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DO CORPORATE CONTROL AND PRODUCT MARKET COMPETITION LEAD TO STRONGER PRODUCTIVITY GROWTH? EVIDENCE FROM MARKET-ORIENTED AND BLOCKHOLDER-BASED GOVERNANCE REGIMES

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Do corporate control and product market competition lead to stronger productivity growth?

Evidence from market-oriented and blockholder-based governance regimes

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Abstract:

This study investigates the impact of corporate governance and product market competition on total factor productivity growth for two large samples of German and UK firms. In poorly performing UK firms, the presence of strong outside blockholders lead to substantial increases in productivity. Contrarily, for German poorly performing and distressed firms, it is bank debt concentration which stimulates productivity growth. Whereas high bank debt concentration also supports productivity growth in German profitable firms, leverage is unrelated to productivity growth in UK firms. Weak product market competition in the UK has a negative impact on productivity growth of in both widely-held firms and concentrated firms with the exception of firms controlled insiders (directors). These seem able to generate productivity increases in firms subject to little market discipline. For profitable German firms, the relation between strong blockholder control and productivity growth is limited. Only control by banks, insurance firms and the government can somewhat reduce the negative effect of weak product market competition.

Keywords: corporate governance, productivity growth, ownership and control, product market competition, financial distress.

JEL classification: D24, D43, G32

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Does good corporate governance lead to stronger productivity growth?

Evidence from market-oriented and blockholder-based governance regimes

Abstract:

This study investigates the impact of corporate governance and product market competition on total factor productivity growth for two large samples of German and UK firms. In poorly performing UK firms, the presence of strong outside blockholders lead to substantial increases in productivity. Contrarily, for German poorly performing and distressed firms, it is bank debt concentration which stimulates productivity growth. Whereas high bank debt concentration also supports productivity growth in German profitable firms, leverage is unrelated to productivity growth in UK firms. Weak product market competition in the UK has a negative impact on productivity growth of in both widely-held firms and concentrated firms with the exception of firms controlled insiders (directors). These seem able to generate productivity increases in firms subject to little market discipline. For profitable German firms, the relation between strong blockholder control and productivity growth is limited. Only control by banks, insurance firms and the government can somewhat reduce the negative effect of weak product market competition.

1. Introduction

In a recent survey, Bartelsman and Doms (2000) identify four factors that are likely to influence productivity growth at the micro level: (i) technology and human capital affecting efficiency in production; (ii) government regulation altering the incentives for innovating, market entry, and gaining market share; (iii) (international) competition on product markets making firms learn faster about new technologies; (iv) firm ownership determining the firm's choices on technology and inputs. Research on the impact of this fourth factor, namely ownership and control, on changes in productivity has been scarce. Not just ownership and control is expected to influence factor productivity but, more generally, the corporate governance regime in which the firm operates. For the purposes of this study, we interpret corporate governance as the amalgam of the firm's control concentration and structure, and capital structure (including the role of banks as major creditors) and their interactions with product market competition and corporate performance. The corporate control definition of La Porta et al. (1997, 2000) also incorporates those aspects of corporate law and (stock exchange) regulation which have a bearing on disclosure and shareholder and creditor protection. Therefore, we investigate the relation between corporate governance and market discipline, and productivity growth for two different corporate governance regimes: the Anglo-American market-oriented and the continental European blockholder-based corporate governance systems.

Empirical evidence on the role of corporate governance and its impact on firm performance has recently been accumulating (see Shleifer and Vishny (1997) for a survey on the US and Denis and McConnell (2003) for an international review). Most research has concentrated on the Anglo-American governance regime characterised by well-developed capital markets, the prevalence of institutional investors such as mutual and pension funds, substantial investor protection, an active market of corporate control, and a

focus on shareholder value. In the blockholder-based economies of continental Europe, capital markets are shallow compared to the UK and the US, ownership is marked by strong control concentration and complex pyramidal ownership structures, there is lower investor protection, and the firm's objective is a (legally enshrined) stakeholder approach (Barca and Becht (2001)). This study builds on the institutional differences between market-oriented and bank-oriented systems of corporate governance to learn more about the efficacy of corporate control. We choose two countries typical for each of these governance regimes: for the market-oriented system, we opt for the UK, and for the blockholder-based system for Germany. It should be noted that the German corporate landscape is not only characterised by large controlling share blocks, but also by the predominance of large banks. These German 'house banks' (*Hausbanken*) are major creditors with long-term lending relationships. They frequently also exert control rights through direct and indirect share ownership which often yields supervisory board representation. Therefore, Germany is often referred to as a 'bank-oriented' corporate governance system.[1]

This paper provides the following contributions to the literature: first, whereas most research focuses on productivity in one single country, the paper analyses two large samples of firms belonging to two substantially different corporate governance regimes. Second, the traditional productivity models are expanded by specific shareholder and creditor control as well as by product market competition. Third, we analyse the relation of product market competition, governance and productivity growth by applying the Arellano and Bond (1991) estimation method to take care of endogeneity problems, which have often plagued earlier empirical studies (Börsch-Supan and Köke (2002), Himmelberg et al. (1999)). Fourth, as good governance is critically important in poorly performing and financially distressed firms, we study the role of creditor and shareholder involvement in such firms in generating productivity improvement.

Our main findings are: (i) When UK firms are financially distressed or incur losses, the presence of strong outside blockholders (insiders, individuals and families, banks and insurance companies) lead to substantial increases in productivity. Contrarily, for German poorly performing and distressed firms, bank debt concentration stimulates productivity growth. Thus, it seems that in both countries, different governance devices (blockholders versus *Hausbanken*) are responsible for productivity increases. (ii) High bank debt concentration stimulates productivity growth in German profitable firms, but mainly in a context of weak product market discipline. Leverage is unrelated to productivity growth in UK firms. (iii) For UK firms, weak product market competition has a negative impact on productivity growth of widely-held profitable firms and of profitable firms controlled by most types of outside blockholders (individuals or families not related to a director, insurance companies or investment funds, or non-financial firms). (iii) For profitable German firms, the relation between strong blockholder control and productivity growth is limited. Only controlling banks, insurance firms and government stakes can somewhat reduce the negative

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[1] For an early empirical study that examines the relation of ownership concentration, bank influence and profitability, see Cable (1985). For more recent evidence, see Edwards and Nibler (2000), Gorton and Schmid (2000), Lehmann and Weigand (2000).

effect of weak product market competition. (iv) For profitable UK firms, the interaction effects of product market competition and control reveal that blockholder control has little impact on productivity growth with exception of controlling insiders (directors) who generate productivity increases in firms subject to little market discipline.

The paper proceeds as follows: Section 2 derives the hypotheses. Section 3 describes the sample and data sources and shows how the corporate governance and competition variables are measured. In addition, this section provides some preliminary evidence on the relation of corporate governance and competition to productivity growth. Section 4 derives the empirical model of productivity growth and details the GMM estimation procedure with instrumental variables. Section 5 discusses the results and Section 6 concludes.

2. Hypotheses

A number of theoretical studies argue that intense product market competition ensures that efficient production is a prime managerial aim (see Allen and Gale (2000) for a review). For example, Holmström (1982) and Nalebuff and Stiglitz (1983) show that perfect competition reveals full information about the occurrence of common cost shocks to shareholders. They show that the discipline of product markets stimulates managers to perform optimally (in a profit-maximising sense). This is confirmed by Hart (1983) who shows that competition reduces the amount of managerial slack. Hermalin (1992) studies the influence of product market competition on managerial performance and shows that under certain conditions increased competition reduces agency costs. Consequently, we hypothesize that competition (measured by the absence of monopoly rents) directs managerial effort towards value creation which can be achieved by (amongst others) productivity growth. The alternative hypothesis states that increased competition may raise demand elasticity and reduce demand for the individual firm. As a consequence, increased competition may actually lead to reduced managerial effort (Horn et al. (1994)) and may increase the probability of bankruptcy (Schmidt (1994)).

Hypothesis 1: *Intense product market competition stimulates productivity growth.*

Large share blocks incentivise their owners to collect corporate information, monitor management and influence corporate policy (Shleifer and Vishny (1986)). This behavior is conditional upon the size of the share blocks: sufficiently large blocks enable the shareholders to internalise the costs of monitoring which are borne entirely by the monitoring shareholders whereas the shareholders can only reap the potential benefits in terms of future performance increases in direct proportion to their equity stakes. As such, a dispersed ownership structure will lead to free-riding behavior as monitoring is too costly (Grossman and Hart (1980)). Hence, we expect shareholder control to be reflected in stronger productivity growth.

Hypothesis 2a: *Strong voting power encourages controlling shareholders to monitor management, reflected in increases in productivity.*

Different types of shareholders may have distinct incentives or abilities to monitor management. As not only the concentration of ownership but also its structure varies substantially between German and UK firms, different monitoring intensity may be expected in these countries. In the UK, directors are the second most important group of shareholders in terms of aggregate share ownership. Consequently, directors with substantial voting power may pursue their own objectives which may be dominated by private benefits rather than value maximisation. Thus, productivity growth may be slower in insider-dominated firms. In German firms, private outsiders (individuals and families) and non-financial corporations constitute the prevalent shareholder category and, frequently hold supervisory board memberships (Edwards and Fischer (1994)).

Mutual or pension funds and insurance companies are, in aggregate, the largest shareholders in listed UK firms. Still, there are dissenting opinions about institutional shareholder activism. Goergen and Renneboog (2001) report that UK institutions are passive shareholders because (i) they lack the resources to be involved in the corporate strategies of all their investments, (ii) their share stakes in individual firms are frequently modest in size, and (iii) due to insider trading regulation, they abstain from collecting private information in order not to immobilize their portfolios' liquidity. Likewise, Faccio and Lasfer (2000) find that occupational pension funds are not involved in monitoring.[2] In Germany, large banks hold relatively small individual share stakes, but their importance is amplified through proxy votes, voting rights restrictions and supervisory board seats. Hence, monitoring and strategy formulation by such banks (eg. *Deutsche Bank, Commerzbank, Dresdner Bank, Hypovereinsbank*) and large insurance firms (like *Allianz* and *Munich Re*) may be more important than in the UK (Franks and Mayer (2001)).

