and institutional investors (5.0%). However, financial institutions also have significant stakes in some German corporations, with top 5% of the firm-years showing a bank (insurance) ownership of above 5.8% (6.2%). With respect to the board variables, the mean fraction of outside directors is 81% per firm-year, driven partially by smaller firms without employee representatives. The chairman of the supervisory board is a former executive in 12% of the firm-years.

Table 3 contains information on the evolution of the different ownership measures around the capital gains tax reform, which became effective in 2002. Panel A documents that the reform lead to an overall decrease in ownership, with median *block ownership* declining from 47.3% in 2002 to 41.5% in 2006.⁷ It is interesting to note that the changes in ownership were far from uniform. Panel B, for example, shows that very significant reductions in ownership can be observed for large firms. For this group of corporations, the median *block ownership* decreased from 42.8% in 2002 to 30% in 2006, a reduction of 30%. The ownership reduction was most pronounced in the year after the reform. In contrast, small firms showed an overall increase in ownership concentration after 2002.

⁷ Some ownership changes took already place before the tax reform, i.e. in the years 2000 and 2001. Our results in the subsequent analysis do not change if we exclude the 2000-2001 period from our analysis. Our regression results also do not change if we exclude the year 2006 from the analysis (the year which shows a slight reversal in the ownership variables).

Panel D shows that the increases in ownership are mainly due to increased holdings by institutional investors and corporations. Institutional investors increased their average stockholdings by 16% (from 4.8% in 2002 to 5.6% in 2006), and corporations by 32% (from 8.9% to 11.7%). Most strikingly, banks reduced their holdings by 45% and insurance firms by 71%. These substantial reductions in bank and insurance ownership mainly took place immediately after the 2002 tax reform, which is consistent with the evidence in Dittmann, Maug and Schneider (2008). Overall, the divergence in the evolution of equity holdings across owner-types after the tax reform is consistent with Enriques and Volpin's prediction (2007) that the tax change in Germany would not necessarily lead to an overall reduction in ownership. Figures 3 to 5 illustrate the evolution of ownership graphically.

4.3 Internal Capital Markets: Measures and Descriptive Statistics

We use two different measures of both size and efficiency of internal capital markets. Our size measures take into account all operating segments. However, the efficiency measures are based on operating non-financial segments only, for reasons of comparability.⁸ Appendix II explains in detail the exact procedure behind the construction of each variable, which we only summarize here.

Measures of the Size of the Internal Capital Market

Our measures of the size of a firm's internal capital market capture the amount of resources exchanged within a multisegment firm.

⁸ Financial segments are not comparable to non-financial segments on several dimensions. First, their investment rates are very different. Investment in fixed assets, for example, is negligible for financial segments. Second, we cannot match data on financial segments with stand-alone financial firms due to different reporting standards. Whenever an industrial firm operates a financial segment, business segment data have to be disclosed according to the segment reporting rules that are used for all other non-financial segments. The data are therefore not comparable with those of financial firms such as banks. Third, ROA as a measure of profitability is inadequate for banks and financial segments of non-financial firms, because the risk of the assets is not taken into account. The literature has suggested alternative measures for financial firms like Risk-Adjusted Return on Capital (see, for example, Stoughton and Zechner (2007) and the references cited therein).

For our first proxy, $SizeICM_i^{BM}$, we follow the methodology in Billet and Mauer (BM, 2003) and directly calculate the resources exchanged. We calculate for each segment whether it is a net provider or a net receiver of funds based on the difference between its after-tax cash flow and its investment (capital expenditures). If this difference is positive (i.e., if the segment does not invest all the cash it generated), a segment provides capital to other segments in the firm by making a transfer. Likewise, if the difference is negative, a segment can only finance its investment through capital received in the form of a subsidy through the internal capital market from other segments. As discussed in the Appendix, we subtract an allocated share of dividends from a segment's transfer amounts. The size of a firm's internal capital market in a given year is then calculated as the sum of the values of the different transfers and subsidies, standardized by total firm assets.

For our second proxy, $SizeICM_i^{RSZ}$, we follow the more indirect computation method from Rajan, Servaes and Zingales (RSZ, 2000). We measure cross-subsidies as the difference between a segment's investment rate and the average investment rate of single-segment firms in the same industry (i.e., we compute the industry-adjusted investment rate of a segment). We then follow RSZ and make an adjustment to this standardized investment rate by subtracting the industry-adjusted investment rate averaged across the segments of the firm. We do this to account for the fact that diversified firms might have more overall funds available than single-segment firms. Finally, we define that a segment receives a subsidy (makes a transfer) if this adjusted investment rate is larger than 0 (smaller than 0) and measure the size of a firm's internal capital market as the sum of the absolute values of the subsidies and transfers across all segments. Like in the BM measure, larger numbers of this size proxy suggest that higher amounts of resources are exchanged within a firm.

Panel A of Table 4 reports descriptive statistics for both size measures.

Measures of the Efficiency of the Internal Capital Market

An internal capital market is defined as being efficient if segments with better investment opportunities have priority in the allocation of funds and receive resources from less promising units (see Shin and Stulz (1998)).

Our first efficiency measure follows BM. For each segment-year, we calculate the return on assets as a measure of the segment's investment opportunities. We then compare a segment's return on assets with the asset weighted return on assets (ROA_j) of the firm's remaining segments. We then define a subsidy as efficient (inefficient), if the ROA of the money-receiving segment is above (below) the average ROA of remaining segments $\overline{ROA}_{-j}$. We measure the contribution of the subsidy to the overall efficiency of the internal capital market by multiplying $ROA_j - \overline{ROA}_{-j}$ by the amount of the subsidy. This product is positive if a subsidy is efficient and negative if it is inefficient. Likewise, a transfer is considered efficient (inefficient), if the ROA of the money-providing segment is below (above) the average of the remaining segment. The contribution to the value of the internal capital market is then computed as $(\overline{ROA}_{-j} - ROA_j) * Transfer_j$. A transfer is efficient if the product is positive and inefficient if it is negative. Finally, we calculate the overall efficiency of a firm's internal capital market by adding up across all of the firm's segments the values of efficient and inefficient subsidies as well as the values of efficient and inefficient transfers and standardize this sum by total assets of a firm. The resulting proxy is called $EffICM_i^{BM}$.

Our second and alternative efficiency measure follows RSZ. We use their measure of a segment's subsidy/transfer and multiply it by the difference between the segment's ROA and the

average ROA of the remaining segments in the firm. Finally, we add the weighted subsidies and transfers across all segments of a firm in a given year and standardize it by total firm assets. The resulting efficiency variable is abbreviated as $EffICM_i^{RSZ}$.

Descriptive statistics of both efficiency measures are presented in Panel A of Table 4. The panel also includes dummy variables that is set equal to zero if the internal capital market of a firm is *inefficient* according to the measure by BM and RSZ, respectively; and one otherwise. Panel B reports the grouping of firm-year observations according to these two binary measures of inefficiency. As can be seen from the panel, about 92% of the firm-year observations are put into the same category, with the remaining deviations being due to the slightly different nature of the BM and RSZ methodologies.

Finally, we complement our governance and internal capital markets measures with several control variables that we construct using firm-level data from Worldscope. A description of all variables in our data set is provided in Table A-1 in Appendix II.

5. Empirical Results

5.1 Preliminary Results: Univariate Analyses

In this section, we analyze the univariate relations between corporate governance and internal capital markets using our various measures. Table 5 reports the number of operating segments as well as the size and efficiency measures for firms with high and low block ownership (which we use as our main governance variable). For each of the two groups, the table also contains a dummy variable that is set equal to zero if the internal capital market of a firm is overall inefficient according to the BM or RSZ measure; and one otherwise.

Consistent with Alternative Hypothesis 1, we find that firms with higher block ownership have fewer operating segments. This result is in line with the notion that ownership

concentration prevents CEOs from engaging in value-destroying diversification to satisfy their private objectives (Scenario 3 in Figure 1). However, it is also consistent with the notion that large shareholders fail to engage in value-creating diversification (e.g. Jensen (1986) or Stulz (1990)). If, as the results of Lins and Servaes (1999) suggest, diversification in Germany on average has no significant impact on value, the implication is that the benefits and costs of ownership concentration cancel each other in the aggregate.

We also find preliminary evidence in support of Alternative Hypothesis 2, which suggests that firms with more concentrated ownership have smaller and less active internal capital markets. Our findings indicate that active reallocations of resources act as a substitute mechanism to governance structures in facilitating that good investment projects are chosen, as suggested by Stein (2003).

Finally, we find some preliminary support for Hypothesis 3 in that inefficient internal capital markets are less frequent among firms with high block ownership. Specifically, $(1-0.849=)$ 15.1% of the firms that have low block ownership in a given year operate an internal capital market that can be categorized as being overall inefficient based on the BM measure; this compares to only $(1-0.937=)$ 6.3% of firms if block ownership is high. These univariate results are in line with models such as Scharfstein and Stein's (2000) who suggest that capital misallocations are in part due to agency problems at the headquarters level. In what follows, we use multivariate regression analysis to shed further light on the above relations.

5.2 Corporate Governance and Diversification

The first question we address in our multivariate analysis is whether firms with more concentrated ownership are more or less diversified. To answer this question, we regress the number of operating segments on our ownership measures, the fraction of outside directors, the

number of mandates of the chairman, and the dummy that reflects whether the chairman used to be a former executive of the firm. We hereby follow Lang and Stulz (1994) and Berger and Ofek (1995) in using the number of segments as a measure of diversification. As further controls, we include firm size, leverage, liquidity, and profitability. All variables are defined in Table A-1. To account for any year-specific effects, we estimate our regressions with year-fixed effects. The standard errors are corrected for heteroskedasticity and clustered at the firm level to account for intra-firm autocorrelation. For robustness, we also cluster the standard errors at the year level. We are unable to use firm fixed effects as our dependent variables and also several independent variables often do not vary over time. Constants are not reported but were included in all regressions.

