Class Struggle Inside the Firm: A Study of German Codetermination*

Gary Gorton
The Wharton School
University of Pennsylvania
Philadelphia, PA 19104,
and NBER

Frank Schmid
Federal Reserve Bank of St. Louis
St. Louis, MO 63102

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Abstract

Who should control the firm? What should be the firm's objective function? If contracts are incomplete, then the group of input providers that most needs their interests protected should be allocated control rights to the firm. Existing theories argue that the suppliers of capital are most in need of protection. We empirically assess this answer by examining the German system of "codetermination," a governance system under which employees are allocated some control rights over corporate assets by law. Codetermination laws require that employees be represented on the (supervisory) board of directors. If codetermination sufficiently empowers employees, and if stockholders' rights cannot be contractually protected, then employees may redistribute the firm's surplus towards themselves. In addition, if employee interests are not contractually protected, then employees' may prefer a different objective function for the firm. For example, employees may hamper capitalist flexibility by resisting restructuring of the firm if that would jeopardize their human capital. We examine this with particular reference to the unification of East Germany and West Germany, a shock that may have caused employees in the former West to resist restructuring; the more so in codetermined firms. We also examine whether shareholders respond to codetermination with more concentrated block holdings, perhaps increasing their bargaining power with employees, or with higher leverage, committing more cash to leave the firm. Finally, we examine the relationship between codetermination and the performance sensitivity of compensation for board members.

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"The campaigns for.... codetermination on boards of directors appear to be attempts to control the wealth of stockholders' specialized assets ... a wealth confiscation scheme" Alchian (1984, p. 46).

"Laws on Codetermination, combined with a tradition of patriarchal concern, have made European CEOs deeply committed to their employees, treating them more like partners in a long-term enterprise than anonymous factors of production" Henzler (1992, p. 60).

I. Introduction

Who should control the firm? What should be the objective function of the firm? Why are the suppliers of capital allocated control rights, rather than other stakeholders in the firm, in particular, employees?[1] These are fundamental questions for the theory of the firm. For some, these questions have obvious answers. For example, Hansmann and Kraakman (2000) write of a "…widespread normative consensus that corporate managers should act exclusively in the economic interests of shareholders…" (p. 1). In this paper, however, we view these questions as worthy of investigation. We investigate the proposition that the suppliers of capital should control the firm by empirically examining the German system of codetermination under which the employees of large firms are, by law, allocated some control rights in the form of (voting) seats on the firm's supervisory board. If board seats are important for control of the firm, then codetermination empowers employees. Then detectable effects of employee input into decisions, altering the nature of the firm, would be evidence that contracts are incomplete. Further, we examine the revealed preferences of employees under this system to determine whether their power, if indeed they have any, is used to redistribute surplus or whether (in addition) they alter the objective function of the firm. Such a finding would provide evidence that employee interests were not completely protected under the system that allocates all control rights to Capital. A final possibility is that codetermination may lead to a lower surplus because of conflict between Labor and Capital, that is, class struggle inside the firm.

If contracts are complete, then the allocation of control rights to the firm is irrelevant. Therefore, the answer to the question of which party should control the firm is usually based on the observation that whenever specific investments are noncontractible, and the firm's decision-making structure affects the distribution of quasi-rents, then the party most at risk of ex post expropriation should be allocated control rights. Some then argue that the suppliers of capital should control the firm because they are most in need of such protection against ex-post expropriation by other stakeholders. The other stakeholders can be contractually protected, it is argued, or they have effective sources of bargaining power that can protect their specific

investments ex post, so they should not be allocated control rights. In Grossman and Hart (1986) and Hart and Moore (1990), the costs and benefits of noncontractible decisions (implicitly) accrue to capital suppliers. Employees' efforts are not sensitive to these decisions. Thus, capitalists should control the firm. Williamson (1985) also argues that capitalists should control the firm, since the employee's firm-specific human capital can be protected by a "governance structure" (pp. 242-43).[2] Perhaps, codetermination is such a "governance structure."

These assertions as to why Capital should control the firm are certainly not obviously true. Zingales (1997), for example, has observed that the argument that capitalists are most at risk of ex post expropriation seems most applicable to an entrepreneurial firm, where the capitalist is contributing human capital, rather than to a large corporation where the outside investors are contributing funds. Also, the idea that other stakeholders, in particular, employees, have sufficient means to protect themselves has been questioned. Shleifer and Summers (1988) argue that employees' interests are not protected because takeovers are a way for shareholders to expropriate employees, through a "breach of trust." Also, see Law (1986) and Drucker (1986). Moreover, the persistence of firms controlled by the suppliers of capital is not necessarily evidence of the superiority of this form of organization. An important observation made in the large theoretical literature on the question is that the persistence of capital-managed firms (that is, firms where the suppliers of capital have control rights) may be due to the inherent difficulties of labor-managed firms.[3] Many of the problems that have been identified as weaknesses of labor-managed firms could be solved, at least in theory, if employee membership rights in the firm were marketable. But, this marketability of membership rights may be difficult to implement as a practical matter. As a theoretical matter, Dow (1993) shows that capital-managed firms can survive even though the labor-managed firms yield a larger surplus. Thus, it is not obvious why we observe a prevalence of capital-managed firms.

Besides the suppliers of capital, employees, the suppliers of labor, constitute the other important stakeholder in the firm. In Germany, as in many countries (see, e.g., Hansmann, 1990, and Rippey, 1988), the suppliers of labor have an important role in running the firm. In Germany, in particular, the firm's employees are allocated some control rights by law, although in general, they have no cash flow rights (in the usual sense of residual financial claims).[4] The general idea is for the suppliers of capital and the suppliers of labor to "cooperatively" run the firm; employees' interests are protected. To accomplish this, employees are legally "entrenched," that is, made immune from the wishes of Capital to some extent. Allocating some control rights to employees may be incentive-compatible as employees may only then be willing

to develop firm-specific human capital. Also, employees in a codetermined system will perhaps monitor managers who would otherwise not necessarily act in the interests of outside shareholders. Overall, the German system provides an alternative model of corporate governance that requires study.

Under the German system of codetermination firms may be required by law to appoint employees to the supervisory board of the firm. Codetermination laws apply to all German private corporations (GmbHs) with more than 500 employees, and to all stock corporations (AGs). Depending on the size of the firm, employees may constitute either one half or one third of the firm's supervisory board. These two codetermination regimes are called parity-codetermination and non-parity codetermination. The board system in Germany is two-tiered: there is the supervisory board and the management board. The management board runs the day-to-day operations; its chairman (or "speaker") is the firm's CEO. The supervisory board oversees the management board, appoints its members, sets their salaries, and approves major decisions. It is the supervisory board that determines the strategic direction of the firm. Consequently, while these firms are generally unionized, codetermination is different than unionization because employees (and not just those in unions) can potentially influence the firm's choice of activities and the division of profit. Codetermination "entrenches" workers by legislating that they have voting rights on the supervisory board.

Codetermination affects the composition of the membership of the supervisory board. The position and role of the board of directors in firm management is particularly significant because the board of directors represents the top of the firm's decision hierarchy. Corporations, as a matter of principle and law, must have a board of directors. In most countries, the board is the only corporate body whose functioning and structure are governed by corporate law. (See Klein and Coffee, 1986, and Meier-Schatz, 1988). Despite their acknowledged importance, boards are widely held to be ineffective, at least in the United States where the issue has been studied (see, e.g., Morck, Shleifer, and Vishny, 1989). In Germany, the supervisory board relies on the management board for information and may be fairly powerless. But, Kaplan (1994) provides some evidence that in Germany the supervisory board does act effectively to displace managers when the firm has not done well. Part of our analysis will be to determine whether the composition of the supervisory board affects corporate decisions.

Needless to say, codetermination has been controversial since its inception and literally thousands of papers have been written on the subject.[5] The controversy emanates from the

ideological implications of dictating that some of the capital owners' control rights be ceded to Labor. Jensen and Meckling (1979) point out that codetermination is a binding constraint: Owners could have adopted such a system voluntarily, but did not. They suggest that it must, therefore, be inefficient. Freeman and Lazear (1995) and Levine and Tyson (1990) argue the opposite viewpoint, that codetermination could be socially efficient, but not in the owners' private interests. It may be that the firm's total revenues would increase with codetermination, but the owners' share would shrink (Freeman and Lazear, 1995; also see Dow, 1993). Alternatively, it may be that while privately beneficial for each firm individually, there is a coordination failure because no one firm wants to risk being the first to adopt codetermination (see Levine and Tyson, 1990). Therefore, it is argued, the government must introduce codetermination by law, much as firm owners would not have adopted the National Labor Relations Act in the United States voluntarily.

We investigate the following hypotheses. We first ask whether there is evidence that contracts are incomplete. It may be that there are no effects of codetermination, either because employees simply do not have enough power via their board seats to affect the firm, or because Capital has responded to codetermination by writing contracts to eliminate the effects of codetermination. For example, Capital has tried over the years to weaken the power of the supervisory board by removing their ability to make important decisions. (This has been the subject of numerous court cases.) Our first tests are aimed at determining whether codetermination results in any detectable alterations in how the firm functions, that is, we ask: Do employees actually have the power to influence the decisions of the firm? If employees have such power, we then go on to ask whether the effects of codetermination are purely redistributive.

In fact, we find that there are important affects of codetermination, so Capital has been unsuccessful at contracting to protect its interests. Then we ask how employees use that power. This is the second set of hypotheses. According to the dominant paradigm on control of the firm, employees should not be allocated control rights because their interests can be sufficiently protected by contract. According to this view, if there are any affects of codetermination on the firm, they should be purely redistributive. (For this reason, we should expect that the suppliers of capital would be opposed to the adoption of codetermination.) That is, maximization of firm value is the objective function if employees, having been allocated control rights, use these control rights to redistribute surplus. If, however, employees' interests are insufficiently protected by contract or the governance structure, then once in possession of some control rights,

employees will alter the decisions of the firm in the direction of protecting their own (private) interests, *insofar as these interests are not already protected.* That is, if there is at least the possibility of a "breach of trust," and employee control rights (in the form of board seats) endow them with power, then employees may take actions to prevent this from happening. Thus, the objective function of the firm is determined by whether employees' interests can be contractually protected without allocating them control rights.

To the extent that codetermination empowers them, employees may act to protect their interests in several ways. Employees may prefer more diversification as a way of avoiding firm default and the subsequent loss of their firm-specific human capital investments. In this case, total firm risk decreases. Firm default may not be the most important risk faced by employees. As default by large firms is very rare, it may be that business cycle-related lay-offs, or wage reductions due to restructuring, for example, are more important risks, as these are more frequent. Employees may want to use the firm as an intertemporal insurance vehicle. That is, employees may resist restructuring, lay-offs, and wage reductions, protecting themselves against (business cycle) shocks to the firm, as predicted by the theoretical models of Chang (1992) and Miyazaki (1984).[6] In fact, in a similar vein, firms with strong labor unions in the U.S. tend to be less responsive to labor market conditions; for example, see Freeman and Medoff (1984, 1981).

The idea that employees' resistance to restructuring inhibits Capital's flexibility in responding to changing market conditions is related to the literature on "Eurosclerosis." Eurosclerosis is the idea that labor markets in European economies cannot respond to large shocks because of governmental and institutional restrictions. For example, Bentolila and Bertola (1990) write: "…the highly regulated nature of European labor markets constrains the flexibility of firms' employment policies in such ways that hiring a worker is definitely a risky proposition, and the degree of uncertainty about the future is a crucial parameter in the firm's problem" (p. 39). Codetermination is a specific example of how firms' flexibility may be constrained. Like the literature on Eurosclerosis, we empirically investigate the idea that employees use the firm to smooth their income and hedge their firm-specific human capital through time by protecting their employment and resisting restructuring, in response to shocks.

The particular shock that we focus on is the reunification of East Germany with West Germany. This event was one of the largest shocks to an advanced economy since World War II. Employees in the West may have resisted restructuring and investment in the East, for fear of cheap labor in the former East Germany replacing West German employees. This behavior

would result in the shareholders facing increased risk because the firm would be slow in reallocating assets in response to changes in its environment. If employees were sufficiently contractually protected, through seniority for example, then they would not use their power (if they had any) to alter the firm's objective function.

We find, in fact, that codetermination does empower employees, and that they use their power in ways that contradict the desires of shareholders, that is, they change the objective function of the firm.[7] The next set of hypotheses concerns whether shareholders take countermeasures to try to mitigate the effects of employees' decisions. That is, employees' power may be limited by measures that shareholders take to counteract their power. Evidence of countermeasures would strongly suggest that the ability to influence decision-making via supervisory board seats is valuable to employees, allowing them to redistribute firm surplus towards themselves and to protect their interests through influencing the direction of the firm.

We empirically investigate two types of shareholder countermeasures. The first concerns capital structure. Shareholders (at the firm's annual meeting) may increase firm leverage to commit more of the firm's cash flows to external creditors. As discussed below, this has been a response of shareholders to unionization in the United States and the United Kingdom. Also, the equity ownership structure may differ as a function of the extent of codetermination. Shareholders in firms with equal representation may have more concentrated blocks in order to increase their bargaining effectiveness in supervisory board meetings. The supervisory board of firms with equal representation may be more likely to include banks or families as important participants. We examine whether block shareholding is more concentrated in firms with equal representation than in non-parity codetermined firms, and whether the identity of the shareholders are different.

Secondly, we examine compensation issues for board members. In addition to altering the capital structure and the equity ownership structure of the firm in response to codetermination, shareholders can (at the firm's annual meeting) also set the incentive system, that is, they can alter the compensation arrangements to try to affect the firm's decision-making. Therefore, we investigate the sensitivity of the compensation of board members to codetermination.

The paper proceeds as follows. Section II is a brief literature survey. Section III provides some background on the German codetermination system and German corporate finance. Section IV deals with issues of equity ownership data and the measurement of equity

control rights. Section V discusses hypotheses on the effects of codetermination on firm performance, introduces the econometric methodology, and reports on empirical results. Section VI analyzes the capital structure and equity ownership structure responses of shareholders to codetermination. Section VII examines whether codetermination affects board compensation. Finally, Section VIII concludes.

II. The Literature on Codetermination and Related Issues of Worker Control

In general, there is no empirical literature that addresses the issue of the allocation of control rights to the firm across different types of stakeholders. In addition, while the literature on German codetermination is massive, there is relatively little quantitative work.[8] As FitzRoy and Kraft (1993) put it: "...there have been few attempts to quantify economic effects, and they all suffer from inadequate data and methodology" (p. 366). Kraft (1989) surveys some of this literature. We briefly provide an overview of the literature on codetermination and some related issues.

Svejnar (1982b) analyzes relative wages at the industry level, in the coal and steel industries, using annual data over the period 1946-1972. (The coal and steel industries are covered by special codetermination laws; see Appendix A.) He finds that the introduction of codetermination (in these industries) in 1951 was accompanied by a wage increase in steel, but not in coal mining. Also, see Svejnar (1981, 1982a). Benelli, Loderer, and Lys (1987) use accounting data to compare leverage, profitability, dividend payout, capital intensity, and total workers' pay, before and after passage of the 1976 Codetermination Act, for matched pairs of firms. They also present "event" studies based on passage of the 1976 Act. The sample size is 64. They find few effects of codetermination. Their main finding is that stock return variances decline following passage of codetermination laws, "[these] results [are] consistent with the implication that codetermination leads to less risky investments" (p. 563). Gurdon and Rai (1990) find a higher rate of return on assets after 1976, but their sample is 28, compared with a control group of eight firms. FitzRoy and Kraft (1993) study 68 companies in two years: 1975, the year before the 1976 Codetermination Act was passed, and 1983. They estimate translog value-added equations and find that codetermination reduced productivity by 19.7%.[9] They also find that return on equity declines. Cable and FitzRoy (1980) estimate a Cobb-Douglas production function using data on 42 firms. They include as an input a measure of "participation" of workers in firm decision-making based on a questionnaire and find that

"participation" increases productivity. In summary, previous studies use small samples and obtain mixed results.

Almost all of these studies examine firms before and after 1976 or before and after 1951 (the years when major codetermination legislation was passed, as described below) to identify the effects of codetermination. This requires data from periods when data is quite costly to collect, which explains why sample sizes are so small. The paucity of data is a serious problem and motivates our approach in this paper, discussed below. The stock market has played a much smaller role in the savings-investment process in Germany than in the United States and the United Kingdom. This is probably the main explanation for the dearth of empirical work on the codetermination system. Without a stock market that requires disclosure and generates price data, it is more difficult to obtain data, limiting the analysis somewhat.

Rather than study the behavior of firms before and after the passage of a codetermination law, we study a panel of firms and rely on cross-section variation in the fraction of votes held by employee representatives on the supervisory board to identify the effects of codetermination. We focus on the 1990s and, consequently, have a much larger sample. In addition, by the 1990s firms have adjusted to the presence of codetermination. Nevertheless, studying a panel also has issues. Large firms tend to have many employees, and consequently are subject to parity codetermination. Conversely, firms with non-parity codetermination tend to be smaller. This may confound the effects of codetermination with the effects of size. In what follows we address econometrically these issues.

The general question of how employee control or influence over the disposition of corporate assets affects firm behavior and value has been addressed in the literature on labor unions. Labor unions are an instance where workers are not allocated control rights, but have more bargaining power than they have in a competitive labor market. There is evidence that unions affect the value of equity. Ruback and Zimmerman (1984), using event study methodology, find that announcements of unanticipated collective bargaining agreements reduce equity value. Salinger (1984) studies monopolized industries and finds that unions capture most monopoly rents. Abowd (1989) finds that union members' wealth and shareholders' wealth move in opposite directions when there is an unexpected change in bargained labor costs. Also, see Freeman and Medoff (1984), Clark (1984), Bronars and Deere (1990), and Voos and Mishel (1986), among others. In general, the conclusion is that unionization is associated with lower firm profitability. (See Hirsch, 1991, for a brief survey.) But, while unions are successful in

redistributing firm surplus towards workers, there is little evidence that they have altered firms' real operating decisions, that is, the firm's objective function.

Stockholders or capitalists respond to unions and the threat of unionization by committing to pay cash out of the firm via leverage. Bronars and Deere (1991) "find strong evidence of a positive relationship between unionization and debt-equity ratios using a set of large, publicly-traded firms" (p. 232). This result is confirmed by Garvey and Gaston (1996) and is consistent with bargaining models in which financing with senior debt commits the firms to a tougher bargaining stance with respect to negotiated wages. Also, see Perotti and Spier (1993). We examine this issue as well. The German firms that we study are unionized, but, as explained below, codetermination includes a broader range of employees than simply unionized workers. Since codetermination may result in more power over decision-making in the firm than unions have, it is less clear that leverage will be used in the same way.[10]

III. The German Codetermination System and German Corporate Governance

In this section we provide some background on the legal forms of ownership in Germany, the codetermination laws, and the German system of corporate governance. We also examine the identities of supervisory board members.

A. Legal Forms of Corporate Ownership and Codetermination

Aside from sole proprietorships, German firms can be organized into limited liability companies (Kapitalgesellschaften, i.e., corporations) and partnerships (Personengesellschaften). The most common forms of limited liability companies are Aktiengesellschaften (AGs) and Gesellschaften mit beschränkter Haftung (GmbHs). AGs, literally "stock companies," are the equivalent of publicly held companies in the United States or public limited companies in the United Kingdom. GmbHs, literally "corporations with limited liability," are similar to stock corporations except that there is no traded stock and disclosure rules are less strict. Partnerships are organized either as an Offene Handelsgesellschaft (OHG), a general partnership, or a Kommanditgesellschaft (KG), a limited partnership.

Codetermination laws apply to GmbHs with more than 500 employees and to stock corporations (AGs). If there are costs to the owners due to employees legally being allocated control rights via board membership, then owners may choose to forego these organizational forms. Broadly, there appears to be evidence that German owners do indeed choose ownership

structures that avoid codetermination (though there are many other factors involved, as well). Edwards and Fischer (1994) point out that: "It appears that legal forms of enterprise with owners who are not protected by limited liability are much more important in the German than in the UK economy" (p. 83). Partnerships and sole proprietorships are much more important in Germany than in the United States or the United Kingdom.

AGs and big GmbHs are governed by a two-tier board system: the supervisory board (Aufsichtsrat) and the management board (Vorstand). (All stock corporations must have a supervisory board, but GmbHs are not required to have one as long as they do not have more than 500 employees, i.e., as long as they are not required to have employee representatives on the supervisory board.) The management board runs the company and reports to the supervisory board. The main function of the supervisory board is to control and monitor management and, in this capacity, the supervisory board has the right to appoint and dismiss members of the management board, fix their salaries, and (depending on the corporation's articles of association) approve major decisions of the management board. In particular, corporate restructuring, changes to the lines of business and other strategic realignments need the supervisory board's approval.[11]

There are three different forms of codetermination in Germany. These are detailed in Appendix A. First, under 1951 legislation, equal representation between employees and shareholders is required in the coal and steel industry (Montan-codetermination). Second, under the Codetermination Act of 1976, if the corporation has more than 2,000 employees, then the employees must elect one-half of the supervisory board members. Typically, about one-third of the employee representatives are members of the works council, which is a body of workers that participate in firm decision-making below the supervisory board level. The remainder of the employee representatives are external trade union representatives. Even though half the seats go to workers, representation is not quite equal since the chair, appointed by the shareholders, has an extra vote. Also, at least one employee representative must be elected from the *leitende Angestellte* (senior executives or senior managers). Third, under the Works Constitution Act of 1952, one-third employee representation is required of companies with 500 to 2,000 employees.[12]

In our analysis, we concentrate on the most common forms of codetermination: equal representation (parity-codetermination other than Montan-codetermination) and non-parity codetermination (where one third of the supervisory board members are employee representatives). We measure the impact of codetermination by comparing firms across these

two codetermination regimes. Broadly, when we talk about the influence of codetermination in our empirical analysis below, we mean the extra influence employees have with equal representation compared to non-parity representation. The extra influence of equal representation has been confirmed repeatedly in field studies (Niedenhoff, 1993; Gerum, Steinmann and Fees, 1988). Also, we analyze the impact of codetermination for stock corporations (AGs). Figures published in the financial statements of GmbHs tend to be highly aggregated, making a meaningful empirical study impossible.