Hypothesis 2b: *As monitoring abilities differ across different types of shareholders, we expect that specific types of shareholders are better monitors and can hence ensure stronger productivity growth: (i) Controlling outsider shareholders (individuals and families not related to directors, financial institutions, non-financial firms and the government) have a positive impact on productivity growth. (ii) In firms where insiders (directors) can exercise strong voting power, the relation between control and productivity growth is insignificant or negative as insiders may pursue their own personal objectives and are insulated from monitoring actions by outside shareholders.*

In view of the ownership differences between Germany and UK, we expect the negative insider effect to be stronger in the UK and the positive effect of private outsiders (banks and insurance companies, and non-financial firms) to be stronger in Germany.

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[2] In contrast, Crespi and Renneboog (2000) report that the casting of votes by institutions has risen substantially in the 1990s and is now at around 41% for investment funds, 59% of pension funds and 87% of insurance companies. The fact that the UK government intends to stimulate monitoring by institutions is reflected by the efforts of the 1999 Newbold Committee of Inquiry on institutional vote execution (Stapledon and Bates (2002)).

Poor financial performance may serve as a signal of poor managerial quality which invites large shareholders to step up corporate monitoring. For firms in financial distress, Franks et al. (2001) show that outside shareholders, when refinancing the firm, frequently dismiss underperforming management and propose a plan of corporate restructuring involving strategies to improve factor productivity. Specifically for Germany, the government seems more inclined to interfere in ailing companies than in the UK: for instance, the government intervened in Holzmann and Deutsche Telecom.

Hypothesis 2c: *In financially distressed firms, controlling blockholders are needed for corporate restructuring leading to productivity improvements.*

Intense product market competition may make corporate governance actions redundant (null hypothesis) or reinforce corporate governance actions by shareholders (alternative hypothesis).

Hypothesis 2d: *Shareholder control and product market competition are supplementary disciplinary mechanisms such that in industries with strong competition, shareholder control has little bearing on productivity growth and vice versa.*

Banks are effective monitors because they act as delegated monitors (Diamond (1984)). Their incentives to monitor increase with the size of their equity and debt portfolios in individual firms. In addition, (bank) debt financing reduces free cash flow and therefore has a bonding or pre-commitment effect on management (Jensen (1986)). Management can use high leverage to signal credibly that they maximize profitability and productivity. We expect that creditor monitoring (by banks) is larger in Germany as firms contract large amounts of debt with large house banks (Edwards and Fisher (1994)).

Hypothesis 3a: *The bonding effect of high leverage stimulates productivity growth. In Germany, strong bank monitoring leads to increases in factor productivity.*

When a violation of debt contracts is imminent, creditor monitoring and creditor involvement in the firm's corporate policy increases.
Hypothesis 3b: *Poor corporate performance or financial distress triggers intense creditor monitoring, reflected in higher productivity growth. Considering the credit concentration with large German house banks, creditor-related productivity growth is larger in Germany than in the UK.*
Hypothesis 3c: *High leverage or bank debt, and product market competition are supplementary disciplinary mechanisms such that in industries with weak competition, creditor monitoring has little bearing on productivity growth and vice versa.*

3. Sample description, data sources and descriptive statistics
In this study, we use firm-level data from Germany and the UK. Information on the firms' production inputs and outputs enable us to estimate corporate productivity growth. We also collect detailed

information on ownership structure and concentration, on capital structure, on corporate performance and financial distress, and on the competitive environment for each firm.

A. Sample composition and data sources

The German sample consists of an unbalanced panel of 1074 non-financial firms covering the years 1986-96.[3] The sample includes firms which are listed on the German exchanges (304 firms; 2797 firm years) and firms which are not (770 firms; 3679 firm-years). The listed firms represent more than 85% of the stock market capitalization. The sample covers approximately 63% of all large public corporations (*Aktiengesellschaft*) and is therefore representative for this type of firm. In addition, all medium-sized and large private corporations (*GmbH*s) are included in the sample.[4] We partition the firms into three large industry groups: the largest number of firms (841) belongs to the manufacturing sector, 57 are in the construction industry, and 176 can be classified as wholesale and retail trade. Data from balance sheets and profit and loss-statements are gathered from Hoppenstedt's *Bilanzdatenbank*. Information on all shareholding of at least 5% and on the control structure is collected from various editions of Hypobank's *Aktienführer* as well as Hoppenstedt's *Konzernstrukturdatenbank*.

The UK sample includes 502 firms which constitutes one third of all non-financial listed firms or about half of the manufacturing, construction and trade firms, from which the sample is drawn. The sample covers the period 1992-99 and captures more than 80% of market capitalization. Like for Germany, the largest number of firms (314) belongs to the manufacturing sector. Thirty-five companies are in the construction industry and 153 belong to wholesale and retail trade. Balance sheet and Pofit and Loss data are collected from Thomson Financial Datastream. Information on control concentration[5] and ownership structure are collected from Worldscope Disclosure archives, which report all large share stakes of 5% or more. In order to classify the more than 5000 individual shareholders into insiders (directors and their families) and outsiders (shareholders not related to directors), we consulted the London Stock Exchange Monitor and the Who's Who guides. To identify institutional shareholders, we consulted Datastream and Institutional Investors Annual Guides. Throughout the paper, we refer to executive and non-executive directors and their families as 'insiders', and to other individuals and families, financial institutions, industrial and commercial companies and other major shareholders as 'outsiders'. The insiders'

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[3] The sample excludes all firms from the financial services industries as well as firms that operate in industries still heavily regulated during the period of observation (e.g., media, telecommunication, and transport).

[4] We incorporate all the *GmbH*s included in the Hoppenstedt *Bilanzdatenbank*. This databank contains information of all *GmbH*s with at least € 50 million in sales. Detailed data on smaller *GmbH*s are not available due to limited disclosure requirements. *GmbH*s cannot be listed on a stock exchange.

[5] Although the UK ownership disclosure threshold (3%) is lower than in Germany (5%), we aligned the thresholds at 5% for both countries.

shareholdings consist not only of their beneficial holdings but also of the non-beneficial ones held on behalf of families and charitable trusts. Directors do not obtain cash flow benefits from these holdings but they can exercise the control rights. Where stakes were held by nominee companies, we identified the effective investors via information provided by the company's finance managers or controllers. Shareholdings of nominees were classified under the category of the effective owner.

B. Measuring large shareholder voting power and leverage

Our first voting power variable captures whether or not a large blockholder can exert a substantial amount of control power (*CONTROL*). For German firms, ownership concentration is high and control is frequently exercised through pyramid structures and cross-shareholdings (Becht and Röell (1999)). This implies that concentration measured at the direct level of ownership is inappropriate for Germany (Becht and Böhmer (2003), Köke (2002, 2003)).[6] Therefore, the *CONTROL*-variable for German firms indicates whether or not a firm is controlled by a strong ultimate shareholder owning stakes of 25%/50%. The concept of ultimate ownership (described in appendix 1) encompasses the complexity of control structures and strong control concentration. For the UK, *CONTROL* equals one when the large shareholder owns a share stake of at least 10%. Although such a stake is small in a continental European context, control power based on a 10% equity stake is in most UK firms substantial given the dispersed ownership structure.[7] As alternative measures of total control concentration, we use the Herfindahl index of overall ownership concentration (*HERF*), the size (percentage of total voting rights) of the largest share block (*BLOCK*) by company or the relative voting power of a shareholder measured by its Shapley value (*SV*).

Table 1 (panel A) provides some descriptive statistics on control concentration in UK and German firms. Whereas the median largest block in a UK listed firm is 15.6% and hence does not even reach the blocking minority threshold (of 25%), the largest (ultimate) owner holds a median stake that surpases the supermajority of 75% in the average German firm.[8] The Herfindahl index which captures not only control concentration but also voting rights dispersion, shows an even larger difference between Germany and the UK.

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[6] Renneboog (2000) shows that it is the ultimate shareholders who use their voting power to remove the management of poorly performing firms listed on the Brussels stock exchange and that there is little evidence of monitoring by shareholders at the direct level (first ownership tier).

[7] A detailed account of control structures and the distribution of control concentration for most European countries is given in Barca and Becht (2001). Increasing the control threshold for UK to 15% or 20% does not substantially change the outcome of the paper. Furthermore, the results are robust as regressions including %-ownership and relative power indices (Shapley values: see appendix 1) give a similar outcome (see Section 5)

[8] Note that the two numbers are not directly comparable as the UK sample consists of listed firms only whereas the German sample consists of both listed and non-listed firms. The median largest block of a German listed firm is still large, around 65% (Barca and Becht (2001)).

[insert table 1 about here]

In addition, we identify all shareholders owning 5% of more of the voting equity for each firm and categorize them into 8 owner classes ($TYPE_i$): (i) individuals and families not related to a director; (ii) insiders consisting of the CEO, chairman and other executive and non-executive directors and their families; institutional investors consisting of (iii) banks, (iv) insurance companies, (v) investment and pension funds and (vi) real estate firms; (vii) non-financial companies; (viii) the government. The variable $TYPE_i$ equals one when a firm is controlled by a shareholder of one of the above categories, $SHARE_i$ equals one if a specific shareholder category i is the dominating category in terms of aggregate percentage of voting rights. Panel B of Table 1 shows that the largest fraction of voting rights is ultimately owned by non-financial firms (38.9%), or by individuals or families (30.0%). Institutional ownership is limited in Germany: banks hold on average 5.6% of the voting rights (through substantial share stakes of at least 5%) and insurance companies control 2.5%. Nonetheless, actual voting power of banks may exceed the voting power they derive from their own equity stakes if they make use of proxy voting (*Depotstimmrecht*).[9] Recent evidence, however, suggests that proxy voting is unlikely to significantly enhance bank voting power (Edwards and Nibler (2000)). Government agencies control 4.6% of the German sample firms. The average free float amounts to 18.4%. For the UK, the distribution of shareholders is strikingly different. Most shares are widely-held. The shareholder class controlling (cumulatively) the largest fraction of shares (20.8%) in the UK is that of financial institutions, of which mutual and pension funds are the dominant category. Individuals and families, most of whom are insiders, control 14.4% of the shares. Since the privatisation wave of the end of the 1980s, the UK government is no longer involded in corporations as a large shareholder.

