

The influence of industry concentration on merger motives – empirical evidence from machinery industry mergers

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Abstract

Linking industrial organization theory and capital market research, we provide empirical evidence that merger motives of firms are influenced by their prevailing industry concentration. We analyze wealth effects for target, acquiring and rival firms for 330 transactions in the machinery industry between 1997 and 2007. We show that mergers in concentrated industries are primarily motivated to achieve productive efficiency gains. This seems surprising as we rather expect monopolistic collusion motives. For fragmented industries, on the other hand, we observe both, productive efficiency and monopolistic collusion motives for firm mergers. In the absence of wealth transfers there seems no indication for agency problems. Our findings suggest that the traditional research on merger motives falls too short by not considering structural market differences in form of industry concentration.

Keywords: Industry concentration, Merger motive, Event study, M&A

JEL-Classification: G14, G34

1. Introduction

Although the influence of market structure on success of corporations has long been outlined by the industrial organization theory, only little is known about its specific impacts on merger motives. By examining stock price reactions to merger announcements, we examine how industry concentration influences merger decisions and motives of the management.

Our argumentation seems simple. The motives of the management to engage in mergers should be driven by their prevailing market environment where industry concentration is a major aspect. We link to the industrial organization theory arguing that exogenous market factors determine endogenous market conduct. This argumentation is similar to Hou and Robinson (2006) who find that industry concentration influences the risk behavior of firms, an assumption that is based on traditional views of Schumpeter (1912) and Bain (1954). Industry concentration influences innovation dynamics and distress risk of firms and directly impacts the process of creative destruction. We suppose that this influence should be reflected also in the strategic merger motives of the firm management. For example, as innovation dynamics and strive for efficiency seems higher in highly competitive industries (Knott and Hart 2003), most mergers in fragmented industries should be motivated by synergy gains in form of operational, managerial or financial synergies. Contrarily, mergers in concentrated industries should be primarily driven by monopolistic collusion motives, as tendencies to limit output, raise product prices and/or lower factor prices (Chatterjee 1986) seem more promising. Capital markets should recognize the impact of industry concentration and evaluate those transactions differently.

We test three primary lines of arguments that explain merger motives (Trautwein 1990; Fee and Thomas 2004; Sharur 2005). First, the efficiency theory that suggests mergers are motivated by synergies and hence wealth creation depends on the fit of both companies. Second, the monopolistic collusion theory that argues mergers (horizontal and conglomerate mergers) are executed to improve market positioning and to achieve market power. Third, the agency and hubris theories that assume either agency problems in form of wealth transfers between acquiring and target shareholders, or hubris of the management in form of overestimation of potential synergies and overpayment of the target. By observing wealth effects of target, acquirer, and rival companies, we test how specific industry characteristics influence merger motives of the management.

In our argumentation we tie financial research with industrial organization theory that highlights the influence of market structure and competition on firm behavior. Although previous research has in some cases included industry characteristics as determinant for merger success (excess returns), to our knowledge this paper is the first that examines the effect on merger motives. To fill this gap we test the efficiency, collusion and hubris hypothesis under different conditions of market structure (i.e. concentrated and fragmented markets). We base our analysis on 330 transactions between the 1997 to 2007 period, examining target, acquirer, combined entity and rival reactions. By separating two groups of concentrated and fragmented industries we test the merger motive by examining wealth effects (see for example Eckbo 1983; Stillmann 1983; Fee and Thomas 2004; Sharur 2005) and by comparing correlations between change of industry concentration and excess returns (Ghosh 2004).

We focus our analysis specifically on the machinery industry. Relative to other industries such as banking, telecommunications or pharmaceuticals, the machinery industry is sufficiently homogenous that general market trends and developments are similar and, through its high fragmentation in sub-industries, it guarantees a heterogeneity of industry concentration levels that allows to examine the impact on merger motives.¹ Comparing the amount of academic research, it seems that a cross-industry analysis may fall too short to consider specific industry related market developments and trends. As those trends could substantially influence merger motives, we circumvent this problem by focusing on one industry.²

Using event study methodology, we find support for our initial hypothesis that industry concentration influences merger motives of the management. Against our expectations, transactions within highly concentrated industries are not motivated by monopolistic collusion but rather by productive efficiency gains. In contrast, in fragmented industries we detect both, productive efficiency and monopolistic collusions motives. Regardless of the prevailing industry concentration there are no indications for agency and hubris motives, as acquirer returns are positive and no wealth transfer between shareholders is observed. We confirm those findings through a cross sectional analysis. Results show

¹ The fragmentation can be observed, for example, in the concentration ratios published by the US Census: the largest 20 machinery manufacturer in the US sum up to 27.8% market share compared to 56.3% in commercial banking or 78.8% in telecommunication

² Although the analysis of M&A activity on shareholder value has generated a vast amount of academic research, results are to some extent contradictory. Especially acquirer reactions seem difficult to foresee as industrial dynamics and trends are difficult to compare across industries. This finding seems to be considered in the growing amount of econometric analysis for specific industries.

that wealth creation mechanics of mergers are different depending on their industry concentration background (in some cases even opposed). Considering value maximizing behavior of the management, those differences should consequently lead to different merger motives of the management.