B. The Ownership Structure of German Firms, Banks, and Monitoring

In addition to codetermination, there are other features of the German governance system that differ from the Anglo-American system and which play roles in our analysis. These features are of independent interest. One such important feature is the widespread presence of block shareholders. In stock market-based economies, outside block shareholders are often viewed as monitors of firms' managers (see, e.g., Shleifer and Vishny, 1986; Kahn and Winton, 1998; and Maug, 1998). But, the empirical evidence for this in the United States is mixed, e.g., Demsetz and Lehn (1985), Mikkelson and Ruback (1985), and Holderness and Sheehan (1988). In Germany, block share holding is much more pervasive compared to the stock market-based economies of the United States or the United Kingdom. The samples in Gorton and Schmid (2000) display the importance of block holders: 65 (162) out of 82 (283) firms in their small (large) 1975 sample have block holders holding at least 25%; for their small (large) 1986 sample it is 40 (171) out of 56 (280). Also, Franks and Mayer (1994) study a sample of 171 German companies during the late 1980s and find that in 85% of these companies there is a single shareholder that holds at least 25%. Edwards and Fischer (1994) report that: "The vast majority of German AGs have a single shareholder who owns 25 percent or more of the voting capital" (p. 194).

Such pervasive block holding is very different than what is observed in the United States and the United Kingdom. In the United States a survey of stock exchange listed firms in 1984 showed that only 20% of the firms had at least one nonofficer who owned 10% of firm's stock; 13% of the firms were majority owned (see Holderness and Sheehan, 1988).[13] In the United Kingdom the proportion of public limited companies with a majority shareholder is also far smaller than in Germany (see Edwards and Fischer, 1994). In the case of Germany, it may be that block holders are important because they are more powerful in bargaining with employee representatives on the supervisory board than would be dispersed shareholders. We will

investigate the role played for various types of block holders, paying particular attention to their identities, as discussed below.

Another important feature of the German corporate governance system concerns the role of banks. Banks play a much more important role in Germany than in the United States or the United Kingdom, as described in Gorton and Schmid (2000) and Edwards and Fischer (1994). Gorton and Schmid study the effects of bank ownership of control rights on the performance of (nonfinancial) firms. They find that in the 1970s and in the 1980s there is a significant positive relationship between bank control rights holdings and firm performance, measured by the market-to-book ratio of equity. Here we will reexamine this question for the 1990s. Also, as shown by Gorton and Schmid (2000), bank control rights holdings translate into supervisory board seats. As with nonbank block holders, the presence of bank representatives on the supervisory board may be important in bargaining with employees.

Other unique features of the German governance system include proxy voting by banks and the possibility of voting restrictions. In Germany, banks vote the shares of dispersed shareholders in proxy. This would appear to drastically increase the power of banks. But, Gorton and Schmid (2000) test for this effect and do not find it. Data on bank proxy voting is difficult and expensive to come by. As Gorton and Schmid do not find significant effects of proxy voting by banks, we do not pursue that issue here.[14]

Voting restrictions are also present in the charters of some German firms. These restrictions prevent block holders from voting more than a fixed number of votes, regardless of the number of voting shares owned. Voting restrictions are fairly rare, but have important anti-takeover implications. A typical restriction is that a block holder can exercise at maximum 5% or 10% of the firm's total voting stock independent of the size of his block. See the discussion in Gorton and Schmid (2000).

Our analysis will take account of the firm's ownership structure, i.e., the holding of equity control rights by various types of agents and the degree of concentration of these control rights. In Section IV we will detail how we measure equity control rights and equity control rights concentration. This appears to be the first time these issues have been addressed when analyzing the effects of codetermination.

C. Supervisory Board Composition

As the supervisory board is the central institution affected by codetermination, it is worth examining the identities of the individuals on the board. Table 1 shows the composition of the shareholder representation on the supervisory board (panel 1) and the employee representation on the supervisory board (panel 2). Recall that the size of the supervisory board depends on the number of employees of the company. These data are from a survey dated May 31, 1979, as reported by Gerum, et al. (1988).

With respect to shareholder representation on the supervisory board, other companies without any equity share in the firm have the largest number of seats (18.5% on average). According to Gerum, et al., (1988) these are typically related businesses, such as partners and suppliers. Consultants, such as lawyers and auditors, are next (13.5%). Finally, there are bank and nonbank block holders. About one third of the shareholder representatives do not own stock in the company. Also, some of these groups, such as consultants, would appear to have interests more closely aligned with management than with outside shareholders.

The employees are overwhelmingly represented by workers who are not affiliated with labor unions or works councils (these entities are equally important across the two codetermination regimes). The next largest group, however, consists of labor union representatives that are not actually employees of the company (29%). The third largest group consists of white-collar managers. In order for the employees to successfully influence firm decision-making, these three employee groups must agree.

IV. Ownership of German Firms

Our analysis will primarily consist of regressing measures of firm value, leverage, board compensation, risk, and other variables on control rights variables and a set of normalizing regressors. The set of control rights variables comprises an indicator variable that is equal to 1 for equal representation (and 0 otherwise), a set of equity control rights variables, and an indicator variable, which is equal to 1 if the firm has a voting restriction (and 0 otherwise). In general, we are looking for the influence of codetermination on the measures of firm performance or other firm characteristics. As codetermination is an allocation of control rights in the form of supervisory board seats, the effects of this allocation may depend on how the remaining control rights are allocated. We will define “ownership” in terms of equity control rights, i.e., control rights that emanate from equity ownership. We will also be interested in measuring the size of the largest

holder of control rights, effectively a measure of the concentration of ownership. Finally, we will argue that "ownership" is predetermined; it is not caused by firm performance or by the presence or absence of codetermination.

A. Data

Our data start with a sample consisting of annual observations on the largest 250 German nonfinancial stock corporations during the years 1989-1993, which were traded at the end of this period in at least one of the top-tier markets (amtlicher Handel or geregelter Markt).[15] Details on the construction of the sample are contained in Appendix B. In forming the sample, company size is measured by total assets, based on unconsolidated reports. From the sample of 250 corporations, firms are omitted if they are in financial distress, involved in bankruptcy proceedings, or engaged in mergers.[16] Also omitted are financial holding shells, real estate companies, public transport companies, cooperatives, and Kommanditgesellschaften auf Aktien (KGaAs; a hybrid organizational form between a partnership and a stock corporation). We discarded observations when firms were transformed into stock corporations during the fiscal year in question. Moreover, we dropped firms that are neither subject to equal representation (other than Montan-codetermination), nor to non-parity representation.[17] This leaves a total of 902 observations for the five-year period analyzed. Due to missing data, not all regressions will have the same number of observations. Also, the number of observations differs across years because new firms enter the sample as they are founded or transformed into stock corporations within the analyzed time period.

Company balance sheet and income data are from unconsolidated annual reports, taken from: Handbuch der deutschen Aktiengesellschaften, edited by Verlag Hoppenstedt & Co., Darmstadt, various issues, published annually. In a few cases we had to resort to the company reports themselves in order to complete the data. Also, we used the company statements as published in Bundesanzeiger (an official publication of the German Ministry of Justice). The equity ownership structure data are from Saling Aktienführer, edited by Verlag Hoppenstedt & Co., Darmstadt, various issues. One unfortunate feature of the data is that, while the total wage bill is available, the number of employees is typically not published in unconsolidated reports. Therefore, the wages per employee are not known.

We use accounting and stock market based measures of profitability as indices of firm performance. The reliability of stock market-based measures for German firms is confirmed by Harris, Lang, and Möller (1994). They study large German firms over the period 1982-1991 and

find that the relationship between 18-month stock returns and annual earnings is basically the same as in the United States.

Table 2 shows the distribution of companies in the sample across industries (according to the International Standard Industrial Classification (ISIC) scheme, see United Nations, 1990). Table 3 provides summary information on the dependent variables for the 1993 fiscal year. Of these 186 firms, 63% are subject to equal representation; 8% of these firms have voting restrictions. Board compensation is given as per-capita compensations, obtained by dividing the total compensation of the board by the number of board members. Individual compensation data for board members are not publicly available. Details on the construction of the variables from the accounting data can be found in Appendix C.

B. Measuring Ownership

Measuring "ownership" in Germany is complicated because pyramiding and cross-shareholding separate cash flow rights (claims to residual cash flows) from control rights in the form of votes. Franks and Mayer (1994) and Emmons and Schmid (1998) discuss these ownership structures in Germany. La Porta, Lopez-de-Silanes, and Shleifer (1999) argue that a measure of control or power should be based on control rights as they emanate from equity ownership. These authors provide a methodology to make these calculations in the presence of complicated ownership structures. We proceed similarly and calculate the equity control rights held by different parties, taking account of pyramids and cross-shareholding. Gorton and Schmid (2000) describe in more detail how this is done for the case of Germany. In the following we provide a brief overview.

Determination of equity control rights in complicated ownership structures (such as pyramids and cross-shareholdings) depends on a definition of the *ultimate owner*, the agent at which tracing the ownership structure stops. We categorize firms into the following ultimate owners: non-executive employees (EE); management (EM); families, including family-controlled trusts (EF); domestic banks (EB); nonfinancial firms (EN); domestic government entities, including government-controlled trusts or special-purpose banks (EG); foreign banks; domestic and foreign insurers; foreign government entities; trusts not elsewhere classified; domestic and foreign equity funds, including bank-financed venture capital.

The classification of ultimate owners generally follows La Porta, Lopez-de-Silanes, and Shleifer (1999). One important difference, however, is that, unlike La Porta, Lopez-de-Silanes,

and Shleifer, we have nonfinancial firms and private equity funds as ultimate owners. In many instances, these firms are not traded, which means that ownership data is generally not available. Even in cases where these firms are traded, we often reach a point in the chain at which we cannot trace the holdings further. Stopping at this point introduces some arbitrariness to the procedure, but this is dictated by the data limitations. Furthermore, breaking up traded nonfinancial firms but not breaking up nontraded nonfinancial firms (as La Porta, Lopez-de-Silanes, and Shleifer did) seems arbitrary too. In the same vein, La Porta, Lopez-de-Silanes, and Shleifer do not break up non-publicly-traded firms (or financial firms), presumably because of a lack of data. While we trace ownership backwards through the chain as far as we can, data limitations prevent us from eliminating nonfinancial firms or equity funds as ultimate owners.

Basically, the idea in La Porta, Lopez-de-Silanes, and Shleifer (1999) is to trace the holdings of equity control rights backwards through the ownership chain, basing the final measure of holdings on a critical cut-off level of holdings. For example, suppose party A holds 26% of Firm B's voting shares and Firm B holds 40% of Firm C's voting shares. Then under a 25% cut-off rule, party A is an ultimate owner of Firm C and is assigned a 26% holding of control rights in Firm C. If party A held only 18% of Firm B, then under a 25% cut-off rule, party A would not be an ultimate owner of Firm C. We define the cut-off level to be 25 percent because corporate charters in Germany make this percentage a powerful block. [18]

With complicated shareholder structures, the procedure of assigning equity control rights to ultimate owners can be quite involved. Figure 1 shows a typical example of a pyramid in our samples and illustrates the method and issues that arise when measuring ownership by control rights in Germany. The figure shows the shareholder structure of one of our sample firms, Linotype-Hell AG, on September 30, 1992. Following our principle of defining control rights based on votes, the graph displays ownership as fractions of votes (which is not necessarily identical to the fractions of equity from which these votes emanate). Linotype-Hell AG has two block holders: Siemens AG (33%) and Frega Vermögensverwaltungsgesellschaft mbH (16.67% plus one share), a financial holding shell. Frega is owned by Commerzbank AG (40%), Bührmann-Tetterode Nederland N.V. (20%), The East Asia Co. Ltd. A/S, Copenhagen (20%), and Iduna Lebensversicherung (20%). Siemens, Bührmann-Tetterode, the East-Asia Co., and Iduna are ultimate owners. Allocation of equity control rights according to the weakest link principle is as follows: Siemens 33%; Bührmann-Tetterode, the East-Asia Co., and Iduna each 16.67%.

Table 4 shows the number of pyramids and cross-shareholdings for our sample in the year 1992, the last year for which we collected equity ownership data. 13% of our sample firms are held through pyramids. There is only one case of cross-shareholding.

In our analysis we do not completely rely on the identity of an ultimate owner to define control associated with equity ownership. We also measure another dimension of the firm's control structure, the extent to which control rights are concentrated. To measure concentration we look at the fraction of votes controlled by the largest ultimate owner (Emax). This is the simplest, most straightforward measure of concentration of ownership, particularly in Germany where a single large ultimate owner is pervasive. This measure does not require a theory of how large shareholders interact. Thus, we do not rely on a theoretical model as a basis for a concentration measure.[19]

C. Who Owns German Firms?

Tables 5, 6, and 7 provide detail on the distribution of equity control rights of the firms in our sample. We are interested in the degree of block holding of control rights by ultimate owners and also in the distribution of control rights across different types of ultimate owners.

Table 5 shows the distribution of equity control rights across different types of ultimate owners. Note that the mean fraction of control rights held by the largest ultimate owner (Emax) equals 51%. Families are the most important category of ultimate owner; their mean equity control rights amount to 10.6%. Domestic banks, on average, hold 6% of the equity control rights. Domestic nonfinancial firms are the only type of ultimate owner with a median greater than zero. This reflects the extent of the data issues in unraveling the ownership structure.

Table 5 also shows the difference in ownership allocation of equity control rights across different types of ultimate owners between firms with parity codetermination and firms with non-parity codetermination. Smaller firms have non-parity codetermination and these firms tend to have larger concentrations of ultimate owners. Holdings by management, families, domestic nonfinancial firms, and domestic government (among others) tend to be larger in non-parity codetermined firms. Note that the largest ultimate owner differs in holdings by 11.5 percentage points.

Table 6 provides more detail on the distribution of the size of equity control rights allocations. Again, the pervasiveness of block holding is apparent. In the last line of the table it is seen that 63% of the firms have an ultimate owner with at least 50% of the control rights.

Families own at least 50% of the control rights in 12% of the firms. Domestic non-financial firms constitute the modal category of largest owner, followed by families, foreign non-financial firms, domestic banks, management, and domestic government entities. These ultimate owners are quantitatively the most important types, and will thus be included in our quantitative analysis, along with the fraction of control rights held by firm insiders, that is management and non-executive employees.

Table 7 shows pair-wise rank correlation coefficients between the holdings of the most important ultimate owners. Management equity control rights are positively correlated with (non-executive) employee control rights. Families' equity control rights are negatively correlated with equity control rights held by domestic government entities. Equity control rights held by domestic banks are negatively correlated with control rights held by nonfinancial firms. Nonfinancial firms' control rights are negatively correlated with the control rights of any other of the aforementioned ultimate owners with the exception of non-executive employees.

D. Changes in the Equity Ownership Structure Over Time

Our tests will take the ownership structure of control rights as exogenous or, at least, predetermined with respect to firm performance. In other words, we assume that holders of control rights do not purchase their shares in anticipation of the firm performing well. That this is a reasonable assumption is shown in Table 8.

Table 8 shows the changes in control that occurred for firms in our sample. A change of control is an instance where the identity of the largest ultimate owner changes. Such instances comprise block trades (a block holder sells its entire block to another investor, possibly of the same ultimate owner type), floating of blocks in the market, or accumulation of previously dispersed shares. The table shows that control changes are rare. The results in the table imply that control in the firm changes, on average, once every 17 years. Thus we conclude that we can treat the shareholder as an exogenous variable in our analysis.

There is also the issue of whether the codetermination regime is of influence on the firm's shareholder structure. It may be that when a firm crosses the 2,000-employee threshold (and thus becomes subject to equal representation), the identity of the block holders changes, as well as the size of their blocks. We examine these hypotheses below and find that they are not the case.

Codetermination itself is essentially exogenous. A firm cannot circumvent the 1976 Codetermination Act (or the 1951 Montan-codetermination Act) by moving assets to subsidiaries. Codetermination applies to the concern as a whole. A firm belongs to a concern if the parent company is in control of this company. Thus the only way to avoid equal representation is to keep the number of employees below 2,000 through outsourcing, or to run the firm as a partnership. Often, these solutions might be more costly than to grant employees equal representation on the supervisory board.

V. Codetermination, Ownership Structure, and Firm Performance and Risk

In this section we investigate whether the allocation of supervisory board seats to employees has any detectable effect on the performance of the firm. If board seats are valuable, and Capital cannot contractually protect itself, then employees should, minimally, be able to redistribute surplus to themselves. If we find that board seats are valuable for employees, then we investigate whether employees seek to alter the objective function of the firm.

A. Possible Effects of Codetermination

It is not immediately obvious that codetermination provides employees with sufficient power to significantly influence the activities of the firm. Even when employees constitute half of the supervisory board, the chairman can exercise an extra vote if this is the second time that the ballot on the issue is tied. (This second vote is rarely used though; the shareholders' representatives tend to seek consensus; see Bericht der Kommission Mitbestimmung, 1998, p. 103.) Moreover, some important decisions are taken at the annual meeting. At this meeting, shareholders have the right to: change the corporate charter (including changes to the firm's equity, e.g., stock issues); dissolve the company; approve the annual report of the management board; and decide on the firm's payout via dividends. In general, votes at the annual meeting require a simple majority (50% plus one vote). However, changes to the charter (including changes to equity) require approval of at least 75% (a "qualified majority") of the votes. While the supervisory board has important influence on the firm's investment projects, the shareholders at the annual meeting have power over the firm's capital structure by deciding on the firm's dividend policy and the issue of new equity.

Even if codetermination empowers employees, it may be the case that there are countervailing mechanisms that shareholders adopt to mitigate the effects of codetermination. Explicit or implicit contracts may allow shareholders to protect their interests even in the

presence of codetermination. For example, the pervasiveness of block holders and the identity of the block holders, e.g., families and banks, in particular, may be a response to codetermination. A block holder, controlling the nonemployee supervisory board seats, may be a tougher bargainer with the employees. Below we will investigate whether codetermination causes such block holdings and we will examine the identity of block holders as a reponse to codetermination. Finally, compensation arrangements for board members (and possibly individual managers—though we have no data on individual managers) might be altered to counteract the effects of codetermination.

If contracts are not complete, so that codetermination empowers employees, then we ask: How do employees use their power? Do they simply redistribute surplus? If employee interests are not contractually protected, then they would seek to do more than simply redistribute surplus. Employees may desire to (further) diversify the firm to protect firm-specific human capital that would be lost were the firm to default. Diversification reduces this likelihood. Firm-specific human capital can be substantial. Topel (1990) finds that, in the United States, long-tenured employees that are laid off through no fault of their own (e.g., as a result of a plant closing) typically earn 15% to 25% less on their next jobs.[20] And May (1995) finds evidence that older (U.S.) managers, with (presumably) more at stake in their firm, are more likely to engage in diversifying actions. German employees, therefore, may have both the desire and the power to prevent such potential losses.

Insolvency of large corporations is very rare. But, there is another risk that is more prevalent. Employees may resist restructuring, lay-offs, or wage reductions, i.e., reallocations of the firm's (human) assets in response to changes in the firm's environment, possibly contributing to Eurosclerosis. So, another possible alteration of the objective function by employees concerns resisting such changes in order to smooth risk through time. Chang (1992) presents a model of firm capital structure in the presence of risks to employees from decisions by the suppliers of capital. Chang's model deals with restructuring, events in which employees may be fired, laid-off, relocated, reassigned, receive reduced compensation, or have fewer promotion opportunities. Suppliers of capital seek to engage in restructuring to maximize firm value, but employees may suffer pecuniary and non-pecuniary costs. Employees seek to avoid restructuring because market incompleteness means that their losses associated with restructuring cannot be mitigated. Furthermore, restructuring itself is not contractible. That is, it is assumed that employees cannot be protected from restructuring. Chang does not consider the welfare question of whether control should be allocated to employees. But, for purposes here Chang presents a model in

which employees' interests cannot be fully protected; if allocated control rights, different restructuring decisions would be taken.

Miyazaki (1984) also presents a model of the firm that is relevant to the issue of restructuring. Miyazaki investigates the effects on firm decision-making of varying degrees of employee bargaining power inside the firm. Miyazaki emphasizes the presence of firm-specific factors that explain the presence of quasi-rents. Like Chang, it is not the case that employees simply want to maximize the surplus of the firm, though the reasoning is different. However, again, employees that have bargaining power use it to not only to increase compensation, but also to lower layoff probabilities. Other related theoretical models are those of Aoki (1982, 1980) and Svejnar (1982c).

The idea that codetermination impedes the flexibility of shareholders in responding to macroeconomic, and other, shocks is a widespread view in Germany. A recent bipartisan study put it this way:

> Changes in competitive conditions in international product markets seem to have decreased the *amount of time for decision-making* that is available to firms. Shorter product cycles and overall less predictable markets reward quick decisions and make it harder for codetermined firms to compensate longer consensus-forming time lags with shorter implementation lags. To the extent that these new competitive conditions require an acceleration of firm internal decision-making processes, codetermination bodies will have to change their ways of operation if they do not want to stand in the way of firm performance and do not want to give up on their claim to effective participation. What is most needed is *de-bureaucratization* and *a shortening of the information and consultation channels* between firm management and the employee representation …. (Bericht der Kommission Mitbestimmung, 1998, p. 66; italics in original; our translation).

Of course, the real issue is whether employee resistance to "changes in competitive conditions" is really due to bureaucracy or whether employees have a different notion of how the firm should be run. Our hypothesis is that employee resistance to "de-bureaucratization" will increase the firm's total risk as the firm is more exposed to adverse changes in its competitive environment because it cannot respond quickly by restructuring.[21]

B. Econometric Methodology

When analyzing the influence of codetermination on the firm, we face the problem of separating the influence of codetermination from the influence of firm size. Large firms tend to have many employees, and consequently, tend to be subject to equal representation. The problem

of separating these two influences, size and codetermination, is aggravated by a lack of knowledge about whether firm size has an influence on the firm characteristics of interest (i.e., measures of firm performance and risk), and, if there is such an influence, what the nature of this influence is. We therefore estimate a semi-parametric model, in which firm size is included in the nonparametric part, while all other (nonconstant) explanatory variables are in the parametric part. This way we can "purge" the data from the influence of firm size, before estimating the influence of codetermination. In other words, we let the effects of firm size be as nonlinear as possible and allow this nonlinear relationship to explain as much variation in the dependent variable as possible. To be conservative with respect to the potential influence of codetermination, we prefer to err on the side of over-fitting, i.e., to err on the side of ascribing variation of the dependent variable to the influence of firm size rather than to the firm's codetermination regime.

