

Workers on the board and long-term investment in German companies

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Abstract

A recurring debate in political economy is whether financial markets are plagued by short-termism, i.e. dominated by investors who focus on short-term financial returns, to the neglect of long-term investment. Due to this ‘overweighting’ of short-term returns, these investors pressure the companies they are invested in to pay out available resources in the form of stock buybacks or increased dividends, rather than invest in long-term projects, even when such long-term investments are expected to be quite profitable. Supporters of the ‘short-term’ thesis point to the decreasing rate of investment by the non-financial corporate sector and the higher rate of investment by companies that are not listed on the stock market. In addition, recent studies have identified investor type as one of the key determinants of company investment behaviour. Up to now, however, this literature has hardly examined the influence that board-level employee representation (or BLER for short) may have on company investment policies. This paper makes two contributions to the literature. First, it uses a unique six-component measure of codetermination strength in German companies, the Mitbestimmungsindex (MB-ix), which provides a more differentiated indicator for worker influence in corporate governance than most quantitative studies. Second, this paper uses robust regression models to deal with the strong influence of extreme outliers in the data. Based on a sample of more than 200 companies listed on the German stock market between 2006-2017, this paper shows that the strength of BLER (as measured by the MB-ix) is significantly and positively related to the rate of capital investment.

Keywords: Co-determination, worker participation, corporate governance, capital investment

1. Introduction

A controversial debate in academia and in the public policy field is whether stock markets are affected by the problem of short-termism.¹ According to one view, stock markets are increasingly dominated by institutional investors who focus on the financial performance of companies over the very short term, i.e. the coming year or even current financial quarter (Stout 2012). As a result, these investors pressure the companies they are invested in to finance projects with short-term returns or even to pay out available resources to shareholders in the form of share buybacks or higher dividends, and to avoid long-term investments, even if they are likely to have a significant return. This debate is not new, reaching back at least to the mid-20th century critique of the ‘City of London’ and the failure of British banks to provide long-term loans. It reappeared in the 1980s as a critique of Anglo-American style market dominated financial systems, which (it was claimed) were not providing the investment that

¹ See e.g. Milano (2019) and other articles in Vol 30 Issue 4 of the Journal of Applied Corporate Finance on “Corporate Governance and Short-Termism”.

bank-based systems such as Germany and Japan were supplying for the modernization of their manufacturing sectors (Porter 1992). The recent version of this thesis appeared after the 2008/9 financial crisis, with the added elements of critique including the heavy use of stock options for executive remuneration (purportedly one of the reasons for the overly-risky behaviour of financial institutions in sub-prime markets), the explosion in the magnitude of share buybacks, and the proliferation of activist hedge funds demanding (other things) the payout of cash to shareholders (Stout 2012).

Perhaps because the bulk of relevant research has been done on US listed companies, which almost without exception have no worker representatives on their boards, the role of board-level employee representation (BLER) has been almost entirely neglected in this debate. This however becomes a major deficiency when horizons are extended to Europe, where there is a legal framework for BLER in corporate governance in a majority of EU28 countries (Waddington and Conchon 2015). It is widely known that BLER is a central feature of the ‘German model’ of economic organization (Hall and Soskice 2001; Whitley 1992, 1999), but it is also quite widespread in the Nordic countries, Austria, and (recently) in France. Although more than 40 quantitative studies have been done on co-determination in Germany (Scholz and Vitols 2019), only two have examined the relationship between co-determination and the rate of capital investment – one dating from 1987 – and both with inconclusive results (Benelli 1987, Wohnhas 2013). Relevant in this context is the fact that the dominant theoretical perspective in economics has a critical view of co-determination, arguing that workers will use their influence to increase wages and staffing levels, at the expense of the long-term interests of the company.

This paper addresses this issue by analysing the relationship between co-determination strength and the rate of capital investment in more than 200 companies listed on the German stock exchange between 2006-2017. The paper thus addresses two deficits in the literature, first by extending the analysis of ‘short-termism’ to Europe, second by examining an outcome which has been almost entirely neglected in the literature on co-determination. In doing so it introduces two innovations. First, a six-component index of co-determination strength (MB-ix) is used as a more differentiated measure of worker influence in corporate governance. Second, robust regression is used as a method well suited to the problem of extreme outliers in the data.

Our main finding is that co-determination strength is positively and significantly related to the rate of capital investment; holding a set of control variables constant, the rate of capital investment is about one percentage point higher in companies with the maximum score of 100 on this index than in companies without co-determination. A secondary finding is that the rate of capital investment is lower in companies with a higher percentage of institutional investors (shareholders with a small percentage of shares, or ‘freefloat’). Our conclusion is that BLER appears to encourage long-term (capital) investment, whereas minority shareholders appear to discourage it.