Regarding capital structure, we use different measures for Germany and the UK. Given that Germany is often considered as a 'bank-based economy', an important measure of leverage is the amount of bank debt to total debt (*BANK*) which is expected to capture the importance of the *Hausbanks*. For the UK, we employ a borrowing ratio (*BORROW*), measured as interest payments over EBITDA (an inverse measure of interest coverage by cash flows), the ratio of short-term debt (i.e., with maturity less than one year) to total debt (*SHORT*) and the debt/equity ratio (*LEVERAGE*). The reason why we do not use the bank debt ratio for the UK is that it is only reported for a small minority of UK firms. In fact, this may not be a serious shortcoming because, in contrast to Germany, (i) bank debt is less prominent relatively to issued corporate bonds and (ii) bank debt is usually not concentrated with a single bank. Furthermore, other UK-focused studies apply similar measures (Nickell et al. (1997), Nickell and Nicolitsas (1999)) which enhances the comparability of results. In our sample, the bank debt ratio amounts to 26.1% for the average German company. For the UK, we find an average borrowing ratio of 15.1% and an average ratio of short-

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[9] At a firm's annual meeting, a bank can exercise the voting rights related to a firms' shares that are deposited in the bank by the bank's clients. The bank is allowed to do so provided that it announces its voting intentions to its clients in advance and provided that these clients approve.

term debt of 49.9%.

C. Measuring product market competition

To measure the intensity of product market competition, we determine the firm's rents from production (*RENT*), which is interpreted as an ex post measure of market power. The motivation for using this measure is that firms operating in less competitive markets should be able to sell their products above marginal cost, and therefore earn higher rents after covering their expenses (on capital, labor, and materials); see Nickell et al. (1997) and Januszewski et al. (2002) for empirical implementations of these competition measures. Production rents (*RENT*) are defined as follows:

$$RENT_t = \frac{S_t - r^{K_t} p^{K_t} K_t}{Q_t} \tag{1}$$

The denominator, Q_t, is nominal output (value added), $p_t^Y Y_t - p_t^M M_t$. The numerator is a measure of firm's nominal operating surplus, S_t, less nominal cost of capital, $r_t^K p_t^K K_t$. In this notation, Y_t is real output, L_t, K_t, and M_t are real labor, capital, and materials inputs, while p_t^Y, p_t^L, p_t^K, and p_t^M are the corresponding prices. Finally, r_t^K is the user cost of capital, defined as $r_t^K = \delta + r_t$, where δ is the depreciation rate (as in Nickell 1996) and r_t is the risk-free market interest rate. The depreciation rate is equivalent to the market premium multiplied by beta, which we equate to one as a large faction of the German sample are not listed. The raw operating surplus, S_t, is usually measured by earnings before interest, taxes, and depreciation (EBITDA). We use this EBITDA as reported in the UK annual accounts. However, German firms are entitled to retain a fraction of earnings to build up reserves. Therefore, the German EBITDAs are a downward-biased measure of raw operating surplus. In our sample, this effect is even large enough to make the mean of the rents variable negative in the pooled sample. Therefore, in accordance with Lehmann and Weigand (2000) and Januszewski et al. (2002), we employ an alternative measure of raw operating surplus: sales less costs for materials and labor (hence, $S_t = p_t^Y Y_t - p_t^M M_t - p_t^L L_t$). In economic terms, this definition is equivalent to the definition of EBITDA.

Table 2 illustrates the ex post rents, an inverse measure of the intensity of product market competition, for 20 two-digit industries. As there may be differences in the level of rents between Germany and the UK resulting from the different approaches to calculate EBITDA, we compute relative industry-specific ex post rents, i.e., relative to the level of rents for all manufacturing industries in Germany and the UK, respectively. For example, a value of 163.0% for the German food industry means that rents in this industry are on average 63% higher compared to rents for all sample firms, which suggests low product market competition. Table 2 reveals that the industry-specific intensity of competition is not necessarily the same in Germany and the UK, stemming from, for instance, different degrees of producer concentration or different product market regulations. For example, the vehicle construction industry is highly competitive in Germany (with relative rents of 57.3%) while this industry is not in the UK (rents

are 124.3%).[10] Hence, our empirical analysis (Section 5) will allow for the fact that competition may have dissimilar effects on productivity growth in both countries.

[insert table 2 about here]

D. Measuring financial distress

The relation between product market competition, corporate governance and changes in productivity may be entirely different for poorly performing firms. To measure whether a firm is in financial difficulties, we use two indicator variables: (i) *LOSS* equals one when a firm reports a negative EBITDA and is therefore not able to cover its cost of capital, and (ii) *STRESS* equals one when a firm is not able to cover its current interest payments out of current EBITDA. Applying the EBITDA-measure of Section 3.B, we find that about 5.0% of German firms generate earnings losses, and about 8.9% of UK ones.[11]

E. Productivity changes and descriptive statistics

 Prior to developing an empirical model of the impact of corporate governance and product market competition on changes in productivity, we present some descriptive statistics on corporate control, leverage, product market competition and financial distress for two subsamples of firms with positive and negative productivity growth by country. To calculate changes in productivity for this univariate analysis, we estimate a standard two-factor Cobb-Douglas production function with value added as the dependent variable, and labor and capital as independent variables and interpret the residuals from this static regression as a measure of relative firm productivity (i.e., relative to the regression mean). This concept of relative productivity has a long tradition in applied productivity analysis (see Doms et al. (1995) for an application). In a second step, we calculate the first difference of the residuals to obtain a measure of productivity growth.[12,13]

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[10] For a vivid account on the compound effect of competition on productivity differentials between industries and industrialized nations, see Porter (1992).

[11] This discrepancy may emanate from actual differences in financial performance, but also to some extent from using different methodologies to calculate EBITDA. In section 5.B, we examine the robustness of all measures employed in the regressions, using a range of alternative measures.

[12] As our sample comprises firms from manufacturing as well as from the construction and trade industries, we interact the input coefficients, labor and capital, with dummy variables capturing whether a firm belongs to the construction sector (D_{con}) or the trade sector (D_{trade}). This specification enables us to test whether the input coefficients for the construction and trade industries differ from those for manufacturing. As appendix 2 shows that trade sector firms use a different combination of factor inputs, we analyse these firms separately.

[13] Our measure of productivity growth is the first difference of the residuals from the production function estimated using a random effects model for Germany and a fixed effects model for the UK.

[insert table 3 about here]

The bivariate analysis of Table 3 shows that both for Germany and the UK, lower levels of rents (and hence more intense product market competition) are associated with higher levels of productivity growth. A larger fraction of firms that experience financial difficulties, measured as earnings losses (*LOSS*) or low interest coverage (*STRESS*), show a positive change in productivity in the year following poor financial performance. This suggests that financial difficulties put more pressure on firms to increase productivity. It should be noted that, when firms are poorly performing as a consequence of bad management, productivity increases may easily be achievable. We find little evidence that control concentration in the UK is related to productivity growth, but for German firms ownership concentration is higher in companies with productivity growth than in those with productivity decreases. The positive impact of strong control is most significant when an individual or family, or a non-financial firm is the ultimate owner. Capital structure does not appear to play a role in bringing about productivity changes.

One reason for considering changes in rather than levels of productivity is that some corporate governance and competition variables may be endogenous to the level of productivity. As productivity growth is less persistent than productivity levels, endogeneity problems may be less severe if lagged values of corporate governance and competition are used (see also the discussion in Nickell (1996)). In the econometric analysis of Section 5, we use productivity growth as the dependent variable and address the remaining potential endogeneity by using an instrumental variables approach.

4. A productivity growth model and estimation methodology

In this section, we derive an empirical model of productivity growth from the firm's production function, modelling explicitly the sources of total factor productivity. We assume that productivity is shaped by the compound effect of past conditions under which the firm operated, such as intense product market competition or tight shareholder/creditor control. As in Nickell et al. (1997), our starting point is a standard Cobb-Douglas production function with two factor inputs,

$$Y_{it} = L_{it}^{\beta_L} K_{it}^{\beta_K} A_{it}$$

(2)

where Y_{it} is value added, L_{it} is labor, K_{it} is capital, and A_{it} is a measure of total factor productivity for firm i in year t. Since we use value added as the output measure, which is defined as total sales less materials costs, we implicitly allow for materials as a third input.

As we are interested in the determinants of total factor productivity growth, we transform the production function (2) into a regression equation in several steps. First, we take logs and include lagged output using

a weight λ. This expansion takes into account potential persistence in output. We also include firm fixed effects, α_i, to allow for unobserved firm heterogeneity. Since output can have a stochastic component, we add an error term, ε_{it}, which is assumed to be serially uncorrelated over time. This yields our basic log-linear empirical production function, with small letters denoting logs of Y_{it}, L_{it}, K_{it} and A_{it}:

$$y_{it} = \lambda y_{it-1} + (1-\lambda)\beta_L l_{it} + (1-\lambda)\beta_K k_{it} + (1-\lambda)a_{it} + \alpha_i + \varepsilon_{it}$$

(3)

Second, taking first differences eliminates the fixed firm effect α_i. We obtain the differenced growth version of the adjusted Cobb-Douglas production function in (2):

$$\Delta y_{it} = \lambda \Delta y_{it-1} + (1-\lambda)\beta_L \Delta l_{it} + (1-\lambda)\beta_k \Delta k_{it} + \Delta a_{it} + \Delta \varepsilon_{it}$$

(4)

Finally, we specify the sources of productivity growth by using the level of corporate governance and product market competition in year *t-1*. Corporate governance and competition are proxied by the control structure (i.e., *CONTROL, TYPE, SHARE, BLOCK, SV*), capital structure (i.e., *BANK, BORROW, LEVERAGE*), and product market competition (*RENT*), which enter the model with a one-year lag. To control for cyclical effects in productivity growth and to filter out productivity shocks, we add a contemporaneous industry-specific index that measures capacity utilization (*CYCLE*) and the time effects μ (see appendix 1 for definitions). To control for growth effects related to firm size but unrelated to corporate governance and competition, we include lagged total assets (*ASSET*). Thus, productivity growth is modelled as

$$\Delta a_{it} = \mu_t - \mu_{t-1} + \gamma_1 CYCLE_{it} + \gamma_2 ASSET_{it-1} + \beta_1 RENT_{it-1} + \beta_2 BANK_{it-1} + \beta_3 CONTROL_{it-1}$$

(5)

Our empirical model of productivity growth is given by (4) and (5). The structure of this model corresponds to the differenced panel model with lagged endogenous variables considered in Arellano and Bond (1991). They develop a generalized method of moments (GMM) estimator that makes use of both the lags of the dependent and explanatory variables as instruments. In our application, this approach addresses the potential endogeneity problems with respect to the corporate governance and competition variables that enter the right-hand side of equation (4).[14] As an example of endogeneity problems,

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[14] An alternative estimation approach for dynamic panel data models is the standard instrumental variables (IV) estimator proposed by Anderson and Hsiao (1981). Still, since we model the influence of corporate governance and competition on productivity *growth* using the parameterization in equation (5), the Anderson-Hsiao IV estimator is not readily applicable in our setting.

competition may not be independent of productivity changes because well-performing firms may eventually gain a position of market dominance.