The remainder of the paper is structured as follows. We first introduce the machinery industry before we give a brief overview over the academic merger motive research as well as an outlook on some current views of the industrial organization theory. Summarizing those findings we derive our hypotheses. In section three, we provide some descriptive statistics on our sample, identify several factors that potentially explain the observed wealth effects of the transaction and discuss our econometric methodology. In section four, we conduct both univariate and multivariate analysis to identify the determinants of the wealth effects and their impact on merger motives – more specifically, we examine whether excess returns of transactions in fragmented or concentrated industries have different cross-sectional determinants of merger success. We conclude with a discussion of our findings (section five).

2. Market characteristics and literature review

2.1. Basic market characteristics

The analysis of the influence of industry concentration on merger motives needs to focus on an industry with unique characteristics: heterogeneity within the concentration ratios of its sub-industries (to allow for the analysis of influence on merger motives) and homogeneity with regard to specific market trends and developments (to guarantee that merger motives are not influenced by a general divergence of industry trends). In our opinion, the machinery industry fulfills these requirements.

First, the various machinery sub-industries provide sufficient heterogeneity. For example, the market for manufacturing of printing machines (SIC 3555) is very concentrated with a limited amount of rivals, each with high market shares. On the other hand, markets such as machine tools manufacturing (SIC 3541) are highly fragmented and characterized by low market concentration. Basing our analysis on the four-digit SIC code industry classification, we examine more than 37 different sub-industries with nine industries to be classified as a concentrated industry (Herfindahl-Hirschman index > 0.18). This heterogeneity in sub-industry market concentration allows us to examine the impact on merger motives of firms.

Second, the machinery industry is sufficiently homogenous that general macroeconomic trends are similar across machinery sub-industries. Although the intensity of trends may be different, we observe the following trends in all submarkets of the machinery industry. First, the shift of sales markets towards emerging countries that makes a global footprint of all machinery manufacturers more and more essential. Second, the trend to realize efficiency improvements and the pressure for cost savings as competition from low cost countries, but also pressure from own customers (that delegate their own cost pressure to the manufacturers) increase the need for operational excellence. Third, the dynamics in innovation and technological development, as low cost competitors increase the need for technological leadership. In contrast to a cross-industry comparison, this basic homogeneity allows us to reduce dilution of results through a general divergence of industry trends.

2.2 Research theories on merger motives

Although the decision to merge is often driven by a complex pattern of motives that cannot be put into a single approach, academic research has developed some major theories that help to explain underlying motives and assumptions. However, a final answer to the motivations behind the merger has not been found, as it is difficult for economic researchers to identify the sources of gains with their coarse information set (Andrade, Mitchell et al. 2001). This paper tries to bring additional light into this topic by suggesting to consider the influence of industry concentration in the academic research of merger motives. In the following, we shortly introduce the three theories we test for and explain how these motives can be identified observing capital market reactions of stakeholder firms:

The first theory is the efficiency or synergy theory. It states that mergers are executed to achieve synergies, comprising financial synergies (lower cost of capital), operational synergies (combination of operations and knowledge transfer) and/or managerial synergies (when the acquirer's management possesses superior management skills and abilities). In fact, synergies are often cited as key argument to improve productive efficiency and to justify management actions (Porter 1987). Capron (1999) argues that cost synergies are often driven by asset divestitures (physical assets and cutback of personnel), while revenue-enhancing synergies emphasize the redeployment of the resources to enhance revenue capabilities of the firm. Empirical research shows that a relationship between net present value of the synergies and announcement day return

exists, although revenue-enhancing synergies are less valued than cost-reduction synergies (Comment and Jarrell 1995; Walker 2000; Houston, James et al. 2001). Fee and Thomas (2004) find evidence consistent with improved productive efficiency and buying power as sources of gains to horizontal mergers. Andrade and Stafford (2004) highlight that mergers are an effective mean for industries with excess capacity to rationalize and induce exit. To identify a productive efficiency motive in firm mergers, empirical research suggests to examine capital market reactions (Eckbo 1983; Fee and Thomas 2004; Sharur 2005). Following the literature, the positive impact of synergies and productive efficiency gains is reflected in positive capital market evaluations for target and acquiring companies to merger announcements. In contrast, share price reactions of rival companies are not clearly determinable as both positive and negative excess returns can be argued. For example, if the merging parties achieve a more efficient production/market positioning then rivals should be worse off as competitive disadvantages result (Schumann 1993). The opposite effect occurs, if the merger induces a positive signal indicating that the rivals are able to copy the efficiency gain of the merging companies (e.g. better production routines).