2. Theory and Hypotheses

The concept of short-termism reaches back at least to the mid-20th century, when it became apparent that UK manufacturing was falling behind industry in other countries such as Germany (Vitols 1997). In the wake of the 1929 stock market crash an investigative committee (the Macmillan Committee) was formed by the government to examine whether the needs of industry were being served by the British financial system. One explanation that was advanced in the public debate was that the UK's financial system was dominated by a handful of large banks (the 'City of London') that were only willing to advance short-term loans to nonfinancial companies. Due to these short-term financing constraints, UK manufacturing companies were not able to make the long-term investments needed to modernize and keep up with companies from countries with more supportive financial systems. In 1945, the Bank of England together with major banks established the Industrial and Commercial Finance Corporation (ICFC), which was supposed to supply long-term finance especially to SMEs (this later became 3i, one of the largest private equity funds in the world).

In the 1980s the debate on short-termism reached the US, when it became apparent that companies in sectors such as autos, steel, chemicals and machine tools were falling behind competitors from Japan, Germany and elsewhere. A number of major efforts were made to investigate the reasons for the decline in competitiveness (Womack et al 1992; Jacobs 1991). The most prominent of these efforts was an expert group chaired by Michael Porter, who commissioned papers on various aspects of the problem. The results of these papers and the discussions in the expert group were summarized by Porter in a 1992 Harvard Business Review article entitled "Capital Disadvantage: America's Failing Capital Investment System" (Porter 1992). However, interest in the topic waned as the US and UK 'liberal market economies' appeared to overtake Japan, which began its decades-long struggle with a major banking crisis, and (West) Germany, which became preoccupied with unification.

Following the financial crisis of 2008/2009 the thesis of short-termism has reappeared in the US and UK and spread to many other countries as well (Stout 2012; Lazonick 2014; Vitols 2015). The post-crisis economic recovery has been unusually weak and the rate of capital investment by the nonfinancial corporate sector notably lower in the US and Europe. The average holding time of shares has fallen below one year, and assets under management at hedge funds dedicated to high-speed trading or 'activist' strategies (i.e. pressuring management to alter its strategies, for example to pay out cash as dividends or buying back shares) has continued to increase (DesJardine 2019). There is a widespread perception that all of these phenomena are linked.

One formalization of short-termism focuses on the rate at which investors discount future returns (see Table 1) and thus have different payback requirements. An investor with a relatively low annual discount rate of 5% would have a 'hurdle rate' of 27.6% for an investment with a five-year payback period. This means that they would support a five-year investment that would have a profit of more than 27.6% at the end of the period. A 'short-term investor', in contrast, would have a much higher discount rate. In the case of a discount rate of 20%, the investor would require a return of at least 148.8% after five years to go ahead with the investment. Using the example of an investment that would return 100% after five years, the investor with a 5% discount rate would support this investment, whereas the investor with a 20% discount rate would oppose this investment. If the company has no alternative investment above the hurdle rate of 148.8%, the 'short-term' investor would prefer that the company pay out the money to the investor, e.g. in dividends or share buybacks.

Table 1: Hurdle rates for investors with different discount rates

Time horizon: Discount rate:	1 year	2 yrs	3 yrs	4 yrs	5 yrs	Support for project with 100% payback in 5 years?
...of 5%	5.0%	10.3%	15.8%	21.6%	27.6%	Yes
...of 20%	20.0%	44.0%	72.8%	107.4%	148.8%	No

A key puzzle posed in the literature is why these hurdle/discount rates are so high. The answer offered by Porter (1992) is the rising percentage of share ownership accounted for by institutional investors, which he says had increased from 8% in 1950 to 60% in 1990. The investment managers making the portfolio decisions for these funds are evaluated on an annual or even quarterly basis, and must therefore prioritize short-term returns to preserve their jobs. Furthermore, many of these institutional investors compete for access to funds, thus their ability to raise and retain funds from the general public may be heavily influenced by their short-term performance. Recently there has been a major increase in the number of activist hedge funds and a spread of their activity beyond their main market, the US. Their average holding period for investments is between one and two years, and their speciality is to make one-time demands on management to undertake policies to increase share price, e.g. by selling off parts of their operation or paying out cash in the form of special dividends or share buybacks.

Some observers claim that there is no problem with short-termism, citing the increasing amount of R&D investment and rising valuations on stock markets, both of which are taken as indicators of investors' orientation to the future (Roe 2018). However, an increasing number of studies based on sophisticated methodologies demonstrate that the general trend of short-termism is increasing, for example in an increase in the average discount rate used by both investors and companies (Sampson and Shi 2019) or in a decrease in 'asset duration' (i.e. the expected life of capital investments) (Martin et al 2016). Capital expenditure rates also appear to be much lower for listed companies than for non-listed companies (Asker 2015). These studies also shed light on the determinants of firm heterogeneity, with investor type being one of the key variables influencing time horizons. Whereas large 'strategic' investors (such as founders/families, foundations and non-financial corporations) generally are long-term in their orientation, institutional investors tend to be more transient and have shorter average holding periods. This leads to our first hypothesis, which is:

Hypothesis 1: *the rate of capital investment (i.e. physical investments which are expected to have a working life of more than one year) will be lower, the greater the percentage of a company's shareholders is accounted for by institutional investors*

Here we take it that a higher rate of capital investment indicates a longer-term orientation and interest in the firm.