Our estimates in Table 6, based on negative binomial regressions, confirm the previous univariate results. More specifically, they indicate that firms with more concentrated ownership operate smaller number of segments, as predicted by Alternative Hypothesis 1. Firms with more segments also seem to be larger, more leveraged, and have higher cash holdings.

In unreported regressions, we re-estimate the regressions from Table 6 including only observations from the sub-period 2002-2006. We do this to ensure that our results are not driven by the variation in ownership before the 2002 tax change. The results are qualitatively similar to those reported here. For robustness, we also use the number of reported segments instead of the number of operating segments as the dependent variable, and find that the results are the same.

5.3 Corporate Governance and the Size of Internal Capital Markets

In a next step, we regress the measures of the size of internal capital markets on the different ownership variables and controls. We do this to investigate whether internal capital markets and governance mechanisms work as substitutes or complements. Recall that our size

proxies measure the amount of resources exchanged within a multisegment firm. Whereas the BM measure directly tries to compute the exchanged resources by looking at the difference between segment cash flow and segment investment, the RSZ measure is more indirect and compares segment investment rates with those of stand-alone firms. We include the same set of controls as in the previous regressions.

The estimates in Table 7 provide evidence in line with Alternative Hypothesis 2 and the univariate results in Table 5. All ownership measures are negatively related to the size of the internal capital market, suggesting that internal capital markets and ownership structures work as substitute mechanisms to ensure that good investment opportunities are chosen. However, the only significant association is that between the Herfindahl index of ownership concentration and the RSZ measure of internal capital market size (see Panel B). Based on the results in column (9) of Panel B, a one standard deviation increase in *ownership concentration* decreases the average RSZ size measure by about 5%.

Interestingly, our results also suggest a relation between the number of mandates of the chairman and whether or not he or she is a former executive. However, the effects do not hold for both size specifications and the causal effect is (for the reasons discussed above) less clear than for the ownership variables. Further results from Table 7 imply that more highly leveraged firms and, to some extent, less profitable firms also operate more active internal capital markets.

5.4 Corporate Governance and the Efficiency of Internal Capital Markets

Having studied the extent of capital reallocations without evaluating their efficiency, we proceed to link the governance structure variables with our two efficiency measures. We regress the dummy variable that indicates if the internal capital market of a firm is overall inefficient or

not on the ownership and board variables as well as on our set of controls.⁹ As in the previous section, we use two different efficiency measures, one based on the method by BM and one based on RSZ. In our reported baseline regressions, we set the efficiency dummies equal to 1 if the underlying continuous efficiency measures had missing values, because in such cases we cannot identify that the internal capital market is inefficient. However, our results in the subsequent analysis do not change if we leave those values as missing.

The logit regressions in Table 8 show that an increase in ownership concentration, regardless of how we measure it, appears to positively affect the efficiency of a firm's internal capital market. These effects are highly significant and hold independently of whether the efficiency measure is computed based on BM or RSZ. With regard to the economic effect, based on the regressions in column (3) of Panel A, a one standard deviation increase in *ownership concentration* reduces the probability that the average firm in a given year operates an inefficient internal capital market by 0.034.

Table 8 further suggests that firms with higher fractions of outside directors are less likely to show inefficient resource reallocations. Again, this result holds independent of whether we calculate the efficiency of a firm's internal capital market according to the BM or RSZ measure. Based on the regressions in column (9), a one standard deviation increase in the fraction of outside board members is associated with a decrease in the probability of operating inefficient resource allocations by about 5%. As pointed out previously, we are more careful with

⁹ We use the efficiency dummies as dependent variables because the continuous efficiency measures frequently take the value 0. This happens, for example, whenever a firm has two operating segments, one of which is a financial operating segment. The measure of the efficiency of the internal capital market measures is then 0 by definition (as the efficiency measure is based only on operating non-financial segments). Specifications using this variable in linear regressions would therefore be inappropriate. Using a dummy that takes the value 0 if and only if a firm has an inefficient internal capital market (and 1 otherwise) avoids this problem.

establishing a causal link between outside directors and the capital market efficiency as the change law had a more indirect effect on the composition of German supervisory boards.

The results in Table 8 further suggest that larger and more leveraged firms operate less efficient internal capital markets. It is well recognized that high leverage can result in distorted investment policies due to asset substitution (Jensen and Meckling, 1976), underinvestment (Myers, 1977), or inefficient liquidation policies (Harris and Raviv, 1990). Our finding of a negative effect of leverage on the efficiency of internal capital markets is consistent with some of these classical arguments as well as with the results of Peyer and Shivdasani (2001), who specifically show that high leverage has the potential to distort a firm's internal investment policy.

In unreported regressions, we again re-estimate the regressions from Table 9 for the sub-period 2002-2006 to ensure that our results are not driven by the variation in ownership before the 2002 tax change. While the obtained results for the RSZ are basically identical in all specifications, the results for the BM measure have the same signs and coefficients but are not significant across all ownership specifications (with the *t*-statistics being close to significant in these cases). We also obtain very similar results if we re-run our regressions with lagged values of the governance variables and if we compute the efficiency measures with imputed segment Tobin's Q instead of Return on Assets.

Overall, the results in Table 8 are consistent with our Hypothesis 3. If ownership is concentrated in the hands of large blockholders, multisegment firms seem to be more likely to prioritize segments that show promising investment opportunities and reallocate corporate resources accordingly. Hence, large owners seem to play an important monitoring role in preventing CEOs from misallocating corporate resources to enjoy private benefits, as suggested by the theoretical models of Rajan, Servaes, and Zingales (2000), Scharfstein and Stein (2000),

and Wulf (2008). Our results are in line with previous studies suggesting that large shareholders have stronger incentives to monitor and are more active in governance (e.g. Shleifer and Vishny (1986), and Franks and Mayer (2001) for Germany). They also confirm the evidence in Lins and Servaes (1999) that the diversification discount of German firms is smaller for firms with high insider ownership.

In Table 9 we further trace the mechanism behind the efficiency-increasing effect of large blockholders. We decompose *block ownership* into its constituent owner-types to investigate whether certain types of owners are particular effective in increasing the efficiency of capital allocations. Most interestingly, we find that an increase in ownership by other corporations and/or by insiders appears to positively affect the allocative efficiency of multisegment firms. In contrast, increases in bank ownership have a negative effect that is significant in specification (1) of Panel A.¹⁰ Our results are again robust to using lagged values.

Given that the tax reform led to decreases in bank and insider ownership yet corporate ownership increased, the implication is that the tax reform's indirect impact on the efficiency of internal capital markets was mixed. The broader implication is that governments should exercise caution when implementing reforms that seek convergence in international governance structures. Our results suggest that, at least with regard to the internal allocation of resources, German corporations and their minority shareholders have benefited from the demise of the banks' corporate control and the improved incentives for industrial corporations to invest in one another. Yet the decrease in insider (including founding family) ownership has had a negative impact.

5.5 Firm Performance and Efficiency of Internal Capital Markets

To close our analysis, we relate the measures capturing the efficiency of the firms' internal capital market with their overall corporate performance. We therefore regress the

¹⁰ Dittmann, Schneider and Maug (2008) provide related evidence on the dark sides of bank ownership in Germany.

Tobin's Q of a firm in a given year on the efficiency dummies and a set of controls. To alleviate measurement problems with respect to Tobin's Q , we use two alternative transformations of Tobin's Q (see Ferreira and Matos (2007)): $\log(Q)$ and $-1/Q$. The regression estimates are reported in Table 10. In regressions (3)-(6) we include a dummy variable that takes the value 0 if the internal capital market of a firm is inefficient according to the measure by BM, i.e. if their inefficiency measure is negative; and 1 otherwise. Likewise, in regressions (7)-(10) we include a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by RSZ, i.e. if their efficiency measure is negative; and 1 otherwise.

The results in Table 10 show that a more efficient internal capital market also translates into higher firm performance, independent of whether we use the BM or the RSZ measure. Our results are consistent with the findings in Billet and Mauer (2003) who show that their efficiency measures are similarly related to the excess value (diversification discount) of a firm. Our results are identical if we estimate the regressions for the 2002-2006 period.

5.6 Changes in Ownership Structures and Firm Characteristics: Selection versus Influence

In order to identify a causal effect of the changes in ownership on internal capital markets, we need to mitigate concerns that the ownership changes were mainly due to expected future changes in the internal organization (i.e., the size and efficiency of the internal capital markets) and not to the tax change. We address these concerns in different ways.

First, while selection arguments are a severe concern in studies relating firm performance and governance variables (see the arguments in Giannetti and Laeven (2008)), ownership changes in anticipation of changes in firms' internal capital markets are much less likely. While investors might increase ownership in anticipation of a higher firm value, it is unlikely that investors adjust their holdings in anticipation of changes in the internal capital market.

Consistent with this argument, Stein (2003), for example, writes that it is hard to see why (management) ownership should be spuriously correlated with measures of internal capital allocation.

Second, we take the view that some investors might believe that changes in the internal capital markets will necessarily lead to changes in firm performance and therefore adjust their holdings in anticipation of such changes. To mitigate that such considerations drive our results, we test whether in firms where substantial ownership reductions were observed, blockholders did expect a particularly low future performance. We therefore compare firms that experienced large reductions in ownership with firms that only saw small reductions. We follow Helwege, Pirinsky and Stulz (2007) and define a decrease in block ownership as large if the reduction in Block ownership at a given firm and in a given year was at least 5%. Table 11 compares firm characteristics for firms of the two groups. Most importantly, the table shows that both profitability (EBIT/Total Assets), i.e. a measure of current performance, and Tobin's Q, i.e. a measure of expected future performance, do not significantly differ between firms experiencing large and small declines in ownership. Furthermore, the reduction in ownership also does not seem to be related to other observable firm characteristics, namely market capitalization, leverage or liquidity (cash holdings).