For each year in our dataset, we estimate a semi-parametric regression equation of the form:

$$y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i \qquad (1)$$

with y_i being an observation of the dependent variable for firm *i (i = 1,...,n)*. The regressor z_i represents the size of firm i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term.

We estimate Eq. (1) following Speckman (1988). In the first step, we smooth the dependent variable vector, $\boldsymbol{y}$, on firm size, $\boldsymbol{z}$. The smoother matrix, $\boldsymbol{S}$, establishes a linear relationship between $\boldsymbol{y}$ and the estimate $\hat{\boldsymbol{y}}$:

$$\hat{\boldsymbol{y}} = \boldsymbol{S} \times \boldsymbol{y} \ . \qquad (2)$$

We apply the smoother LOESS (locally weighted regression) as developed by Cleveland and Devlin (1988) and Cleveland, Devlin, and Grosse (1988). LOESS estimates the functional form in each observation by defining a neighborhood of q data points around the observation in question. These data points are chosen and weighted based on the Euclidean distance. We use a tricube weight function with quadratic fitting as suggested by Cleveland and Devlin. The fraction of data points that are comprised in the neighborhood, $g = q / n$, is called the smoothing parameter. We chose a smoothing parameter of 0.7. We also estimated the model with alternative smoothing parameters ($g = 0.4$ and $g = 1$) without obtaining qualitatively different results on the influence of codetermination. Note that a "neighborhood" captures the idea of

characteristics of firms that are near the point of interest. This makes sense in cross section, but not in the time series dimension. Therefore, we estimate relationships year by year.

In the second step, we "purge" the dependent variable and the explanatory variables of the parametric part from the influence of firm size, which is contained in the nonparametric part:

$$\tilde{\boldsymbol{y}} = (\boldsymbol{I} - \boldsymbol{S}) \times \boldsymbol{y} \tag{3a}$$

$$\tilde{\boldsymbol{X}} = (\boldsymbol{I} - \boldsymbol{S}) \times \boldsymbol{X} \tag{3b}$$

with $\boldsymbol{I}$ being the identity matrix.

In the third step, the vector $\boldsymbol{\beta}$ is estimated using ordinary least squares:

$$\hat{\beta} = (\tilde{\boldsymbol{X}}'\tilde{\boldsymbol{X}})^{-1} \times \tilde{\boldsymbol{X}}'\tilde{\boldsymbol{y}} \ . \tag{4}$$

As Speckman (1988) has shown, the bias of the estimator, $\hat{\boldsymbol{\beta}}$, is asymptotically negligible for sufficiently low values of the smoothing parameter, g.

The estimated impact of the explanatory variables in the partially linear model is

$$\hat{\boldsymbol{f}} = \boldsymbol{S} \times (\boldsymbol{y} - \boldsymbol{X}\hat{\boldsymbol{\beta}}) \ . \tag{5}$$

Thus, we obtain as the estimated vector of the dependent variable the following:

$$\hat{\hat{\boldsymbol{y}}} = \boldsymbol{X}\hat{\boldsymbol{\beta}} + \hat{\boldsymbol{f}} \ . \tag{6}$$

It is then straightforward to show that $\hat{\hat{\boldsymbol{y}}}$ is a linear function in $\boldsymbol{y}$:

$$\hat{\hat{\boldsymbol{y}}} = \boldsymbol{L}_S \times \boldsymbol{y} \tag{7a}$$

with

$$\boldsymbol{L}_S = \boldsymbol{X}(\tilde{\boldsymbol{X}}'\tilde{\boldsymbol{X}})^{-1}\tilde{\boldsymbol{X}}'(\boldsymbol{I} - \boldsymbol{S}) + \boldsymbol{S}_F \tag{7b}$$

$$\boldsymbol{S}_F = \boldsymbol{S}[\boldsymbol{I} - \boldsymbol{X}(\tilde{\boldsymbol{X}}'\tilde{\boldsymbol{X}})^{-1}\tilde{\boldsymbol{X}}'(\boldsymbol{I} - \boldsymbol{S})] \ . \tag{7c}$$

Based on the linearity shown in Eq. 7a, we use results from Cleveland and Devlin (1988, p. 599) on the distribution of the residuals of LOESS regressions to estimate standard errors for $\hat{\boldsymbol{\beta}}$ as proposed by Speckman (1988, p. 421), and confidence intervals for $\hat{\boldsymbol{f}}$.

To demonstrate that the results are not driven by firm size we also present plots for the estimate of the nonparametric part, $\hat{\boldsymbol{f}}$, which represents the level of the influence of firm size.

Since the intercept in the estimated semi-parametric model is not identified, only the changes in the values on the ordinate, not the values themselves, should be interpreted. Note that plots can look somewhat choppy when LOESS is used as a one-dimensional smoother (i.e., with one nonconstant variable in the nonparametric part; see Bradley and Tibshirani, 1993, p. 78). The graphs include 90% confidence intervals bands.

C. Codetermination and Firm Performance

In this section we empirically investigate the effects of codetermination on firm performance, as measured by the market-to-book ratio (MTB), the return on assets (ROA), and the return on equity (ROE). The market-to-book ratio is essentially Tobin's Q. While we do not construct estimates of the replacement costs of fixed assets or adjust for taxes, Perfect and Wiles (1994) show that these adjustments are not significant. With exceptions that are mentioned later, all the regression equations have the same set of independent variables. This standard set of regressors comprises the following variables that represent the firm's control rights structure:

- Co: equal to 1 if firm is subject to equal representation on the supervisory board, 0 otherwise;
- EE: fraction of equity control rights held by non-executive employees;
- EM: fraction of equity control rights held by management;
- EF: fraction of equity control rights held by families;
- EB: fraction of equity control rights held by domestic banks;
- EN: fraction of equity control rights held by nonfinancial firms;
- EG: fraction of equity control rights held by the (domestic) government entities, including special-purpose banks and trusts controlled by the government;
- Emax: fraction of equity control rights held by the single largest block holder;
- VR: equal to 1 if the firm has adopted a voting restriction, 0 otherwise.

To avoid simultaneity problems, all control rights variables are lagged by one year, with the exception of the variable Co. In our regressions, we also include, as a measure of firm size, the log of the firm's stock market capitalization, lagged by one year (SMC) and a set of industry indicator variables (following ISIC categories). Details about the construction of the variables are contained in Appendix C.

Under the null hypothesis of no affects of codetermination, maximization of the performance measures is the goal of the controlling shareholders. The regression results are shown in Table 9. The main variable of interest is Co, which indicates equal representation. The

important result in the table is that codetermination does affect the value of the firm. For all five years, we find a significant negative impact of parity-codetermination on the market-to-book ratio of equity (MTB) (panel A) and ROA (panel B). For ROE, our results are statistically significant for the years 1989 and 1993, but insignificant for the years 1990, 1991, and 1992. Thus we conclude that employees do have power to affect firm decisions when they are represented on the supervisory board. The transfer of some control rights from equity holders to employees results in a different set of choices for the firm, choices that lower the market-to-book ratio of equity, return on assets, and return on equity. Averaged over the five years we analyzed, codetermination reduces MTB by 27% and ROA by 5 basis points. [22] Taking into account that for three years the influence of codetermination on ROE is insignificant, codetermination decreases the return on equity on average by 2 basis points.

The impact of the ownership structure on firm performance is also interesting. The influence of families on firm value is significantly positive in the year 1991 by all three performance measures, but insignificant otherwise (with the exception of a positive influence on MTB in 1992). As discussed below, the year 1991 may be of particular significance since it reflects the effects of the reunification of East and West Germany. The influence of banks is insignificant with the exception of the year 1989 when banks increased MTB but lowered ROA. This contradicts the results of Gorton and Schmid (2000), possibly reflecting the later time period compared to their samples. The impact of government entities is insignificant or significantly negative, but never significantly positive. This indicates that firms that are controlled by government entities might have a different objective function, similar to firms with equal representation.

Figures 2, 3, and 4 show the influence of firm size (as measured by the log of the firm's stock market capitalization) on firm performance for the median year (1991). Firm size tends to increase MTB and ROA, while the influence of ROE seems weak (but positive). The plots show the location of firms on the size spectrum, and the type of codetermination they are subject to. While small firms tend to be non-parity codetermined and larger firms seem to have equal representation, there is a great deal of overlap between the two types.

D. Codetermination and the Firm's Objective Function: Results

Employees are altering firm decisions, reducing firm performance (from the point of view of the shareholders). Why are they doing this? Are they deriving some private benefits from the power to influence corporate decisions? Are they altering the firm's objective function?

As discussed above, employees are stakeholders in the firm to the extent that they have firm-specific human capital investments. Employees may want to protect quasi-rents that would be lost if they were fired, laid-off, or possibly assigned to a different job. One possibility is that employees are concerned with the firm failing. So, we first ask whether a higher degree of codetermination is associated with a more diversified firm, that is, a larger number of lines of business of the firm. Perhaps more importantly, they lose quasi-rents when the firm restructures. Second, we look for evidence that employees avoid restructuring in parity-codetermined firms. In this latter case, we ask whether the firm's total risk increases with codetermination, as avoidance of restructuring shifts risk to shareholders. It might be that employee resistance to restructuring shifts risk to equity holders. Intuitively, by impeding the ability of shareholders to respond to negative shocks in the economy, employees make holding shares riskier, but protect themselves.

In regard to possible resistance to restructuring, it is important to note that our sample spans the event of the reunification of East and West Germany. Reunification of the two Germanys was one of the largest and most jarring transformations of any major industrialized country in the postwar era. Between 1989, the date our sample starts, and January 1991 (the middle of our sample), reunification went from being inconceivable to being a reality. For background see, e.g., Sinn and Sinn (1992). Because of the fears concerning cheap labor in the former East, the event of reunification offers an excellent opportunity to test possible employee desires to alter Capital's decisions.

The first issue, concerning the number of lines of business is addressed in Table 10 (with Figure 5 showing the influence of firm size for the median year, 1991). The table provides no evidence that parity-codetermined firms have more lines of business, i.e., are more diversified. Also, the type of ultimate owner seems to have no impact on this issue, except in the case of government ownership, which has a significantly negative effect in the year 1992. Figure 5 shows that the number of lines of business increases with firm size.

The second issue concerns the influence of codetermination on the standard deviation of the firm's weekly stock returns. Is there evidence that risk is shifted to Capital to the extent that employees impede flexibility? Controlling for the impact of the level of the firm's total stock return for the year is complicated by the fact that some firms have negative total returns. We thus expect the influence of the total return for the year on the standard deviation of weekly

returns to be nonlinear. This is why we include the total return in the nonparametric part of Eq. 1, in addition to firm size.

Table 11 shows the regression coefficients of the parametric part. For three of the five years analyzed, codetermination significantly increases the standard deviation of the firm's stock returns. For the years 1989 (before reunification) and 1992 we cannot reject the null hypothesis of no such influence. In the remaining years there is evidence that codetermination shifts risk to Capital, consistent with employee fears about reunification leading them to resist restructuring, i.e., moving production to the former East to take advantage of cheap labor. Note also that for three of the five years we find evidence that banks and nonfinancial firms also increase the total risk of the firm.

Figures 6 and 7 show the influence of firm size and of total stock return on the firm risk for the calendar year 1991, the median year in the sample. These figures are "conditioning plots" (Cleveland and Devlin, 1998, p. 601). In these plots the influence of one variable of the nonparametric part is shown while the values of the other variables in the nonparametric part of the regression model are held constant. Note that LOESS conditioning plots are smooth, in contrast to the choppy plots in Figures 2-5, which were obtained when LOESS was used as a one-dimensional smoother (i.e., with one nonconstant variable in the nonparametric part). Figure 6 shows the impact of firm size on the standard deviation of the firm's weekly stock return. The plot shows that this influence is slightly negative, although the confidence intervals are wide. Figure 7 shows the impact of the total stock return for the year on the standard deviation of the stock returns. As can be expected, the relationship is u-shaped with the minimum in the neighborhood of zero total return. For the other four years the graphs look similar (not shown).

VI. Shareholders' Capital and Ownership Structure Responses

Since there is a negative effect of codetermination on firm performance (from the shareholders' point of view), shareholders may take countervailing measures. In this section we investigate whether shareholders respond to codetermination by taking counteracting measures. One way to do this might be by altering the firm's capital structure. Shareholders can influence the decision-making of the firm by choice of the capital structure (see, e.g., Hart, 1995; and Chang, 1992). We investigate firms' leverage as a function of codetermination. Recall the results discussed in the Introduction concerning the response of U.S. firms to unions. These firms tend to increase leverage.

Another possible countermeasure concerns the concentration of the equity control rights. Bargaining with employees on the supervisory board and overseeing management outside of the formal channel of the board structure may be more effective if the equity control rights are more concentrated. In the next section we examine whether shareholders increase the performance sensitivity of compensation for board members.

A. Codetermination and Leverage

If employees can affect the real activities of the firm, they must be aware that they cannot affect the debt-equity ratio since that is one important decision that the supervisory board does not make independently. Leverage is voted on by the shareholders at the annual meeting of the firm. If employees reduce the return on equity and make equity stakes riskier, then the shareholders should issue less of it. Also, in response to employees' power and desire to alter the firm's decisions (from what shareholders would otherwise agree to), shareholders may be able to use leverage to reassert their authority over decision-making. For example, if employees alter the mix of the firm's real activities in the direction of less restructuring activity, the shareholders may respond by altering leverage, increasing financial leverage to threaten them with a higher likelihood of default. Also, as with U.S. firms responding to unions, shareholders can increase leverage to commit to paying cash out of the firm, rather than to employees in the form of higher wages. We address these issues by analyzing whether leverage is affected by codetermination.

We measure the influence of codetermination on the firm's capital structure (as chosen by the shareholders at the annual meeting) by regressing the (log of the) debt-equity ratio on the standard set of independent variables. The empirical results are given in Table 12 (with the influence of size for the median year, 1991, displayed in Figure 8). The regression coefficients representing the influence of codetermination are positive and statistically significant, except for an insignificant coefficient in year 1992. That is, there is evidence that shareholders use capital structure to mitigate the impacts of codetermination. Employees of parity-codetermined firms are treated similar to unionized workers in the United States.

B. The Concentration and Identity of the Equity Ownership Structure

We now turn to examining whether equity control rights are more concentrated in firms with equal representation. We measure concentration by the size of the ultimate owner (Emax). The results in Table 13 show that codetermination is not a significant determinant of the size of

the largest ultimate owner. This finding is consistent with our earlier point that it is difficult to trade equity in Germany and blocks seem to be the product of firm specific events in the past. Figure 9 shows the influence of firm size on the equity control rights concentration for the year 1991. With the exception of a negative influence for the very large firms, firm size seems to have no effect on the size of the largest ultimate owner. Similar plots were obtained for the other three years (not shown).

VII. Codetermination, Firm Size, and Board Member Compensation

When faced with employees on the supervisory board, shareholders may respond by making compensation of board members more sensitive to firm performance. To date there has been little work on board compensation in Germany. As Pistor (1999) writes: "An empirical analysis of codetermined supervisory boards is constrained by the lack of systematic data" (p. 30). There are, however, a few studies. Schwalbach and Grasshoff (1997) use proprietary consulting firm data to look at the relation between managerial pay and performance and find little evidence of sensitivity. Kaplan (1994), however, does find that the elasticity of cash compensation to stock price performance in Germany is roughly comparable to the United States. Neither of these studies examines the issue of codetermination on the compensation of board members. We examine the sensitivity of board member compensation to codetermination issue in this section.

A. Is the Reduction in Firm Value Due to Managers or Employees?

Recall that there are two boards of directors that oversee German public limited companies, AGs. The supervisory board oversees the management board. Codetermination affects only the supervisory board. Management board compensation is typically explicitly dependent on the performance of the firm. Firm performance is traditionally measured using accounting information. Explicit performance pay for supervisory board members exists, but is rare. This does not preclude the possibility that supervisory board compensation is implicitly performance-sensitive over time and in cross-section.

Shareholders may want to counteract the desire of managers or board member employees to resist restructuring by adopting more performance-sensitive compensation for the agents that are making these decisions. These agents could be the management, the employees, or both groups.

B. Compensation Results

For the board compensation regressions, we again face the problem of separating the influence of codetermination from the influence of firm size. Here the issue is complicated by a possible interaction between firm size and performance-sensitivity of compensation, as evidenced by Murphy (1998). Thus, in addition to firm size, we include firm performance in the nonparametric part. LOESS does not only allow for nonlinearities in the influences of individual variables; in contrast to kernel smoothers, for instance, it also allows for interactions among the variables. For example, LOESS can allow the impact of performance on compensation to be nonlinear (holding the influence of firm size constant) and, at the same time, it can allow the influence of firm performance to vary with firm size.

We measure board compensation by the log of compensation per board member. As above, we measure firm size by the (log of the) firm's stock market capitalization, SMC. For firm performance we use the (log of the) market-to-book ratio of equity, MTB. Although compensation of directors with stock options was illegal in Germany for the period we analyze, we chose MTB. Firstly, from the equity holders' point of view it is the firm's stock market performance that matters. Compensation contracts can be linked to variables that are correlated with the firm's stock market performance, even though stock options are not possible. Secondly, using MTB as a performance measure will allow us to compare are results to Kaplan (1994) who analyzed board compensation in Germany using a stock market-based measure of firm performance. Other explanatory variables are: Co, which is equal to 1 for parity-codetermined firms, and 0 otherwise; Co x Perf, which measures changes in the performance-sensitivity of the board compensation; 0/1 variables for industry affiliation, based on ISIC categories (United Nations, 1990).

The results for the management board compensation are shown in Table 14. Panel A covers the management board, panel B covers the supervisory board. For neither of the two boards and none of the five years analyzed can we reject the null hypothesis that codetermination does not make board compensation more sensitive to firm performance.

Figures 10-13 show the influence of firm performance and firm size on the board compensations for the median year in the sample, 1991. Figure 10 contains the conditioning plot of the impact of firm performance on the per-capita compensation of the management board, with firm size being held constant at its median level. The plot shows that this influence is actually slightly negative, although the confidence intervals are wide. Figure 11 shows the impact of firm

size on the per-capita compensation of the management board, with firm performance held constant at its median. The plot shows that compensation increases with firm size.

Figures 12 and 13 display the regression results for the supervisory board. Figure 12 shows a slightly hump-shaped impact of firm performance on the per-capita compensation of the supervisory board, with a clear negative impact for firm performance for high performance levels. Figure 13 is similar to Figure 11 in showing that board compensation increases in firm size.

Figures 10-13 are not aberrations. We obtain very similar plots for the other four years (not shown). For some of these years, the negative influence of firm performance on the management or the supervisory board compensation is even more pronounced. This is inconsistent with Kaplan's (1994) findings that show that compensation is sensitive to firm performance in Germany.

VIII. Conclusions

The German codetermination system legally requires firms to allocate supervisory board seats to employees depending on the number of employees in the firm. We show empirically that the allocation of some control rights over corporate assets to employees affects the allocation of firm resources and risk. Codetermination creates bargaining power for employees by effectively transferring some of the suppliers of capitals' control rights to them in the form of seats on the supervisory board. The votes attached to shares are less valuable when employees are entitled to supervisory board seats by law.

We find that with employees on the supervisory board, firm resources are directed differently, decreasing the return on assets and the market-to-book ratio. Also, the return on equity decreases. Employees influence decisions such that the firm's systematic risk increases because of employees resisting restructuring efforts by shareholders. Codetermination appears to be a binding constraint on shareholders. They can avoid codetermination only by breaking up the firm into small independent units (which are not united in a group) or by moving to a partnership. Such changes in the organizational form seem to be prohibitively costly for many large German stock corporations. Of the available methods for counteracting codetermination, shareholders increase the leverage of the firm.

To address the question of "Who should control the firm?" requires a welfare function that weights the utilities of the suppliers of capital and the utilities of the suppliers of labor. It is

clear from our results that employees have different objectives than those of the suppliers of capital and that achieving their objectives reduces the utility of the suppliers of capital. The revealed preference of employees suggests that protecting firm-specific human capital is a real and quantitatively significant issue. Their behavior in parity-codetermined firms suggests that their contribution to the firm makes them an important stakeholder.

None of this is to say whether codetermination is socially optimal or not.

Footnotes

[1] Control rights are valuable. For example, there is a premium attached to voting shares compared to nonvoting shares, and by the premium paid to purchase a block of shares. For example, the U.S. Securities and Exchange Commission (1987), examining 26 firms with dual-class stock, found that the low-vote common stock traded at a discount of 4% or 5%. Lease, McConnell and Mikkelson (1983) also looked at dual-class stock and found that the voting stock traded at a 1% to 7% premium. Also, see Lease, McConnell, and Mikkelson (1984), DeAngelo and DeAngelo (1985), and Zingales (1995) who all show that, in the United States, shares with superior voting rights rate at a premium. Also, Zingales (1994) and Barclay and Holderness (1989) study block trades, which transfer control, and find premiums averaging 19% over the post-announcement exchange-quoted price. Vishny and Shleifer (1997) review the evidence for countries other than the United States.

[2] Alchian and Demsetz (1972), Alchian (1984), and Fama and Jensen (1983), Meade (1972), and Kihlstrom and Laffont (1979), among many others, make other arguments. Alchian and Demsetz (1992) argue that a "monitor" is needed to help resolve moral hazard-in-teams problems. The monitor is motivated by virtue of being the residual claimant. Further, the monitor must be the owner of the physical assets to keep these assets from being abused. It is not explained why workers could not own the assets. Fama and Jensen (1983), Meade (1972), and Kihlstrom and Laffont (1979), among others, argue that workers are risk averse, while outside investors specialize in risk bearing. Consequently, employees prefer a fixed wage, while outside investors are willing to bear the residual claim. This argument applies to cash flow rights, not control rights. See Zingales (1997) and Dow and Putterman (1999) for summaries of these views and Holmstrom and Tirole (1989) and Hart (1989) for surveys of the theory of the firm.