The second theory is the monopolistic collusion theory arguing mergers (horizontal and conglomerate mergers) are executed to improve market positioning and to gain market power. Trautwein (1990) summarizes that the monopoly theory's record appears to be weak, as most studies show that the primary reason for mergers is not to achieve monopoly power. This is confirmed by recent studies. For example, Fee and Thomas (2004) found in their investigation of upstream and downstream product-market effects only little evidence for monopolistic collusion. Evidence on the monopoly consequences of mergers can be identified by observing target, acquirer and rival reactions. As an improvement of the market positioning is achieved there should be a positive wealth gain to target and acquirer shareholders. Additionally, also competitors should benefit through collusive mergers since the positioning of all companies in the industry is improved. This is as collusion mergers have a tendency to limit output, raise product prices and/or lower factor prices (Chatterjee 1986). However, a positive rival reaction for itself cannot finally prove monopolistic collusion motives (Stillmann 1983; Eckbo and Wier 1985). Consequently, we apply an additional methodology to strengthen the interpretation of results. We follow the approach of Gosh (2004) and test whether a positive correlation between shareholder wealth gains and change in industry

concentration exist. The combination of those approaches allows to identify competitive collusion motives of the firm.

The third line of reasoning focuses on the explanation why mergers often destroy wealth for bidding shareholders. It includes the agency theory (managers who maximize their own utility) and hubris theory (overestimation of management's abilities). Empirical studies show that at least part of the large price increases in the target firm shares are attributed to a general wealth transfer from bidder to target. Roll (1986) argues that hubris is necessary to explain why managers do not abandon unfavorable takeover offers also since reflection would suggest that such bids are likely to represent positive errors in valuation. Seyhun (1990) finds that mergers are value destroying for acquiring firms and conclude that takeovers are motivated by agency problems or hubris. Walking and Long (1984) find that the existence or absence of managerial resistance to a takeover bid is directly related to the target management's personal wealth changes induced by takeovers. We test for the hubris or agency motive by assessing whether negative acquirer returns are observed and/or a wealth transfer between target and acquirer shareholder exists.

Although in academic literature there exist also other theories such as the process theory (limited information, organizational routines and political power) or the disturbance theory (merger waves are caused by economic disturbances) we focus on the tree lines of arguments introduced before (efficiency/synergy, monopolistic collusion and agency/hubris motives).³ Table I summarizes expected capital market reactions to cumulative abnormal returns of target, bidder, combined entity and rivals following the introduced theories.

2.3 Influence of industry structure and related empirical evidence

Although this study is to our knowledge the first that specifically analyses and empirically tests the impact of industry concentration on merger motives, the impact of industry characteristics has long been addressed by the industrial organization theory.

One of the key questions industrial organization theory tries to answer is how market structures influence performance and profitability of firms. Empirical research confirms a relationship between market structure and firm profitability, although results were often weak (Weiss 1974). The probably most known model to explain firm performance

³ For more information see the summary on merger motives of Trautwein (1990)

is called the structure-conduct-performance (SCP) paradigm (Slade 2004). The SCP holds that exogenous market structure (in our case industry concentration) determines endogenous market conduct (the way in which the firms in that industry interact), which in turn determines firm performance (profitability). Although this model has experienced much criticism, arguing that the cause and effect are backwards (Demsetz 1973) and showing that shows cross-industry differences in profits are sometimes not positively related to market structure (Hirschey 1985; Rumelt 1991), recent research resumed the discussion about the influence of industry characteristics on firm performance.

For example, Slade (2004) finds in his empirical analysis of 14 nonferrous-metal mining and refining markets strong support for the SCP model. Firms profits are positively and significantly related to the structure of their markets, and this relationship holds in all specifications that were estimated. Similar evidence was also provided by Azzam (1997) in a analysis of the US beef packing industry. He empirically confirms the tradeoff between market power and cost efficiency from increased concentration. Contrarily, Morrison Paul (2003) provides evidence of substantive cost economies implying economic motivations for observed concentration, consolidation, and diversification. Hou and Robinson (2006) show that there is a link between industrial concentration and overall stock returns. Their empirical analysis proves that firms in more concentrated industries earn lower returns, even after controlling for size, book-to-market, momentum, and other return determinants. They argue that a high industry concentration either insulates firms from undiversifiable distress risk by high barriers to entry, or decreases their risk-behavior because they engage in less innovation (Knott and Hart 2003), and thereby command lower expected returns (risk based explanation). We conclude that there seems to be an influence of market structure on firm performance and that exogenous factors impact endogenous market conduct, which in turn influences firm performance. We transfer this linkage to merger motives of firms.⁴ By analyzing merger performance (wealth creation) and the exogenous factor industry concentration we observe how the endogenous market conduct (in our case merger motives) is influenced. Similar to Hou and Robinson (2006) we focus on industry concentration as a key variable to determine underlying market structures.

⁴ In fact, this linkage was partially considered in the classical capital market research, where industry concentration is sometimes included as a independent variable to test for its influence on value generation. However, in this paper we are not only interested to measure impacts on excess returns but to examine whether merger motives depend on prevailing industry structures.

2.4 Influence of industry concentration on merger motives

We develop our research hypotheses by transferring the main argument of the industrial organization theory to the specific situation of an M&A decision – the market structure (exogenous factor) influences the conduct and performance of firms (endogenous factor). Using industry concentration as main determinant of market structure (see for example Hou and Robinson (2006), Curry and George (1983)), we examine how merger motives of firms are influenced by observing capital market reactions of target, acquirer and rival firms.