6. Conclusions

This paper shows that corporate governance has a significant impact on the size and efficiency of internal capital markets. Specifically, ownership concentration reduces the extent of corporate diversification and the size of a firms' internal capital markets, but increases the probability that such markets are in fact efficient.

Our paper contributes to the literature in several ways. First, despite a rich theoretical literature about the relation between corporate governance and internal capital markets, our study is one of the first to empirically test this relation and, to our knowledge, the first one to control for both endogeneity and measurement error problems. By doing so, we are able to test theories of internal capital markets and provide evidence of the causal link between ownership structures and the size and efficiency of these markets.

Second, our paper contributes to the corporate governance literature by providing new evidence about the benefits and costs of ownership concentration. Specifically, our findings suggest that the agency benefits of ownership concentration outweigh its agency costs, since large shareholders successfully prevent self-interested managers from engaging in value-destroying diversification and ensure that internal resource allocation is based on the attractiveness of investment opportunities and not on agency motives or informational distortions.

Third, because we use a recent tax reform in Germany as a natural experiment for our study, we are also able to evaluate the impact of the reform on the welfare of minority investors, which the reform sought to protect. In this sense, our findings suggest that the reform may have in fact been counterproductive. The policy implication is that caution should be exercised when implementing tax or other legal reforms that seek convergence in international corporate governance systems, since there is no “one size fits all” solution to governance problems.

Appendix I

Segment Data Reporting

Since 1998, German firms are required to report segment-level information, which allows us to construct the measures of the size and efficiency of internal capital markets used in this paper (see Beer, Deffner and Fink (2007) and Langguth and Brunschön (2006)). Because most large German firms report according to the international accounting standards IFRS and US-GAAP (around 99% of all large firms), most of our sample firms follow the corresponding segment rules of IAS 14 and SFAS 131. The remaining firms use the German Accounting Standard, whose segment reporting rules are qualitatively similar to the international ones. There is no appreciable difference between the two standards in the quality of the data reported.

Overall, segment disclosure rules in Germany are hence basically identical to the requirements for U.S. firms. For each segment, firms have to report its business description, total sales, operating income, total assets, capital expenditures, and depreciation. Segment data have to be reported for all firm segments for which either (i) total segment sales are larger than 10% of total firm sales or (ii) total segment assets are larger than 10% of total firm assets.

Like any study that uses business segment data, we have to deal with some potential weaknesses of these data (see, e.g., Villalonga (2004b)). First, we find, as do Beer, Deffner and Fink (2007), that the quality of segment reporting in Germany increases with firm size. Some small firms, for example, do not fully report all mandatory segment variables. Since our internal capital markets measures require the availability of a wide range of variables, large firms are therefore somewhat overrepresented in our sample. Second, an inspection of our segment data and an analysis of annual reports show many segment reorganizations and name changes that took place during our sample period. Thus, it is difficult if not impossible to track a specific

segment over time. In line with Rajan, Servaes, and Zingales (2000, p. 54), we address this problem by ensuring that no data item is calculated using data spread over multiple years. Third, since there have been some changes in accounting and segment reporting regimes over our sample period, we add year dummies to our regressions to account for such effects. We also analyze the annual reports of the sample firms to see whether changes in accounting rules have lead to reorganizations of the segments disclosed. However, this turned out never to be the case.

Appendix II

Variable Descriptions

A. Construction of internal capital market variables

Throughout this paper, we use the following conventions and notation:

- If a segment receives internal capital from other segments, we say it receives a subsidy. If a segment provides internal capital into to other segments, we say it provides a transfer.
- For the construction of the size of an internal capital market, we use all operating segments of a firm. The calculation of the efficiency measure is based on all operating non-financial segments.

1. Size measure according to Billet and Mauer (BM, 2003)

- To measure the size of the internal capital market, we apply the measure from Billet and Mauer (2003).
- For each year and each firm, we categorize a segment j as a provider or receiver of internal capital based on the difference between a segment j 's after tax cash flow ($ATCF_j$) and its investment I_j (capital expenditures), i.e. $ATCF_j - I_j$.
- If the difference is positive, a segment j provides capital to other segments in the firm by making a transfer. If the difference is negative, a segment receives a subsidy.
- Thus: $Subsidy_j^{BM} = \max(I_j - ATCF_j, 0)$.
- A segment's after tax cash flow is computed as $ATCF_j = (EBIT_j - R_j)(1 - T_j) + D_j$ where R_j is a segments imputed interest expense, and T_j is a segments imputed tax rate, and D_j a segments depreciation.

- T_j is the median ratio of taxes paid to pretax income of single-segment firms in the segments
- R is computed as the product of a segment's reported sales and the median ratio of interest expense to sales of single-segment firms in the segments industry.
- D_j based on the available segment data of a firm.
- If $ATCF_j > I_j$, the segment j makes a transfer. We construct this transfer in two steps.
- In a first step, we define $PotentialTransfer_j^{BM} = \max(ATCF_j - w_j Div_i - I_j, 0)$, where w_j is the asset weight of transfer segment j , and Div_i is the cash dividend paid by the firm.
- To make sure that transfers do not exceed subsidies, but to allow that subsidies exceed transfers, we follow BM (2003) and calculate in a second step the transfer as

$$Transfer_j^{BM} = \min[PotentialTransfer_j^{BM}, \frac{PotentialTransfer_j^{BM}}{\sum PotentialTransfer_j^{BM}} (\sum Subsidy_j^{BM})].$$

- This is done to account for the fact that some investment is externally financed.
- The size/volume of an internal capital market of a given firm in a given year is then calculated as the sum over the values of the transfers and subsidies (standardized by total firm assets (TA_i)), i.e. as

$$SizeICM_i^{BM} = \frac{\sum Subsidy_j^{BM} + \sum Transfer_j^{BM}}{TA_i}.$$

This variable is our first measure of the size of the internal capital market at firm i in year t .

2. Size measure according to Rajan, Servaes and Zingales (RSZ, 2000)

- As an alternative measure of the size of an internal capital market, we use the method from Rajan, Servaes and Zingales (RSZ 2000) and look at the difference between the investment a

segment makes when it is part of a diversified firm and the investment it would make had it been a stand-alone firm (single segment (*ss*) firm in the same industry), i.e. we calculate: $I_j / TA_j - I_{ss} / TA_{ss}$. I_{ss} / TA_{ss} is the average investment rate of single-segment same-industry firms.

- We follow RSZ and make an adjustment to this standardized investment rate as a diversified firm might have more funds available than a stand-alone firm. If we measure transfers and subsidies by the difference between the investment rate of a segment and that of a single-segment firm, we might otherwise treat these additional funds as resources exchanged rather than as additional funds to all segments. We therefore calculate the following adjusted investment rate: $I_j / TA_j - I_{ss} / TA_{ss} - \sum_j w_j (I_j / TA_j - I_{ss} / TA_{ss})$, where I is investment of segment j , ss means single segment firm, w is a segment j 's share of total firm assets (TA).

- We then define that a segment receives a subsidy/makes a transfer if the following holds:

$$Subsidy_j^{RSZ} = I_j / TA_j - I_{ss} / TA_{ss} - \sum_j w_j (I_j / TA_j - I_{ss} / TA_{ss}) \text{ if Value} > 0$$

$$Transfer_j^{RSZ} = I_j / TA_j - I_{ss} / TA_{ss} - \sum_j w_j (I_j / TA_j - I_{ss} / TA_{ss}) \text{ if Value} < 0.$$

- The size of the internal capital market of firm i at time t is then the sum of the *absolute* values of transfers and subsidies across all segments of a firm i in a year t , i.e.

$$SizeICM_i^{RSZ} = \sum Subsidy_j^{RSZ} + \sum |Transfer_j^{RSZ}|.$$

- This variable is our second measure of the size of an internal capital market of a firm.

3. Efficiency measure according to Billet and Mauer (BM, 2003)

- For each year and each segment, we calculate the return on assets (ROA_j) which is the ratio of a segments earnings before interest, taxes, and depreciation to its total assets.
- We then also calculate the asset-weighted average return on average ($\overline{ROA}_{-j}$) of a firm's remaining segments.
- We follow BM and define a subsidy as efficient (inefficient) if $ROA_j > \overline{ROA}_{-j}$ ($ROA_j < \overline{ROA}_{-j}$).
- We measure the contribution of the subsidy to the value of a firm's internal capital market as $(ROA_j - \overline{ROA}_{-j}) * Subsidy_j$. This product is >0 if subsidy is efficient and <0 if it is inefficient.
- We likewise classify a transfer as efficient (inefficient) if $ROA_j < \overline{ROA}_{-j}$ ($ROA_j > \overline{ROA}_{-j}$).
- We measure the contribution of the transfer to the value of a firm's internal capital market as $(\overline{ROA}_{-j} - ROA_j) * Transfer_j$. This product is >0 the transfer is efficient and <0 if it is inefficient.
- In total, we hence have four possible cases:
 - 1) Efficient Subsidy (Value >0)
 - 2) Efficient Transfer (Value >0)
 - 3) Inefficient Subsidy (Value <0)
 - 4) Inefficient Transfer (Value <0).
- Then we calculate the overall efficiency of an internal capital market by adding up across all segments of a firm the values of the different subsidies and transfers (the values of efficient and inefficient subsidies as well as the values of efficient and inefficient transfers).
- Then we standardize this measure by total assets of a firm

$$EffICM_i^{BM} = \frac{EfficientSubsidy / Transfer + InefficientSubsidy / Transfer}{TA_i}.$$

This variable is our measure of the efficiency of the internal capital market at firm i in year t .