[3] On the theoretical literature, see Dow (1993), Moretto and Rossini (1999), and the references cited therein.

[4] Employees do sometimes own shares. We describe the prevalence of this in our sample and we will take account of this below.

[5] Adopted after World War II, as described subsequently, by 1955, the German bibliography alone contained more than seven thousand entries (according to Spiro, 1958, p. 1). Arguments for and against codetermination are summarized by Monissen (1978) and Pejovich (1978).

[6] Also see Aoki (1980) and Svejnar (1982c).

[7] None of our results allow us to make welfare statements.

[8] There is an empirical social psychology literature on employer and employee behavior under codetermination. FitzRoy and Kraft (1993, p. 365) provide a summary of this literature, as follows: "Though successive stages in the development of these [codetermination] laws were bitterly opposed by employers and many economists, subsequent (usually non-quantitative) studies have reached a broad and favorable consensus, crediting codetermination with a significant role in maintaining cooperative labor relations and facilitating technological and structural change." The gist is the conclusion that: "Considerable research in social psychology associates an increase in power sharing with a reduction in alienation and with the removal of restrictions on work effort" (Gurdon and Rai, p. 291). Also, see Blumberg (1968) and Bruyn and Nicolau-Smokovitis (1979).

[9] Let β be the regression coefficient of a 0/1 variable, then the change in the dependent variable as a result of a switch of this indicator variable from zero to one amounts to: $e^{\beta} - 1$. For details

see Halvorsen and Palmquist (1980). Based on the regression coefficients presented by FitzRoy and Kraft (1993, Table 2), the aforementioned decrease of 19.7% is thus calculated as follows: $e^{0.13} - e^{-0.06}$.

[10] Another literature that is related concerns workers' cooperatives. In workers' cooperatives there is no issue concerning the allocation of control rights between owners and employees, two groups that may have different objective functions. In cooperatives, the workers are the owners. In the cooperative form of organization, it is perhaps clearer that there will be a difference in behavior compared to the orthodox firm where workers and owners are distinct groups. The evidence suggests that this is the case. See, e.g., Pencavel and Craig (1994), Craig and Pencavel (1992), and Berman and Berman (1989).

[11] See Morck, Shleifer and Vishny (1989) for evidence on the importance of boards in affecting firm value in the United States.

[12] In addition, the milieu in Germany with respect to the power conferred on workers generally is quite different than in the United States or the United Kingdom. For example, in addition to labor unions and codetermined supervisory boards, German firms have works councils. Works councils also participate in decision-making within the firm. They are formally independent of unions. For details see Müller-Jentsch (1995).

[13] This includes firms listed on the New York Stock Exchange, the American Stock Exchange and over-the-counter firms; a total of 5,240 firms.

[14] Gorton and Schmid (2000) explain the lack of significance of bank proxy voting in their performance regression by the endogeneity of this variable: proxy voting results from the firms' shareholder structure, which the authors also control for in their regression equations.

[15] The remaining market is over-the-counter. Firms that are exclusively traded over-the-counter are not included in our sample.

[16] Financial distress occurs if the absolute value of the firm's loss exceeds the reserves (Rücklagen), i.e., if the book value of equity falls short of its face value.

[17] We eliminated four firms with Montan-codetermination and two other firms which special codetermination arrangements. One of these two firms has 15 seats and gives three to workers; the other firm has 21 seats and gives 10 to workers. The former company has some of their power plants located in Switzerland; there is a contract between Switzerland and Germany, which deals with this problem. The second exception is Maingas AG (gas utility). The majority of voting stock is held by the city of Frankfurt a.M. This firm has agreed to increase the number of its employee representatives beyond what is required by law.

[18] At the annual shareholders' meeting (Hauptversammlung—a term which means "the event of the meeting," but also refers to the legal entity), shareholders have the right to: change the corporate charter (including changes to the firm's "equity base," that is, issue more stock); dissolve the company; approve the annual report of the management board; decide on the firm's pay-out via dividends. In general, votes at the annual meeting require a simple majority (50 percent plus one vote). However, changes to the charter (including changes to the "equity base") require approval of at least 75 percent (a "qualified majority") of the votes. A company may, in the charter, set a higher level than three quarters of the votes, but three quarters is the minimum set by law. Most companies follow the 75 percent rule.

[19] Our results are not qualitatively changed if we calculate the Herfindahl Index of control rights distribution. The existing theoretical models are not of much use as they are based on

probabilistic voting behavior under the assumption of one share-one vote. In addition, these theories are based on environments where all shareholders are alike except that they have differing numbers of votes, e.g., the Shapley-Shubik Power Index (Shapley and Shubik, 1954) or the Banzhaf Index (Banzhaf, 1965, 1968). Also, see Leech (1988), Leech and Leahy (1991), and the references cited therein for further discussion. Basically, the German environment is much more complicated than these models.

[20] Jacobson, LaLonde, and Sullivan (1993) find that these losses persist so that six years later these workers are still earning 25% less than comparable workers who did not lose their jobs.

[21] The flexibility with which the firm is able to use and reallocate labor also affects the firm's operating costs. In Germany, wages and working conditions are negotiated on the industry level between the regional "employers association" and the regional labor union(s). A region typically comprises a state, and in most cases there is only a single union that represents the workers. These contracts run for at least one year but frequently are multi-year agreements. While these contracts are explicit about wages, they often leave details of working conditions open for negotiation on the firm level (Bericht der Kommission Mitbestimmung, 1998, pp. 87-93). If equal representation makes workers more powerful than non-parity codetermination, then labor can appropriate a higher fraction of the surplus from cooperation when these issues come up for negotiation at the firm level.

[22] Let β be the regression coefficient of a 0/1 variable in a semi-logarithmic model, then the change in the dependent variable as a result of a switch of this indicator variable from zero to one amounts to: $e^{\beta} - 1$ (Halvorsen and Palmquist, 1980).

Appendix A: On Codetermination

Codetermination (Mitbestimmung) means having employee representatives on the supervisory board. In the narrow sense it means equal representation (parity codetermination). Though the laws have been modified over the years, all firms in Germany are governed by at least one of the following five laws:

- Montan-Mitbestimmungsgesetz (Coal and Steel Codetermination Act), adopted May 21, 1951;
- Betriebsverfassungsgesetz (Industrial Constitution Act), adopted October 11, 1952;
- Mitbestimmungsergänzungsgesetz (Amendment to Coal and Steel Codetermination Act), adopted August 7, 1956;
- Mitbestimmungsgesetz (Codetermination Act), adopted May 4, 1976;
- Aktiengesetz (Stock Corporation Act), adopted September 6, 1965.

Codetermination started with Montan-codetermination in 1951; it requires equal representation for corporations (i.e., companies with limited liability) in the coal and steel industries. The second law, Betriebsverfassungsgesetz (1952), extended codetermination to all corporations, requiring that a third of the seats be given to employee representatives (see section 76 paragraph 6 and s 81 para 1). In 1976, equal representation was extended from coal and steel to corporations of all other industries; however, unlike in coal and steel, the chairman was given a second vote. The third law, Mitbestimmungsergänzungsgesetz, supplements the 1951 Montan-codetermination law and deals with the question of how codetermination is organized in concerns; it is not of special interest here since we analyze unconsolidated financial statements.

Section 76, paragraph 1, of Betriebsverfassungsgesetz (the Industrial Constitution Act) assigns one third of the supervisory board seats of a stock corporation to employee representatives. Section 76, paragraph 6, says that family-owned stock corporations that have less than 500 employees are not subject to codetermination. "Family-owned" means that there is a single shareholder that is a natural person or the shareholders are relatives or in-laws. Section 81, paragraph 1, excludes from codetermination firms with political, union, religious, charitable, educational, scientific, artistic, or similar interests.

Montan-Mitbestimmungsgesetz (Coal and Steel Codetermination Act) applies to corporations that extract iron ore or coal and to corporations that manufacture basic iron and steel. This law overrides Section 76, paragraph 6, of Betriebsverfassungsgesetz and overrides Aktiengesetz. The number of seats on the supervisory board is 11, 15, or 21. Eleven is the minimum. The firm may choose the number 15 if the face value of equity exceeds 20 million DM. It may choose 21 if the face value of equity exceeds 50 million DM. The law describes the composition of the board seats for the case of 11 seats. For higher numbers of seats, the proportions remain the same. The supervisory board consists of four representatives of the shareholders

and a further member; four representatives of the employees and a further member; and a further member (colloquial: neutral member). These "further" members are not allowed to be representatives of labor unions or employer associations; they are not allowed to have any economic relationship to or interest in the firm. Basically, each side elects five members. The so-called neutral member is proposed by the (rest of the) supervisory board; both sides have the same voting power here (the neutral member is not elected by the board itself but by the same committee as the other board members).

Montan-codetermination is the only form of codetermination that grants workers a representative on the firm's management board. This so-called labor director (Arbeitsdirektor) is, like any other member of the management board, appointed by the supervisory board. Unlike any other member however, he cannot be appointed against the majority of votes of the employee representatives.

Mitbestimmungsgesetz (Codetermination Act) applies to all corporations with regularly more than 2,000 employees if they are not subject to Montan-codetermination. Half the members of the supervisory board are employee representatives, the other half are shareholder representatives. The number of seats on the supervisory board is equal to 12 if the number of employees regularly does not exceed 10,000; 16 if the number of employees regularly exceeds 10,000 but does not exceed 20,000; 20 if the number of employees regularly exceeds 20,000. The Codetermination Act (as the Industrial Constitution Act) does not apply to firms with political, union, religious, charitable, educational, scientific, artistic, or similar interests. Also, firms in the media industry are excluded (to safeguard freedom of speech).

The members of the supervisory board elect the supervisory board's chairman and the vice-chairman with two-thirds of the votes. If the candidates fail to obtain these majorities, the shareholder representatives elect the chairman and the employee representatives elect the vice-chairman. This voting scheme ensures that the chairman always is a shareholder representative. When the votes on supervisory board decisions have been tied twice on the same subject, the chairman can exercise an extra vote.

The Stock Corporation Act (Aktiengesetz) does not override any of the Codetermination Acts mentioned above. According to this law, the number of members of the supervisory board is equal to three. The company's charter may choose a higher number, which must be divisible by three. However, the law gives maximum numbers for total board seats: nine if the face value of equity does not exceed 3 million DM; 15 if the face value of equity exceeds 3 million DM but does not exceed 20 million DM; 21 if the face value of equity exceeds 20 million DM.

Appendix B: Data Sources and Construction

The sample consists of the largest 250 stock corporations in Germany that traded at the end of the year 1993 in at least one of the two top-tier market segments: amtlicher Handel or geregelter Markt. In forming the sample, company size was measured by total assets. The sample does not include:

- Kommanditgesellschaften auf Aktien (KGaAs; a hybrid organizational form between a partnership and a stock corporation);
- Financial firms (banks, insurance companies, brokerage firms, financial holding shells);
- Public transportation companies;
- Real estate companies;
- Companies of benefit to the public (gemeinnützig) or with cooperative character;
- Companies that are in the state of liquidation or that have filed a petition for bankruptcy.

From the list of 250 corporations we drop firms if:

- The company is subject to Montan-codetermination, follows special codetermination arrangements, or is not subject to codetermination at all.
- The company is in financial distress in at least one of the years in the sample. Financial distress occurs if the absolute value of the firm's loss exceeds the reserves (Rücklagen), i.e., book value of equity falls short of face value.
- The company underwent restructuring following a merger during the sample period.

Moreover, we discarded observations when firms were transformed into stock corporations during the fiscal year in question.

We analyze the first fiscal year that ends in a calendar year. (If there are incomplete fiscal years there may be two fiscal years ending in one calendar year.) We analyze the unconsolidated reports. When we look at incomplete fiscal years we scale the flows to 12-month values. We do so for return on assets (ROA), return on equity (ROE), and board compensation.

The number of observations varies by the regression approach. One of the reasons for this is that some of the sample firms are transformed from partnerships into stock corporations during the analyzed period. Another reason is missing data for some of the variables. For example, for a few years and firms no information on gross interest expenses was given in the annual reports, and consequently, return on assets could not be calculated.

The data used when explaining the standard deviation of stock returns is a subset of the sample used for the performance regressions. This is because for stocks with low liquidity, no standard deviations were

published. Also the (unbalanced) panel used for the board compensation analysis is a subset of the sample used for the performance regressions. The reason is missing information on board compensation, which is due to one of the following reasons:

- Board compensation data is not reported in Hoppenstedt, Bundesanzeiger, or the company report;
- In at least one year, board compensation includes payments for previous years of an unknown amount (and consequently cannot be subtracted);
- In at least one year, there are payments reported for previous years that fall into the panel period, but the amounts of these payments are not known and the years are not given;
- In at least one year the board was (at least partially) compensated by the parent company by an unknown amount.

The equity ownership structure data are from Saling Aktienführer, ed. by Verlag Hoppenstedt & Co., Darmstadt, various issues. These are annual volumes. The information is based on September 30 of each year. Annual reports are taken from: Handbuch der deutschen Aktiengesellschaften, ed. by Verlag Hoppenstedt & Co., Darmstadt, various issues. These volumes are published annually. In a few instances we had to resort to the company reports themselves in order to complete the data. Also, we used the company statements as published in Bundesanzeiger, an official publication of the German Ministry of Justice.

Appendix C: Definitions of Variables

This appendix explains how the variables were calculated. Details on German accounting are found in Ordelheide and Pfaff (1994).

Definition of Dependent Variables

(1) Market-to-book ratio of equity (MTB). The numerator is the end-of-calendar-year market value of equity, aggregated over all categories of stock. There are few firms for which not all categories of stock are traded. Non-traded shares are either standard voting stocks (when nonvoting stock is traded only) or stocks with multiple votes (when stocks with single votes are traded). In these instances, we price non-traded stocks the same as traded stocks. An alternative strategy would be to adjust the price of non-traded stocks via discounts or premiums according to their different endowments with votes. However, one can expect that the price of the now traded stock would be higher if the currently non-traded stock traded too. This is because of the probability of a control change through bidders (which might affect the dividend stream on voting and nonvoting stock) would then be higher. Due to lack of quantitative evidence as to how the now traded stock would change in price if the currently non-traded stock became traded, we do not make any adjustments. We rather view the existence of multiple categories of stock and the fact that some of them are not traded, as endogenous, i.e., as explained by the firm's equity control structure.

The numerator is the end-of-calendar year book value of equity. For firms with other than calendar fiscal years the book value was linearly interpolated. In the regressions, MTB was used in logarithmic form.

The book value of equity is calculated as follows:

Gezeichnetes Kapital (subscribed capital)
- \- Ausstehende Einlagen auf das Kapital (unpaid contributions on subscribed capital)
- \+ Rücklagen (reserves)
- \- Rücklagen für eigene Anteile (reserves held against own shares)
- \+ Genußscheinkapital (participation certificates, if payments to these securities are included in the result of ordinary business activity)
- \+ 0.5 × Sonderposten mit Rücklageanteil (special item with a reserve component).

The "special item with a reserve component" is multiplied by 0.5; this is because this item has not been taxed yet. The tax rate of 0.5 is not the legislated tax rate. The effective tax rate is not known since it depends on actual income and is affected by income smoothing via declaration of provisions. We follow the usual academic and practitioner procedure and use 0.5.

Participation certificates are a kind of preferred stock. There is a wide variety. Sometimes the owner is guaranteed a low interest rate, but also receives some residual income, depending on the company's profit. There are also cases where they participate in the losses. Legally, the company can choose the conditions under which residual profit is paid and there are many variations. In some cases, these liabilities are very similar to preferred stock, while in other cases they are close to bonds with fixed interest payments. We define them as equity if the payments to these securities were included in the result of ordinary business activity. Otherwise they are regarded as debt.

(2) Return on assets (ROA). The numerator consists of:

Zinsen und ähnliche Aufwendungen (interest and similar expenses)
+ Ergebnis der gewöhnlichen Geschäftstätigkeit (result of ordinary business activity)
+ Entlohnung des Genußscheinkapitals (payments to participation certificates) if not included in one of the previous two positions.

The denominator of ROA is the end-of-fiscal-year value of total assets. It is calculated as follows:

Bilanzsumme (balance sheet total)
- Ausstehende Einlagen auf das Kapital (unpaid contributions on subscribed capital)
- Rücklagen für eigene Anteile (reserves held against own shares)
- Disagio (loan redemption premium).

(3) Return on equity (ROE). The numerator is Ergebnis der gewöhnlichen Geschäftstätigkeit (result of ordinary business activity), which is a pre-tax position. It does not include extraordinary income and expenses, taxes on profits, and other taxes. The denominator of ROE is the end-of-fiscal-year book value of equity as defined above.

(4) Lines of Business. The number of lines of business is based on ISIC divisions (International Standard Industrial Classification of All Economic Activities, United Nations, 1990). The classification was undertaken by the authors because there is no publicly available official industry classification of the corporations in our sample. In the regressions, the number of lines of business was used in logarithmic form.

(5) Standard deviation of stock returns. They are from Göppl et al. (1996) who calculated them on the basis of annualized weekly continuous total returns. In the regression analysis we use the debt-equity ratio in logarithmic form.

(6) Firm leverage. Leverage was measured by the debt-equity ratio, based on end-of-fiscal-year values. Debt is non-equity liabilities with stated maturity. Equity is calculated as described above. In the regression analysis we use the debt-equity ratio in logarithmic form.

(7) Emax: Size of the largest fraction of votes controlled by a single shareholder.

(8) Board compensation. Management board and supervisory board compensation is measured on a per-capita basis, because compensation data for individual board members is not publicly available. Since we analyze the unconsolidated reports we subtract compensation obtained from subsidiaries. Members of the management board (and less frequently, members of the supervisory board) of large firms tend to hold board seats in subsidiaries. We subtracted license fees and severance pay to management board members. We subtract compensation paid for previous years and add it to the respective years. (The latter can only be done if the payments were made within the period covered by the panel. However, these payments are rare and always small.)

Definition of Independent Variables

The control structure variable Emax also serves as an independent variable. In this use, it was lagged by one year. With the exception Co, such a lag was applied also to all other variables that were employed to describe the firm's control structure (EE, EM, EB, EF, EN, EG, VR, to be described below). For example, for the fiscal year 1993 (or 1992/93 for firms with other than calendar fiscal years), the firm's control structure variables date from September 30, 1992.

(1) Co: Equal to 1 if the firm is subject to equal representation on the supervisory board; 0 otherwise.

(2) EE: Fraction of equity control rights held by non-executive employees.

(3) EM: Fraction of equity control rights held by management. This includes voting stock controlled by the firm through cross-shareholding.

(4) EB: Fraction of equity control rights held by domestic banks. Government-owned special-purpose banks (e.g., Kreditanstalt für Wiederaufbau; Bayerische Landesanstalt für Aufbaufinanzierung) are not included but instead classified as government entities.

(5) EF: Fraction of equity control rights held by (domestic or foreign) families (including family trusts). If a family controls a firm that controls stock in a sample firm, then this shareholder counts as "family" if (and only if) the family holds a seat on the sample firm's supervisory board.

(6) EN: Fraction of equity control rights held by (domestic or foreign) nonfinancial firms.

(7) EG: Fraction of equity control rights held by domestic government entities, including government-controlled special-purpose banks and government-contolled trusts.

(8) VR: Equal to 1 if the firm has adopted a voting restriction, 0 otherwise. Voting restrictions put a ceiling to the fraction of total voting stock a block holder can exercise at the annual meeting.

(9) R: Total stock return of the firm for the year. The data are from Göppl et al. (1996).

(10) LV: Leverage (fraction of non-equity liabilities in total liabilities) based on end-of-fiscal year values. Equity is calculated as described above. Total liabilities are equal to total assets, which are described above. In the regression analysis we use this variable in logarithmic form.

(11) Industry indicator variables. These 0/1 variables indicate the industry the firm in question is operating in. Industries are based on ISIC categories. Category D (manufacturing) serves as the reference category.

(12) Stock market capitalization (SMC): Natural log of numerator of market-to-book ratio of equity, MTB, measured in units of 1 DM and lagged by one year. When Emax was used as a dependent variable, SMC is taken from the end of the calendar year 1991. (In that case Emax dates from September 30, 1992.)

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Table 1

Composition of supervisory boards with equal representation, broken down by board size and type of board member for a sample of firms compiled by Gerum, Steinmann, and Fees (1988). Panel A: shareholder representatives. Panel B: employee representatives. In each panel, column 1 represents firms with not more than 10,000 employees (board size is 12 members); column 2 contains firms with 10,000 employees or more, but not more than 20,000 (board size is 16 members); column 3 represents firms with more than 20,000 employees (board size is 20 members). Column 4 displays the sample average. Shareholder representatives and employee representatives each occupy half of the seats on supervisory boards with equal representation (as required by the 1976 Codetermination Act). Neither shareholder representatives nor employee representatives have to be shareholders or employees in person. The data is from the year 1979. Sums of percentages by column may differ from 100 due to rounding.