Arellano and Bond (1991) show that endogenous variables lagged two or more periods are valid instruments, provided there is no serial correlation in the time-varying component of the error terms in equation (3); we test this condition for all specifications. The instruments we use are $y_{i,t-j}$ for $j \geq 2$, and second lags of *RENT* and *ASSET*. We test for instrument validity using a Sargan test of over-identifying restrictions.[15] The standard errors of our parameter estimates are robust with respect to heteroskedasticity. We also experiment with additional instruments, using all time-varying measures of the control structure and capital structure. For Germany, our main results do not qualitatively change. For the UK, these specifications cannot be estimated due to problems of multi-collinearity.

While the Arellano-Bond approach can in principle deal with potential endogeneity problems in our application, there is a caveat. Blundell and Bond (1998) show that in autoregressive models with persistent series, the first-difference estimator can be subject to finite sample bias as a result of weak instruments. They argue that this bias could be greatly reduced by estimating a model with equations in both levels and first differences. We do not apply such a GMM-in-systems estimation procedure here for two reasons. First, we assume that the *level* of corporate governance and competition influences productivity *growth*, which suggests the use of a first-difference estimator. The estimation method has the advantage that changes in productivity rather than levels of productivity across firms and industries are compared. Second, the potential finite sample bias is unlikely to be an issue as both our samples for Germany and the UK are large.

5. Discussion of results

In Section A, we present the Arellano and Bond GMM-estimation results of the effects of corporate governance and product market competition on productivity growth. We examine German and the UK firms separately because the theoretical considerations of section 3 suggest that some of the governance and competition measures are country-specific. Furthermore, a pooled regression which assumes that production technologies are identical for Germany and the UK, is not appropriate (see appendix 2). In section B, we investigate the robustness of our results.

A. Effects of corporate governance and product market competition

Our analysis sets out with a basic model that relates the intensity of product market competition (*RENT*), debtholder influence (*BANK* for Germany; *BORROW* for the UK), and large shareholder control

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[15] Following Arellano and Bond (1991), we use the two-step version of the GMM estimator for obtaining the Sargan test statistic, while coefficient estimates are based on the one-step version. Arellano and Bond report that the one-step Sargan test is sensitive to heteroskedasticity, tending to over-reject the null.

(*CONTROL*) to productivity growth. Model (1) for Germany in Table 4 shows that a low level of rents and a higher fraction of bank debt to total debt are associated with higher productivity growth. As *RENT* is an inverse measure of product market competition and bank debt (usually granted by one *Hausbank*) is a proxy for creditor influence, these findings suggest that firms experience higher productivity growth when operating in more competitive markets and when being exposed to tight creditor control. These findings provide some support for hypotheses 1 and 3a, but not for hypothesis 2a as strong shareholder control does not enter the relation significantly. For the basic UK model (1), none of these measures have an impact on productivity growth. Table 5 summarizes the main hypotheses and the economic effects of this section.

[insert table 4 about here]

As hypothesized in Section 2, intense product market competition as well as poor firm performance may affect the effectiveness of corporate control. Therefore we investigate the interaction between competition (*RENT*), poor corporate performance (*LOSS*) and corporate governance (large shareholder control and creditor influence) in model (2) of Table 4. For Germany, we conclude that the impact of bank debt on productivity growth is reinforced by poor financial performance, which supports hypothesis 3b. The findings suggest that poorly performing firms that are considerably dependent on bank credit, benefit from intensified creditor monitoring. This, in turn, leads to productivity growth in the subsequent period. The difference in productivity growth between loss-making firms in the highest quintile of bank debt and those in the lowest quintile of bank debt amounts to 3.65% (see Table 5). Model (2) also shows that the interaction of rent and bank debt is significant and positive. The economic effect of bank debt depends on the degree of product market competition: a high concentration bank debt leads to increased productivity growth of 0.5%[16] in a strongly competitive environment, and of 1.6% in a weakly competitive one. This supports hypotheses 3a and 3c.

In model (2), we also analyse German shareholder control in the context of poor corporate performance and intense product market discipline. The parameter estimate of strong shareholder control (*CONTROL*), and that of *CONTROL* interacted with the degree of competition show that in an environment with strong product market competition (*RENT* is e.g. 0.5), the presence of blockholders does not contribute to productivity growth (0.171-0.471*0.5 equals -0.06%). We also observe that blockholder control dampens this negative effect of weak competition somewhat, but that the negative effect of weak competition dominates with –0.54% (0.171-0.471*1.5; see Table 5). These findings fail to support hypothesis 2d. We also find no evidence of a role of large blockholders in poorly performing firms (hypothesis 2c).

[insert table 5 about here]

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[16] For firms with bank debt in the highest quintile (ratio is 0.7).

For UK firms, model (2) shows that weak competition (high rents) in widely-held firms has a negative impact on productivity growth. Productivity is 0.25% worse in firms with weak competition (RENT=1.5) compared to firms with strong competition (RENT=0.5). We investigate the economic effect of blockholder control depending on the competitive landscape for profitable firms by looking at various scenarios using the parameter estimates of *RENT, CONTROL* and its interaction term with *RENT*. Whereas controlling blockholders do not have a significant impact on productivity growth for profitable firms in a strongly competitive environment, blockholders do contribute to productivity growth for profitable firms operating in a weakly competitive industry.[17] The strongest relation in model (2) is that between productivity changes and the interaction term between poor performance and blockholder control. This implies that in poorly performing firms, blockholders contribute significantly to productivity improvement, in line with hypothesis 2c. It seems that blockholders do fulfil their governance task in situations when it matters most: namely poor performance and financial distress. Finally, model (2) shows that leverage is not related to productivity changes in the UK.

As we wish to refine our conclusions on shareholder control, we analyse which types of controlling shareholders are able to improve productivity growth in Table 6.[18] Model (3) confirms that for German firms facing intense product market competition, corporate control does not contribute to productivity growth whereas control matters in firms lacking such a competitive environment. Weak competition has a strongly negative impact on productivity changes, but the presence of controlling stakes (at the ultimate ownership level) held by banks and large insurance firms and the government matters. It should be noted that, in contrast to the UK, the dominant banks (mainly *Deutsche Bank, Commerzbank, Dresdner Bank, Hypovereinsbank*) and insurance firms (like *Allianz* and *Munich Re*) frequently hold substantial share stakes, often strengthened by proxy votes (Franks and Mayer (2001), Köke (2003)). These findings partially sustain hypothesis 2b. Unlike for the UK, there is no evidence in Table 6 that blockholders in Germany improve productivity in poorly performing or financially distressed firms (which fails to support hypothesis 2c). We confirm that this role seems to be preserved for the *Hausbanks*: bank debt concentration (*BANK*) has a beneficial impact on productivity growth in poorly performing firms. Thus, in line with hypothesis 3b, it seems that corporate losses encourage German banks that granted large loans to confer with the firm's board about implementing survival strategies, part of which focus on productivity increases.

[insert table 6 about here]

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[17] Intense competition for profitable firms controlled by a blockholder yields –0.02% (-0.252*0.5-0.079+0.369*0.5). Model (2) also shows that the presence of controlling blockholders has a positive impact of 0.10% on productivity growth for profitable firms facing weak competition (-0.252*0.5-0.079+0.369*1.5).

[18] The reference category of shareholder is that of small, dispersed shareholders.

For UK firms, model (3) shows that weak competition significantly hampers productivity growth especially in widely-held, profitable firms and in profitable firms controlled by individuals or families (not related to a director), by insurance companies or investment funds, or by non-financial firms. In companies with strong control concentration in the hands of insiders and, to a smaller extent, of banks, the combined effect of competition and shareholder control does not have a significant impact on productivity changes (see parameter estimates of *RENT, TYPE insider/bank* and its interaction with *RENT*; the combined effect is 0.05%). However, insider (and bank) control of firms facing little competition (high *RENT* of e.g. 1.5), leads to a significant productivity growth of 0.5%.[19] From these findings, we conclude that blockholder control has little impact on productivity changes in profitable firms with the exception of controlling insiders (directors) who manage to generate productivity increases in firms subject to little market discipline. Consequently, product market competition and insider control are supplementary, which supports hypothesis 2d. Blockholders of most types (insiders, individuals and families, banks and insurance companies) seem instrumental in increasing productivity in poorly performing firms (which supports hypotheses 2b and 2c).[20] The degree of leverage does not seem to have any impact on productivity which implies that hypothesis 3a is not sustained. This may result from the fact that creditors of UK firms are relatively dispersed (compared to German ones) such that it is more difficult for these banks and bondholders to deliberate on corporate strategy with the board of directors.

All versions of our Arellano and Bond GMM model are supported by the standard battery of specification tests. The Sargan tests do not reject the hypothesis of instrument validity. Also, the tests for second-order serial correlation of the residuals do not reject the null of zero correlation. Wald tests cannot reject the hypothesis of constant returns to scale. Finally, in all specifications we report, the slope coefficients and the sets of time and industry dummy variables are jointly significant according to the Wald tests (not reported).