4. Efficiency measure according to Rajan, Servaes and Zingales (RSZ, 2000)

- To construct an alternative measure of the efficiency of an internal capital market, we follow RSZ and weight the measure of a subsidy to/transfer from a segment by the difference between a segment's ROA_j and the average $\overline{ROA}_j$ in the firm.
- We then add the weighted subsidies and transfers across all segments of a firm i in a given year t and standardize it by total assets.
- The efficiency of an internal capital market is then measured as

$$EffICM_i^{RSZ} = \frac{\sum_j TA_j (ROA_j - \overline{ROA})(I_j / TA_j - I_{ss} / TA_{ss}) - \sum_j w_j (I_j / TA_j - I_{ss} / TA_{ss})}{TA_i}.$$

This variable is our second measure of the efficiency of the internal capital market of a firm.

5. Deviations from and extension of the above measures in our analysis

In our analysis, we made the following simplifying assumptions and deviated slightly from the above procedures:

- Instead of using single segment firms to impute tax rates of segments, we use the tax paid by the company and allocate it to the segments based on earnings weights.
- Whenever we use variables for a segment (such as the imputed segment Tobin's Q , segment ROA , or an industry investment rate) based on a comparison with data from firms operating in the same two-digit SIC code, we calculate the respective variable using all CDAX firms with a matching based on the primary SIC code.¹¹ In the baseline case, we calculate the

¹¹ Our results do not change if we conduct our comparison based on three-digit SIC codes.

(equal-weighted) mean across all of these firms. In robustness checks, we also analyze the asset-weighted mean and the median. We also only analyze variables of comparable focused (single segment) firms instead of firms that are focused *and* firms that are diversified. However, this has the drawback that it dramatically reduces the number of observations.

- We equal-weight all variables in the formulas above. In robustness checks, we use also use an asset-weighting.
- In our regressions, we do not include the “raw” and continuous efficiency measures from BM and RSZ as described above but rather a dummy variable which indicates whether the internal capital market of a given firm can be classified as being inefficient or not. We call these variables $DEffICM_i^{BM}$ and $DEffICM_i^{RSZ}$. The reason for this procedure is that in many cases the efficiency measures takes the value 0. This happens, for example, if a firm has a non-operating segment and two operating segments whereby one of these two operating segments is a financial operating segment. The measure of the efficiency of the internal capital market measures is 0 in that case (as the efficiency measure is based only on operating non-financial segments). Specifications using the normal efficiency measure in linear regressions would therefore be inappropriate and misspecified. Using a dummy that is set equal to zero if and only if a firm has an inefficient internal capital market avoids this problem.
- For robustness, we also use imputed segment Tobin’s Q instead of Return on Assets for the construction of the efficiency measures.

B. Other variables

Table A-1 provides an overview of the variables in our data set and the respective data sources.

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Table 1
Firm characteristics: Descriptive statistics

This table reports summary statistics of the firms in our sample. *Market capitalization* is the market value of equity of a firm (Worldscope code WC08001). *Firm size* is the book value of total assets (WC02999). *Leverage* is total debt (WC 03255) divided by total assets. This variable is winsorized at 1% and 99%. *Liquidity* is the value of cash and marketable securities (WC02001) divided by total assets (also winsorized at 1% and 99%). *Profitability* is earnings before interest and taxes (EBIT) (WC18191) divided by total assets (winsorized at 1% and 99%). *Tobin's Q* is the market value of assets divided by the book value of assets. The market value of assets equals the book value of assets plus the market value of equity less the book value of equity. *No. of reported segments* is the number of segments of a firm that is reported in Worldscope. *No. of unrelated segments* is the number of segments in different 2-digit SIC code industries. *No. of operating segments* is the number of operating segments, i.e. the number of segments that are not consolidation or holding segments. The source of our data is Worldscope. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables.

Variable	Mean	Median	STD	5% Perc.	95% Perc.	Obs
Market capitalization (in 1000 EUR)	1,773,859	79,330	7,311,083	8,083	7,784,044	1710
Firm Size (in 1000 EUR)	3,240,180	123,898	14,954,760	14,088	10,323,000	1713
Leverage	0.53	0.56	0.25	0.12	0.89	1680
Liquidity	0.16	0.09	0.20	0.01	0.53	1158
Profitability (EBIT/Total assets)	0.03	0.06	0.18	-0.28	0.27	1602
Tobin's Q	1.58	1.22	1.30	0.69	3.65	1677
No. of reported segments	3.16	3.00	1.75	0.00	6.00	1713
No. of unrelated segments	2.07	2.00	1.06	1.00	4.00	1607
No. of operating segments	1.74	2.00	0.98	1.00	4.00	1713

Table 2
Corporate governance characteristics: Descriptive statistics

This table contains summary statistics of corporate governance variables of the firms in our sample. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). WH20 (WH10) represents the fraction of firms that are widely held. A firm is widely held if there is no controlling shareholder who owns more than 20% (10%) of the shares of a firm. The table also contains ownership information on the different types of blockholders of a firm. The underlying ownership measure is *block ownership*. For each owner-type, the table hence contains information on the ownership stakes in a firm (in %). Insiders are defined as either executives of the firm or members of the founder-family of a firm. *Outside directors* is percentage of directors on the supervisory board who are outsiders. Outsiders are directors that are neither current nor former executives/employees of the company. Union activists are not categorized as outsiders. *Chairman's other mandates* is the number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board. *Chairman is former executive* is a dummy that is set equal one if the chairman of the supervisory board is a former executive board member of the firm. Our data is hand-collected from annual reports and forms 20-F. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables.

Variable	Mean	Median	STD	5% Perc.	95% Perc.	Obs
<i>Ownership Variables</i>						
Block ownership	44.92	40.95	25.78	0.00	78.70	1571
Ownership concentration	0.16	0.11	0.17	0.00	0.50	1571
Top blockholder	31.18	27.00	22.77	0.00	71.00	1571
WH20	0.36	0.00	0.48	0.00	1.00	1571
WH10	0.22	0.00	0.41	0.00	1.00	1571
<i>Owner-Type Variables</i>						
Bank	1.07	0.00	5.51	0.00	5.87	1571
Insurance	0.77	0.00	3.64	0.00	6.20	1571
Institutional Investor	5.02	0.00	13.98	0.00	32.30	1571
Corporation	10.08	0.00	20.02	0.00	62.27	1571
Government	0.60	0.00	4.09	0.00	0.00	1571
Insider	23.10	14.30	24.72	0.00	69.00	1571
Others	0.24	0.00	2.41	0.00	0.00	1571
<i>Board Variables</i>						
Outside directors	0.81	1.00	0.23	0.42	1.00	1554
Chairman's other mandates	2.81	2.00	2.79	0.00	8.00	1531
Chairman is former executive	0.12					1539

Table 3
Evolution of ownership concentration measures over time

This table contains information on the evolution of different ownership measures over time. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). *WH20* and *WH10* represent the fraction of firms that are widely held. A firm is widely held if there is no controlling shareholder who owns more than 20%/10% of the shares of a firm. The data is hand-collected from annual reports and forms 20-F. Panel A looks at all firms in the sample. Panel B looks only at those that are in the highest market capitalization quartile while Panel C looks at those that are in the lowest market capitalization quartile. Panel D looks at the evolution of different owner-types over time. The sample consists of all non-financial firms that were listed in German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006.

Panel A: All Firms

Years	Block Ownership		Ownership concentration		Top blockholder		WH20		WH10	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	42.86	50.02	0.1737	0.1447	33.32	33.96	0.31	0.00	0.19	0.00
2001	41.86	47.90	0.1627	0.1119	31.82	29.60	0.32	0.00	0.19	0.00
2002	42.02	47.28	0.1563	0.1119	30.34	27.00	0.37	0.00	0.22	0.00
2003	42.26	46.53	0.1659	0.1093	31.41	27.00	0.35	0.00	0.22	0.00
2004	40.77	42.70	0.1630	0.1037	30.63	26.50	0.38	0.00	0.23	0.00
2005	38.51	38.64	0.1519	0.0855	29.26	25.20	0.42	0.00	0.26	0.00
2006	39.25	41.46	0.1643	0.0903	31.00	25.95	0.39	0.00	0.21	0.00
Change										
(00-06)	-8%	-17%	-5%	-38%	-7%	-24%	+27%	0%	+12%	0%
(02-06)	-7%	-12%	5%	-19%	+2%	-4%	+6%	0%	-5%	0%

Panel B: Large Firms

Years	Block Ownership		Ownership concentration		Top blockholder		WH20		WH10	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	41.21	48.40	0.1802	0.1062	31.94	27.80	0.40	0.00	0.23	0.00
2001	39.61	40.45	0.1643	0.0993	30.20	25.48	0.42	0.00	0.23	0.00
2002	40.34	42.80	0.1594	0.1084	30.09	27.35	0.39	0.00	0.24	0.00
2003	36.03	40.25	0.1474	0.0946	28.45	25.75	0.39	0.00	0.26	0.00
2004	36.42	33.00	0.1597	0.0640	30.08	25.00	0.40	0.00	0.21	0.00
2005	32.17	29.12	0.1355	0.0432	26.92	20.30	0.48	0.00	0.26	0.00
2006	35.14	30.00	0.1640	0.0630	31.04	25.10	0.42	0.00	0.21	0.00
Change										
(00-06)	-15%	-38%	-9%	-41%	-3%	-10%	+4%	0%	-9%	0%
(02-06)	-13%	-30%	3%	-42%	+3%	-8%	+8%	0%	-13%	0%