A second hypothesis refers to the relationship between co-determination (BLER) and capital investment. Here we present two alternative hypotheses regarding this relationship. The first is derived from the 'law and economics' perspective, and expects that this relationship is negative, because workers will use their power to pursue particularistic interests (higher wages and higher staffing levels) at the expense of other stakeholders and the long-run interests of the firm. For example, Jensen

and Meckling state that codetermination "...is another case of a powerful special interest group using the political system to effect a wealth transfer from others to themselves" (1979: 474). This critical hypothesis would thus expect that:

Hypothesis 2a: *the rate of capital investment will be negatively related to the strength of co-determination*

The alternative hypothesis, which is derived from the stakeholder theory of the firm, is that this relationship will be positive, since workers have a longer-term interest in the survival of the firm than shareholders. We thus derive the opposite hypothesis:

Hypothesis 2b: *the rate of capital investment will be positively related to the strength of co-determination*

3. Data and methods

For this paper we rely mainly on data taken from the project 'Co-determination and forward-looking corporate governance: measuring workers' strength and influence with a co-determination index (or 'MB-ix project' for short).² In the context of this project an innovative measure of worker influence in corporate governance, known as the 'Mitbestimmungsindex' or 'MB-ix'. The motivation for this index is that conventional measures of codetermination strength used in econometric work – dummy variables for the three co-determination forms in German (one-third, parity and Montan) – does not capture the considerable heterogeneity of worker influence within each of these co-determination types. Furthermore, European legislation (European Company, European Cooperative Society, Directive on Cross-border mergers, 2019 EU Company Law Package) has introduced new variations in co-determination arrangements through a negotiated procedure. The number of companies with such arrangements has proliferated in the past decade, for example currently seven of the DAX30 companies currently have co-determination arrangements derived through negotiations.³

The makeup of the MB-ix is described in detail elsewhere (Scholz and Vitols 2016, 2019). Here we mention that it is composed of six components, each of which can receive a value between 0 (minimum) and 100 (maximum value). The overall MB-ix score is a weighted average of these six components, which very briefly are:

- **Component 1:** the percentage of worker representatives on the supervisory board, taking into account whether these worker representatives are in the works council or external trade union representatives
- **Component 2:** pertains to the function and position of the deputy chair of the supervisory board, as in companies with strong codetermination, one of these deputies is supposed to be a worker representative
- **Component 3:** measures the extent of worker representation on board committees
- **Component 4:** focuses on the degree of fragmentation of worker representation through the internationalization of employment and presence of a European/international works council

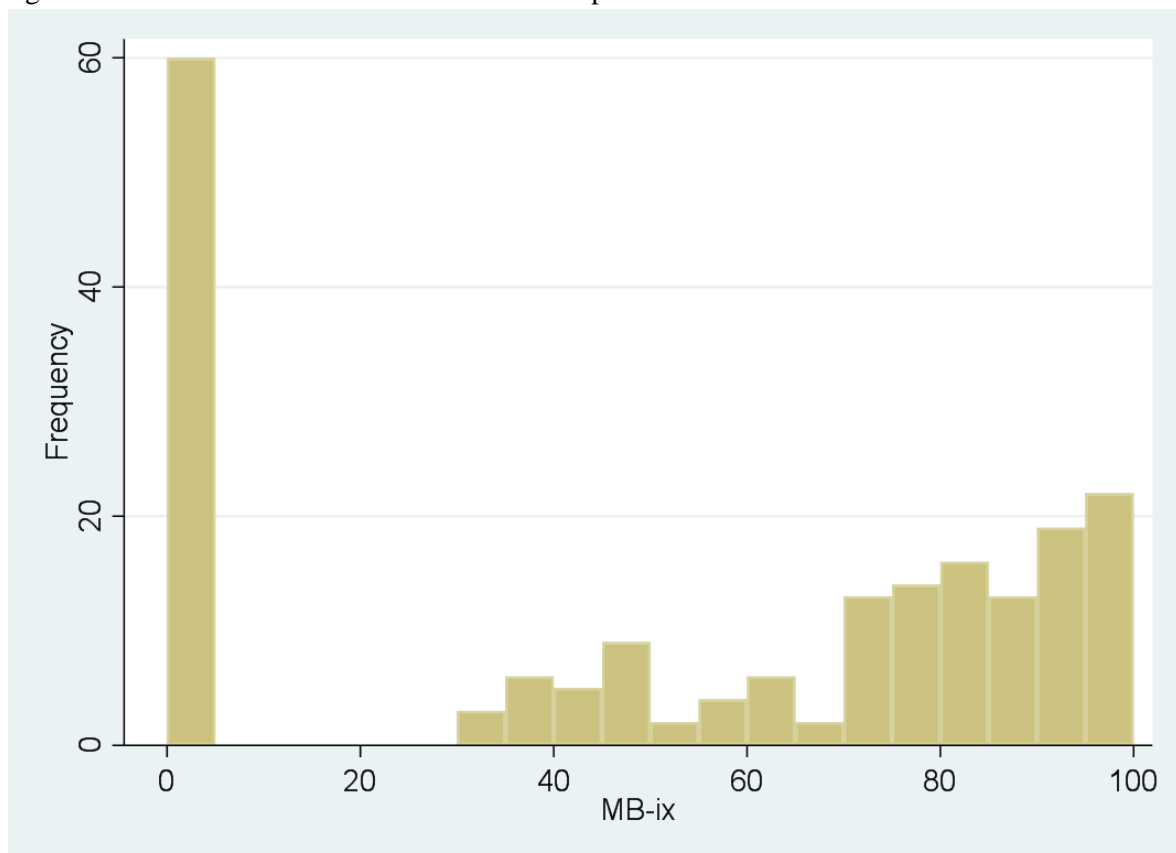
² For more information on this project see www.mitbestimmung.de/mbix