B. Sensitivity of results

In this section, we examine the robustness of our findings by introducing alternative specifications of some key variables and by experimenting with alternative instruments. In addition, we also estimate the model for firms in the trade industry, which use a different production technology than manufacturing and construction firms (see appendix 2).

a. Alternative definitions for performance, capital structure and shareholder control.

We investigate whether the results from our benchmark specification, model (3) from Table 6 remain

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[19] From model (3) in Table 6: -0.262*1.5-0.158+0.686*1.5=0.47%.

[20] A Wald test reveals that the sum of the coefficients for *TYPE* and the interaction with *LOSS* is significantly positive for private outsiders, banks, and funds.

valid when we use an alternative measure for poor performance. We substitute a financial distress-variable, capturing the fact that cash flow is insufficient to pay the interests (insufficient interest coverage; *STRESS*), for the earnings losses-variable (*LOSS*). For Germany, all results remain (statistically as well as economically) unaffected.[21] For the UK, most results are also similar, but the interaction of shareholder control (*TYPEbank*) and poor performance (*STRESS*) is no longer significant at normal levels of statistical significance. What remains valid is the beneficial role of insiders, institutional investors and outsider individuals and families in firms in financial difficulties. Changing the interest coverage cut-off point (the dummy variable STRESS equals 1 when the firm's cash flow is just sufficient to pay interest expenses; EBITDA/interest=1) on which the financial distress variable is based to 0.5 or to 1.5 does not changes our findings. We conclude that the evidence of Table 6 regarding poor performance remains valid to alternative definitions of performance and distress.

When we use the borrowing ratio (*BORROW*) rather than bank debt (*BANK*) in the model specification for Germany, we find that this alternative measure of creditor influence is not related to productivity growth.[22] Similar non-significant results are obtained for *LEVERAGE*. Interestingly, this shows that the degree of leverage is not important in terms of monitoring, but that the type of creditor (namely, banks) influences changes in total factor productivity. This is hardly surprising: we pointed out above that German banks typically play a key role among lenders to German companies, and therefore the volume of bank debt should matter more than the volume of interest paid to all types of lenders. In addition, the bulk of bank debt of German firms is usually contracted from one bank with which the firm has a privileged relation. As we cannot use *BANK* for the UK (due to insufficient information), we substitute short-term debt to total debt (*SHORT*) and the debt-equity ratio *(LEVERAGE)* for *BORROW* (in separate regressions). Like the variable *BORROW*, *SHORT* and *LEVERAGE* do not have a significant impact on productivity growth. All other results for the UK from Table 6 remain valid.

We also re-estimate model (3) replacing the shareholder control variables *TYPE*$_i$ (which indicate whether a firm is controlled by an (ultimate) large shareholder of a specific category *i*) by a dummy variable that points out which shareholder category has the largest percentage of aggregate voting rights (*SHARE*).[23] For Germany, there is no significant change in results. For the UK, the interactive effect of *LOSS* and the respective ownership categories is maintained (and even strengthened for non-financial firms). As a further robustness test, we use Shapley values (*SV*) which capture the relative voting power of shareholders (the degree to which a shareholder is pivotal in shareholder voting coalitions). For Germany,

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[21] Results are not shown for reasons of conciseness, table is available upon request.

[22] Results are not shown for reasons of conciseness, table is available upon request.

[23] This new variable assumes that coalitions of shareholders can be forged more easily when shareholders are from one specific category of owner. For an indirect test of shareholder coalitions in the UK (measured by Shapley values): see Crespi and Renneboog (2001).

this measure is similar to the control dummy variable as the Shapley value of the largest ownership in almost all cases converges to 1. For the relatively more dispersed ownership concentration of UK firms, in contrast, the *SV* captures relative control more accurately than the dummy variable used above. Still, the results for the models including Shapley values are statistically and economomially similar to the ones presented in model (2) of Table 4. [24]

All of our results are robust against alternative definitions of the capital stock. We experimented with capital stock measures constructed using the method applied by Nickell (1996) and Nickell et al. (1997). They also apply a perpetual inventory method, but do not assume a constant rate of depreciation. Our estimation results are robust to varying annual depreciation rates within the range of 4% to 12%.

b. Alternative instruments

We also experimented with alternative sets of instrumental variables. For Germany and the UK, all of our results are robust to variations of the lag lengths chosen for the instruments. They are also robust to using additional instruments, particularly the second lags of all time-varying measures of ownership structure and capital structure, but only for Germany. For the UK, some of these specifications cannot be estimated due to problems of multicollinearity. We identified the following results from model (3) of Table 6 that remain valid throughout all robustness tests: (i) monitoring by creditors influences productivity growth positively in Germany but not in the UK, and only for firms in financial difficulties, (ii) monitoring by shareholders reduces the negative impact of weak competition when the owner is a bank or an insurance company in Germany, (iii) monitoring by shareholders leads to productivity decreases in non-financially distressed UK firms when these shareholders are insiders (or to a lesser extent, banks), (iv) strong shareholder control (by insiders, private outsiders and institutions) leads to productivity growth in financially distressed UK firms.

c. Different industry focus: the trade sector

All results discussed above are based on a sample of German and UK manufacturing and construction firms, which were shown to have similar production technologies (see appendix 2). In order to investigate whether our findings are also valid for the trade industries (i.e., retail and wholesale trade), we re-estimate model (3) using a sample of trade firms.[25] Bank debt influences productivity growth positively in highly

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[24] We also determine the probability that the largest shareholder is able to win a vote with a probability of 95% (*WIN*) and use this variable instead of *TYPE*. For Germany, the results from model (3) remain qualitatively unaffected (not tabled), but for the UK we cannot use this specification as the hypothesis that the second order correlation of residuals is zero is rejected. See Leech and Leahy (1991) for a description of this concept and Nickell et al. (1997) for an empirical application to UK firms.

[25] Results are not shown for reasons of conciseness, table is available upon request.

competitive industries in Germany but, in contrast to our findings for manufacturing and construction firms, bank debt does not stimulate productivity increases in poorly performing firms. Such firms experience productivity increases when large insurance firms (and to a lesser extent, the government) are controlling blockholders. For the UK, the results for trade firms are different from the results obtained in Tables 4 and 6. Strong creditor influence (measured as *BORROW*) in combination with intense competition has now a beneficial impact on productivity growth, and there is a positive impact on productivity growth for firms in which outsider individuals or families are controlling shareholders. A similarity between the results for trade and manufacturing firms in the UK is that banks as well as funds exert a monitoring role for poorly performing firms. Overall, most of our findings for manufacturing and construction firms do not entirely apply to trade firms. We note, however, that both in Germany and in the UK financial institutions (banks, insurance companies and funds) appear to have a monitoring function for trade firms as well.

7. Conclusions

This study investigates the impact of corporate control by blockholders and creditors as well as of product market discipline on changes in total factor productivity. We find strong evidence that corporate governance and product market competition affect productivity growth, but the results differ substantially between Germany and the UK. The role of controlling blockholders and of bank creditors is particularly important in poorly performing firms.

Bank debt is positively correlated to future productivity changes in German firms suffering from financial distress or incurring earnings losses. This implies that banks, notably *Hausbanken* (house banks), perform a monitoring role in those firms in order to preserve the value of their loans. Poorly performing firms that are strongly dependent on bank credit, benefit from intensified creditor monitoring in terms of productivity increases. We also reveal that the presence of controlling blockholders does not seem to be related to productivity changes in poorly performing German firms.

By studying the interaction effects of product market competition and bank debt on productivity growth in profitable German firms, we document that the impact of bank debt depends on the competitive environment. High bank debt concentration stimulates productivity growth, especially in a context of weak product market discipline.

For profitable German firms, the relation between strong blockholder control and productivity growth is limited. We only find that blockholder control attenuates the negative effect of weak competition on productivity changes (while this negative effect of weak competition convincingly prevails). This blockholder effect (taken at the ultimate ownership level and hence incorporating the complex and pyramid shareholder structures) is limited to banks, large insurance firms and government stakes. It should

be noted that, in contrast to the UK, the dominant banks (mainly *Deutsche Bank, Commerzbank, Dresdner Bank, Hypovereinsbank*) and insurance firms (like *Allianz* and *Munich Re*) frequently hold substantial share stakes, often strengthened by proxy votes (Franks and Mayer (2001), Köke (2003)). Furthermore, it should be noted that representatives of banks and financial institutions occupy a seat on the supervisory board and are well positioned to influence corporate strategy. These results are at odds with a sceptical view on the German model of corporate governance that states that corporate governance in Germany is too bank-oriented and therefore too inflexible compared to the Anglo-Saxon market-oriented system (Hellwig (2000)). Our results suggest that lending relationships and institutional ownership in Germany cannot simply be dismissed as too inflexible and outdated, as often argued. Our results are therefore consistent with Cable (1985), who documents a disciplinary role of German banks for the 1970's, and with Elsas and Krahnen (1998), who confirm (based on credit-file data) that German house banks provide liquidity insurance in times of financial difficulties. Our results are also consistent with Gorton and Schmid (2000) and Lehmann and Weigand (2000) who find a positive impact of bank ownership on earnings-based performance measures. In contrast, our findings are inconsistent with Edwards and Nibler (2000) who dismiss that German banks are an important factor in the German corporate governance system.

For UK firms, we show that weak competition has a negative impact on productivity growth of widely-held profitable firms and of profitable firms controlled by most types of outside blockholders (individuals or families not related to a director, insurance companies or investment funds, or non-financial firms). A number of recent empirical studies confirm such a disciplinary role of product market competition: Bottasso and Sembenelli (2001) for Italy, Januszewski et al. (2002) for Germany, and Caves (1992) and Porter (1992) for evidence from several major Western economies. The interaction effects of product market competition and control reveal that blockholder control has little impact on productivity growth in profitable firms with the exception of controlling insiders (directors) who manage to generate productivity increases in firms subject to little market discipline.