Panel C: Small Firms

Years	Block Ownership		Ownership concentration		Top blockholder		WH20		WH10	
	Mean	Median	Mean	Mean	Mean	Median	Median	Median	Mean	Median
2000	44.24	52.41	0.1722	0.1600	34.03	33.91	0.31	0.00	0.15	0.00
2001	39.26	45.00	0.1349	0.1089	31.00	27.70	0.28	0.00	0.12	0.00
2002	39.63	42.60	0.1293	0.0909	27.91	24.99	0.43	0.00	0.18	0.00
2003	40.08	45.80	0.1416	0.0940	30.02	27.33	0.35	0.00	0.22	0.00
2004	39.45	38.55	0.1428	0.0861	28.74	29.91	0.39	0.00	0.23	0.00
2005	42.51	39.12	0.1756	0.1144	32.50	25.20	0.38	0.00	0.20	0.00
2006	47.06	51.31	0.2027	0.1351	36.43	33.61	0.29	0.00	0.13	0.00
Change										
(00-06)	+6%	-2%	+18%	-16%	+7%	-1%	-6%	0%	-16%	0%
(02-06)	+19%	+20%	+57%	+49%	+31%	+34%	-32%	0%	-30%	0%

Panel D: Different Owner-Types

Years	Bank		Insurance		Institutional Investor		Corporation		Government		Insiders	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	1.30	0.00	0.96	0.00	3.25	0.00	8.79	0.00	0.79	0.00	27.32	25.00
2001	1.19	0.00	1.25	0.00	4.31	0.00	8.95	0.00	0.68	0.00	25.44	22.00
2002	1.64	0.00	1.37	0.00	4.79	0.00	8.89	0.00	0.56	0.00	24.58	19.90
2003	1.22	0.00	0.63	0.00	5.56	0.00	9.63	0.00	0.58	0.00	24.27	19.65
2004	0.76	0.00	0.64	0.00	5.83	0.00	11.01	0.00	0.51	0.00	21.66	13.61
2005	0.61	0.00	0.43	0.00	5.85	0.00	11.22	0.00	0.49	0.00	19.58	7.48
2006	0.90	0.00	0.39	0.00	5.57	0.00	11.70	0.00	0.68	0.00	19.54	7.40
Change												
(00-06)	-31%	0%	-59%	0%	+72%	0%	+33%	0%	-13%	0%	-28%	-70%
(02-06)	-45%	0%	-71%	0%	+16%	0%	+32%	0%	+21%	0%	-21%	-63%

Table 4
Size and efficiency of internal capital markets

This table reports in Panel A descriptive statistics of the size and efficiency measures for the internal capital markets of the sample firms. $SizeICM_i^{BM}$ is the measure of the size of an internal capital market from Billet and Mauer (BM, 2003). It is calculated as the sum of the absolute values of the transfer and subsidies in the internal capital market of a firm, standardized by the total assets of a firm. Transfers and subsidies are hereby defined as the differences between a segment's after tax cash flow and its investment. If this difference is positive (negative), its absolute value is defined as a subsidy (transfer). $SizeICM_i^{RSZ}$ is the measure of the size of an internal capital market from Rajan, Servaes and Zingales (RSZ, 2000). It is calculated as the sum of the absolute values of the transfers and subsidies in the internal capital market of a firm. To calculate subsidies and transfer in this case, we construct the difference between the investment rate of a segment and the investment rate of comparable stand alone firms in the same industry. If the difference is positive (negative), we define it as a subsidy (transfer). $EffICM_i^{BM}$ is the measure of the efficiency of an internal capital market from BM. $EffICM_i^{RSZ}$ is the measure of the efficiency of an internal capital market from RSZ. The construction of these measures is documented in the Appendix. The calculation of the size of the internal capital market of a firm is based on all operating segments of a firm. The calculation of the efficiency of the internal capital market of a firm is based on all operating non-financial segments of a firm. All four variables are winsorized at 1% and 99%. $DEffICM_i^{BM}$ is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by BM, i.e. if $EffICM_i^{BM}$ is negative, and 1 otherwise. $DEffICM_i^{RSZ}$ is a dummy variable that takes is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by RSZ, i.e. if $EffICM_i^{RSZ}$ is negative, and 1 otherwise. The source of our data is Worldscope. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables. The dummies $DIneffICM_i^{BM}$ and $DIneffICM_i^{RSZ}$ are set to 0 if $EffICM_i^{BM}$ or $EffICM_i^{RSZ}$ have missing values. All our results in the subsequent tables (especially in Tables 9-11) do not change if we leave the values of these dummies as missing instead. Panel B reports a cross-table for the inefficiency dummies.

Panel A: Summary Statistics

Variable	Mean	Median	STD	5% Perc.	95% Perc.	Obs
$SizeICM_i^{BM}$	0.0199	0.0000	0.0714	0.0000	0.1206	1685
$SizeICM_i^{RSZ}$	0.0248	0.0000	0.1071	0.0000	0.1264	1687
$EffICM_i^{BM}$	-0.0013	0.0000	0.0116	-0.0008	0.0000	1694
$EffICM_i^{RSZ}$	0.0000	0.0000	0.0016	-0.0004	0.0008	1140
$DEffICM_i^{BM}$	0.9002					1713
$DEffICM_i^{RSZ}$	0.9154					1713

Panel B: Cross-Tables for Inefficiency Dummies

		$DEffICM_i^{BM}$				
		1		0	Total	
$DEffICM_i^{RSZ}$	1	1,484	(86.6%)	84	(4.9%)	1,568
	0	58	(3.4%)	87	(5.1%)	145
	Total	1,542		171		1713

Table 5
Ownership structures and the size and efficiency of internal capital markets:
Univariate Results

This table contains information on the size and efficiency of the internal capital market of firms with high and low block ownership. It also displays the number of reported segments of firms with high and low block ownership. *Block ownership* is high (low) if it is above (below) the median value in the sample. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. $SizeICM_i^{BM}$ is the measure of the size of an internal capital market from Billet and Mauer (2003). $SizeICM_i^{RSZ}$ is the measure of the size of an internal capital market from Rajan, Servaes and Zingales (2000). $EffICM_i^{BM}$ is the measure of the efficiency of an internal capital market from Billet and Mauer (2003). $EffICM_i^{RSZ}$ is the measure of the efficiency of an internal capital market from Rajan, Servaes and Zingales (2000). The table also reports p-values and z-values of tests for significant differences between firms of the two groups. The calculation of the size of an internal capital market is based on all segments in the sample. The calculation of the efficiency of an internal capital market is based on all operating non-financial segments in the sample. $DEffICM_i^{BM}$ is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Billet and Mauer (2003), i.e. if $EffICM_i^{BM}$ is negative, and 1 otherwise. $DEffICM_i^{RSZ}$ is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Rajan, Servaes and Zingales (2000), i.e. if $EffICM_i^{RSZ}$ is negative, and 1 otherwise. The source of our data source is Worldscope. The sample consists of all non-financial firms that were listed in German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006.

	Block ownership low		Block ownership high		p-value (t-Test)	z-value (Wilcoxon)
	Mean	Median	Mean	Median		
No. of operating segments	1.9247	2.0000	1.6219	1.0000	0.0000	0.0000
$SizeICM_i^{BM}$	0.0236	0.0000	0.0182	0.0000	0.1446	0.0000
$SizeICM_i^{RSZ}$	0.0335	0.0000	0.0202	0.0000	0.0192	0.0000
$EffICM_i^{BM}$	-0.0016	0.0000	-0.0011	0.0000	0.4471	0.0003
$EffICM_i^{RSZ}$	0.0000	0.0000	0.0001	0.0000	0.5452	0.5924
$DEffICM_i^{BM}$	0.8493		0.9370		0.0000	0.0000
$DEffICM_i^{RSZ}$	0.8644		0.9501		0.0000	0.0000

Table 6
Corporate governance and number of operating segments: Negative binomial regression results

The dependent variable in these negative binomial regressions (count data model) is the number of operating segments of a firm. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). *Outside directors* is percentage of directors on the supervisory board who are outsiders. *Chairman's other mandates* is the number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board. *Chairman is former executive* is a dummy that is set equal to one if the chairman of the supervisory board is a former executive board member of the firm. *Firm size* is the book value of total assets. *Leverage* is total debt divided by total assets. *Liquidity* is the value of cash and marketable securities divided by total assets. *Profitability* is earnings before interest and taxes divided by total assets. The regressions are based on all segments of the firms in the sample. Absolute-values of heteroskedasticity robust t-statistics are reported in parentheses. Standard errors are clustered at the firm level to account for within-firm correlation. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables. * means significance at 10%, ** significance at 5%, and *** significance at 1%.