³ Allianz, BASF, E.ON, Fresenius, SAP and Vonovia are European Companies (SEs) and Münchner Rück negotiated new co-determination procedures under the EU cross-border mergers directive.

- **Component 5:** measures the importance of the supervisory board in the overall corporate governance of the firm
- **Component 6:** assesses where responsibility for personnel policy is located in the management board

The MB-ix has been calculated for each year-end (31 December) between 2006 and 2017 for the following companies: members of the four leading indexes (DAX, MDAX, SDAX and TecDAX), which by definition of the indexes sums up to 160 companies, plus 30+ additional parity co-determined listed companies not included in these indexes. This sums up to a total of 2314 company-years in the sample, or an average of 193 companies per year. The distribution of MB-ix values across firms in one year (2017) is shown in Figure 1.

Figure 1: Distribution of MB-ix values across sample firms in 2017



In addition to the MB-ix score, a variety of financial and organizational data were gathered for these companies, either from the online database Capital IQ or hand-collected from annual reports and company websites.

The dependent variable, CAPEX, is the rate of capital investment, defined as capital expenditures (i.e. investments in property, plant and equipment with an expected use-life of at least one year) in one year divided by the total assets of the company at the beginning of the period.

A causal variable of interest, FREEFLOAT, is taken from the indexes developed by the Deutsche Börse (German stock exchange). Since the value of free float market capitalization is one of the factors taken into account to determine index membership, the Deutsche Börse regularly calculates the free

float of companies listed on its exchanges (electronic exchange XETRA as well as floor trading in Frankfurt). The free float is calculated as a residual – amount of stocks remaining after the percentage of stocks held by large (>5%) investors are summed up. We take this variable to be a proxy for the influence of institutional investors, since these investors rarely take positions of more than 5% of the share capital in a company.

Finally, a number of control variables which are expected to influence the rate of capital investment (CAPEX) are included (see Table 2).

Table 2: Variables and hypothesized relationship to capital expenditures (CAPEX)

Variables	Hypotheses
CAPEX_ASS (Dependent Var)	
MB-ix	+ or -
FREEFLOAT	-
ROA	+
LEVERAGE	-
AGE	?
AGE SQUARED	?
SALES	?
SALES SQUARED	?
TIMETREND	-
Industry dummies (SIC 1 digit)	varies

Profitability (ROA or return on assets), defined as net income over one year divided by total assets at the beginning of the year, is expected to be positively related to capital expenditures, since more profitable companies will have greater resources available for long-term investment

The level of indebtedness (LEVERAGE), defined as total debt divided by total assets, is expected to be negatively related to capital expenditures, since heavily indebted companies must commit a significant proportion of their financial resources to repaying interest on this debt.

The age of the firm (AGE), defined as the number of years since the company foundation, is included since capital investment needs are expected to vary significantly over the life cycle of the firm. The squared value of this (AGE SQUARED) is included, since this relationship may be complex and the inclusion of the squared term allows for a non-linear relationship between age and investment . On the one hand young companies might be expected to have a high demand for capital investment as they expand (e.g. as they ramp up investment after developing their initial market). On the other hand, young companies might be expected to have a lower demand for capital investment, since they may be investing more in product development, customer relationships, etc.

Since size is invariably considered to be an influencing factor, the variable SIZE, defined as the amount of sales in one year, is included as a control variable. The squared variable SIZE SQUARED is also included, since the relationship with capital expenditure may be complex. On the one hand a

large size may be associated with capital-intensive mass production, but on the other hand a large size may be associated with more efficient use of capital and thus a lower level of capital intensity.