Panel A: Shareholder Representatives				
	(1)	(2)	(3)	(4)
Size of Supervisory Board	12 Members	16 Members	20 Members	Sample Average
	Percentage of seats by type of shareholder representative			
Individual shareholders	9.3	3.9	1.8	5.7
Shareholder association	1.2	1.8	1.9	1.5
Representatives of companies with >50% equity stakes	14.6	14.6	10.1	13.1
Representatives of companies with <50% equity stakes	7.8	11.6	6.3	8.1
Representatives of banks with >50% equity stakes	0.5	2.1	0.2	0.7
Representatives of banks with <50% equity stakes	3.6	7.7	3.5	4.4
Representatives of foreign companies	8.6	4.3	2.9	5.9
Representatives of government entities with equity stakes	2.5	11.4	24.6	11.7
Representatives of companies without equity stakes	17.2	17.1	21.2	18.5
Representatives of banks without equity stakes	13.1	8.6	10.4	11.3
Former members of the management board	4.0	5.0	3.8	4.2
Consultants	17.0	10.9	10.3	13.5
Representatives of government entities without equity stakes	0.6	1.1	2.9	1.5
Total	100	100	100	100
Number of observations	158	55	68	281

Table 1 (cont'd)

Panel B: Employee Representatives				
	(1)	(2)	(3)	(4)
Size of Supervisory Board	12 Members	16 Members	20 Members	Sample Average
	Percentage of seats by type of employee representative			
Members of company workers' councils	2.6	4.2	5.0	4.6
Chairman of the workers' council	1.6	2.7	1.6	1.8
Member of subsidiary's workers' council	3.3	5.7	8.1	5.4
Non-members of workers' council	3.1	3.0	2.5	2.9
White-collar employees with managerial functions	16.7	12.7	10.3	13.7
Non-employee labor union representatives	31.5	23.6	29.0	29.0
Employee labor union representatives	1.6	1.4	0.4	1.2
Other employees	60.4	53.3	56.9	58.6
Total	100	100	100	100

Table 2

Distribution of firms by International Standard Industrial Classification (ISIC) as published by United Nations (1990). The classification, which is based on the fiscal year 1993 (or 1992/93 for firms with other than calendar fiscal years) was undertaken by the authors because there is no publicly available official industry classification of the corporations in our sample.

Number of Firms	ISIC Category	Industrial Classification
1	A	Agriculture, hunting, and forestry
2	C	Mining and quarrying
129	D	Manufacturing
24	E	Electricity, gas, and water supply
6	F	Construction
16	G	Wholesale and retail trade; repair of motor vehicles, motorcycles, and personal and household goods
1	H	Hotels and restaurants
4	I	Transport, storage, and communications
2	K	Real estate, renting, and business activities
1	N	Health and social work
Total: 186		

Table 3

Summary measures of dependent variables. Due to missing values, the number of observations differs across variables. Market-to-book ratio of equity, MTB, is calculated for the end of the calendar year 1993 (186 observations). Return on assets, ROA, return on equity, ROE, and leverage (measured by the debt-equity ratio) are calculated for the fiscal year 1993 (or 1992/1993 for firms with other than calendar fiscal years). The numbers of observations equal 185 for ROA, and 186 for ROE and leverage. The number of lines of business (186 observations) is based on ISIC divisions (International Standard Industrial Classification, United Nations, 1990; each ISIC category shown in Table 2 comprises several divisions). The standard deviation of stock returns is calculated for the calendar year 1993 on the basis of annualized weekly continuous total returns (132 observations). The per-capita compensations of the management board and the supervisory board (171 observations) are for the fiscal year 1993 (or 1992/1993 for firms with other than calendar fiscal years), measured in units of 1,000 DM. Sources: Saling Aktienführer, various issues, Darmstadt, Germany: Hoppenstedt & Co.; Handbuch der deutschen Aktiengesellschaften, various issues, Darmstadt: Hoppenstedt & Co.; Göppl et al. (1996).

	Minimum	Median	Mean	Maximum	Standard Deviation
Market-to-book ratio of equity (MTB)	0.002	2.290	2.769	14.625	1.880
Return on assets (ROA)	-0.347	0.065	0.061	0.328	0.087
Return on equity (ROE)	-2.251	0.115	0.071	1.126	0.343
Number of lines of business	1	1.5	2.161	17	1.953
Standard deviation of stock returns	0.079	0.243	0.250	0.813	0.083
Leverage (debt-equity ratio)	0.050	0.685	1.109	20.875	1.883
Per-capita management board compensation	151	583	655	2,324	309
Per-capita supervisory board compensation	3.9	22.5	30.9	155.5	25.1

Table 4

Firms by type of multi-level equity ownership. Multi-level ownership structures are either pyramids or cross-shareholdings. A pyramid occurs when the firm's stock is held indirectly via (one or more) financial holding shells. Cross-shareholdings are cases where firms own shares in each other, either indirectly via a financial holding shell, or directly. The observations are from the year 1992 (September 30), the last year for which we collected equity ownership data. Some of the types of multi-level equity ownership data listed are not mutually exclusive.

Firms by Type of Multi-Level Equity Ownership	Number (Percentage) of Firms
Firms with pyramidal ownership structure	25 (13)
Firms with shareholder that owns directly and through pyramid	3 (2)
Firms with shareholder that owns through more than one pyramid	2 (1)
Firms with cross-shareholdings	1 (1)
Firm without an ultimate owner (completely dispersed)	8 (4)
Total number of firms	186

Table 5

Summary measures of fractions of equity control rights held by ultimate owners. Ultimate owners are shareholders that are viewed as agents in control of their equity stakes, as opposed to financial holding shells, which are simply control vehicles. Blocks are not added up for each type of ultimate owner, i.e., if a firm has two bank block holders they count as two observations. Column 6 presents the difference in means between the two codetermination regimes: mean for firms with equal respresentation minus mean for firms where employee representations occupy one third of the supervisory board sets only. The observations are from September 30, 1992, which is the last year for which we collected equity ownership data. Source: Saling Aktienführer 1993, Darmstadt, Germany: Hoppenstedt & Co., 1992.

Type of Ultimate Owner	(1) Minimum	(2) Median	(3) Mean	(4) Maximum	(5) Standard Deviation	(6) Difference in Means across Codetermiation Regimes
Employees (EE)	0	0	0.002	0.138	0.014	0
Management (EM)	0	0	0.042	0.870	0.146	-0.019
Families, incl. trusts (EF)	0	0	0.106	0.888	0.231	-0.036
Banks, domestic (EB)	0	0	0.060	0.766	0.138	0.028
Banks, foreign	0	0	0.002	0.398	0.029	0.003
Nonfinancial firm, domestic	0	0.111	0.306	1	0.349	-0.143
Nonfinancial firm, foreign	0	0	0.096	0.989	0.262	0.057
Government entities, incl. trusts, domestic (EG)	0	0	0.040	0.900	0.144	-0.015
Government, incl. trusts, foreign	0	0	0.002	0.240	0.020	0.003
Insurers, domestic	0	0	0.035	1	0.120	0.027
Insurers, foreign	0	0	0	0	0	0
Trusts (not elsewhere classified)	0	0	0.002	0.335	0.024	-0.005
Private equity fund, domestic	0	0	0.006	0.570	0.056	-0.015
Private equity fund, foreign	0	0	0.001	0.100	0.007	-0.001
Biggest block (Emax)	0	0.512	0.536	0.996	0.263	-0.115
Number of firms	186					

Table 6

Distribution of ultimate owners by size of block of equity control rights. Ultimate owners are shareholders that are viewed as agents in control of their equity stakes, as opposed to financial holding shells, which are simply control vehicles. Blocks are not added up for each type of ultimate owner, i.e., if a firm has two bank block holders they count as two observations. The cases listed in column 5 (largest shareholder) are not mutually exclusive, because of ties. The observations are from September 30, 1992, which is the last year for which we collected equity ownership data. Source: Saling Aktienführer 1993, Darmstadt, Germany: Hoppenstedt & Co., 1992.

Type of Ultimate Owner	Number (Percentage) of Firms				
Size of block	(1) ≥ 0.05	(2) ≥ 0.25	(3) ≥ 0.5	(4) ≥ 0.75	(5) Largest shareholder
Management (EM)	18 (10)	13 (7)	10 (5)	2 (1)	15 (8)
Families, incl. trusts (EF)	44 (23)	31 (17)	22 (12)	10 (5)	30 (16)
Banks, domestic (EB)	40 (22)	24 (13)	4 (2)	2 (1)	18 (10)
Banks, foreign	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)
Nonfinancial firm, domestic	97 (52)	87 (47)	63 (34)	36 (19)	73 (39)
Nonfinancial firm, foreign	26 (14)	23 (12)	20 (11)	16 (9)	23 (12)
Government entities, incl. trusts, domestic (EG)	18 (10)	11 (6)	9 (5)	2 (1)	11 6)
Government, incl. trusts, foreign	2 (1)	0 (0)	0 (0)	0 (0)	1 (1)
Insurers, domestic	23 (12)	10 (5)	2 (1)	2 (1)	9 (5)
Insurers, foreign	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trusts (not elsewhere classified)	1 (1)	1 (1)	0 (0)	0 (0)	1 (1)
Private equity fund, domestic	3 (2)	2 (1)	2 (1)	0 (0)	2 (1)
Private equity fund, foreign	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Largest shareholder (Emax)	177 (95)	159 (85)	117 (63)	52 (28)	---
Number of firms	186				

Table 7

Correlation matrix of important ultimate owners. Ultimate owners are shareholders that are viewed as agents in control of their equity stakes, as opposed to financial holding shells, which are simply control vehicles. Important ultimate owners are those that are quantitatively most significant (see Tables 5 and 6). Blocks of equity control rights are not added up for each type of ultimate owner, i.e., if a firm has two bank block holders they count as two observations. We use Spearman's rank correlation coefficient, which uses average ranks in the case of ties. The observations are from September 30, 1992, which is the last year for which we collected equity ownership data. The number of observations equals 186. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level. Source: Saling Aktienführer 1993, Darmstadt, Germany: Hoppenstedt & Co., 1992.

	Employees (EE)	Management (EM)	Families (EF)	Domestic Banks (EB)	Nonfinancial Firms (EN)
Employees (EE)	1				
Management (EM)	0.152**	1			
Families (EF)	0.121*	0.043	1		
Domestic Banks (EB)	-0.018	-0.059	0.001	1	
Nonfinancial Firms (EN)	-0.113	-0.308***	-0.423***	-0.257***	1
Domestic Government Entities (EG)	-0.056	-0.117	-0.185**	-0.043	-0.088

Table 8

Control changes in firms by type of transaction. We measured control changes as changes in the identity of the shareholder with the largest fraction of equity control rights. The table covers the period 1987-1992, where 1992 is the last year for which we collected equity ownership data. The ownership information dates from September 30 of the respective years. For example, column 1 compares the equity ownership data from September 30, 1988 to the same day in 1987. Note that most trades are block trades, i.e., a large shareholder sells its entire block to one (or sometimes two) other investor(s). The number of possible transactions (last row) is the number of firms that are included in the sample in both of two neighboring years. Source: Saling Aktienführer, 1988-1993 issues, Darmstadt, Germany: Hoppenstedt & Co., 1987-1992.

Type of Transaction	(1) 1987-1988	(2) 1988-1989	(3) 1989-1990	(4) 1990-1991	(5) 1991-1992	(6) 1987-1992
Family sells to family	1	1	0	1	0	3
Family sells to bank	0	0	0	0	0	0
Family sells to nonfinancial firm	1	2	2	0	0	5
Bank sells to family	0	0	0	0	0	0
Bank sells to bank	0	0	0	0	0	0
Bank sells to nonfinancial firm	0	4	2	2	0	8
Nonfinancial firm sells to family	0	0	1	0	0	1
Nonfinancial firm sells to bank	2	0	0	4	0	6
Nonfinancial firm sells to nonfinancial firm	2	2	6	2	4	16
Government floats block (privatization)	1	0	0	0	0	1
Family floats block	0	0	1	1	0	2
Investor accumulates dispersed shares	1	2	2	0	0	5
Other transactions	1	1	2	0	1	5
Total	9	12	16	10	5	52
Number of possible transactions	172	173	177	180	185	887

Table 9

Firm performance and control rights allocation. Firm performance is measured by market-to-book ratio of equity, MTB (panel A); return on assets, ROA (panel B); and return on equity, ROE (panel C). We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the performance of firm i. The regressor z_i represents the size of firm i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The parametric part includes the following variables, the regression coefficients of which are displayed in this table: Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; EE: fraction of equity control rights held by non-executive employees; EM: fraction of equity control rights held by management (includes control rights from cross-shareholding); EF: fraction of equity control rights held by (domestic or foreign) families; EB: fraction of equity control rights held by domestic banks; EN: fraction of equity control rights held by (domestic or foreign) nonfinancial firms; EG: fraction of equity control rights held by domestic government entities; Emax: maximum fraction of equity control rights held by a single shareholder; VR: equal to 1 if the firm has adopted a voting restriction, 0 otherwise; ISIC: industry affiliation based on International Standard Industrial Classification (United Nations, 1990), with category D (manufacturing) serving as the numeraire industry. Equity control rights variables, VR and SMC, are lagged by one year. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. The estimated nonparametric part for the median year (column 3, panels A-C) is displayed in Figures 2-4.

Panel A: Market-to-Book Ratio

	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	-2.377×10^{-1}	(-2.804***)	-2.794×10^{-1}	(-3.108***)	-2.737×10^{-1}	(-3.167***)	-4.620×10^{-1}	(-4.581***)	-3.227×10^{-1}	(-3.241***)
EE	-2.078	(-0.542)	-2.478	(-0.464)	-1.706	(-0.970)	-1.465	(-0.647)	-1.517	(-0.624)
EM	-4.137×10^{-1}	(-1.413)	-3.322×10^{-1}	(-1.221)	-3.767×10^{-2}	(-0.122)	5.298×10^{-2}	(0.143)	-9.688×10^{-1}	(-1.456)
EF	3.362×10^{-1}	(1.249)	3.732×10^{-1}	(1.498)	5.803×10^{-1}	(2.490**)	7.379×10^{-1}	(3.248***)	-4.972×10^{-1}	(-0.812)
EB	4.541×10^{-1}	(1.920*)	2.697×10^{-1}	(1.024)	3.030×10^{-1}	(1.170)	-7.759×10^{-2}	(-0.331)	-1.454	(-1.365)
EN	-2.113×10^{-1}	(-0.870)	-2.089×10^{-1}	(-1.009)	6.921×10^{-2}	(0.369)	5.710×10^{-2}	(0.306)	-9.746×10^{-1}	(-1.437)
EG	-9.028×10^{-1}	(-2.309**)	-1.150	(-3.183***)	-6.488×10^{-1}	(-1.870*)	-4.599×10^{-1}	(-1.520)	-1.411	(-2.106**)
Emax	4.479×10^{-1}	(1.918*)	4.359×10^{-1}	(2.139**)	2.993×10^{-1}	(1.329)	1.179×10^{-1}	(0.508)	5.362×10^{-1}	(1.242)
VR	-9.710×10^{-3}	(-0.077)	-1.669×10^{-1}	(-1.226)	-1.608×10^{-1}	(-1.257)	-1.794×10^{-1}	(-1.545)	-5.032×10^{-2}	(-0.207)
ISIC A	3.497×10^{-1}	(2.526**)	3.578×10^{-1}	(2.739***)	3.204×10^{-1}	(1.916*)	3.467×10^{-1}	(1.723*)	8.381×10^{-1}	(3.113***)
ISIC C	4.719×10^{-1}	(1.471)	7.711×10^{-1}	(2.484**)	4.492×10^{-1}	(1.263)	4.497×10^{-1}	(1.671*)	4.568×10^{-1}	(1.702*)
ISIC E	1.629×10^{-1}	(0.968)	3.764×10^{-1}	(2.163**)	2.316×10^{-1}	(1.467)	1.605×10^{-1}	(1.182)	4.464×10^{-1}	(1.889*)
ISIC F	1.636×10^{-1}	(1.412)	3.063×10^{-1}	(4.101***)	2.248×10^{-1}	(2.254**)	2.562×10^{-1}	(2.705***)	9.994×10^{-2}	(0.677)
ISIC G	-1.122×10^{-1}	(-1.028)	-4.388×10^{-2}	(-0.373)	-1.125×10^{-2}	(-0.123)	6.919×10^{-2}	(0.661)	1.155×10^{-1}	(1.076)
ISIC H	5.725×10^{-1}	(6.180***)	9.216×10^{-1}	(9.968***)	1.333	(14.154***)	1.353	(11.453***)	1.019	(3.303***)
ISIC I	-3.409×10^{-1}	(-3.419***)	-1.437×10^{-1}	(-1.057)	-8.407×10^{-2}	(-0.355)	-2.653×10^{-1}	(-1.101)	-1.177×10^{-2}	(-0.038)
ISIC K	1.057	(2.545**)	7.393×10^{-1}	(5.303***)	7.090×10^{-1}	(4.212***)	2.381×10^{-1}	(0.640)	3.063×10^{-1}	(0.812)
ISIC N	---	---	---	---	---	---	-8.849×10^{-2}	(-0.620)	4.080×10^{-1}	(2.945***)
R^2	0.283		0.336		0.302		0.376		0.160	
Number of observations	173		177		180		186		186	

Table 9 (cont'd)

Panel B: Return on Assets										
	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	-5.604×10^{-2}	(-5.350***)	-3.786×10^{-2}	(-3.171***)	-3.937×10^{-2}	(-2.926***)	-3.855×10^{-2}	(-3.173***)	-7.400×10^{-2}	(-4.765***)
EE	-9.855×10^{-1}	(-4.261***)	-5.492×10^{-1}	(-1.667*)	4.415×10^{-2}	(0.177)	-9.875×10^{-2}	(-0.234)	-7.599×10^{-2}	(-0.193)
EM	-4.640×10^{-2}	(-1.249)	1.206×10^{-2}	(0.368)	9.580×10^{-3}	(0.146)	-5.851×10^{-2}	(-0.923)	-8.812×10^{-3}	(-0.158)
EF	-2.091×10^{-2}	(-0.791)	6.220×10^{-4}	(0.023)	7.775×10^{-2}	(1.848*)	-1.423×10^{-2}	(-0.396)	3.749×10^{-2}	(1.117)
EB	-8.918×10^{-2}	(-1.915*)	-2.218×10^{-2}	(-0.753)	-6.148×10^{-2}	(-1.499)	-4.425×10^{-2}	(-1.568)	-3.898×10^{-2}	(-1.092)
EN	-5.709×10^{-2}	(-2.700***)	-2.204×10^{-2}	(-1.111)	4.166×10^{-2}	(1.318)	-2.815×10^{-2}	(-0.912)	-4.956×10^{-2}	(-1.538)
EG	-8.894×10^{-2}	(-3.239***)	-5.399×10^{-2}	(-2.215**)	2.254×10^{-2}	(0.583)	-5.643×10^{-2}	(-1.610)	-6.458×10^{-2}	(-1.815*)
Emax	1.805×10^{-2}	(0.716)	9.755×10^{-3}	(0.424)	-5.050×10^{-2}	(-1.446)	3.529×10^{-2}	(1.159)	1.304×10^{-2}	(0.339)
VR	-5.504×10^{-3}	(-0.309)	-1.336×10^{-2}	(-0.625)	-1.031×10^{-2}	(-0.551)	-5.809×10^{-3}	(-0.342)	2.323×10^{-2}	(1.347)
ISIC A	-4.340×10^{-2}	(-2.407**)	-3.113×10^{-2}	(-2.084**)	-4.123×10^{-3}	(-0.119)	1.494×10^{-2}	(0.469)	-1.857×10^{-2}	(-0.694)
ISIC C	3.716×10^{-2}	(0.952)	6.321×10^{-2}	(2.026**)	1.691×10^{-2}	(0.362)	1.022×10^{-1}	(4.262***)	2.203×10^{-2}	(0.945)
ISIC E	-2.726×10^{-2}	(-1.919*)	-2.843×10^{-2}	(-2.080**)	-6.027×10^{-2}	(-3.995***)	-1.656×10^{-2}	(-1.389)	1.411×10^{-2}	(0.777)
ISIC F	-3.511×10^{-2}	(-2.578***)	-4.617×10^{-2}	(-3.324***)	-3.806×10^{-2}	(-1.123)	-5.030×10^{-3}	(-0.167)	3.175×10^{-2}	(1.189)
ISIC G	5.237×10^{-3}	(0.294)	1.213×10^{-2}	(0.449)	-3.506×10^{-2}	(-0.843)	2.048×10^{-2}	(1.158)	3.262×10^{-2}	(1.423)
ISIC H	-8.387×10^{-2}	(-6.082***)	-1.410×10^{-2}	(-1.246)	-1.026×10^{-2}	(-0.497)	-7.920×10^{-2}	(-5.021***)	-7.081×10^{-2}	(-2.943***)
ISIC I	-3.803×10^{-2}	(-2.386**)	-3.690×10^{-2}	(-4.094***)	-5.399×10^{-2}	(-2.812***)	-2.483×10^{-2}	(-1.431)	8.495×10^{-3}	(0.398)
ISIC K	1.014×10^{-1}	(1.400)	2.018×10^{-2}	(0.556)	2.957×10^{-2}	(0.919)	5.654×10^{-2}	(0.912)	1.275×10^{-2}	(0.244)
ISIC N	---	---	---	---	---	---	7.378×10^{-3}	(0.404)	-1.946×10^{-2}	(-1.030)
R^2	0.320		0.161		0.089		0.133		0.201	
Number of observations	171		174		177		184		185	

Table 9 (cont'd)