We assume that certain merger motives or merger strategies are, in different industry concentration environments, more promising than others. As merger motivations are focused on maximizing shareholder value, merger strategies should be different for various industry concentration backgrounds. For example, the collusion effect should be higher for companies in already concentrated markets (Chatterjee 1986) while in fragmented industries this effect seems more difficult to achieve. Considering both, internal risk-affinity and external effect side, we presume that industry concentration influences merger motives of the management. As a direct parameterization seems difficult, we derive hypotheses based on subsamples of concentrated and fragmented industries:

Concentrated industries allow their market participants for a dominant market positioning. Firms can take use of scale advantages and are able to limit output, raise product prices and/or lower factor prices (Chatterjee 1986). On the other hand, market pressure and competition for innovation dynamics and efficiency leadership is less than in fragmented industries (Knott and Hart 2003). Furthermore, market concentration often goes along with firm size concentration. Moeller, Schlingemann et al. (2004) found the larger a company the more it is prone to hubris or agency problems. Those empirical findings lead us to our first hypothesis:

Hypothesis 1: In concentrated industries monopolistic collusion motives should dominate merger decisions; furthermore, acquirers are more likely to fall for hubris or agency problems

As we described in section 2.1 the machinery industry is characterized by trends for internationalization, innovation dynamics and operational efficiency. As competitive pressure is especially strong for fragmented industries, the merger motive synergy

(financial, operational and managerial) will play a major role. In contrast to concentrated industries, fragmented industries will face difficulties in achieving potential gains from monopolistic collusion. A strong increase in market shares is less probable than in concentrated industries. Our hypothesis is as follows:

Hypothesis IIa: Fragmented industries strive for efficiency improvements, monopolistic collusion and/or hubris is not a major motive

On the other hand, competitive pressure forces companies for any enhancement of their strategic positioning. As a result, if a sufficient market share gain can be achieved than also collusion rents should be a good argument for a merger.

Hypothesis IIb: If a high change in industry concentration is observed for fragmented industries then monopolistic collusion can be a motive for firm mergers

The confirmation or rejection of those hypotheses creates a general understanding of the validity of the assumption that industry concentration influences merger motives of the management.

3. Data and methodology

3.1. Sample composition

Our sample includes merger & acquisitions from the Thomson Financial One Banker deal database announced between January 1, 1997 and December 31, 2007. For our analysis we included all transactions that fulfill the following requirements (table II):

- The acquirer is a machinery manufacturer (mid description machinery) and has sufficient stock information via Datastream available
- The transaction is a majority investment (>50% share after deal completion) and the acquirer did not own a majority stake in the target company before
- The deal value is at least USD 20m
- The acquirer primary SIC code is within the two-digit SIC-code classification "35" but not part of computer equipment and office machines⁵
- Transactions of one acquirer do not overlap within the estimation period of 250 days to avoid dilution of effects

⁵ We excluded: 3570 computer & office equipment, 3571 electronic computers, 3572 computer storage devices, 3575 computer terminals, 3576 computer communication equipment, 3577 computer peripheral equipment

- Transaction details are confirmed through Factiva press research

This screening procedure gives us a total sample of 330 relevant transactions that provide the basis for our data analysis. Table III shows descriptive statistics about the data composition.

To examine rival reactions to merger announcements we identify 880 relevant rival firms from the Thomson Financial Peer Analysis database. In our analysis, we consider any company as rival company (besides the bidder and target) that reports its primary 4-digit SIC code in the industry where acquirer and target company overlap. If there is no overlapping, we use the primary SIC code segment of the acquirer to test for rival reactions. For the rival portfolio, we include all companies with revenues larger than USD 1m where sufficient share data through Datastream was available. For the average deal in our sample, we identify 23 rival firms to calculate announcement period abnormal returns.

To measure the industry concentration we compute a sales-based Herfindahl Hirschman index (HHI) in the industry where the acquirer's and target's four-digit SIC-code overlap (see for example Hou and Robinson 2006). The calculation of the industry concentration measure requires detailed information regarding market share information of firms in each sub-industry. We obtain the data using the Thomson Financial database, where we also included available "private company" information. The annual HHI is computed as follows:

$$HHI = \sum_{i=1}^n s^2$$

where s is the respective market share of firm i and n the number of all (public and private) companies in the respective industry. The HHI can range from almost zero to one (when one firm possesses 100% market share) with a higher value indicating a higher degree of concentration in the relevant industry. Following the guidelines of the US Antitrust Division of the Department of Justice we consider all industries with an HHI index greater than 0.18 as highly concentrated.

3.2 Factors that explain the value creation from machinery M&A

We analyze the influence on merger motives by measuring determinants of wealth creation through several cross-sectional factors that are closely related to industry characteristics. We furthermore include some standard control variables to examine whether capital market reactions are connected to other determinants of wealth creation

and to test whether value generation mechanics are different in fragmented and concentrated industries. Table IV provides an overview of the variables we include in our analyses.