Dependent Variable: *No. of Operating Segments*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Block ownership		-0.003** (2.32)				-0.003** (2.26)	-0.003** (2.34)			-0.003*** (7.36)
Top blockholder			-0.002* (1.83)					-0.003* (1.77)		
Ownership concentration				-0.393** (2.21)					-0.402** (2.02)	
Outside directors					-0.330* (1.90)	-0.316* (1.85)	-0.252 (1.42)	-0.260 (1.46)	-0.253 (1.42)	-0.252*** (4.28)
Chairman's other mandates							0.007 (0.70)	0.007 (0.64)	0.007 (0.66)	0.007** (2.22)
Chair. is former exec.							0.163 (1.54)	0.159 (1.49)	0.158 (1.51)	0.163*** (6.02)
Firm Size	0.088*** (4.80)	0.082*** (4.31)	0.085*** (4.45)	0.084*** (4.55)	0.064*** (2.69)	0.057** (2.39)	0.061*** (2.66)	0.064*** (2.77)	0.064*** (2.78)	0.061*** (6.14)
Leverage	0.437*** (3.37)	0.473*** (3.50)	0.462*** (3.44)	0.467*** (3.46)	0.458*** (3.35)	0.459*** (3.36)	0.453*** (3.32)	0.442*** (3.24)	0.449*** (3.28)	0.453*** (5.88)
Liquidity	0.318*** (2.95)	0.405*** (3.46)	0.403*** (3.36)	0.401*** (3.35)	0.457*** (3.75)	0.442*** (3.69)	0.467*** (3.89)	0.466*** (3.79)	0.465*** (3.81)	0.467*** (3.46)
Profitability	0.098 (0.74)	0.161 (1.12)	0.174 (1.19)	0.182 (1.25)	0.094 (0.62)	0.126 (0.86)	0.091 (0.59)	0.103 (0.65)	0.109 (0.69)	0.091 (0.79)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1123	1048	1048	1048	1037	1037	1003	1003	1003	1003
McFadden R-squared	0.034	0.038	0.037	0.038	0.037	0.040	0.044	0.043	0.043	0.044

Table 7
Corporate governance and internal capital market size: Regression results

The dependent variable in these regressions is the size of the internal capital market of a firm. The regressions in Panel A use the size measure from Billet and Mauer (2003), while the regressions in Panel B use the size measure from Rajan, Servaes, and Zingales (2000). *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). *Outside directors* is percentage of directors on the supervisory board who are outsiders. *Chairman's other mandates* is the number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board. *Chairman is former executive* is a dummy that is set equal to one if the chairman of the supervisory board is a former executive board member of the firm. *Firm size* is the book value of total assets. *Leverage* is total debt divided by total assets. *Liquidity* is the value of cash and marketable securities divided by total assets. *Profitability* is earnings before interest and taxes divided by total assets. The size measures are calculated based on all segments of the firms in the sample. Absolute-values of heteroskedasticity robust t-statistics are reported in parentheses. Standard errors are clustered at the firm level to account for within-firm correlation. Constants were included in the regressions but are not reported. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables * means significance at 10%, ** significance at 5%, and *** significance at 1%.

Panel A: Size of Internal Capital Market (Measure from Billet and Mauer (2003))

	Dependent Variable: $SizeICM_i^{BM}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Block ownership		-0.000 (0.50)				-0.000 (0.49)	-0.000 (0.20)			-0.000 (0.35)
Top blockholder			-0.000 (0.50)					-0.000 (0.25)		
Ownership concentration				-0.009 (0.56)					-0.005 (0.26)	
Outside directors					-0.009 (0.49)	-0.009 (0.47)	-0.009 (0.50)	-0.009 (0.49)	-0.009 (0.49)	-0.009 (0.54)
Chairman's other mandates							-0.002** (1.98)	-0.002* (1.94)	-0.002* (1.95)	-0.002** (2.97)
Chair. is former exec.							-0.007 (1.09)	-0.007 (1.08)	-0.007 (1.10)	-0.007 (1.71)
Firm size	-0.002 (1.12)	-0.003 (1.39)	-0.003 (1.41)	-0.003 (1.42)	-0.004 (1.40)	-0.004 (1.39)	-0.003 (1.05)	-0.003 (1.07)	-0.003 (1.08)	-0.003 (1.40)
Leverage	0.046** (2.28)	0.051** (2.52)	0.051** (2.46)	0.051** (2.49)	0.051** (2.47)	0.051** (2.49)	0.052** (2.52)	0.052** (2.46)	0.052** (2.50)	0.052** (2.76)
Liquidity	0.025* (1.71)	0.029 (1.62)	0.029 (1.61)	0.029 (1.61)	0.029 (1.65)	0.029 (1.60)	0.027 (1.51)	0.027 (1.49)	0.027 (1.50)	0.027*** (4.01)
Profitability	-0.136*** (4.35)	-0.140*** (3.97)	-0.140*** (3.95)	-0.140*** (3.94)	-0.141*** (4.02)	-0.141*** (4.01)	-0.130*** (3.90)	-0.130*** (3.89)	-0.130*** (3.89)	-0.130*** (6.34)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1103	1028	1028	1028	1017	1017	983	983	983	983
Adj. R-squared	0.094	0.091	0.091	0.091	0.091	0.090	0.076	0.077	0.076	0.076

Panel B: Size of Internal Capital Market (Measure from Rajan, Servaes, and Zingales (2000))

Dependent Variable: $SizeICM_i^{RSZ}$										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Block ownership		-0.000 (0.78)				-0.000 (0.80)	-0.000 (0.73)			-0.000 (0.82)
Top blockholder			-0.000 (1.57)					-0.000 (1.40)		
Ownership concentration				-0.051** (2.48)					-0.051** (2.18)	
Outside directors					-0.021 (0.58)	-0.020 (0.56)	-0.012 (0.31)	-0.011 (0.29)	-0.010 (0.26)	-0.012 (0.38)
Chairman's other mandates							0.000 (0.05)	0.000 (0.10)	0.000 (0.15)	0.000 (0.05)
Chair. is former exec.							0.039* (1.96)	0.039** (2.00)	0.039** (2.03)	0.039* (2.19)
Firm size	0.005 (1.63)	0.005 (1.41)	0.004 (1.31)	0.004 (1.29)	0.003 (0.59)	0.003 (0.53)	0.003 (0.65)	0.003 (0.60)	0.003 (0.59)	0.003 (0.83)
Leverage	0.034* (1.68)	0.035* (1.67)	0.034 (1.59)	0.034 (1.62)	0.036 (1.63)	0.036* (1.66)	0.037 (1.61)	0.035 (1.51)	0.036 (1.55)	0.037 (1.76)
Liquidity	-0.014 (0.93)	-0.011 (0.67)	-0.013 (0.75)	-0.013 (0.79)	-0.011 (0.65)	-0.011 (0.72)	-0.008 (0.52)	-0.010 (0.61)	-0.011 (0.65)	-0.008 (0.76)
Profitability	0.006 (0.37)	0.005 (0.26)	0.008 (0.43)	0.009 (0.51)	0.001 (0.08)	0.003 (0.17)	-0.005 (0.28)	-0.002 (0.10)	-0.000 (0.00)	-0.005 (0.27)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1105	1030	1030	1030	1019	1019	985	985	985	985
Adj. R-squared	0.012	0.010	0.012	0.014	0.010	0.010	0.017	0.019	0.021	0.017

Table 8
Corporate governance and internal capital market efficiency: Logit regression results

The dependent variable in these logit regressions in Panel A is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Billet and Mauer (2003), i.e. if their inefficiency measure is negative, and 1 otherwise. In Panel B, the dependent variable is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Rajan, Servaes and Zingales (2000), i.e. if their efficiency measure is negative, and 1 otherwise. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). *Outside directors* is percentage of directors on the supervisory board who are outsiders. *Chairman's other mandates* is the number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board. *Chairman is former executive* is a dummy that is set equal to one if the chairman of the supervisory board is a former executive board member of the firm. *Firm size* is the book value of total assets. *Leverage* is total debt divided by total assets. *Liquidity* is the value of cash and marketable securities divided by total assets. *Profitability* is earnings before interest and taxes divided by total assets. The efficiency measures are calculated based on all operating non-financial segments of the firms in the sample. Absolute-values of heteroskedasticity robust t-statistics are reported in parentheses. Standard errors are clustered at the firm level to account for within-firm correlation. Constants were included in the regressions but are not reported. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables. Note that we set the dummies used in these regressions equal to 0 if the underlying efficiency measures had missing values. All our results in the subsequent do not change if we put the values of these dummies equal to missings instead. The table reports marginal effects. * means significance at 10%, ** significance at 5%, and *** significance at 1%.

Panel A: Efficiency of Internal Capital Market (Measure from Billet and Mauer (2003))

Dependent Variable: $DEffICM_i^{BM}$										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Block ownership		0.001*				0.001	0.001			0.001***
		(1.82)				(1.59)	(1.56)			(3.32)
Top blockholder			0.001**					0.001*		
			(2.10)					(1.81)		
Ownership concentration				0.195**					0.186*	
				(2.36)					(1.94)	
Outside directors					0.220***	0.212**	0.195**	0.191**	0.189**	0.195***
					(2.60)	(2.44)	(2.10)	(2.10)	(2.06)	(4.39)
Chairman's other mandates							0.003	0.003	0.003	0.003
							(0.67)	(0.63)	(0.63)	(0.88)
Chair. is former exec.							-0.083	-0.085	-0.085	-0.083
							(1.23)	(1.26)	(1.28)	(1.41)
Firm size	-0.024***	-0.023***	-0.023***	-0.022***	-0.009	-0.006	-0.009	-0.009	-0.008	-0.009
	(3.88)	(3.49)	(3.44)	(3.36)	(0.99)	(0.74)	(0.95)	(0.96)	(0.90)	(1.36)
Leverage	-0.162**	-0.182**	-0.175**	-0.175**	-0.171**	-0.168**	-0.165**	-0.158**	-0.159**	-0.165***
	(2.28)	(2.50)	(2.42)	(2.44)	(2.49)	(2.38)	(2.26)	(2.17)	(2.22)	(2.58)
Liquidity	0.150	0.129	0.133	0.134	0.063	0.077	0.071	0.074	0.073	0.071
	(1.20)	(0.92)	(0.93)	(0.94)	(0.48)	(0.57)	(0.53)	(0.55)	(0.55)	(1.10)
Profitability	0.097	0.100	0.090	0.084	0.140**	0.128*	0.151**	0.140*	0.135*	0.151***
	(1.47)	(1.46)	(1.29)	(1.20)	(2.07)	(1.90)	(2.12)	(1.91)	(1.82)	(3.83)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1123	1048	1048	1048	1037	1037	1003	1003	1003	1003
McFadden R-squared	0.090	0.097	0.098	0.102	0.106	0.111	0.119	0.121	0.123	0.119