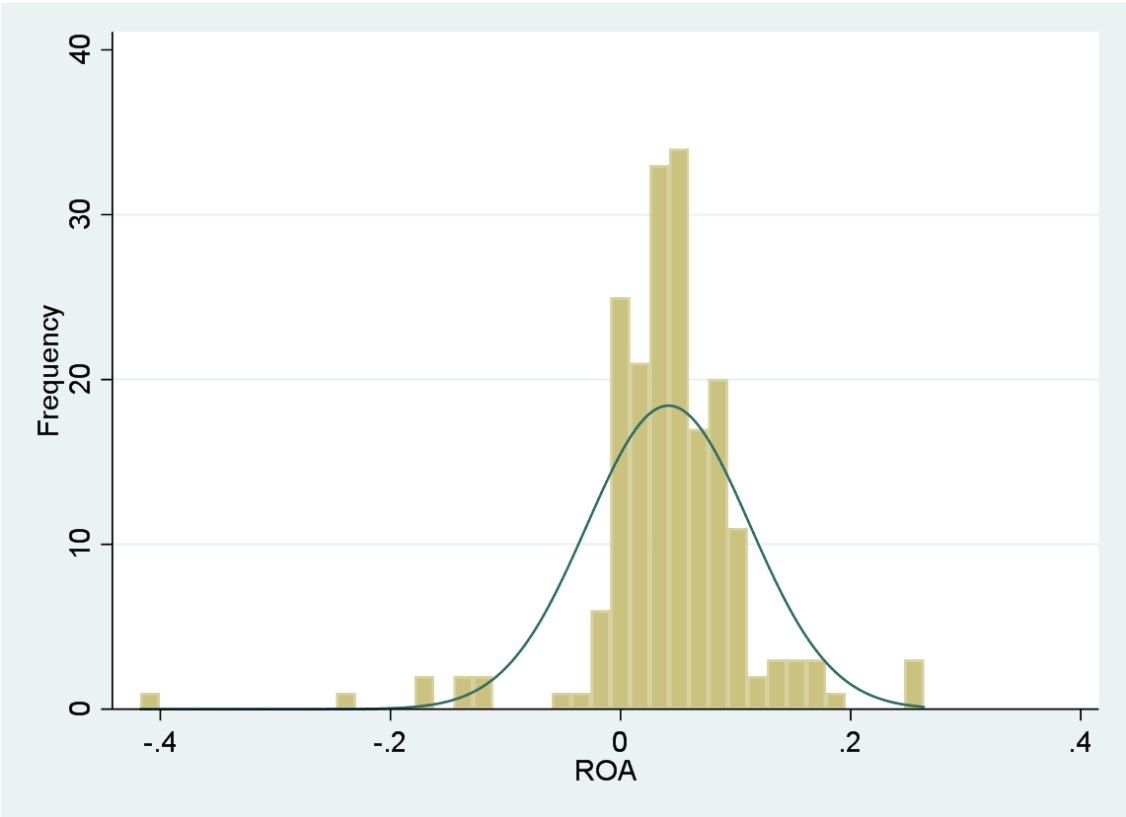
Since the level of capital investment appears to be decreasing over time, a trend variable (TIMETREND) is included, which increases by a value of one each year in the analysis.

Finally, since the characteristics of the industry a company is active in will have a major influence on the demand for capital investment, control variables are included for the main industry of activity. These are defined as dummy variables for each of the major “1-digit” SIC (Standard Industrial Classification) industries.

The method of robust regression was used in the analysis due to the heavy influence of a few extreme outliers (Li 1985). Traditional methods for dealing with outliers include removing all outliers above a certain cut-off point, and ‘Winsorization’ i.e. altering the value of outliers to specific cut-off points (e.g. to 1% and 99% of the distribution). Robust regression uses a more sophisticated methodology, eliminating some outliers but altering the weighting of others so the ‘real’ data is still used in the analysis.