Panel C: Return on Equity										
	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	-8.386×10^{-2}	(-2.888***)	-4.849×10^{-2}	(-1.297)	-4.561×10^{-2}	(-0.917)	-6.712×10^{-2}	(-1.362)	-2.026×10^{-1}	(-3.010***)
EE	-2.629	(-4.440***)	-1.445	(-1.722*)	3.467×10^{-1}	(0.465)	-5.548×10^{-1}	(-0.324)	-1.371	(-0.629)
EM	-1.687×10^{-1}	(-1.696*)	-1.330×10^{-2}	(-0.160)	6.168×10^{-2}	(0.340)	-2.235×10^{-1}	(-0.888)	1.887×10^{-2}	(0.110)
EF	-2.153×10^{-2}	(-0.259)	1.661×10^{-2}	(0.240)	2.960×10^{-1}	(2.550**)	-6.032×10^{-3}	(-0.052)	1.288×10^{-1}	(1.249)
EB	-1.158×10^{-1}	(-1.042)	4.363×10^{-3}	(0.055)	-5.842×10^{-2}	(-0.432)	-7.744×10^{-2}	(-0.765)	-3.917×10^{-2}	(-0.361)
EN	-8.708×10^{-2}	(-1.383)	1.562×10^{-2}	(0.293)	2.249×10^{-1}	(2.728***)	-1.125×10^{-2}	(-0.116)	-8.192×10^{-2}	(-0.859)
EG	-1.617×10^{-1}	(-1.962**)	-4.823×10^{-2}	(-0.644)	1.549×10^{-1}	(1.639)	-1.014×10^{-1}	(-0.936)	-1.113×10^{-1}	(-0.957)
Emax	1.410×10^{-1}	(1.791*)	4.968×10^{-2}	(0.703)	-1.388×10^{-1}	(-1.324)	7.711×10^{-2}	(0.756)	5.800×10^{-2}	(0.512)
VR	2.471×10^{-2}	(0.610)	-1.608×10^{-2}	(-0.360)	-6.411×10^{-3}	(-0.151)	-3.135×10^{-2}	(-0.567)	7.630×10^{-2}	(1.491)
ISIC A	-5.664×10^{-2}	(-1.246)	-6.853×10^{-2}	(-1.526)	1.065×10^{-2}	(0.108)	1.015×10^{-1}	(0.764)	-3.461×10^{-2}	(-0.398)
ISIC C	-1.696×10^{-2}	(-0.278)	5.144×10^{-2}	(1.125)	-2.558×10^{-2}	(-0.287)	1.904×10^{-1}	(2.280**)	1.609×10^{-2}	(0.216)
ISIC E	1.460×10^{-2}	(0.314)	5.788×10^{-3}	(0.149)	-8.145×10^{-2}	(-1.876*)	3.283×10^{-2}	(0.698)	1.181×10^{-1}	(1.639)
ISIC F	-5.502×10^{-2}	(-2.028**)	-5.703×10^{-2}	(-1.870*)	-7.181×10^{-2}	(-1.414)	3.386×10^{-2}	(0.814)	1.532×10^{-1}	(3.728***)
ISIC G	-2.092×10^{-2}	(-0.568)	1.782×10^{-2}	(0.311)	-1.677×10^{-1}	(-1.330)	-7.097×10^{-3}	(-0.140)	6.618×10^{-2}	(1.090)
ISIC H	-2.260×10^{-1}	(-6.193***)	-3.101×10^{-2}	(-0.874)	2.148×10^{-2}	(0.296)	-6.278×10^{-2}	(-1.053)	-1.631×10^{-1}	(-1.916*)
ISIC I	-1.092×10^{-1}	(-2.587***)	-1.207×10^{-1}	(-4.043***)	-1.383×10^{-1}	(-2.399**)	-7.858×10^{-2}	(-1.360)	1.463×10^{-2}	(0.219)
ISIC K	1.969×10^{-1}	(1.770*)	7.717×10^{-2}	(0.754)	5.901×10^{-2}	(0.518)	9.400×10^{-2}	(0.646)	-3.417×10^{-2}	(-0.270)
ISIC N	---	---	---	---	---	---	6.757×10^{-4}	(0.010)	-1.091×10^{-1}	(-1.803*)
R^2	0.166		0.063		0.049		0.063		0.242	
Number of observations	173		177		180		186		186	

Table 10

Number of lines of business and control rights allocation. Lines of business are based on ISIC divisions (International Standard Industrial Classification of All Economic Activities, United Nations, 1990). We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the (log) number of ISIC divisions in which firm i competes. The regressor z_i represents the size of firm i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The parametric part includes the following variables, the regression coefficients of which are displayed in this table: Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; EE: fraction of equity control rights held by non-executive employees; EM: fraction of equity control rights held by management (includes control rights from cross-shareholding); EF: fraction of equity control rights held by (domestic or foreign) families; EB: fraction of equity control rights held by domestic banks; EN: fraction of equity control rights held by (domestic or foreign) nonfinancial firms; EG: fraction of equity control rights held by domestic government entities; Emax: maximum fraction of equity controlled rights held by a single shareholder; VR: equal to 1 if the firm has adopted a voting restriction, 0 otherwise; ISIC: industry affiliation based on International Standard Industrial Classification categories (each of which comprises several divisions), with category D (manufacturing) serving as the numeraire industry. Equity control rights variables, VR and SMC, are lagged by one year. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. The estimated nonparametric part for the median year (column 3) is displayed in Figure 5.

	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	9.349×10^{-2}	(0.862)	1.315×10^{-1}	(1.322)	1.096×10^{-1}	(0.988)	-3.563×10^{-2}	(-0.404)	2.124×10^{-2}	(0.227)
EE	1.712	(0.420)	1.144	(0.319)	-1.214	(-0.359)	6.794×10^{-2}	(0.032)	-2.059×10^{-1}	(-0.103)
EM	-2.061×10^{-1}	(-0.582)	-2.894×10^{-1}	(-1.015)	1.305×10^{-1}	(0.262)	4.597×10^{-2}	(0.147)	-2.017×10^{-1}	(-0.580)
EF	-3.717×10^{-1}	(-1.148)	-4.103×10^{-1}	(-1.325)	-2.076×10^{-2}	(-0.060)	-5.811×10^{-2}	(-0.201)	-2.163×10^{-1}	(-0.702)
EB	-3.976×10^{-1}	(-1.323)	-2.793×10^{-1}	(-0.819)	-1.991×10^{-1}	(-0.571)	-1.866×10^{-1}	(-0.554)	-2.085×10^{-1}	(-0.593)
EN	-2.905×10^{-1}	(-0.957)	-3.872×10^{-1}	(-1.489)	1.710×10^{-2}	(-0.710)	7.244×10^{-2}	(0.301)	-1.075×10^{-1}	(-0.408)
EG	-7.347×10^{-1}	(-1.564)	-7.984×10^{-1}	(-1.808*)	-2.836×10^{-1}	(-0.643)	-3.046×10^{-1}	(-0.681)	-4.828×10^{-1}	(-1.046)
Emax	-2.422×10^{-1}	(-0.810)	-1.359×10^{-1}	(-0.511)	-4.086×10^{-1}	(-1.337)	-5.059×10^{-1}	(-1.917*)	-2.566×10^{-1}	(-0.906)
VR	-4.066×10^{-1}	(-2.144**)	-3.975×10^{-1}	(-2.172**)	-3.372×10^{-1}	(-2.036**)	-3.725×10^{-1}	(-2.121**)	-3.593×10^{-1}	(-2.067**)
ISIC A	-2.574×10^{-1}	(-1.432)	-2.108×10^{-1}	(-1.478)	-3.557×10^{-1}	(-0.615)	-4.074×10^{-1}	(-2.577***)	-2.448×10^{-1}	(-1.434)
ISIC C	9.819×10^{-1}	(4.028***)	1.122	(4.741***)	9.942×10^{-1}	(2.284**)	9.181×10^{-1}	(4.216***)	9.456×10^{-1}	(3.844***)
ISIC E	2.579×10^{-1}	(1.376)	3.307×10^{-1}	(1.845*)	1.858×10^{-1}	(0.989)	1.225×10^{-1}	(0.686)	1.670×10^{-1}	(0.913)
ISIC F	3.664×10^{-1}	(1.894*)	2.578×10^{-1}	(1.370)	2.385×10^{-1}	(0.931)	2.172×10^{-1}	(1.166)	2.056×10^{-1}	(1.120)
ISIC G	8.693×10^{-2}	(0.671)	7.354×10^{-2}	(0.574)	1.068×10^{-1}	(0.561)	6.355×10^{-2}	(0.541)	-4.409×10^{-3}	(-0.036)
ISIC H	-2.402×10^{-1}	(-1.690*)	-2.953×10^{-1}	(-1.973**)	-2.122×10^{-1}	(-0.282)	-2.954×10^{-1}	(-1.956*)	-4.159×10^{-1}	(-2.863***)
ISIC I	2.746×10^{-1}	(1.038)	3.561×10^{-1}	(1.191)	2.403×10^{-1}	(0.800)	1.541×10^{-1}	(0.462)	1.879×10^{-1}	(0.598)
ISIC K	-5.321×10^{-1}	(-2.517**)	-5.329×10^{-1}	(-3.016***)	-6.888×10^{-1}	(-1.580)	-7.838×10^{-1}	(-3.222***)	-7.162×10^{-1}	(-2.796***)
ISIC N	---	---	---	---	---	---	3.541×10^{-1}	(2.998***)	4.480×10^{-1}	(3.519***)
R^2	0.203		0.238		0.232		0.255		0.242	
Number of observations	173		177		180		186		186	

Table 11

Standard deviation of stock returns and control rights allocation. The standard deviation is based on annualized weekly continuous total returns. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the (log of the) standard deviation of the stock returns of firm i. The vector z_i contains the size of firm i, measured by the log of the stock market capitalization of firm i, SMC_i, and the total stock return for the year of firm i, R_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The parametric part includes the following variables, the regression coefficients of which are displayed in this table: Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; EE: fraction of equity control rights held by non-executive employees; EM: fraction of equity control rights held by management (includes control rights from cross-shareholding); EF: fraction of equity control rights held by (domestic or foreign) families; EB: fraction of equity control rights held by domestic banks; EN: fraction of equity control rights held by (domestic or foreign) nonfinancial firms; EG: fraction of equity control rights held by domestic government entities; Emax: maximum fraction of equity controlled rights held by a single shareholder; VR: equal to 1 if the firm has adopted a voting restriction, 0 otherwise; LV: leverage (log fraction of non-equity liabilities in total liabilities); ISIC: industry affiliation based on International Standard Industrial Classification categories (United Nations, 1990), with category D (manufacturing) serving as the numeraire industry. Equity control rights variables, VR and SMC, are lagged by one year. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. The estimated nonparametric part for the median year (column 3) is displayed in Figures 6 and 7.

	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	-3.476×10^{-2}	(-0.581)	1.281×10^{-1}	(1.658*)	2.482×10^{-1}	(2.476**)	1.033×10^{-1}	(0.921)	1.700×10^{-1}	(2.237**)
EE	-1.706	(-2.074**)	-1.163	(-0.928)	-1.292×10^{-1}	(-0.067)	-1.988	(-1.345)	-1.715×10^{-1}	(-0.148)
EM	1.998×10^{-1}	(1.523)	-4.463×10^{-3}	(-0.025)	1.484×10^{-1}	(0.649)	-1.058×10^{-1}	(-0.417)	2.748×10^{-1}	(1.025)
EF	1.808×10^{-1}	(1.368)	-3.804×10^{-1}	(-2.055**)	-2.940×10^{-1}	(-1.571)	-4.674×10^{-1}	(-2.287**)	2.499×10^{-1}	(1.311)
EB	3.462×10^{-1}	(3.119***)	-1.216×10^{-1}	(-0.746)	3.300×10^{-1}	(1.721*)	-1.338×10^{-2}	(-0.066)	3.493×10^{-1}	(2.533**)
EN	2.915×10^{-1}	(2.512**)	-3.074×10^{-1}	(-1.669*)	-1.230×10^{-2}	(-0.073)	-2.890×10^{-1}	(-1.435)	3.998×10^{-1}	(2.754***)
EG	3.328×10^{-1}	(1.203)	-1.953×10^{-1}	(-0.763)	-1.824×10^{-1}	(-0.441)	-4.875×10^{-1}	(-1.581)	2.355×10^{-1}	(1.071)
Emax	-6.372×10^{-2}	(-0.469)	2.402×10^{-1}	(1.386)	1.859×10^{-1}	(0.938)	2.649×10^{-1}	(1.250)	-2.440×10^{-1}	(-1.495)
VR	1.692×10^{-2}	(0.296)	-1.445×10^{-3}	(-0.014)	1.568×10^{-1}	(1.650*)	1.164×10^{-1}	(1.311)	-1.029×10^{-1}	(-1.758*)
LV	2.384×10^{-3}	(0.035)	5.889×10^{-3}	(0.088)	-1.093×10^{-1}	(-1.547)	-1.529×10^{-2}	(-0.218)	-6.034×10^{-2}	(-1.271)
ISIC E	-5.042×10^{-2}	(-0.698)	-3.730×10^{-1}	(-3.467***)	-3.541×10^{-1}	(-2.744***)	-2.664×10^{-1}	(-2.212**)	-1.004×10^{-1}	(-1.144)
ISIC F	-2.421×10^{-1}	(-1.706*)	-5.535×10^{-1}	(-3.749***)	-6.265×10^{-1}	(-3.216***)	-5.900×10^{-1}	(-3.330***)	-2.587×10^{-1}	(-2.022**)
ISIC G	-1.232×10^{-2}	(-0.134)	-2.779×10^{-1}	(-2.487**)	-4.198×10^{-1}	(-2.850***)	-2.555×10^{-1}	(-1.674*)	-1.170×10^{-1}	(-1.277)
ISIC I	-9.370×10^{-2}	(-0.421)	-1.923×10^{-1}	(-0.901)	-6.538×10^{-2}	(-0.297)	-3.686×10^{-1}	(-1.683*)	-1.626×10^{-1}	(-1.157)
ISIC K	-4.500×10^{-2}	(-0.365)	-5.534×10^{-1}	(-3.365***)	4.912×10^{-2}	(0.285)	-1.751×10^{-1}	(-0.629)	9.954×10^{-2}	(0.501)
ISIC N	---	---	---	---	---	---	-1.709×10^{-1}	(-1.022)	1.784×10^{-1}	(1.352)
R^2	0.424		0.186		0.317		0.324		0.387	
Number of observations	116		121		124		131		132	

Table 12

Firm leverage and control rights allocation. Firm leverage is measured by the (log of the) debt-equity ratio. The debt-equity ratio was calculated for the end of the fiscal year. Debt comprises all non-equity liabilities with stated maturity. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the debt-equity ratio of firm i. The regressor z_i represents the size of firm i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The parametric part includes the following variables, the regression coefficients of which are displayed in this table: Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; EE: fraction of equity control rights held by non-executive employees; EM: fraction of equity control rights held by management (includes control rights from cross-shareholding); EF: fraction of equity control rights held by (domestic or foreign) families; EB: fraction of equity control rights held by domestic banks; EN: fraction of equity control rights held by (domestic or foreign) nonfinancial firms; EG: fraction of equity control rights held by domestic government entities; Emax: maximum fraction of equity controlled rights held by a single shareholder; VR: equal to 1 if the firm has adopted a voting restriction, 0 otherwise; ISIC: industry affiliation based on International Standard Industrial Classification categories (United Nations, 1990), with category D (manufacturing) serving as the numeraire industry. Equity control rights variables, VR and SMC, are lagged by one year. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. The estimated nonparametric part for the median year (column 3) is displayed in Figure 8.

	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	5.958×10^{-1}	(3.998***)	5.149×10^{-1}	(3.127***)	4.940×10^{-1}	(2.930***)	2.084×10^{-1}	(1.169)	2.881×10^{-1}	(1.739*)
EE	-1.300×10	(-0.901)	9.550	(2.278**)	3.171	(0.748)	3.253	(0.555)	1.919	(0.323)
EM	2.811×10^{-1}	(0.629)	4.173×10^{-1}	(0.922)	7.429×10^{-1}	(1.242)	6.223×10^{-1}	(0.986)	-2.356×10^{-1}	(-0.453)
EF	-4.704×10^{-1}	(-1.075)	1.976×10^{-1}	(0.469)	5.378×10^{-1}	(1.079)	5.621×10^{-1}	(1.127	-2.161×10^{-1}	(-0.518)
EB	5.644×10^{-1}	(1.188)	2.139×10^{-1}	(0.474)	1.085	(2.098**)	8.306×10^{-1}	(1.841*)	4.563×10^{-1}	(0.929)
EN	3.452×10^{-1}	(0.954)	4.968×10^{-1}	(1.492)	8.332×10^{-1}	(1.822*)	3.705×10^{-1}	(0.870)	-8.461×10^{-4}	(-0.002)
EG	6.097×10^{-1}	(1.047)	1.027	(1.897*)	1.349	(1.876*)	9.320×10^{-1}	(1.229)	5.493×10^{-1}	(0.732)
Emax	4.548×10^{-1}	(1.170)	-6.323×10^{-3}	(-0.016)	8.299×10^{-2}	(0.170)	2.420×10^{-1}	(0.545)	2.859×10^{-1}	(0.737)
VR	-5.030×10^{-2}	(-0.195)	-3.215×10^{-1}	(-1.305)	7.725×10^{-2}	(0.304)	-5.854×10^{-2}	(-0.233)	-2.678×10^{-1}	(-1.163)
ISIC A	-3.193×10^{-1}	(-1.356)	-3.064×10^{-1}	(-1.298)	-5.800×10^{-1}	(-2.188**)	-3.912×10^{-1}	(-1.433)	2.553×10^{-1}	(1.049)
ISIC C	-1.499	(-3.641***)	-1.421	(-2.944***)	-9.337×10^{-1}	(-1.482)	-1.088	(-1.365)	-8.935×10^{-1}	(-1.079)
ISIC E	4.135×10^{-2}	(0.199)	-1.745×10^{-1}	(-0.808)	-2.694×10^{-1}	(-1.098)	-4.804×10^{-1}	(-1.928*)	-4.600×10^{-1}	(-1.829*)
ISIC F	7.616×10^{-1}	(2.581***)	8.453×10^{-1}	(2.410**)	9.618×10^{-1}	(2.584***)	9.764×10^{-1}	(3.246***)	9.601×10^{-1}	(4.436***)
ISIC G	1.936×10^{-1}	(0.816)	2.955×10^{-1}	(1.343)	4.609×10^{-1}	(1.936*)	5.013×10^{-1}	(2.053**)	5.921×10^{-1}	(3.216***)
ISIC H	2.316×10^{-2}	(0.122)	3.735×10^{-1}	(1.995**)	3.467×10^{-1}	(1.148)	2.130	(8.510***)	2.250	(9.210***)
ISIC I	4.065×10^{-1}	(2.036**)	4.862×10^{-2}	(0.124)	3.497×10^{-1}	(0.766)	4.763×10^{-1}	(0.865)	5.296×10^{-1}	(1.008)
ISIC K	-1.479×10^{-1}	(-0.252)	-6.083×10^{-1}	(-0.870)	-1.144×10^{-1}	(-0.131)	-6.789×10^{-1}	(-0.599)	-7.483×10^{-1}	(-1.266)
ISIC N	---	---	---	---	---	---	-5.132×10^{-1}	(-2.355**)	-8.432×10^{-2}	(-0.423)
R^2	0.303		0.242		0.234		0.241		0.296	
Number of observations	173		177		180		186		186	

Table 13

Concentration of equity control rights and codetermination. Equity control rights concentration is measured by the (log of the) largest fraction of equity control rights held by single shareholder, Emax. Firm size is measured by the log of the lagged value of stock market capitalization, SMC. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being $Emax_i$. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The regressor z_i represents the size of firm i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The parametric part includes the following variables, the regression coefficients of which are displayed in this table: Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; ISIC: industry affiliation based on International Standard Industrial Classification categories (United Nations, 1990), with category D (manufacturing) serving as the numeraire industry. The variables Co and SMC are lagged by one year. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. Due to the lag structure of the variables, only four years of data are available. We dropped 10 observations with Emax equal to zero in 1989, and 9 observations in each of the years 1990-1992. The estimated nonparametric part for the median year in the sample (column 3) is displayed in Figure 9.

	(1)		(2)		(3)		(4)	
Year	1989		1990		1991		1992	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	-1.127×10^{-1}	(-1.135)	-5.684×10^{-2}	(-0.475)	-4.467×10^{-2}	(-0.399)	-1.427×10^{-1}	(-1.388)
ISIC A	2.346×10^{-2}	(0.227)	8.428×10^{-2}	(0.810)	-1.638×10^{-2}	(-0.150)	-7.446×10^{-2}	(-0.742)
ISIC C	1.125×10^{-1}	(0.428)	2.367×10^{-1}	(1.098)	2.442×10^{-1}	(0.873)	1.639×10^{-1}	(0.646)
ISIC E	-7.247×10^{-2}	(-0.713)	1.410×10^{-2}	(0.132)	9.665×10^{-2}	(0.847)	-1.225×10^{-2}	(-0.118)
ISIC F	-2.709×10^{-1}	(-1.348)	-1.379×10^{-1}	(-0.708)	-1.560×10^{-1}	(-0.830)	-1.646×10^{-1}	(-0.978)
ISIC G	-2.520×10^{-1}	(-2.386**)	-2.411×10^{-1}	(-1.626)	-2.698×10^{-1}	(-1.879*)	-2.362×10^{-1}	(-2.358**)
ISIC H	1.033×10^{-2}	(0.111)	4.216×10^{-3}	(0.054)	-1.202×10^{-1}	(-1.286)	-1.093×10^{-1}	(-0.847)
ISIC I	-2.241×10^{-1}	(-0.536)	-3.413×10^{-1}	(-0.849)	-3.018×10^{-1}	(-0.905)	-3.379×10^{-1}	(-1.065)
ISIC K	-1.196	(-15.450***)	-1.153	(-7.332***)	-1.241	(-6.410***)	-1.281	(-8.407***)
ISIC N	---	---	---	---			-7.245×10^{-2}	(-0.754)
R^2	0.136		0.111		0.112		0.106	
Number of observations	163		168		171		177	

Table 14

Board compensation and codetermination. We analyze the effects of codetermination on the performance-sensitivity of the supervisory board and the management board compensations. Firm performance is measured by the log of the market-to-book ratio of equity, MTB, while board compensation is measured by the log of compensation per member, measured in units of 1 DM. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the per-capita supervisory board compensation of firm i. The vector $\boldsymbol{z}_i$ contains the performance of firm i, MTB_i, and the size of firm i, measured by the log of the stock market capitalization of firm i, lagged by one year, SMC_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. Explanatory variables in the parametric part are Co: equal to 1 if there is equal representation on the supervisory board, 0 otherwise; Co x Perf: interaction term between firm performance and equal representation; ISIC: industry affiliation based on International Standard Industrial Classification (United Nations, 1990), with category D (manufacturing) serving as the numeraire industry. Standard errors are corrected following White (1980). *t*-statistics appear in parentheses, where * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level (all *t*-tests are two-tailed). The R^2 of this semi-parametric regression model was calculated as the ratio of regression sum of squares and the sum of regression sum of squares and error sum of squares. The estimated nonparametric part for the median year (column 3, Panels A, B) is displayed in Figures 9-12.