Panel B: Efficiency of Internal Capital Market (Measure from Rajan, Servaes, and Zingales (2000))

Dependent Variable: $DEffICM_i^{RSZ}$										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Block ownership		0.001*** (2.66)				0.001*** (2.59)	0.001** (2.57)			0.001*** (6.40)
Top blockholder			0.001** (2.13)					0.001* (1.95)		
Ownership concentration				0.194** (2.53)					0.197** (2.25)	
Outside directors					0.231*** (3.06)	0.222*** (2.93)	0.205** (2.57)	0.206** (2.55)	0.203** (2.52)	0.205*** (7.27)
Chairman's other mandates							0.000 (0.09)	0.001 (0.16)	0.001 (0.14)	0.000 (0.17)
Chair. is former exec.							-0.061 (1.31)	-0.059 (1.25)	-0.058 (1.28)	-0.061 (1.58)
Firm size	-0.020*** (3.15)	-0.017*** (2.63)	-0.018*** (2.80)	-0.018*** (2.79)	-0.004 (0.40)	-0.000 (0.00)	-0.001 (0.15)	-0.003 (0.33)	-0.002 (0.26)	-0.001 (0.37)
Leverage	-0.086* (1.65)	-0.096* (1.83)	-0.090* (1.70)	-0.090* (1.70)	-0.074 (1.31)	-0.064 (1.16)	-0.062 (1.14)	-0.058 (1.05)	-0.059 (1.08)	-0.062** (2.29)
Liquidity	0.144 (1.47)	0.149 (1.35)	0.149 (1.36)	0.151 (1.37)	0.081 (0.82)	0.102 (1.00)	0.091 (0.91)	0.088 (0.87)	0.089 (0.89)	0.091* (1.87)
Profitability	0.022 (0.27)	0.016 (0.18)	0.008 (0.09)	0.003 (0.04)	0.072 (0.83)	0.053 (0.62)	0.061 (0.67)	0.057 (0.60)	0.052 (0.54)	0.061 (1.17)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1123	1048	1048	1048	1037	1037	1003	1003	1003	1003
McFadden R-squared	0.084	0.094	0.090	0.094	0.102	0.116	0.119	0.113	0.117	0.119

Table 9
Efficiency of the internal capital market and different owner-types: Logit regressions results

The dependent variable in these logit regressions in Panel A is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Billet and Mauer (2003), i.e. if their inefficiency measure is negative, and 1 otherwise. In Panel B, the dependent variable is a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Rajan, Servaes and Zingales (2000), i.e. if their efficiency measure is negative, and 1 otherwise. The different regressions include the block ownership of different owner-types. *Outside directors* is percentage of directors on the supervisory board who are outsiders. *Chairman's other mandates* is the number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board. *Chairman is former executive* is a dummy that is set equal to one if the chairman of the supervisory board is a former executive board member of the firm. *Firm size* is the book value of total assets. *Leverage* is total debt divided by total assets. *Liquidity* is the value of cash and marketable securities divided by total assets. *Profitability* is earnings before interest and taxes divided by total assets. The efficiency measures are calculated based on all operating non-financial segments of the firms in the sample. Absolute-values of heteroskedasticity robust t-statistics are reported in parentheses. Standard errors are clustered at the firm level to account for within-firm correlation. Constants were included in the regressions but are not reported. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables. Note that we set the dummies used in these regressions equal to 0 if the underlying efficiency measures had missing values. All our results in the subsequent do not change if we put the values of these dummies equal to missings instead. The table reports marginal effects. * means significance at 10%, ** significance at 5%, and *** significance at 1%.

Panel A: Efficiency of Internal Capital Market (Measure from Billet and Mauer (2003))

	Dependent Variable: $DEffICM_i^{BM}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bank	-0.003 (1.51)						-0.003 (1.47)	-0.002 (1.11)	-0.002 (1.20)	-0.002** (2.26)
Corporation		0.002** (2.36)					0.002*** (2.62)	0.002** (2.57)	0.002*** (2.80)	0.002*** (4.33)
Insider			0.000 (0.05)				0.000 (0.67)	0.000 (0.38)	0.000 (0.39)	0.000*** (3.21)
Institutional				0.000 (0.38)			0.001 (0.78)	0.001 (0.80)	0.000 (0.59)	0.000 (0.41)
Government					0.002 (0.71)		0.002 (1.03)	0.002 (0.91)	0.002 (0.95)	0.002* (1.85)
Insurance						-0.001 (0.26)	0.000 (0.15)	0.001 (0.37)	0.001 (0.46)	0.001 (0.42)
Outside directors								0.207** (2.40)	0.186** (2.02)	0.186*** (3.34)
Chairman's other mandates									0.003 (0.58)	0.003 (0.76)
Chair. is former exec.									-0.067 (1.05)	-0.067 (1.15)
Firm size	-0.025*** (3.91)	-0.024*** (3.92)	-0.026*** (3.79)	-0.025*** (3.84)	-0.027*** (4.16)	-0.025*** (3.79)	-0.024*** (3.56)	-0.008 (0.94)	-0.012 (1.24)	-0.012* (1.78)
Leverage	-0.178** (2.54)	-0.175** (2.47)	-0.183** (2.55)	-0.186*** (2.59)	-0.183** (2.56)	-0.183** (2.55)	-0.172** (2.53)	-0.162** (2.43)	-0.154** (2.26)	-0.154*** (2.73)
Liquidity	0.107 (0.79)	0.133 (0.96)	0.117 (0.85)	0.119 (0.85)	0.117 (0.85)	0.117 (0.85)	0.126 (0.90)	0.081 (0.59)	0.073 (0.56)	0.073 (1.13)
Profitability	0.108 (1.54)	0.097 (1.43)	0.109 (1.57)	0.112 (1.58)	0.116* (1.69)	0.109 (1.57)	0.098 (1.47)	0.127* (1.90)	0.146** (2.08)	0.146*** (4.57)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1048	1048	1048	1048	1048	1048	1048	1037	1003	1003
McFadden R-squared	0.094	0.100	0.090	0.091	0.092	0.091	0.108	0.121	0.130	0.130

Panel B: Efficiency of Internal Capital Market (Measure from Rajan, Servaes, and Zingales (2000))

	Dependent Variable: $DEffICM_i^{RSZ}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bank	0.001 (0.54)						0.001 (0.65)	0.002 (0.77)	0.002 (0.77)	0.002 (1.14)
Corporation		0.001* (1.71)					0.001** (2.22)	0.001** (2.28)	0.002** (2.50)	0.002*** (3.73)
Insider			0.001* (1.67)				0.001** (2.15)	0.001* (1.92)	0.001* (1.77)	0.001*** (4.97)
Institutional				-0.001 (0.83)			-0.000 (0.03)	0.000 (0.28)	0.000 (0.17)	0.000 (0.32)
Government					0.002 (0.61)		0.002 (0.85)	0.001 (0.72)	0.002 (0.72)	0.002 (1.64)
Insurance						-0.001 (0.30)	0.000 (0.05)	0.001 (0.40)	0.001 (0.38)	0.001 (0.38)
Outside directors								0.218*** (2.84)	0.198** (2.47)	0.198*** (7.13)
Chairman's other mandates									0.001 (0.17)	0.001 (0.31)
Chair. is former exec.									-0.055 (1.17)	-0.055 (1.45)
Firm size	-0.022*** (3.18)	-0.020*** (3.12)	-0.018*** (2.60)	-0.022*** (3.38)	-0.023*** (3.31)	-0.021*** (2.98)	-0.018*** (2.64)	-0.002 (0.17)	-0.003 (0.37)	-0.003 (0.95)
Leverage	-0.100* (1.88)	-0.095* (1.76)	-0.093* (1.81)	-0.093* (1.75)	-0.099* (1.86)	-0.099* (1.84)	-0.085* (1.69)	-0.060 (1.11)	-0.056 (1.07)	-0.056** (2.01)
Liquidity	0.136 (1.26)	0.145 (1.34)	0.128 (1.22)	0.128 (1.22)	0.131 (1.22)	0.132 (1.23)	0.147 (1.38)	0.105 (1.04)	0.094 (0.95)	0.094** (2.02)
Profitability	0.029 (0.34)	0.021 (0.24)	0.015 (0.17)	0.024 (0.28)	0.034 (0.39)	0.028 (0.32)	0.007 (0.09)	0.045 (0.53)	0.051 (0.57)	0.051 (1.07)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Clustering by Year	No	No	No	No	No	No	No	No	No	Yes
Observations	1048	1048	1048	1048	1048	1048	1048	1037	1003	1003
McFadden R-squared	0.081	0.086	0.086	0.081	0.081	0.080	0.099	0.119	0.123	0.123

Table 10
Efficiency of the internal capital market and firm value: Regression results

The dependent variable in these regressions is Tobin's Q. To alleviate measurement problems with respect to Tobin's Q, we use two alternative transformations of Q: $\log(Q)$ and $-1/Q$. In Regressions (3)-(6) we include a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Billet and Mauer (2003), i.e. if their inefficiency measure is negative, and 1 otherwise. In Regressions (7)-(10) we include a dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Rajan, Servaes and Zingales (2000), i.e. if their efficiency measure is negative, and 1 otherwise. *Firm size* is the book value of total assets. *Leverage* is total debt divided by total assets. *Liquidity* is the value of cash and marketable securities divided by total assets. *Profitability* is earnings before interest and taxes divided by total assets. The efficiency measures are calculated based on all operating non-financial segments of the firms in the sample. Absolute-values of heteroskedasticity robust t-statistics are reported in parentheses. Standard errors are clustered at the firm level to account for within-firm correlation. Constants were included in the regressions but are not reported. The sample consists of all non-financial firms that were listed in the German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006. The number of observations in the table varies due to missing data for some variables. * means significance at 10%, ** significance at 5%, and *** significance at 1%.