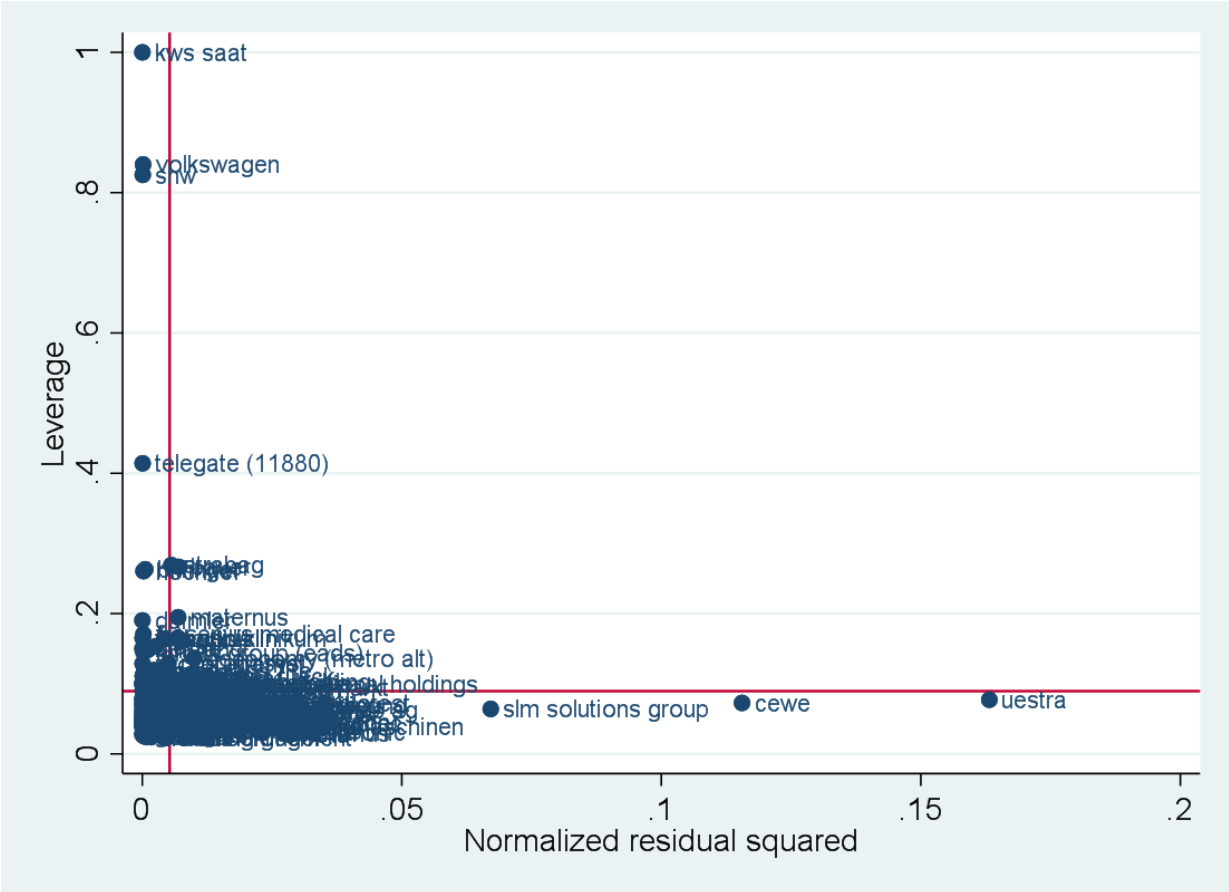
The use of robust regression is justified here because the distribution of a number of variables deviates quite significantly from the ‘normal’ distribution. Figure 2 shows, as one example, the actual distribution of ROA, plotted against the ‘normal’ distribution.

Figure 2: Actual distribution of ROA compared to the normal distribution



An analysis of leverage and residuals resulting from traditional methods (pooled OLS regression) shows that a few companies have an extreme influence on the regression estimates (see Figure 3). For example Volkswagen, whose sales exceed by about 50% the sales of the next largest company (Daimler).

Figure 3: Leverage and residual analysis of OLS regression for the capital investment rate



Since robust regression routines in packages for the statistical software STATA, the package used for the analysis, do not allow for panel analysis, a pooled estimate was generated. As one measure used to attempt to deal with the problem of causality, all independent variables were lagged by one year. In other words, the dependent variable (CAPEX) is for the years 2007-2018 while the independent variables are for the year 2006-2017.

Two different types of robust regression are used as a kind of a ‘robustness’ check – first the routine RREG (based on (Huber 1964)) and second the routine MMREGRESS (Verardi and Croux 2009).

Table 3 contains basic descriptive statistics for the variables used. Table 4 shows correlation coefficients between the variables.

Table 3: Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
CAPEX RATIO	2185	4.061	4.273	0	52.643
MB-ix	2185	52.038	38.912	0	100
SALES	2185	9637.078	22451.27	-53.403	230000
LEVERAGE	2185	.362	.242	0	.983
ROA	2185	.038	.081	-.696	.679
AGE	2185	89.455	73.616	1	652
FREEFLOAT	2185	62.389	29.856	.245	100

Table 4: Correlation coefficients

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) CAPEX RATIO	1.000						
(2) MB-ix	0.095*	1.000					
(3) SALES	-0.033	0.355*	1.000				
(4) LEVERAGE	-0.126*	0.087*	0.169*	1.000			
(5) ROA	0.109*	-0.079*	-0.046	-0.330*	1.000		
(6) AGE	0.063*	0.427*	0.076*	0.078*	-0.046	1.000	
(7) FREEFLOAT	-0.092*	-0.108*	0.144*	0.044	0.031	0.047	1.000

* shows significance at the .01 level

Table 5 shows the regression results for the STATA routine RREG using four different models. Models 1 and 2 include no time trend, and models 2 and 4 include the co-determination strength (MB-ix) variable. In both models 2 and 4 the co-determination strength variable MB-ix is positive and highly significant (at the .01 level), signifying a strong and positive relationship between co-determination strength and capital investment, confirming hypothesis 2b and negating hypothesis 2a. The coefficient for FREEFLOAT in all cases is negative and highly significant (.05 or .01), confirming Hypothesis 1 (i.e. a higher proportion of institutional investors will be associated with lower levels of capital investment).