For the UK, the strongest positive impact of control on productivity changes is in poorly performing firms. Contrary to the German situation, it seems that blockholders of all types (insiders, individuals and families, banks and insurance companies) do fulfil a governance task in situations when it matters most: namely poor performance and financial distress. The fact that blockholdings held by institutions (banks, insurance companies) are positively correlated to future productivity increases is somewhat surprising as past corporate governance research on the UK has produced evidence of a passive monitoring stance by institutions (Lai and Sudarsanam (1998), Faccio and Lasfer (2000)). However, the beneficial impact on firm performance of the more sophisticated institutional investors is in line with evidence from the US (Carleton et al. (1998), del Guercio and Hawkins (1999)).

In contrast to control concentration, leverage is not related to productivity changes in UK firms (even when they are poorly performing). This may result from the fact that creditors of UK firms are relatively

dispersed (compared to German ones) such that it is more difficult for these banks and bondholders to deliberate on corporate strategy with the board of directors. This result is consistent with Franks et al. (2001) who show that even when firms are poorly performing and a violation of debt covenants is imminent, there is little evidence of intensified creditor monitoring. They report that it is rather the large outsider shareholders who restructure poorly performing firms.

This paper has contributed in the following ways to the productivity and governance literature. Firstly, a key result of this paper is that the firm's environment (more specifically, the intensity of competition in product markets) interacts with corporate control and with bank debt concentration and influences productivity growth especially for firms in poor financial health. These relationships between governance characteristics and variables describing the firm's environment remain unobserved as long as empirical model specifications do not allow for more complex interactions of explanatory variables. Second, we used two large data panels consisting of German and UK firms, which are representative for two different corporate governance regimes (respectively, the blockholder-based and market-oriented one). Third, to address potential endogeneity problems (frequently ignored in empirical research (Himmelberg et al. (1999), Börsch-Supan and Köke (2002)), we applied a general method of moments estimation technique developed by Arellano and Bond (1991). As to further research, it may be interesting to expand this analysis to other industries (like the service sector in which different production technologies are used). Also, as bank creditors are particularly important in German corporate governance, more detailed research on the composition of bank debt structure as well as bank representation on corporate boards and shareholder activism by banks would be worthwhile. Likewise, this study would benefit from the analysis of detailed data of the credit structure of UK firms. Another interesting extension to this paper would be an analysis of how productivity growth is obtained (e.g. via corporate asset sales, financial restructuring, board restructuring, changes in voting control).

Appendix 1. Definition of variables

All variables for Germany and the UK are appropriately deflated and are measured in prices of the same year. Sources of price and cost indexes and other aggregate variables are given below, along with details on how we construct each variable.

Control concentration

CONTROL (dummy) indicates whether or not a firm is controlled by a large shareholder: an ultimate large owner for German firms and a shareholder owning at least 10% for UK firms. The concept of ultimate ownership, encompasses the complexity control structures and strong control concentration in Germany:

Concept of ultimate ownership (for Germany)

The identification of the ultimate owner for each firm is based upon German corporate law and involves two steps. First, we identify the ultimate owner for every direct shareholder of a firm using the following three rules:

- Rule 1 (strong ownership rule): A chain of control is pursued to the next level if the shareholder being analyzed is owned with a share stake of 50% or more by a shareholder on the next level, while all other shareholders on the next level own less than 50%.

- Rule 2 (weak ownership rule): If rule 1 does not apply, a chain of control is pursued to the next level if the shareholder being analyzed is owned with a share stake of 25% or more by a shareholder on the next level, while all other shareholders on the next level own less than 25%.

- Rule 3 (stop rule): If neither rule 1 nor rule 2 applies, a chain of control is not pursued any further.

These rules guarantee that no more than one ultimate owner is identified for every direct shareholder. Note that if a shareholder has split his ownership stake in a particular company into several smaller stakes, for example into two blocks of 50% held by two subsidiary firms, we combine these smaller stakes into one single block.

We set the first cut-off point at 50% because German law allows an investor owning 50% of all shares to appoint management.[26] The second cut-off point is set at 25% because an investor owning 25% of the shares has the right to veto board decisions.

After having identified all ultimate owners (for every direct share stake), we single out the shareholder that is in ultimate control of the company. When no shareholder fulfils the above rules, the respective firm is considered as being widely held.

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[26] A 50% majority is sufficient to dismiss management after its regular period of office, and a majority of 75% to dismiss management during its period of office (§103 (1) AktG).

HERF stands for the Herfindahl index of overall ownership concentration. *SHARE* equals one if a specific shareholder category *i* is the dominating category in terms of aggregate percentage of voting rights. *BLOCK* is the percentage of equity controlled by the largest shareholder.

SV (Shapley value) assigns a power index to each shareholder reflecting his relative importance in forming winning voting coalitions. Given that in German firms, the largest shareholder has absolute majority control in more than 85% of the firms, the Shapley value is mostly similar to a dummy variable capturing firm control. In contrast, the dispersed ownership structure of UK firms makes the calculation of relative shareholder power relevant.

For example, if there are three shareholders with 40%, 40% and 20%, for each shareholder's SV is 0.33 because each is pivotal in coalitions yielding more than 50% of the control rights. Within a framework of co-operative games - with transferable utility - in characteristic functional form, Shapley (1953) developed 'Shapley value assignment' ϕ defined as follows:

$$\phi_a(\boldsymbol{w}) =_{\text{def}} \frac{1}{n!} \sum_{X \subseteq N} (|X| - 1)!(n - |X|)!(\boldsymbol{w}X - \boldsymbol{w}(X - \{a\}))$$

and game $\boldsymbol{w}$ is a real-valued function whose domain is the power set (the set of subsets) of N (a non-empty finite set) such that $\boldsymbol{w}\phi = 0$. Any member of N (the grand coalition of $\boldsymbol{w}$), a, is a player of $\boldsymbol{w}$. If X is a coalition, the real number $\boldsymbol{w}X$ is called the worth of X in $\boldsymbol{w}$. Shapley and Shubik (1954) introduced the concept of 'P-power' which posits an office-seeking motivation of voting behaviour and which is reflected in the Shapley values (or Shapley-Shubik values). If the coalition wins, it gains collective possession of a fixed amount of transferable utility and each of the winning votes receive a non-negative payoff, all adding up to the total prize. A problem in calculating the relative voting power in the UK is induced by the fact that the owners of a substantial proportion of the equity capital (on average about 60%) are unknown. Although assumptions on potential coalition formation and voting behaviour could be quantified for this 'ocean' of atomistic shareholders, we assume that they do not participate in coalitions (to monitor management and improve productivity) as it is in practice difficult to organise minuscule share stakes into voting blocks (Chung and Kim (1999)). During protracted hostile take-over battles, coalitions of large shareholders may solicit votes of atomistic shareholders to buttress a coalition, but monitoring with the intention of bringing about productivity improvements seems to be more the competence of large shareholders due to free-riding behaviour of small shareholders. Therefore, prior to calculating the SV's, rescaling the sum of the large share blocks to 100% is a fair assumption. The resulting SV's reflect the relative voting power whereby a winning coalition is expected to reach absolute control (50%+1 of the rescaled vote).

Control concentration by type of owner

In addition, we identify all shareholders for each firm and categorize them into 8 owner classes (*TYPE*): (i) individuals and families not related to a director; (ii) insiders consisting of the CEO, chairman and other executive and non-executive directors and their families; institutional investors consisting of (iii) banks, (iv) insurance companies, (v) investment and pension funds and (vi) real estate firms (for UK only); (vii) non-financial companies; (viii) government. For Germany, we cannot distinguish between private insiders and private outsiders. If a German firm has no ultimate owner according to the concept of ultimate control, the ownership stake is labelled 'dispersed'. For the UK, ownership is 'dispersed' if a firm has no shareholder owning more than 10% of outstanding shares.

Corporate governance: capital structure

Capital structure is measured using three alternative measures of creditor/bondholder influence on management. *BANK* is the ratio of bank debt to total debt (for Germany only), *BORROW* is the ratio of interest payments to earnings before interest, taxes, and depreciation (EBITDA), *SHORT* is the ratio of short-term debt (i.e., with maturity less than one year) to total debt (for the UK only).

Value added

The firm's value added, Y_t, is defined as output (total sales) less total materials costs. Real values are obtained using a two-digit industry-specific producer price index. For Germany, this index is published by the Federal Statistical Office (*Statistisches Bundesamt, Fachserie* 17, *Reihe* 2, 1998). For the UK, this index is published by National Statistics.[27]

Capital stock

The firm's capital stock, K_t, is defined as replacement costs of tangible assets including machines, buildings, and land. For Germany, K_t is deflated using a combined input price index for capital goods and land, weighted by their empirical distribution (*Statistisches Bundesamt, Fachserie* 17, *Reihe* 2, and *Fachserie* 17, *Reihe* 4, 1998). For the UK, K_t is deflated using a price index for plant and machinery for two-digit industries (National Statistics). Both for Germany and the UK, replacement costs of capital are calculated using the method of Bond et al. (1999). They adjust the historical cost values for inflation and then apply a perpetual inventory method with a constant annual depreciation rate of $\delta = 0.08$. Specifically,

$$p^K_t K_t = (1-\delta) \, p^K_{t-1} K_{t-1} \, (p^K_t / p^K_{t-1}) + p^K_t I_t$$

where K_t is the capital stock, p_t^K is the price index for capital goods, I_t is real investment and δ the depreciation rate. The starting value is the net book value of tangible assets, adjusted for inflation in previous years.

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[27] See http://www.statistics.gov.uk/ or Thomson Financial Datastream.

Labor

The firm's labor input, L_t, is defined as the total number of employees.

Business cycle proxy

To control for business cycle effects, we use a survey-based index of capacity utilization at the two-digit industry level as a proxy variable (*CYCLE*). For Germany, this index is part of the *ifo Geschäftsklima* and was obtained from the *ifo Institut für Wirtschaftsforschung*, Munich. For the UK, this index was obtained from Thomson Financial Datastream.