3.2.1 Industry concentration and market structure variables

Industry characteristics determine merger motives and capital market reactions of mergers. To grasp the influence of industry characteristics following variables are included in the analysis: the industry concentration ratio, the change in the industry concentration and industry growth.

As first variable we examine industry concentration. Research has shown that industry concentration plays an important part in determining market power, business behavior and performance of companies (Curry and George 1983) and also is a suitable measure of barriers to entry (Hou and Robinson 2006). For our analysis, we measure the market concentration as a sales based Herfindahl Hirschman index and use it as a suitable indicator for classifying the different sub-industries. We use the industry concentration to perform univariate and multivariate subsample analysis. Comparing the different wealth determinants we analyze whether our initial hypotheses can be confirmed. We include a dummy variable (1= concentrated) to test for the effects of market concentration and to perform univariate subsample analysis. For the cross-sectional analysis we use metric measures of industry concentration.

As second variable we examine the change of industry concentration from the year of the merger to the next. For the univariate analysis this variable allows to further distinguish between underlying productive efficiency versus competitive collusion motives. We apply an approach of Gosh (2004) who states that a positive correlation between shareholder wealth gains and changes in industry concentration is consistent with the competitive collusion or market power theory. This procedure seems necessary as the simple analysis of target, acquirer and rival returns only yields insufficient evidence for underlying merger motives (see section 2.2). Through combination of both procedures we gain a more reliable evaluation of merger motives. We separate the mergers into two groups one with above average change of industry concentration and one with below average change of industry concentration.

Third, we include the respective industry growth as a variable in our analysis. Through analyzing annual growth rates, underlying industry dynamics can be observed a suitable way. According to Clelland, Douglas et al. (2006) there will be a higher level of

competition in an industry with a lower growth rate, reflecting an increasingly zero-sum game of mutual dependence. The lower the growth rate the greater the intensity of rivalry between firms and the greater the influence on the relationship between value creation and its efficacy in producing a competitive advantage. As rivalry is an indicator similar to industrial concentration this variable helps to test whether our hypotheses persist. We calculate the annual growth rates based on the data we obtain through the Thomson One Banker database. We include a dummy variable to distinguish positive (=1) or negative (=0) market growth of the respective four-digit industry.

Table V presents descriptive statistics about the variable composition of our industry characteristics data set. In our data sample 266 transactions operate in a relatively low concentrated industry environment, while 64 transactions take place in concentrated industries (HHI greater than 0.18). The average change in the industry concentration (HHI) is 0.8%. In our data sample the average growth rate per year equals 6.1%.

3.2.2 Control variables

For the multivariate regression we define standard control variables to test whether determinants of wealth creation are similar in fragmented and concentrated industries. We include the following criteria into our analysis: transaction size (absolute and relative), cross-border M&A and public versus private takeover.

First, we include the deal size of the transaction. It seems intuitive, that the larger the deal size, the higher potential implications of the transaction should be for acquirer as well as for target companies. Higher transaction sizes should result in higher synergies and facilitate monopolistic collusion. We include deal-size as an absolute measure.

Second, we include relative size calculated as deal size divided by the bidder's market capitalization at T_{-21} . Asquit, Bruner et al. (1983) found that bidder returns increase with the relative size of the target. Moeller, Schlingemann et al. (2004) state that a high (relative) deal size can also be associated to hubris or agency problems. By incorporating the variable "relative size" we consider if the relative size of the merging firms is disparate.

Third, we examine the impact of cross border transactions as internationalization is one of the key trends in machinery manufacturing. Chatterjee, Lubatkin et al. (1992) found an inverse relationship between perceptions of cultural differences and shareholder gains. Dennis, Dennis et al. (2002) argue that this cultural distance should induce higher costs for post merger integration. Instead, Morosini, Shane et al. (1998) found that the

access to the targets diverse set of routines embedded in different cultures has a positive association to acquisition performance. We include a dummy variable (1 = cross border) to account for cross border effects in stock price reactions.

Fourth, we consider the target's public or private status. Earlier research shows that equity offers for the acquisition of public targets have lower returns, while offers for the acquisition of private firms have higher abnormal returns for bidding shareholders (Fuller, Netter et al. 2002). Moeller, Schlingemann et al. (2004) found that announcement returns for shareholders of small acquirers are not affected by the public or private status of the companies. We assume that stock prices should react more positively to acquirer shareholders when bidding for a private company compared to lower returns when bidding for a public company. We include a dummy variable (1 = private) to account for the public/private status of the target firm.