Regarding the control variables, ROA (profitability) is positively and significantly related to CAPEX, in line with the expectation that greater profitability will be supportive of higher levels of capital expenditure. Size (measured by SALES and SALES SQUARED) appears to be slightly positively related to CAPEX in models 1 and 3, but significance disappears when MB-ix is included (Models 2 and 4), perhaps because of the correlation between SIZE and MB-ix. Contrary to expectations, LEVERAGE (level of debt) does not appear to be a significant determinant of CAPEX. Age has a complex relationship with CAPEX, initially decreasing (SALES) but then increasing (SALES SQUARED). The time trend is negative but not significant.

Table 6 shows the regression results for the STATA routine MMREGRESS for exactly the same four models. The results for codetermination strength (MB-ix) are almost exactly the same as for the

previous routine, indicating further support for Hypothesis 2b (i.e. a positive relationship between co-determination strength and capital expenditure) and for the negation of Hypothesis 2a (negative relationship between these two variables). The coefficients for FREEFLOAT are negative for all four models, however, not significant for models 2 and 4 (i.e. when MB-ix is included). Thus we take these results as weak support for Hypothesis 1 (i.e. a negative relationship between proportion of institutional investors and capital expenditure). There are similar results for LEVERAGE and TIMETREND (not significant). The results for the control variables for size and age are however somewhat different, in both cases CAPEX increases initially (SIZE and AGE have positive coefficients) but then decreases (the coefficients of both of the squared terms are negative) – in most cases the coefficients are significant.

Table 5: Determinants of rate of capital investment (robust regression routine RREG)

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
MB-ix		0.010*** (0.002)		0.010*** (0.002)
SALES	0.198* (0.101)	-0.003 (0.106)	0.198* (0.101)	-0.000 (0.106)
SALES SQUARED	-0.164 (0.099)	-0.060 (0.099)	-0.159 (0.099)	-0.059 (0.099)
ROA	4.681*** (0.614)	5.055*** (0.601)	4.680*** (0.614)	5.054*** (0.601)
LEVERAGE	-0.010 (0.228)	0.014 (0.223)	-0.022 (0.228)	0.006 (0.224)
AGE	-0.160 (0.097)	-0.475*** (0.107)	-0.153 (0.097)	-0.468*** (0.108)
AGE SQUARED	0.600*** (0.092)	0.785*** (0.094)	0.598*** (0.092)	0.781*** (0.094)
FREEFLOAT	-0.006*** (0.002)	-0.004** (0.002)	-0.006*** (0.002)	-0.004** (0.002)
TIMETREND			-0.020 (0.014)	-0.011 (0.013)
Constant	4.431*** (0.196)	3.460*** (0.233)	4.553*** (0.214)	3.539*** (0.249)
Observations	2,185	2,185	2,185	2,185
R-squared	0.334	0.352	0.335	0.353
Industry dummies	YES	YES	YES	YES
F	72.59	73.75	68.20	69.45

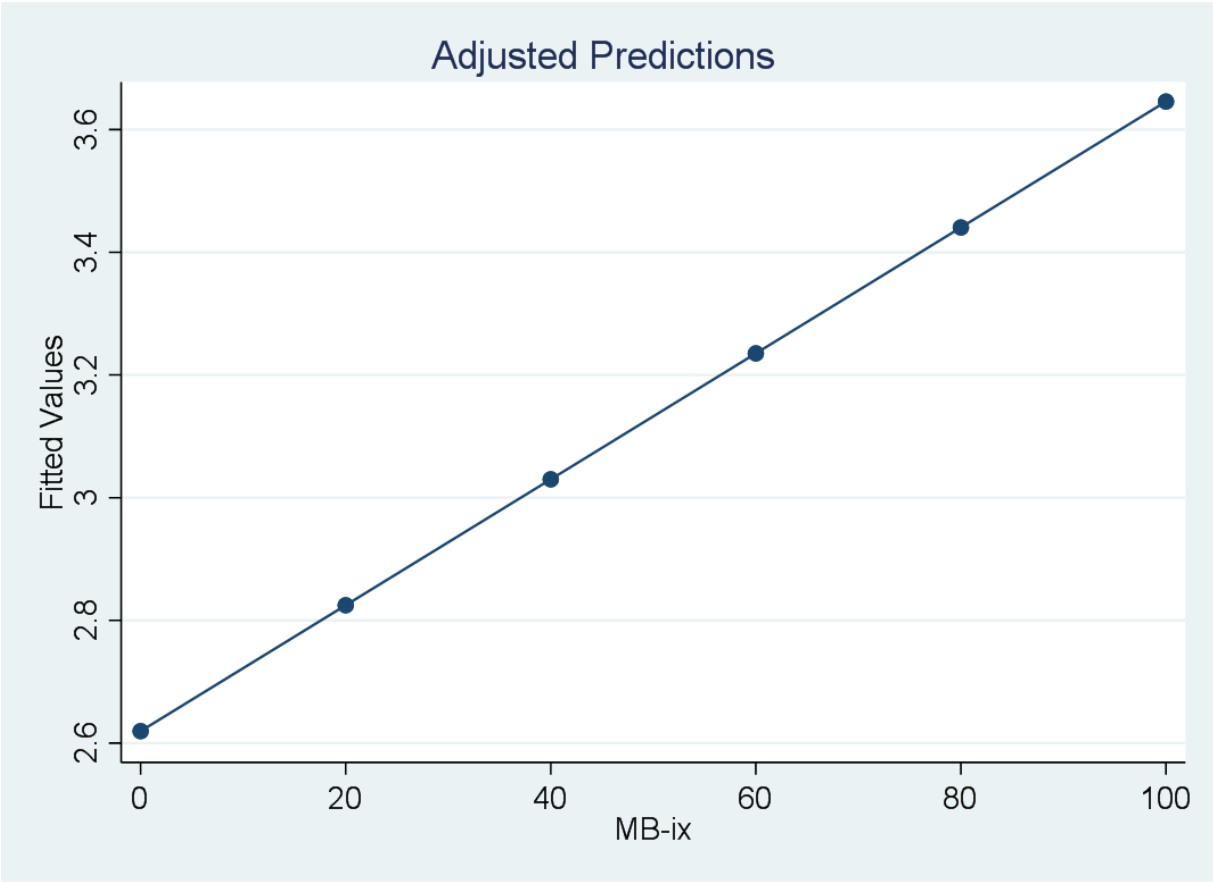
Table 6: Determinants of rate of capital investment (robust regression routine MMREGRESS)