Product market competition

Production rents (*RENT*) are defined as operating surplus minus the cost of capital, divided by value added. Value added, Q_t, is nominal output, $p_t^Y Y_t - p_t^M M_t$. The numerator is the nominal operating surplus S_t, less nominal cost of capital, $r_t^K p_t^K K_t$. Y_t is real output, L_t, K_t, and M_t are real labor, capital, and materials inputs and p_t^Y, p_t^L, p_t^K, and p_t^M are the corresponding prices. Finally, r_t^K is the user cost of capital, $r_t^K = \delta + r_t$, where δ is the depreciation rate and r_t is the risk-free market interest rate.

Appendix 2:

As our samplex comprise firms from manufacturing as well as from the construction and trade industries, we interact the input coefficients, labor and capital, with dummy variables capturing whether a firm belongs to the construction sector (D_{con}) or the trade sector (D_{trade}). This specification enables us to test whether the input coefficients for the construction and trade industries differ from those for manufacturing. This table reports the regression results from simple OLS-models, and from random or fixed effects models which control for unobserved firm heterogeneity. For Germany, both the OLS and the random effects model cannot reject the hypothesis that the input coefficients have a similar impact on construction as on manufacturing firms. Firms from the trade sector, in contrast, appear to use a different production technology. Consequently, in the empirical analysis of Section 5, we pool the firms from the manufacturing and construction sectors, but examine trade firms separately. The hypothesis of constant returns to scale for manufacturing firms is not rejected by the Wald test. The Hausman test does not reject the hypothesis that the firm-specific effects are uncorrelated with the explanatory variables for Germany, which implies that a random-effects model is appropriate. In contrast, the Hausman test for the UK sample indicates that the random effects model should be rejected in favour of a fixed effects model. This fixed effects model discloses that construction firms use a similar production technology as manufacturing firms, but that trade firms use a different one. Hence, we also will pool UK manufacturing and construction firms, but examine UK trade firms separately.

appendix 2 (continued)

The production function for manufacturing, construction and trade firms.

This table presents the regression results from OLS, and random effects and fixed effects models relating the factor inputs of a standard Cobb-Douglas function (capital and labor) to output growth. The p-values (reported in parentheses) are based on robust standard errors, which are calculated using the White/Huber sandwich estimator for the variance-covariance matrix. *, **, *** stand for significance at the 0.10, 0.05, and 0.01 levels, respectively. For definitions of the input variables, see appendix 1.

Independent variables	Dependent variable: output growth (Δy_{it})				
	Germany		UK		
	OLS	Random effects	OLS	Random effects	Fixed effects
Ln (capital)	0.0712^{***}	0.094^{**}	0.306^{***}	0.275^{***}	0.294^{***}
	(0.002)	(0.013)	(0.000)	(0.000)	(0.000)
Ln (capital) * D_{con}	0.0146	0.068	-0.121^{**}	0.001	0.068
	(0.828)	(0.519)	(0.023)	(0.987)	(0.455)
Ln (capital) * D_{trade}	0.158^{***}	0.126^{*}	0.020	-0.084^{**}	-0.190^{***}
	(0.001)	(0.085)	(0.548)	(0.042)	(0.002)
Ln (labor)	0.951^{***}	0.928^{***}	0.690^{***}	0.741^{***}	0.767^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (labor) * D_{con}	0.034	-0.086	-0.080	-0.203^{***}	-.0172
	(0.568)	(0.380)	(0.160)	(0.005)	(0.111)
Ln (labor) * D_{trade}	-0.303^{***}	-0.308^{***}	-0.135^{***}	-0.079^{**}	-0.064
	(0.000)	(0.000)	(0.000)	(0.050)	(0.186)
Time dummies	Yes	Yes	Yes	Yes	Yes
Number of obs.	6476	6476	2282	2282	2282
Adj. R^2	0.575	0.576	0.899	0.900	0.582
Random effects (Hausman test)	--	p=0.492	--	p=0.037	--
Constant returns to scale (Wald test)	p=0.099	p=0.435	p=0.673	p=0.300	p=0.122

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Table 1. Ownership concentration and structure by shareholder type

Panel A shows mean ownership concentration for German and UK sample firms (median in parentheses). *BLOCK* represents the % of control held by the largest shareholder. *HERF* stands for the Herfindahl index of overall ownership concentration. Panel B shows the cumulative % of large shareholdings (of 5% or more) by shareholder category.

Panel A: Ownership concentration

	Germany	UK
% Equity held by largest owner (*BLOCK*)	75.6% (90.0%)	20.8% (15.6%)
Herfindahl of all owners (*HERF*)	66.9% (81.0%)	8.3% (4.6%)
Number of observations.	6476	2280

Panel B: Ownership concentration by type of shareholder

Type of shareholder	Germany Cumulative % of voting rights by type of owner	UK Cumulative % of voting rights by type of owner
Individuals and families	30.0%	14.4%
thereof: Insiders	19.8%	12.1%
Financial institutions	8.1%	20.8%
Bank	5.6%	1.6%
Insurance co's	2.5%	2.6%
Investment fund	0.1%	16.5%
Real estate	0.0%	0.1%
Non-financial firm	38.9%	3.7%
Government	4.6%	0.0%
Dispersed	18.4%	61.1%
Total	100.0%	100.0%
Number of obs.	6476	2280

Table 2: Relative ex post production rents by industry.

This table shows the level of rents (*RENT*), an inverse measure of product market competition, by two-digit industry. Production rents are defined as operating surplus minus the nominal cost of capital, divided by nominal output (value added). Rents are reported as relative rents, i.e., relative to rents of all manufacturing firms contained in the sample. The test statistics are heteroskedastic t-tests of equal means. *, **, *** stand for significance at the 0.10, 0.05, and 0.01 levels, respectively.

	Industry-specific rents relative to rents of all manufacturing firms	
	Germany	**UK**
Food	163.0% ***	150.4% ***
Tobacco	171.3% ***	n.a.
Textiles	60.9% ***	79.7% **
Clothing	194.7% ***	43.8% **
Wood	104.8%	91.4%
Paper	135.8% ***	65.8% ***
Furniture	106.2% **	136.0% ***
Publishing and printing	109.0% ***	131.5% ***
Chemicals	139.1% ***	56.3% ***
Coal and oil processing	145.0% ***	186.7% **
Rubber and plastic	98.2%	134.9% ***
Leather	164.5% ***	87.9%
Rock, stone, glass	104.6% *	82.4%
Metals	42.8% ***	129.3% ***
Metal products	97.3%	98.1%
Machinery	75.0% ***	89.3% *
Electrical machinery	77.9% ***	61.8% ***
Vehicles	57.3% ***	124.3% ***
Medical, optical, and control instruments	71.2% ***	82.0%
Miscellaneous	n.a.	102.3%
All manufacturing firms	100.0%	100.0%
Number of obs.	5329	1424

Table 3: The relation of corporate governance and product market competition on positive versus negative changes in productivity.

This table presents a bivariate analysis of the impact of corporate governance and product market competition on changes in productivity. Changes in productivity growth are approximated by the first differences of the residuals from the estimation of a two-factor Cobb-Douglas production function including time and two-digit industry dummies (appendix 2). This function is estimated using a random effects model for Germany and a fixed effects model for the UK. The sample includes limited to manufacturing and construction firms, which have a similar production technology in terms of appendix 2. *BLOCK* represents the % of control held by the largest shareholder. *HERF* stands for the Herfindahl index of overall ownership concentration. *CONTROL* for German firms indicates whether or not a firm is controlled by an ultimate owner (see appendix 1), and indicates whether a large shareholder controlling 10% of more of the voting rights is present for the UK firms. $TYPE_i$ is a dummy variable expressing whether or not a shareholder of a type i is the controlling shareholder. *BANK* is the ratio of bank debt to total debt (for Germany only), *BORROW* is the ratio of interest payments to earnings before interest, taxes, and depreciation (also known as EBITDA), *SHORT* is the ratio of short-term debt (i.e., with maturity less than 1 year) to total debt (for the UK only). *RENT* is an inverse measure of product market competition. Production rents are defined as operating surplus minus the nominal cost of capital, divided by nominal output (value added). Rents are reported as relative rents, i.e., relative to rents of all manufacturing firms contained in the sample. *LOSS* and *STRESS* are dummy variables which equal 1 if, respectively, the firm generates a negative EBITDA and the firm is not able to cover its interest payments out of current EBITDA. All variables are lagged by a one year with regard to changes in productivity. The test statistics are heteroskedastic *t*-tests of equal means. *, **, *** stand for significance at the 0.10, 0.05, and 0.01 levels, respectively.

Productivity growth	Germany			UK		
	negative	significance of difference in means	positive	negative	significance of difference in means	positive
Control concentration						
Strong control ($CONTROL_{t-1}$)	88.9%		89.2%	82.9%		86.8%
% equity held by largest owner ($BLOCK_{t-1}$)	72.5%	**	74.5%	20.6%		21.0%
Herfindahl of all owners ($HERF_{t-1}$)	62.4%	**	65.2%	8.1%		8.2%
Strong control by owner type ($TYPE_{i,t-1}$)						
$TYPE_{i,t-1}$, i = individual or family	41.7%	***	36.6%	29.6%		32.2%
$TYPE_{i,t-1}$, i = financial institution	8.0%		7.8%	46.7%		46.5%
$TYPE_{i,t-1}$, i = non-financial firm	36.8%	**	40.4%	6.6%		8.1%
Leverage$_{t-1}$						
Bank debt as % of total debt ($BANK_{t-1}$)	29.2%		28.4%	n.a.		n.a.
Interest on EBITDA ($BORROW_{t-1}$)	7.4%		7.7%	9.9%		7.5%
Short-term debt as % of total ($SHORT_{t-1}$)	n.a.		n.a.	48.8%		45.9%
Production rents (1/Competition) ($RENT_{t-1}$)	27.5%	***	27.2%	16.1%	*	15.3%
Financial performance/distress						
Negative EBITDA ($LOSS_{t-1}$)	2.0%	***	6.3%	6.6%	***	14.0%
Interest cover <1 ($STRESS_{t-1}$)	2.1%	***	6.8%	8.2%	***	14.9%
Number of obs.	2155		2596	654		559

Table 4: The impact of corporate control and product market competition on productivity growth

This table presents the results of a GMM-regression (Arellano and Bond, 1991) relating corporate governance and product market competition to productivity growth. The sample includes manufacturing and construction firms. All regressions include time and two-digit industry dummies. Instruments are y_{it-j} and the second lags of *ASSET* and *RENT*. The *p*-values (reported in parentheses) are based on robust standard errors calculated using the White/Huber sandwich estimator for the variance-covariance matrix. *, **, *** stand for significance at the 0.10, 0.05, and 0.01 levels, respectively. For variable definitions, see Table 3 and appendix 1.