3.3 Calculating announcement period abnormal returns

We use standard event study methodology to calculate abnormal returns for target, bidder, combined entity as well as rival companies. We estimate abnormal returns to firm i at date t (AR_{it}) as $AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$, where R_{mt} is the return of the relevant country specific Datastream machinery index.⁶ Our market model parameters are estimated over an observation period of 250 trading days starting at day T_{-300} to T_{-50} relative to the announcement date. We exclude all companies with less trading days available from our sample. We use the announcement date as reported by Thomson financial and crosschecked the data using press research via Factiva. To obtain the cumulative abnormal return (CAR) of a transaction we perform an ordinary least squared (OLS) regression over six different event windows ranging between two days $[-1;1]$ and 20 days $[-10;10]$ around the announcement date. We estimate the combined wealth effect of the merging companies as the cumulative abnormal return (CAR) to a value-weighted portfolio of the acquirer and target (Bradley, Desai et al. 1988). We weight the merging firms with their respective market values of equity for day T_{-21} relative to the announcement date. To estimate CARs for rival companies, we create value-weight rival portfolios (excluding acquirer and target) for the relevant primary four-digit SIC code where bidder and target overlap.

⁶ Abnormal returns describe the difference between the expected return and the actual return observed in the market

To test for statistical significance of the cumulated abnormal returns we follow the recommendation of Harrington and David (2007) and apply the test statistic of Boehmer, Musumeci et al. (1991), an enhancement of the approach by Patell (1976). The test considers the likely difference in cross-sectional return variance between the estimation period from T_{-300} to T_{-50} and the event window. The test statistic z follows a student t -distribution with $T-2$ degrees of freedom. The test results appear to be robust also in the absence of event-induced variance increases (Serra 2004).

4. Empirical results

4.1 Univariate analysis

Table VI shows the abnormal stock returns for the full sample of machinery mergers. We find that significant wealth gains accrue to both shareholders of target and bidding firms. We observe statistically significant results for all of our six event windows with target gains of 17.4%-21.2% while acquirer's shareholders profit between 1.7% and 2.3%. This finding strengthens the assumption that mergers in the machinery industry are not motivated by management hubris or agency problems, but to create value for their shareholders. This is confirmed when we examine the correlation between the cumulative average abnormal returns between acquirer and bidder. We observe no evidence for possible wealth transfers between target and bidder shareholders (compare Berkovitch and Narayanan (1993)). An illustration about the dynamic development of abnormal returns can be seen in figure I.

To test our hypotheses on the influence of merger motives we perform a subsample analysis (table VII) where we observe abnormal returns in the $[-1;1]$ event window around the announcement date. Capital market reactions of transactions in fragmented and highly concentrated industries indicate a general positive abnormal announcement return for target, acquirer and combined entity shareholders. This allows us to exclude agency or hubris theories as no wealth transfers can be detected. The results also show, that acquirer returns are not significantly different in concentrated or fragmented industries, sustaining the recent evidence that firm performance is negatively correlated to industry concentration (Hou and Robinson 2006). At least in the case of merger situations this finding cannot be confirmed (see table VIII). Interesting is also the interpretation of rival reactions. Applying an independent sample t -test we observe that the capital market reactions are statistically different for fragmented and concentrated industries (table VIII). For concentrated industries significantly negative rival reactions

(-0.58% CAR) result, an indication that no competitive collusion motive prevails, as in this case a positive market signaling should occur (compare e.g. Eckbo 1983). Our finding is confirmed when we additionally analyze the change in industry concentration. Examining the correlation between abnormal returns and change in industry concentration we observe a negative correlation factor of -0.33%. As in Gosh (2004), we take this as an indicator to reject monopolistic collusion motives for concentrated industries. In a reverse conclusion, those finding indicate that mergers in concentrated industries are primarily dominated by efficiency gains. This seems interesting as this contradicts our hypothesis that primarily monopolistic collusion motives should be expected in concentrated industries. A possible explanation could be that the incremental utility gain through competitive collusion in already concentrated industries is low.

To test the hypotheses on fragmented industries we divide the subsample further, focusing on the variable change of industry concentration. Again this analysis yields interesting results especially for rival returns. We observe that capital market reactions significantly differ for those transactions that are accompanied by a high change of industry concentration versus those that are accompanied by a low change in industry concentration (table VIII). This finding allows to find evidence for both motives, competitive collusion and productive efficiency. First, the sample of transactions in fragmented industries, where we observe a high change in industry concentration, seems to be motivated by monopolistic collusion. Rival returns experience a substantial positive signal resulting in 2.08% abnormal returns in the [-10;10] event window. This evidence is further strengthened when we compare the correlation of the forty transactions with the highest change in industry concentration with the rival abnormal returns. We detect a positive correlation of 36% (Ghosh 2004), a finding that is in line with competitive collusion motive. Second, support for the productive efficiency motive can be found in those transactions with low change in industry concentration. We observe negative rival returns around the announcement date and a correlation between change of industry concentration and excess returns of 0%. Although statistical significance is low we interpret this as inconsistent with monopolistic collusion motives. Consequently, the results only allow to partially confirm the hypotheses we made about merger motives in fragmented industries. Apparently, both motives (competitive collusion and productive efficiency) exist in fragmented industries

(rejection of H IIa). However, the competitive collusion motive only prevails, when a high change in market concentration can be observed (confirmation of H II b).