Panel A: Management Board

	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	1.666×10^{-1}	(0.951)	2.171×10^{-1}	(1.710*)	5.179×10^{-3}	(0.037)	3.380×10^{-2}	(0.316)	1.978×10^{-1}	(1.406)
Co x Perf	-8.045×10^{-2}	(-0.609)	-5.805×10^{-2}	(-0.776)	-7.573×10^{-2}	(-0.616)	-2.289×10^{-2}	(-0.227)	-2.334×10^{-1}	(-1.493)
ISIC A	-1.197×10^{-1}	(-1.194)	9.495×10^{-2}	(1.050)	-1.330×10^{-1}	(-1.590)	-3.179×10^{-2}	(-0.453)	3.843×10^{-1}	(1.522)
ISIC C	-5.432×10^{-1}	(-4.072***)	-3.808×10^{-1}	(-4.366***)	-8.019×10^{-1}	(-2.937***)	-6.672×10^{-1}	(-1.736*)	-3.001×10^{-1}	(-2.543**)
ISIC E	-4.660×10^{-1}	(-6.386***)	-4.502×10^{-1}	(-6.174***)	-5.906×10^{-1}	(-7.868***)	-5.157×10^{-1}	(-5.825***)	-4.380×10^{-2}	(-0.959)
ISIC F	4.047×10^{-2}	(0.512)	-2.508×10^{-2}	(-0.267)	1.106×10^{-1}	(0.995)	9.278×10^{-2}	(1.061)	3.895×10^{-1}	(2.397**)
ISIC G	2.355×10^{-1}	(3.086***)	3.081×10^{-1}	(3.632***)	2.433×10^{-1}	(2.447**)	2.570×10^{-1}	(3.561***)	4.429×10^{-1}	(3.981***)
ISIC H	1.370×10^{-1}	(0.636)	4.889×10^{-1}	(2.362**)	-3.497×10^{-1}	(-1.475)	-3.639×10^{-2}	(-0.193)	-4.677×10^{-1}	(-1.553)
ISIC I	-2.658×10^{-1}	(-1.286)	-2.882×10^{-1}	(-2.167**)	-2.168×10^{-1}	(-1.160)	-8.947×10^{-2}	(-0.412)	-1.159×10^{-1}	(-0.387)
ISIC K	1.736×10^{-2}	(0.076)	2.943×10^{-1}	(0.995)	2.326×10^{-2}	(0.112)	8.836×10^{-2}	(0.367)	2.202×10^{-1}	(1.065)
ISIC N	---	---	---	---	---	---	2.998×10^{-1}	(3.978***)	9.427×10^{-1}	(3.862***)
R^2	0.401		0.515		0.505		0.415		0.247	
Number of observations	168		171		172		176		171	

Table 14 (cont'd)

Panel B: Supervisory Board										
	(1)		(2)		(3)		(4)		(5)	
Year	1989		1990		1991		1992		1993	
Independent Variable	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)	Coefficient	(*t*-Statistic)
Co	8.017×10^{-2}	(0.340)	-1.048×10^{-1}	(-0.560)	-8.023×10^{-2}	(-0.431)	-1.568×10^{-1}	(-0.965)	-8.719×10^{-2}	(-0.353)
Co x Perf	-1.519×10^{-1}	(-0.880)	7.225×10^{-2}	(0.640)	5.787×10^{-2}	(0.367)	2.029×10^{-2}	(0.120)	-3.457×10^{-1}	(-1.239)
ISIC A	5.953×10^{-1}	(3.070***)	2.761×10^{-1}	(1.518)	6.232×10^{-1}	(3.441***)	5.796×10^{-1}	(3.415***)	1.317	(2.276**)
ISIC C	-1.727×10^{-1}	(-0.449)	-5.454×10^{-1}	(-2.170**)	-3.960×10^{-1}	(-2.235**)	-4.674×10^{-1}	(-2.612***)	-4.227×10^{-1}	(-1.369)
ISIC E	-5.593×10^{-1}	(-4.679***)	-5.217×10^{-1}	(-4.127***)	-4.925×10^{-1}	(-4.089***)	-4.371×10^{-1}	(-3.476***)	1.407×10^{-1}	(1.858*)
ISIC F	-9.418×10^{-2}	(-0.597)	-3.177×10^{-1}	(-1.906*)	-2.775×10^{-1}	(-1.374)	-1.402×10^{-1}	(-0.645)	8.011×10^{-1}	(4.461***)
ISIC G	1.934×10^{-2}	(0.137)	8.087×10^{-2}	(0.460)	8.045×10^{-2}	(0.416)	1.593×10^{-1}	(0.962)	6.621×10^{-1}	(2.595***)
ISIC H	-8.733×10^{-1}	(-3.596***)	7.108×10^{-1}	(2.700***)	2.996×10^{-1}	(0.888)	-3.309×10^{-1}	(-1.085)	-9.732×10^{-1}	(-1.412)
ISIC I	-4.628×10^{-1}	(-1.432)	-8.698×10^{-1}	(-2.109**)	-2.880×10^{-1}	(-0.805)	-2.289×10^{-1}	(-0.692)	-3.196×10^{-1}	(-0.708)
ISIC K	-5.854×10^{-2}	(-0.281)	-4.755×10^{-1}	(-2.704***)	7.578×10^{-2}	(0.393)	-1.265×10^{-1}	(-0.534)	4.961×10^{-1}	(1.991**)
ISIC N	---	---	---	---	---	---	6.073×10^{-1}	(3.658***)	1.471	(2.922***)
R^2	0.229		0.329		0.314		0.313		0.280	
Number of observations	168		171		172		176		171	

Fig. 1. Linotype-Hell AG as an example for a pyramid. Following our principle of defining control rights based on votes, the graph displays ownership as fractions of votes (which is not necessarily identical to the fractions of equity from which these votes emanate). Linotype-Hell AG has two block holders: Siemens AG (33%) and Frega Vermögensverwaltungsgesellschaft mbH (16.67% plus one share), a financial holding shell. Frega is owned by Commerzbank AG (40%), Bührmann-Tetterode Nederland N.V. (20%), The East Asia Co. Ltd. A/S, Copenhagen (20%), and Iduna Lebensversicherung (20%). Siemens, Bührmann-Tetterode, the East-Asia Co., and Iduna are ultimate owners. Allocation of equity control rights according to the weakest link principle is as follows: Siemens 33%; Bührmann-Tetterode, the East-Asia Co., and Iduna each 16.67%. Source: Saling Aktienführer 1993, Darmstadt, Germany: Hoppenstedt & Co., 1992.

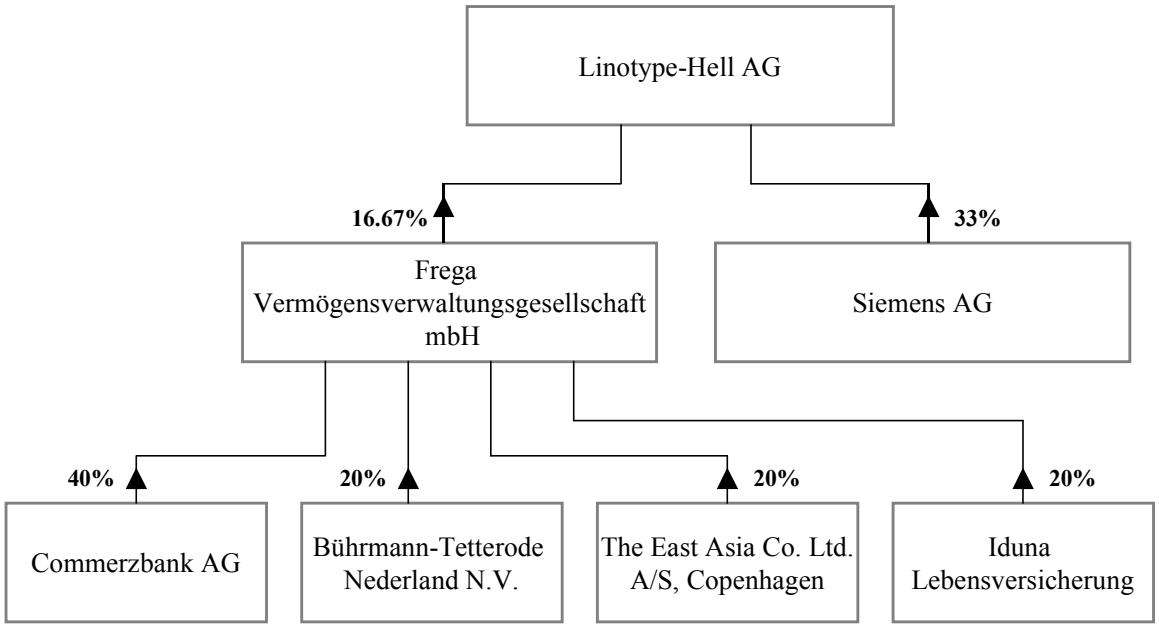

Fig. 2. Market-to-book ratio of equity, MTB, as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). MTB is calculated for the end of the calendar year 1991, which is the median year of our sample. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X_i}\boldsymbol{\beta} + \varepsilon_i$, with y_i being the performance of firm i, MTB_i. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X_i}$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 180 observations. The regression coefficients of the parametric part are displayed in Table 9, panel A, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

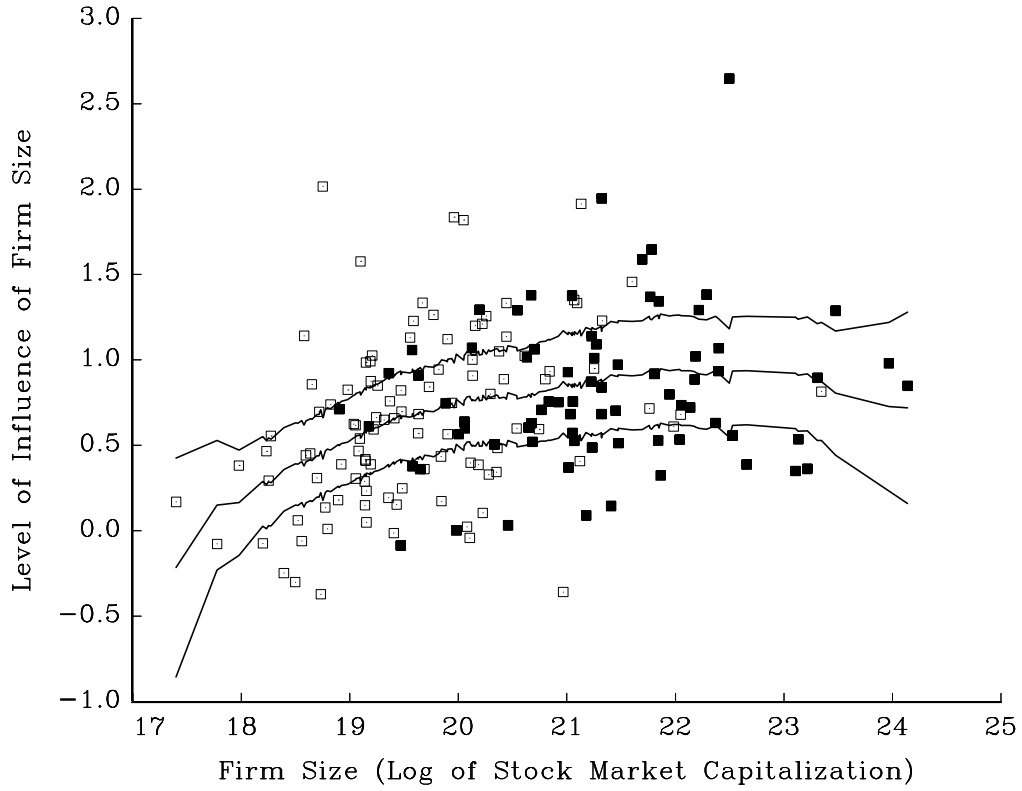

Fig. 3. Return on assets, ROA, as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). ROA is calculated for the end of the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), which is the median year of our sample. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X_i}\boldsymbol{\beta} + \varepsilon_i$, with y_i being the performance of firm i, ROA_i. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X_i}$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 177 observations. The regression coefficients of the parametric part are displayed in Table 9, panel B, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

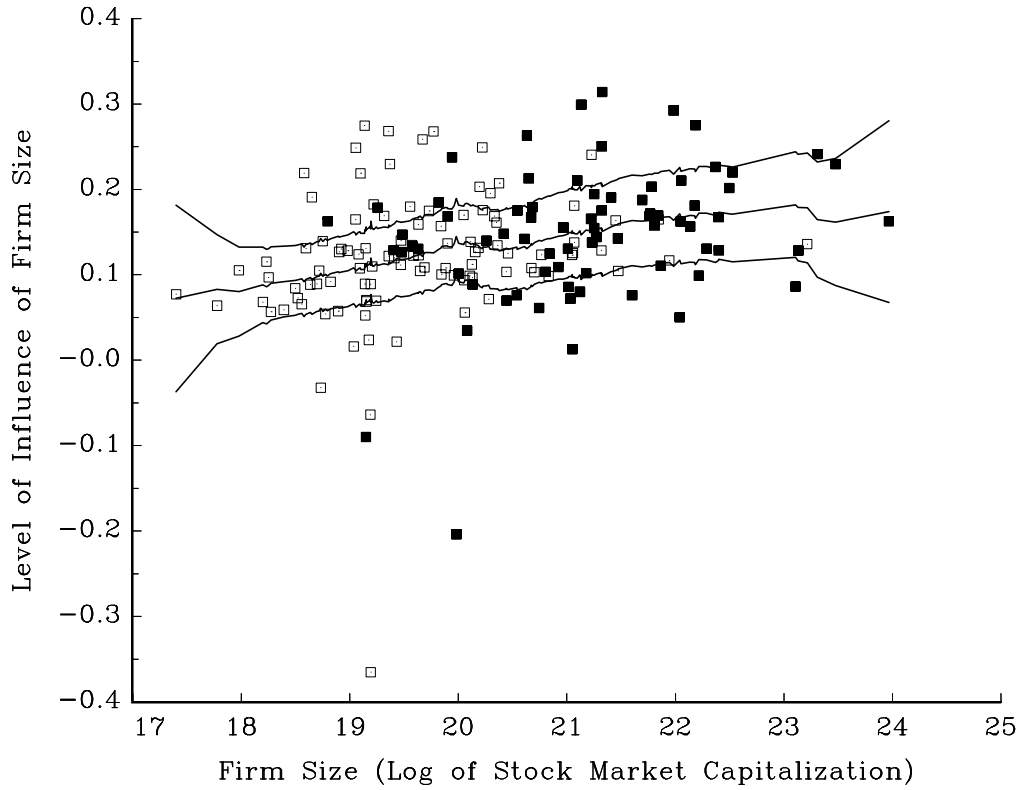

Fig. 4. Return on equity, ROE, as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). ROE is calculated for the end of the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), which is the median year of our sample. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X_i}\boldsymbol{\beta} + \varepsilon_i$, with y_i being the performance of firm i, ROE_i. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X_i}$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 180 observations. The regression coefficients of the parametric part are displayed in Table 9, panel C, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

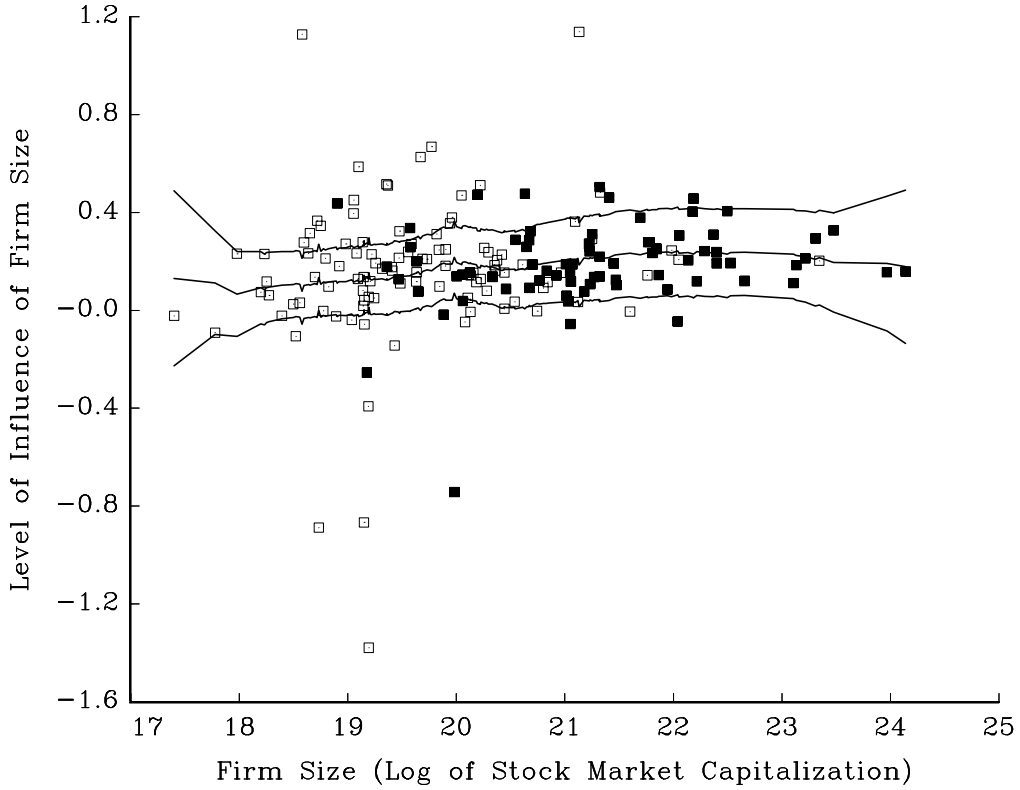

Fig. 5. Number of lines of business (in logarithmic form) as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). We categorized the lines of business according to ISIC divisions (International Standard Industrial Classification of All Economic Activities, United Nations, 1990). We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the (log) number of lines of business of firm i. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 180 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The regression coefficients of the parametric part are displayed in Table 10, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

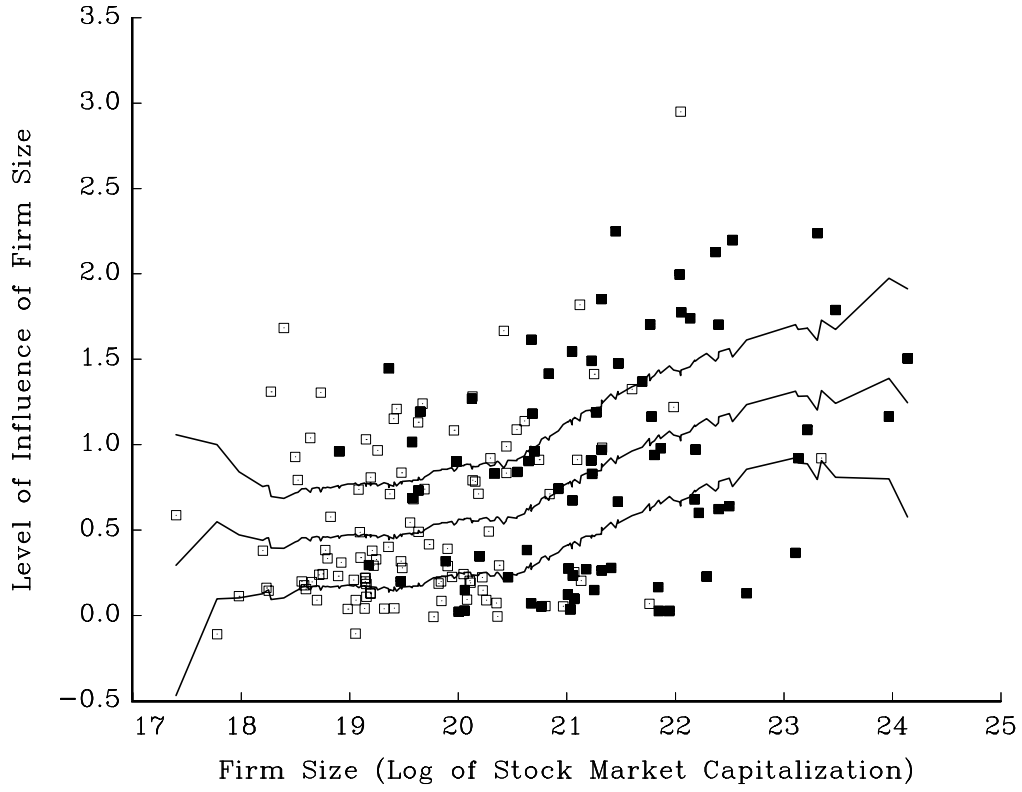

Fig. 6. Standard deviation of stock return as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). The standard deviation is based on annualized weekly continuous total returns. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the (log of the) standard deviation of the weekly stock returns of firm i. The vector $\boldsymbol{z}_i$ contains the size of firm i, SMC_i, and the total stock return for the year of firm i, R_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 124 observations, which are from the calendar year 1991, the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of firm size, $\hat{f}(SMC_i, \overline{R})$, with the total stock return for the year held constant at its median value, $\overline{R}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 11, column 3.