Dependent Variable: Tobin's Q										
	-1/Q	Log(Q)	-1/Q	Log(Q)	-1/Q	Log(Q)	-1/Q	Log(Q)	-1/Q	Log(Q)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$DEffICM_i^{BM}$			0.050*	0.078*	0.050**	0.078***				
			(1.73)	(1.82)	(3.53)	(4.01)				
$DEffICM_i^{RSZ}$							0.048*	0.078**	0.048**	0.078***
							(1.80)	(1.97)	(2.72)	(3.78)
Firm Size	-0.008	-0.014	-0.006	-0.011	-0.006*	-0.011*	-0.006	-0.012	-0.006**	-0.012*
	(0.95)	(1.04)	(0.73)	(0.83)	(2.31)	(2.24)	(0.77)	(0.86)	(2.52)	(2.12)
Leverage	0.139	0.027	0.147	0.039	0.147	0.039	0.143	0.033	0.143	0.033
	(1.02)	(0.21)	(1.07)	(0.31)	(1.61)	(0.29)	(1.05)	(0.26)	(1.58)	(0.24)
Liquidity	0.401***	0.669***	0.398***	0.665***	0.398***	0.665***	0.399***	0.666***	0.399***	0.666***
	(3.84)	(4.45)	(3.82)	(4.43)	(7.35)	(5.77)	(3.82)	(4.42)	(7.67)	(5.92)
Profitability	0.711***	1.132***	0.706***	1.123***	0.706***	1.123***	0.709***	1.128***	0.709***	1.128***
	(4.29)	(4.89)	(4.26)	(4.87)	(6.10)	(8.51)	(4.27)	(4.88)	(6.21)	(8.67)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering by Firm	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No
Clustering by Year	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Observations	1121	1120	1121	1120	1121	1120	1121	1120	1121	1120
Adj. R-squared	0.102	0.299	0.102	0.301	0.102	0.301	0.102	0.301	0.102	0.301

Table 11
Comparison of firm characteristics for firms experiencing
large ownership drops and for other firms

This table compares characteristics of firms that experienced a large decrease in *block ownership* and those that did not experience a large decrease in *block ownership*. A decrease in *block ownership* is considered large if the reduction in *block ownership* at a given firm and in a given year was at least 5% (see Helwege et al. (2007)). *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. Market capitalization is the market value of equity of a firm (WC08001). *Firm size* is the book value of total assets (WC02999). *Leverage* is total debt (WC 03255) divided by total assets. *Liquidity* is the value of cash and marketable securities (WC02001) divided by total assets. *Profitability* is earnings before interest and taxes (EBIT) (WC18191) divided by total assets. *Tobin's Q* is the market value of assets divided by the book value of assets. The market value of assets equals the book value of assets plus the market value of equity less the book value of equity. The source of our data is Worldscope. The sample consists of all non-financial firms that were listed in German stock market index CDAX in 2000 and for which we had segment data. The sample period is 2000-2006.

Variable	Firms with Small Block Ownership Decrease (<5% Drop)		Firms with Large Block Ownership Decrease (>5% Drop)		p-value (t-Test)	z-value (Wilcoxon Test)
	Mean	Median	Mean	Median		
Market cap. (in 1000 EUR)	1,733,740	78,799	2,094,030	96,154	0.4702	0.5823
Firm size (in 1000 EUR)	3,565,655	132,974	3,384,716	125,727	0.8720	0.7510
Leverage	0.5487	0.5717	0.5412	0.5531	0.6606	0.3948
Liquidity	0.1331	0.0871	0.1398	0.0898	0.5799	0.7768
Profitability (EBIT/Total assets)	0.0428	0.0623	0.0426	0.0605	0.9805	0.8627
Tobin's Q	1.47	1.20	1.49	1.26	0.1261	0.6802

Table A-1
Variable Definitions

Variable	Definition	Source
Firm Data		
Market capitalization	Market value of equity of a firm (WC08001).	Worldscope
Firm size	Book value of total assets (WC02999).	Worldscope
Leverage	Total debt (WC 03255) divided by total assets.	Worldscope
Liquidity	Value of cash and marketable securities (WC02001) divided by total assets.	Worldscope
Profitability	Earnings before interest and taxes (EBIT) (WC18191) divided by total assets.	Worldscope
Tobin's Q	The market value of assets divided by the book value of assets. The market value of assets equals the book value of assets plus the market value of equity less the book value of equity.	Worldscope
No. of reported segments	The number of segments of a firm.	Worldscope
No. of unrelated segments	The number of segments in different 2-digit SIC code industries.	Worldscope
No. of operating segments	The number of segments that are not consolidation or holding segments.	Worldscope
Corporate Governance Data		
Block ownership	The sum of the shareholdings of all owners that own more than 5% of a firm.	Hand-collected from Annual Reports/20-F
Ownership concentration	The Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm	Hand-collected from Annual Reports/20-F
Top blockholder	The size of the stake of the firm's largest shareholder (if the shareholder owns more than 5%).	Hand-collected from Annual Reports/20-F
WH10	Fraction of firms that are widely held. A firm is widely held if there is no controlling shareholder who owns more than 10% of the shares of a firm.	Hand-collected from Annual Reports/20-F
WH20	Fraction of firms that are widely held. A firm is widely held if there is no controlling shareholder who owns more than 20% of the shares of a firm.	Hand-collected from Annual Reports/20-F
Outside directors	Percentage of directors on the supervisory board who are outsiders. Outsiders are directors that are neither current nor former executives/employees of the company. Union activists are not categorized as outsiders.	Hand-collected from Annual Reports/20-F
Chairman's other mandates	Number of additional firms where the chairman of the supervisory board also serves on the supervisory or executive board.	Hand-collected from Annual Reports/20-F
Chairman is former executive	Dummy that is set equal to one if the chairman of the supervisory board is a former executive board member of the firm.	Hand-collected from Annual Reports/20-F

Internal Capital Market Data		
$SizeICM_i^{BM}$	Measure of the size of an internal capital market from Billet and Mauer (2003). It is calculated as the sum of the absolute values of the transfer and subsidies in the internal capital market of a firm, standardized by total assets of a firm. Transfers and subsidies are hereby defined as the differences between a segment's after tax cash flow and its investment. If this difference is positive (negative), its absolute value is defined as a subsidy (transfer).	Self-constructed based on Worldscope Data
$SizeICM_i^{RSZ}$	Measure of the size of an internal capital market from Rajan, Servaes and Zingales (2000). It is calculated as the sum of the absolute values of the transfers and subsidies in the internal capital market of a firm. Therefore, we calculate the difference between the investment rate of a segment and the investment rate of comparable stand alone firms in the same industry. If the difference is positive (negative), we define it as a subsidy (transfer).	Self-constructed based on Worldscope Data
$EffICM_i^{BM}$	Measure of the efficiency of an internal capital market from Billet and Mauer (2003). See Appendix for the exact construction.	Self-constructed based on Worldscope Data
$EffICM_i^{RSZ}$	Measure of the efficiency of an internal capital market from Rajan, Servaes and Zingales (2000). See Appendix for the exact construction.	Self-constructed based on Worldscope Data
$DEffICM_i^{BM}$	Dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Billet and Mauer (2003), and 1 otherwise.	Self-constructed based on Worldscope Data
$DEffICM_i^{RSZ}$	Dummy variable that is set equal to 0 if the internal capital market of a firm is inefficient according to the measure by Rajan, Servaes and Zingales (2000), and 1 otherwise.	Self-constructed based on Worldscope Data

Figure 1
Assumptions underlying the hypothesized relation
between ownership concentration and corporate diversification

This figure provides an overview of the assumptions that are underlying the hypothesized relation between ownership concentration and corporate diversification.

		Ownership Concentration	
		Good	Bad
Diversification	Good	Scenario 1 (+)	Scenario 2 (-)
	Bad	Scenario 3 (-)	Scenario 4 (+)

Figure 2
Distribution of Block ownership

This figure shows the distribution of Block ownership for all firm-year observations between 2000 and 2006. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm.

Figure 3
Evolution of ownership concentration measures

This figure shows the evolution of different ownership measures. *Block ownership* (measured on the right scale) is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* (left scale) is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* (right scale) represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). The figure presents the evolution of the median values between 2000 and 2006.

Figure 4
Evolution of ownership concentration measures for large and small firms

This figure shows the evolution of different ownership measures for large (Panel A) and small (Panel B) firms. Firms are considered large if they are in the fourth market capitalization (WC08001) quartile and small if they are in the first market capitalization quintile. *Block ownership* is the sum of the shareholdings of all owners that own more than 5% of a firm. *Ownership concentration* is the Herfindahl index of ownership concentration. It is calculated as the sum of the squared ownership stakes of all shareholders that own more than 5% of a firm. *Top blockholder* represents the stake of the firm's largest shareholder (if the shareholder owns more than 5%). The figure presents the evolution of the median values between 2000 and 2006.

Panel A: Large Firms

Panel B: Small Firms

Figure 5
Evolution of widely held firms and different owner-types

The figure in Panel A shows the evolution of the fraction of widely held firms. *WH20* and *WH10* represent the fraction of firms that are widely held. A firm is widely held if there is no controlling shareholder who owns more than 20%/10% of the shares of a firm. The figure presents the evolution of the mean values between 2000 and 2006. The figure in Panel B shows the evolution of different owner types. For each owner-type, the figure displays information on the mean ownership stakes in a firm from 2000 to 2006.

Panel A: Widely Held Firms

Panel B: Different Owner-Types