Summing up, our initial hypothesis that industry concentration influences merger motives of the management finds empirical support. While in highly concentrated industries no indication for competitive collusions exists (decreasing marginal utility), we identify in fragmented industries both kind of motives, competitive collusion and productive efficiency. To strengthen the observations of the univariate analysis and to filter dilution effects we jointly examine the defined industry and control variables and conduct a multivariate analysis in the following section.

4.2 Cross-sectional regression analysis

By comparing the wealth mechanics of fragmented and concentrated industries we gain further evidence of the influence of industry concentration on merger motives. As we are interested in measuring the influence on merger motives and not on CARs, we need to separately compare the wealth mechanics for transactions in fragmented and concentrated industries. Consequently, we perform two multivariate analyses (for fragmented and concentrated industries) of the defined variables to jointly measure the effect on shareholder value using the cumulative abnormal return over the $[-1;+1]$ event window as dependent variable. We perform the cross sectional analysis for the cumulative abnormal returns of acquirer and rivals, as those provide important insights into wealth creation mechanism. The results are shown in table IX. We compute all test statistics using White's (1980) heteroskedasticity-consistent covariance matrix.

The main finding of the multivariate analysis is that wealth mechanics are different in industries with varying industry concentration backgrounds. Comparing the regression results of abnormal returns we observe that cause and effect relationships are not the same for transactions in concentrated or fragmented industries, in some cases even opposed. This is most true for rival reactions. All defined variables (with the exception of relative size of an transactions) show opposite coefficients for mergers in concentrated and fragmented industries. Besides its low statistical significance this indicates, that the wealth effects on rival companies are exactly opposite. For concentrated industries, we observe that all variables regarding industry characteristics have a negative coefficient. That implies, the higher the industry concentration, the change in industry concentration, or the industry growth the more "damage" is attributed to shareholders of rival firms. Exactly the opposite relations determine wealth

creation in fragmented industries. The same holds true for the defined control variables (except relative size). Apparently, strategies to interact with rivals (i.e. merger motives) are different for companies with varying industry concentration background. But also for acquirer returns we observe this relationship. In concentrated industries results show a positive coefficient and relationship of acquirer abnormal returns with the variables cross-border and target/public and a negative with industry growth (statistically not significant). For fragmented industries, the relationships are exactly the other way round. These findings indicate that the wealth creation mechanics are different depending on the industry concentration level.

With regard to the interpretation on merger motives we observe a significantly negative relationship between change in industry concentration and acquirer abnormal returns in concentrated industries. This supports our interpretation that competitive collusion in concentrated markets is less rewarded by capital markets than productive efficiency motives. For transactions in fragmented industries we do not yield statistically significant results for this variable. As we suspect both, monopolistic collusion and productive efficiency, motives behind the transactions this confirms our univariate results.

Regardless of the industry concentration, the (absolute) transaction size has a significant inverse relationship (negative coefficient) with acquirer abnormal returns while the relative transaction size has a positive relationship. If a large relative size indicates possible synergies between target and acquirer than the results show that in both industry environments a positive relationship between abnormal returns and possible synergies exists. This again points the positive effect of productive efficiency gains. The negative correlation with the (absolute) transaction size for concentrated industries can be explained in two ways. First, as a larger target implies more integration risk, abnormal returns are negative. However, we then would have expected a similar relation for the relative size of the target. Second, as a larger target implies larger market share gains we see that again monopolistic collusion is not rewarded in the case of concentrated industries.

The public and private status influences abnormal returns of acquirer and rivals differently in concentrated and fragmented industries. While a public target in concentrated markets is rewarded by higher acquirer returns it harms shareholder returns of rival companies. We again provide a risk based explanation. As firms in concentrated industries are more prone to risk aversity (Hou and Robinson 2006) they

are better off acquiring targets that are publicly listed. Similar to the argument of Helwege, Pirinsky et al. (2007), public companies imply better available information reducing risk of integration. In fragmented industries acquirer shareholders react negatively to a target public status. In this case, apparently risk aversity does not pay and consequently all merger options should be evaluated by the firm management.

Summarizing, in the cross sectional regression analysis we show that the wealth creation mechanism are different for fragmented and concentrated industries. Considering value maximizing behavior of the management this should lead to different merger motives in M&A situations. Furthermore, the findings regarding underlying merger motives in concentrated and fragmented industries confirm the results of the univariate analysis. We find additional support for our hypothesis that industry concentration influences merger motives.

5. Summary and conclusion

Our objective in this paper is to examine the impact of industry concentration on merger motives of companies. We investigate share price reactions to merger announcements for a sample of 330 transactions in the machinery industry between 1997 and 2007. We limit to machinery transactions because of its unique market characteristics (homogeneity of general market trends and heterogeneity of industry concentration in submarkets). Linking industry specific trends, academic research of merger motives and industrial organization theory we derive our research hypothesis. Conducting univariate analysis and multivariate regression we gain valuable insights into determinants of merger motives. First, we show that merger motives in concentrated and fragmented industries are different. We observe that competitive collusion is not a major motive for firms in concentrated industries and that those mergers are primarily driven by productive efficiency gains. Although this finding can be attributed to the general weak evidence of collusive merger motives (Trautwein 1990), we find evidence that in fragmented industries both, collusion and productive efficiency, are prevailing motives of the firm mergers. Second, the cross sectional regression supports this finding analyzing acquirer and rival excess returns. We show that there is a substantial difference of wealth creation mechanics for fragmented and concentrated industries, indicating different success factors for M&A transactions (especially the impact on rival excess returns is exactly opposite). Assuming value maximizing behavior of the management, those different wealth creation mechanics should lead to different merger

motives of the management depending on their underlying level of industry concentration.