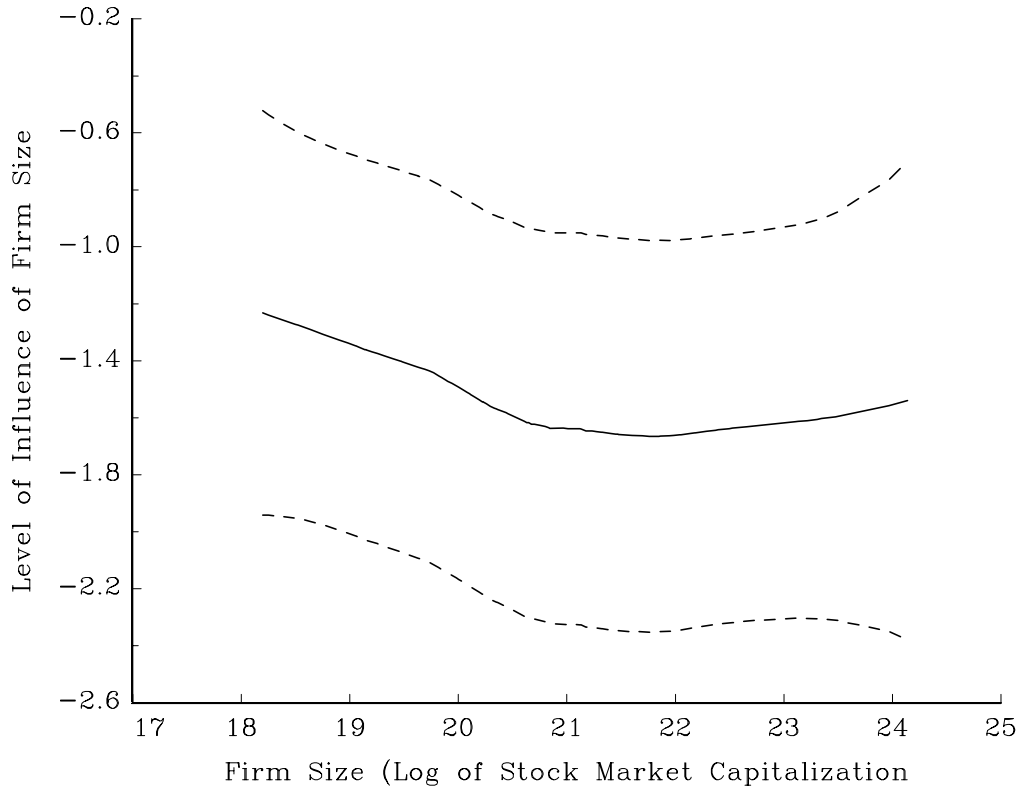

Fig. 7. Standard deviation of stock return as a function of total stock return for the year. The standard deviation is based on annualized weekly continuous total returns. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the (log of the) standard deviation of the stock returns of firm i. The vector $\boldsymbol{z}_i$ contains the size of firm i, measured by the log of the stock market capitalization, lagged by one year, SMC_i, and the total stock return for the year of firm i, R_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 124 observations, which are from the calendar year 1991, the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of the total return, $\hat{f}(\overline{SMC}, R_i)$, with firm size held constant at its median value, $\overline{SMC}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 11, column 3.

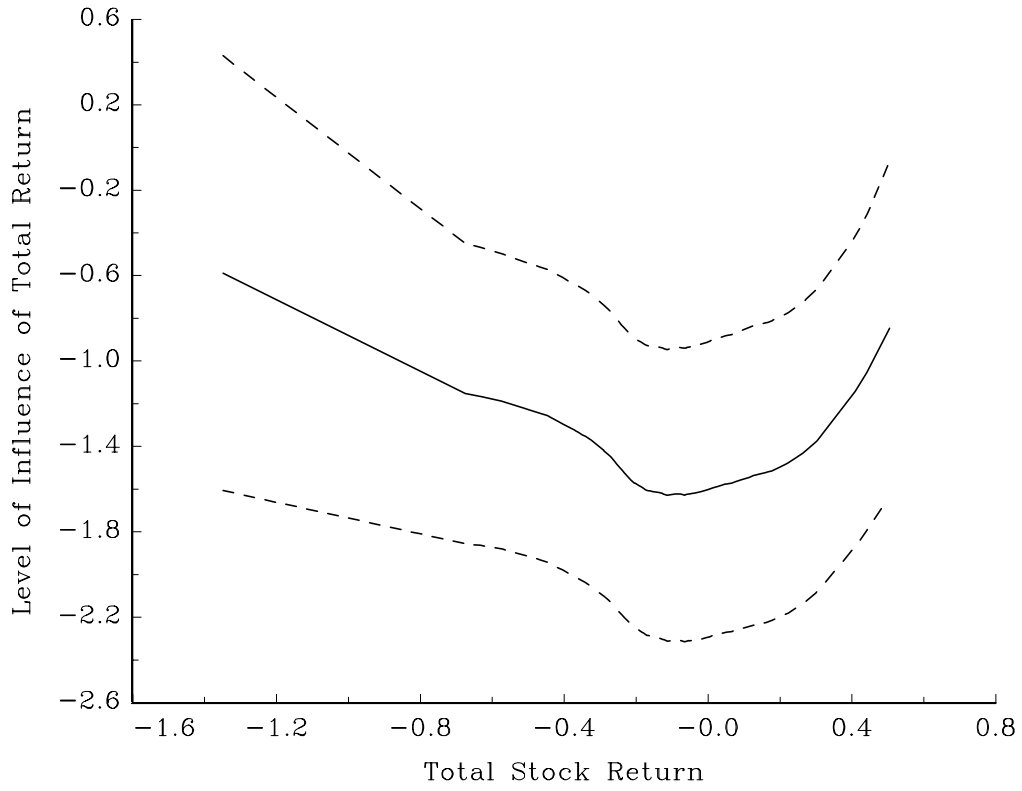

Fig. 8. Firm leverage (measured by the log of the debt-equity ratio) as a function of firm size (measured by the log of the lagged value of stock market capitalization, SMC). Debt comprises all non-equity liabilities with stated maturity. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the log debt-equity ratio of firm i. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 180 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The regression coefficients of the parametric part are displayed in Table 12, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

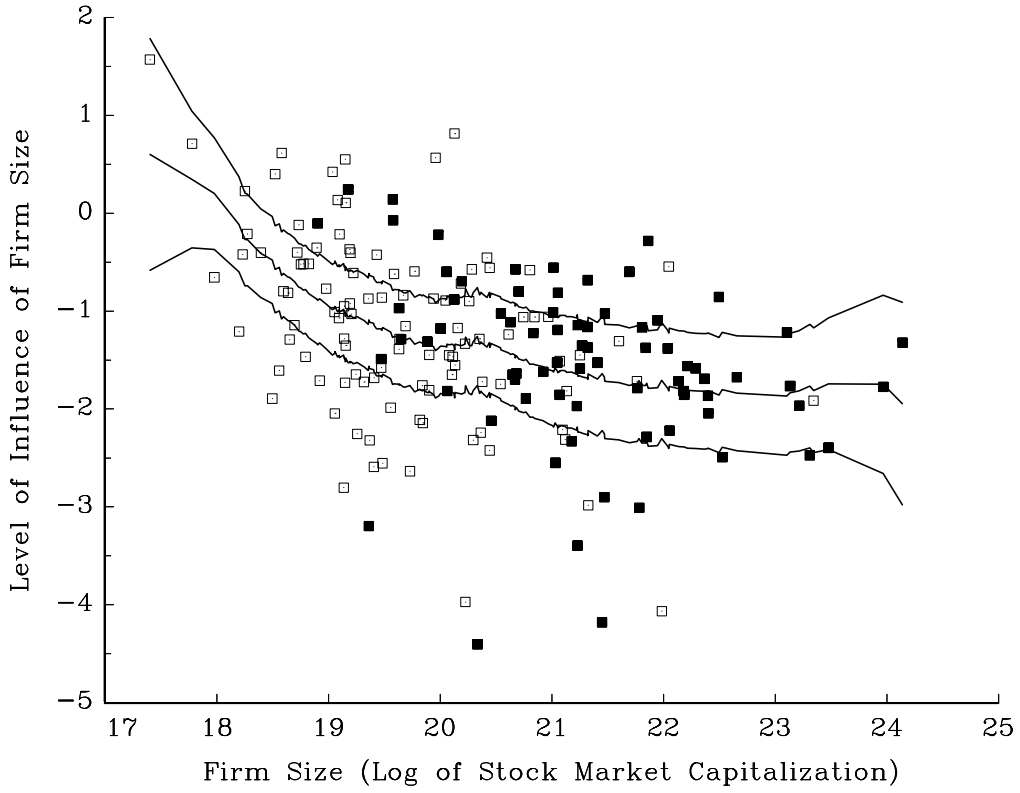

Fig. 9. Concentration of equity control rights as a function of firm size. Equity control rights concentration is measured by the (log of the) largest fraction of equity control rights held by single shareholder, Emax. Firm size is measured by the log of the lagged value of stock market capitalization, SMC. We estimated a semi-parametric regression equation $y_i = f(z_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being $E\,max_i$. The regressor z_i represents the size of firm i, SMC_i, which (along with the intercept) is included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 180 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The regression coefficients of the parametric part are displayed in Table 13, column 3. In this figure, the middle line represents the estimated partial impact, $\hat{f}(z_i)$, while the two neighboring lines are 90%-confidence intervals. The squares stand for the sum of the estimated partial impact and the residual, $\hat{f}(z_i) + \hat{\varepsilon}$, where the solid squares represent firms with equal representation. We dropped 10 observations with Emax equal to zero. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself).

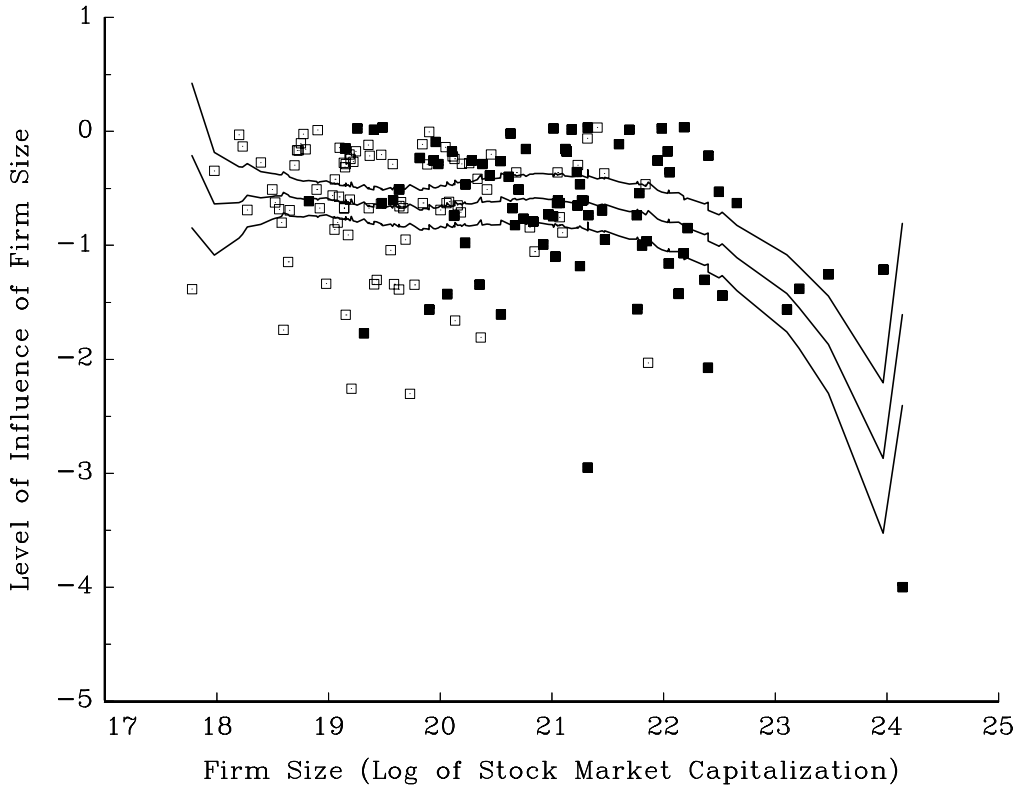

Fig. 10. Management board compensation and firm performance. Board compensation is measured by the log of compensation per member, measured in units of 1 DM, while firm performance is measured by the log of the firm's market-to-book ratio of equity, MTB. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the per-capita supervisory board compensation of firm i. The vector $\boldsymbol{z}_i$ contains the performance of firm i, measured by its the market-to-book ratio of equity, MTB_i, and the size of firm i, SMC_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 172 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of firm performance, $\hat{f}(MTB_i, \overline{SMC})$, with firm size held constant at its median value, $\overline{SMC}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 14, panel A, column 3.

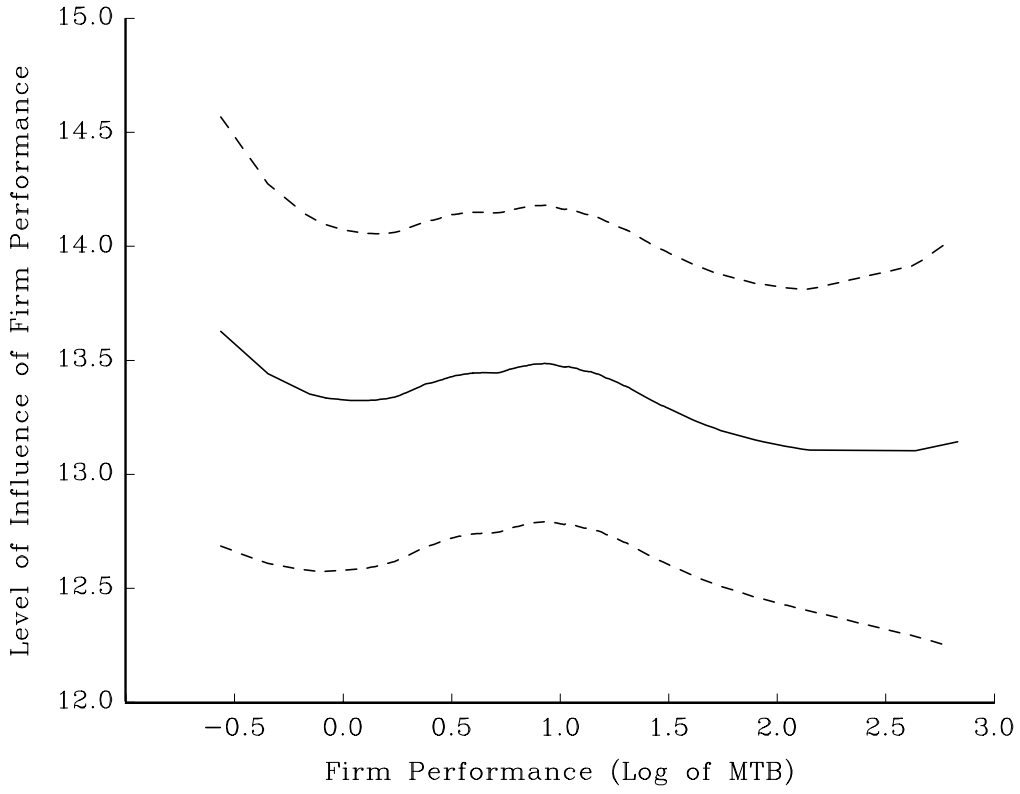

Fig. 11. Management board compensation and firm size. Board compensation is measured by the log of compensation per member, measured in units of 1 DM, while firm size is measured by the log of the firm's stock market capitalization, lagged by one year, SMC. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the per-capita supervisory board compensation of firm i. The vector $\boldsymbol{z}_i$ contains the performance of firm i, measured by its the market-to-book ratio of equity, MTB_i, and the size of firm i, SMC_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 172 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of firm size, $\hat{f}(\overline{MTB}, SMC_i)$, with firm performance held constant at its median value, $\overline{MTB}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 14, panel A, column 3.

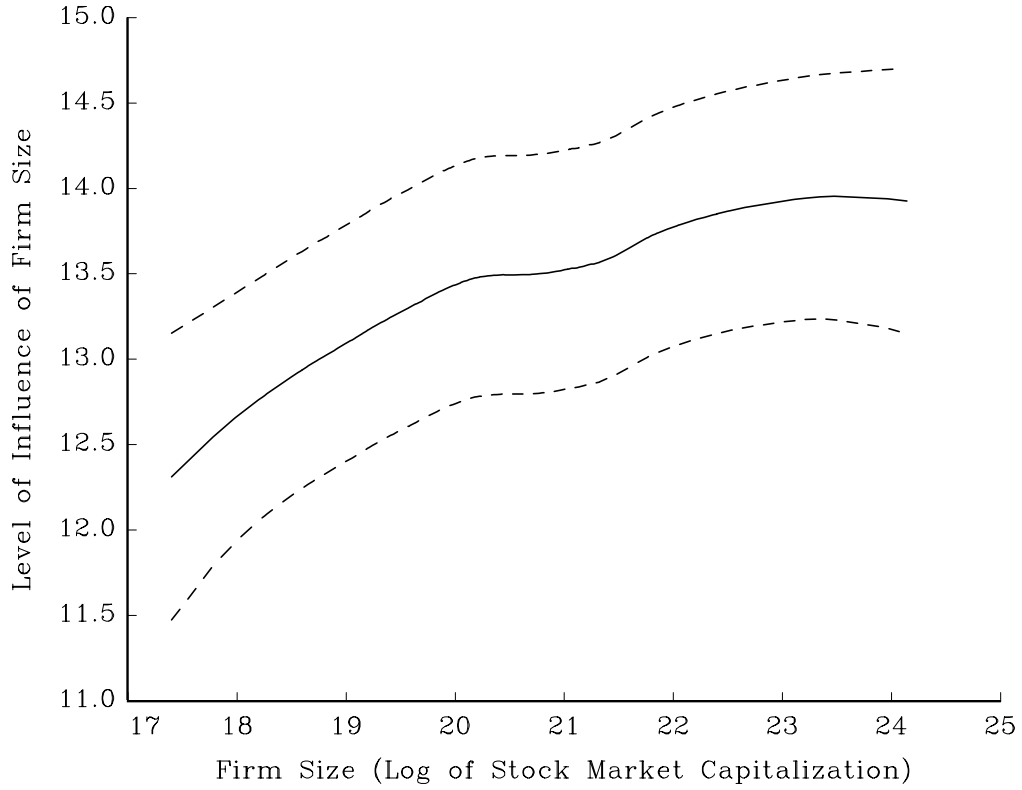

Fig. 12. Supervisory board compensation and firm performance. Board compensation is measured by the log of compensation per member, measured in units of 1 DM, while firm performance is measured by the log of the firm's market-to-book ratio of equity, MTB. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the per-capita supervisory board compensation of firm i. The vector $\boldsymbol{z}_i$ contains the performance of firm i, measured by its the market-to-book ratio of equity, MTB_i, and the size of firm i, SMC_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 172 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of firm performance, $\hat{f}(MTB_i, \overline{SMC})$, with firm size held constant at its median value, $\overline{SMC}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 14, panel B, column 3.

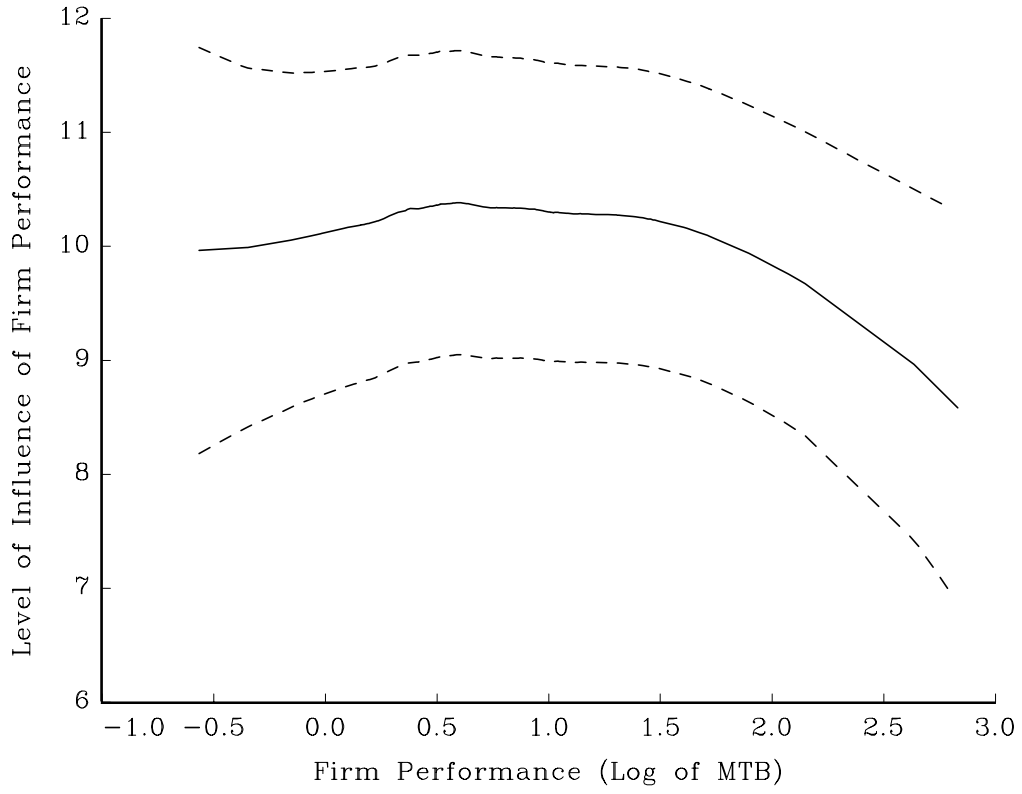

Fig. 13. Supervisory board compensation and firm size. Board compensation is measured by the log of compensation per member, measured in units of 1 DM, while firm size is measured by the log of the firm's stock market capitalization, lagged by one year, SMC. We estimated a semi-parametric regression equation $y_i = f(\boldsymbol{z}_i) + \boldsymbol{X}_i\boldsymbol{\beta} + \varepsilon_i$, with y_i being the per-capita supervisory board compensation of firm i. The vector $\boldsymbol{z}_i$ contains the performance of firm i, measured by its the market-to-book ratio of equity, MTB_i, and the size of firm i, SMC_i. These two variables, along with the intercept, are included in the nonparametric part. The (row) vector $\boldsymbol{X}_i$ comprises the observations of firm i that are contained in the parametric part, and ε_i is an error term. The regression is based on 172 observations, which are from the fiscal year 1991 (or 1990/91 for firms with other than calendar fiscal years), the median year of our sample. The figure is a two-variable conditioning plot (Cleveland and Devlin, 1998, p. 601). The middle line represents the estimated partial impact of firm size, $\hat{f}(\overline{MTB}, SMC_i)$, with firm performance held constant at its median value, $\overline{MTB}$. The two dashed lines are 90%-confidence intervals. Note that the intercept is not identified in regressions of this type, so only vertical distances are meaningful (not the level itself). The regression coefficients of the parametric part are displayed in Table 14, panel B, column 3.