	Model ($1_{GERM.}$)	Model ($2_{GERM.}$)	Interaction with $RENT_{t-1}$	Interaction with $LOSS_{t-1}$	Model (1_{UK})	Model (2_{UK})	Interaction with $RENT_{t-1}$	Interaction with $LOSS_{t-1}$
Part 1: output growth (Δy_{it})								
Lagged output growth (Δy_{t-1})	-0.116 (0.345)	-0.144 (0.200)			0.317** (0.050)	0.286* (0.055)		
Capital growth (Δk_{t-1})	0.297 (0.271)	0.247 (0.330)			0.145 (0.122)	0.112 (0.181)		
Labor growth (Δl_{t-1})	0.778*** (0.000)	0.788*** 0.000)			0.662*** (0.000)	0.741*** (0.000)		
Part 2: productiv. growth (Δa_{it})								
Rent ($RENT_{t-1}$)	-0.638** (0.031)	-0.232 (0.510)			-0.039 (0.593)	-0.252* (0.091)		
Bank debt ($BANK_{t-1}$)	0.238** (0.012)	-0.415 (0.131)	1.563* (0.052)	5.221** (0.030)				
Interest/EBITDA ($BORROW_{t-1}$)					-0.043 (0.239)	0.011 (0.837)	0.060 (0.831)	0.031 (0.710)
Strong control ($CONTROL_{t-1}$)	0.002 (0.928)	0.171* (0.084)	-0.471* (0.083)	-0.193 (0.720)	-0.003 (0.900)	-0.079** (0.039)	0.369** (0.030)	0.198*** (0.006)
Business cycle ($CYCLE_t$)	0.010 (0.598)	0.011 (0.562)			-0.005 (0.134)	-0.006 (0.104)		
Ln of total assets ($ASSET_{t-1}$)	0.010 (0.485)	0.006 (0.696)			-0.005 (0.222)	-0.002 (0.510)		
Time effects	Yes	Yes			Yes	Yes		
Number of obs.	3853	3853			832	832		
Instrument validity (Sargan test)	p=0.4171	p=0.2629			p=0.3868	p=0.5779		
Second-order corr. of resid.	p=0.6753	p=0.7173			p=0.1160	p=0.1094		
Const. returns to scale	p=0.5651	p=0.5917			p=0.1086	p=0.1118		

Table 5: Economic effects of the competition, corporate control and leverage on productivity growth.

This table investigates how corporate control characteristics, leverage structure and product market competition influence productivity growth. The economic effect of corporate control is measured by multiplying the control coefficient by a dummy variable equalling one when a controlling blockholder exists. The economic effect of bank debt in Germany can be measured by looking at the difference in the bank debt ratio of the highest and lowest quintiles, which amounts to 0.7. For the UK, we use the variable BORROW which differs by 0.22 in the highest versus lowest quintile. The economic effect of product market competition can be calculated by calculating the effect of weak competition (RENT=1.5) and strong competition (RENT=0.5) (see Table 2). LOSS is a dummy variable that equals 1 if the firm incurs earnings losses.

	Does productivity improve?				
	Germany			**UK**	
Simple model (model (1))	**Hypothesis**	**Findings**	**Hypothesis**	**Findings**	
Product market competition (inverse of RENT)	Hyp. 1	YES, strongly positive	Hyp. 1	NO	
Bank debt (BANK: Germany) or Leverage (BORROW: UK)	Hyp. 2a	YES, strongly positive	Hyp. 2a	NO	
Blockholder control (CONTROL)	Hyp. 3a	NO	Hyp. 3a	NO	
Model with interactions (models (2) and (3))					
Competition in widely-held, profitable firms (inverse of RENT)	Hyp. 2a	NO (RENT is not significant in models (2) and (3))	Hyp. 2a	YES, productivity is 0.25% worse in firms with weak competition (RENT=1.5) compared for firms with strong competition (RENT=0.5) (models (2) and (3))	
Strong competition in profitable firms with blockholder control (RENT, CONTROL and interaction)	Hyp. 2b, 2d	NO, strong competition and control have no significant impact on productivity growth (0.171-0.471*0.5= -0.06%) (model (2))	Hyp. 2b, 2d	NO, blockholder control in a strongly competitive environment has no effect on productivity growth. (-0.252-0.079+0.369*0.5= -0.02% (model (2))	

Table 5 continue	Does productivity improve?				
	Germany			UK	
Models (2) and (3)	**Hypothesis**	**Findings**	**Hypothesis**	**Findings**	
Weak competition in profitable firms with blockholder control (RENT, CONTROL and interaction)	Hyp. 2b, 2d	YES, weak competition and control has a signif. negative impact on productiv. growth (0.171-0.471*1.5=-0.54%) (model (2)) Conclusion: control (by banks, insurance co's and government; see model (3)) somewhat reduces the negative effect of weak competition, but weak competition still leads to 0.5% less productivity growth than strong competition	Hyp. 2b, 2d	YES, blockholder control in a weakly competitive environment has a positive impact on productiv. growth (-0.252*1.5-0.079+0.369*1.5=0.10%; stat. signif.) (model (2)). This control effect is the result of insider control (and bank control – which is rare).	
Competition and debt in profitable firms (RENT, BANK and interaction)	Hyp. 3c	YES, bank debt leads to increased productivity growth: 0.5% in a strongly competitive environment (and with a bank debt ratio of 0.7, the hightest quintile) and 1.6% in a weakly competitive one (model (2)). Note that this result is not robust in model (3).	Hyp. 3c	NO	
Loss-incurring firms with shareholder control (interaction CONTROL and LOSS)	Hyp. 2c	NO; no evidence of blockholder monitoring in poorly performing firms	Hyp. 2c	YES; blockholders create 0.20% productivity increase (model (2)). Effect depends on type of blockholder: insiders (0.26%), indiv. or families (0.32%), bank (0.40%) and investment and pension funds (0.15%) (model (3))	
Loss-incurring firms with high bank debt (G) or high leverage (UK); (interaction BANK and LOSS)	Hyp. 3b	YES; bank debt concentration creates productiv. increase of 3.65% (=5.221*0.7) (model (2))	Hyp. 3b	NO	

Table 6: Impact of large shareholder control and product market competition on productivity growth.

This table presents the results of a GMM-regression (Arellano and Bond, 1991) relating shareholder control and product market competition to productivity growth for German and UK manufacturing and construction firms. All regressions include time and two-digit industry dummies. Instruments are y_{it-j} and the second lags of *ASSET* and *RENT*. The *p*-values (reported in parentheses) are based on robust standard errors calculated using the White/Huber sandwich estimator for the variance-covariance matrix. *, **, *** stand for significance at the 0.10, 0.05, and 0.01 levels, respectively. For definitions, see Table 3 and appendix 1.

	Model ($3_{GERMANY}$)	Interaction with $RENT_{t-1}$	Interaction with $LOSS_{t-1}$	Model (3_{UK})	Interaction with $RENT_{t-1}$	Interaction with $LOSS_{t-1}$
Part 1: output growth (Δy_{it})						
Lagged output growth (Δy_{t-1})	-0.160 (0.136)			0.300** (0.042)		
Capital growth (Δk_{t-1})	0.273 (0.264)			0.087 (0.262)		
Labor growth (Δl_{t-1})	0.768*** (0.000)			0.745*** (0.000)		
Part 2: productiv. growth (Δa_{it})						
Rent ($RENT_{t-1}$)	0.194 (0.505)			-0.262* (0.085)		
Bank debt ($BANK_{t-1}$)	-0.129 (0.703)	0.569 (0.582)	4.443** (0.039)			
Interest on EBITDA ($BORROW_{t-1}$)				0.038 (0.486)	-0.170 (0.577)	0.055 (0.554)
Controlling shareholder by type i:						
$TYPE_{i,t-1}$ i= private individual or family	0.040 (0.693)	-0.121 (0.666)	0.598 (0.479)			
$TYPE_{i,t-1}$ i= insider (director and family)				-0.158*** (0.004)	0.686*** (0.005)	0.259** (0.017)
$TYPE_{i,t-1}$ i= outsider individual or family				-0.040 (0.291)	0.258 (0.134)	0.319** (0.011)
$TYPE_{i,t-1}$ i = bank	0.607*** (0.004)	-2.388*** (0.006)	-1.214 (0.313)	-0.063* (0.079)	0.400** (0.023)	0.402** (0.042)
$TYPE_{i,t-1}$ i = insurance company	0.373*** (0.008)	-1.089** (0.022)	0.220 (0.369)	-0.143 (0.174)	0.442 (0.285)	0.172 (0.137)
$TYPE_{i,t-1}$ i = investment/pension fund	2.019 (0.354)	-5.391 (0.455)	n.a.	-0.041 (0.308)	0.232 (0.191)	0.151** (0.044)
$TYPE_{i,t-1}$ i = non-financial firm	0.159 (0.155)	-0.380 (0.234)	-0.119 (0.870)	-0.042 (0.435)	0.136 (0.579)	0.175 (0.116)
$TYPE_{i,t-1}$ i = government	0.440* (0.066)	-1.621** (0.017)	0.193 (0.911)			
Business cycle ($CYCLE_t$)	0.011 (0.534)			-0.006 (0.107)		
Ln (total assets) ($ASSET_{t-1}$)	0.001 (0.918)			-0.004 (0.249)		
Time effects	Yes			Yes		
Number of obs.	3853			832		
Instrument validity (Sargan test)	p=0.2707			p=0.6778		
Second-order corr. of resid.	p=0.8434			p=0.2273		
Const. returns to scale	p=0.5354			p=0.1046		