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
MB-ix		0.010*** (0.002)		0.010*** (0.002)
SALES	0.273*** (0.077)	0.083 (0.078)	0.273*** (0.077)	0.083 (0.078)
SALES SQUARED	-0.185*** (0.057)	-0.086* (0.052)	-0.184*** (0.057)	-0.086* (0.052)
ROA	4.277*** (0.746)	4.293*** (0.743)	4.287*** (0.744)	4.292*** (0.744)
LEVERAGE	-0.102 (0.158)	-0.110 (0.154)	-0.102 (0.158)	-0.110 (0.154)
AGE	0.542*** (0.126)	0.148 (0.154)	0.543*** (0.126)	0.148 (0.155)
AGE SQUARED	-0.852*** (0.186)	-0.502** (0.218)	-0.853*** (0.186)	-0.502** (0.218)
FREEFLOAT	-0.006*** (0.002)	-0.003 (0.002)	-0.006*** (0.002)	-0.003 (0.002)
TIMETREND			-0.005 (0.012)	-0.000 (0.012)
Constant	3.934*** (0.279)	3.109*** (0.280)	3.961*** (0.281)	3.109*** (0.286)
Observations	2,185	2,185	2,185	2,185
Industry dummies	YES	YES	YES	YES

Regarding the magnitude of the effect of codetermination strength, an estimate was run based on holding all of the variables at their means, except MB-ix which was allowed to vary. For the value MB-ix = 0 (i.e. there is no presence of workers in the board), CAPEX is estimated at 2.6 (i.e. the annual rate of capital expenditure is estimated to be 2.6% of total assets). For the value MB-ix = 100 (i.e. maximum worker influence), CAPEX is estimated to be about 3.6 (i.e. the annual rate of capital expenditure is estimated to be about 3.6% of total assets). In other words, the difference between no and full co-determination influence on CAPEX is estimated to be about one percentage point.

The estimates for the influence of FREEFLOAT are somewhat smaller, ranging between 0.6 and 0.3 percentage points lower rates of capital expenditure for companies with 100% free float than for companies with no free float.

Figure 4: Fitted values for the rate of capital expenditure at different levels of MB-ix



4. Conclusions

This paper has analysed the determinants of long-term investment, measured by the rate of capital expenditure over total assets of the firm, in a sample of listed companies in Germany between 2006-2017. In particular the influence of the strength of co-determination and the proportion of minority shareholders in a company's shareholder base on capital expenditure were examined. The paper used a new and differentiated measure of co-determination strength, the MB-ix (Mitbestimmungsindex). The second innovation of the paper was to use two types of robust regression techniques to deal with the problem of extreme outliers in the data.

The paper finds very strong evidence for a positive relationship between co-determination strength and the capital expenditure rate. Both robust regression methods yielded an estimate of a rate of capital expenditure of about one percentage point higher for companies with the highest level of worker influence under the German system of parity co-determination than for companies with no co-determination. The paper finds some evidence for the hypothesis that institutional investors reduce the rate of capital expenditure. The main estimate found negative and significant coefficients for the percentage of free float, but the robustness check (2nd robust regression routine) found negative coefficients which however were not significant. However, both routines yielded similar estimates, which was that the shift from a zero percent to a 100 percent free float shareholder base is associated with a decrease in capital expenditures of about 0.3 to 0.4 percentage points.

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