In conclusion, our results provide some additional perspective to the empirical analysis of research motives of mergers. Linking industrial organization theory with the financial research on merger motives, we argue that the analysis of merger motives will gain additional refinement if market characteristics such as industry concentration is considered. Our empirical analysis of the machinery industry (subsample) proves that merger motives depend on industry concentration background. As this paper is the first that analyzes this relationship the question how industry structure influences merger decision remains unanswered. We believe that this field of research should be a fruitful topic for further research.

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Table I

Summary of forecasted CAR reactions to different merger theories

This table summarizes the implications of several merger theories on the cumulative abnormal returns on target, acquirer, combined entity and rival shareholders. It serves to interpret results from the event study analysis of machinery manufacturers.

	Influence on CARs			
	Target	Acquirer	Combined Entity	Rivals
Synergy/productive efficiency theory (maximization of target and acquirer gains)	Positive (bargaining power)	Positive (synergies and lower costs)	Positive (synergies and lower costs)	Unclear (positive signal vs. competitive advantage)
Monopoly theory (improved market positioning and market power)	Positive (bargaining power)	Positive (monopoly rent)	Positive (monopoly rent)	Positive ¹⁾ (market structure)
Agency theory (self interest of management)	Positive (bargaining power)	Negative (misbehavior of management)	Zero to negative	Zero to positive (no competitive advantage)
Hubris theory (overvaluation of target potentials)	Positive (bargaining power)	Negative (overvaluation of synergies)	Slightly positive	Zero to positive (no competitive advantage)

1) As positive rival reactions are not sufficient support for a monopolistic collusion motive we test also for a positive correlation of CARs and our variable change in industry concentration (Ghosh 2004).

Table II

Sample selection

This table shows the total number of completed M&A transactions with target or acquirer mid description machinery over the period from 1997-2007 initially obtained from the SDC/Thomson One Banker Deals database and the final data set after application of the defined selection criteria (1)-(7). The selection criteria are: (1) acquirer mid description is machinery manufacturer; (2) relevant Datastream codes are available for acquirers; (3) the transaction is a majority investment (> 50% share in the target company) while no majority stake was owned before; (4) the relevant deal value is at least USD 20m; (5) transactions within the same estimation period (250 days) of one acquirer are corrected; (6) The acquirer primary SIC Code is within the two digit SIC Code 35, furthermore eliminating all transactions related to computer equipment and office machines (three-digit SIC-Code "357"); (7) transaction details are confirmed in Factiva research.

	Number of transactions	% of reported transactions
Machinery M&A transactions (1997-2007)	5753	100.0%
Screened after criterion (1)	3381	58.8%
Screened after criterion (2)	2899	50.4%
Screened after criterion (3)	2291	39.8%
Screened after criterion (4)	485	8.4%
Screened after criterion (5)	395	6.9%
Screened after criterion (6)	348	6.0%
Screened after criterion (7)	330	5.7%

Table III

Yearly distribution of transactions and transaction volume

This table shows the yearly distribution of the analyzed transactions and transaction volumes.

Year	Number of transactions	Percentage	Transaction Volume	Percentage
1997	42	12.7%	8,125.6	10.2%
1998	36	10.9%	3,541.3	4.4%
1999	38	11.5%	13,695.8	17.2%
2000	30	9.1%	3,504.4	4.4%
2001	16	4.8%	1,630.1	2.0%
2002	18	5.5%	2,763.4	3.5%
2003	25	7.6%	4,602.5	5.8%
2004	23	7.0%	5,017.4	6.3%
2005	30	9.1%	6,603.6	8.3%
2006	30	9.1%	19,550.0	24.5%
2007	42	12.7%	10,633.7	13.3%
Total	330	100.0%	79,667.7	100.0%

Table IV

Variable and source description.

This table contains the definitions and data sources for each variable collected for the four categories industry characteristics, deal characteristics, target characteristics, and acquirer specific characteristics.

Variable name	Definition	Sources
<i>Industry concentration and structure variables</i>		
Industry concentration	Measure of the prevailing industry concentration using the sales based Herfindahl-Hirschman Index (HHI)	Thomson One Banker (Public and Private Company Database)
Change of industry concentration	Percentage change of the respective sub-industry concentration (HHI) to the following year	Thomson One Banker (Public Company Database)
Industry growth	Yearly growth rate of the four-digit SIC-segment using aggregated sales information	Thomson One Banker (Public Company Database)
<i>Control variables</i>		
Transaction size	Transaction volume of the transaction	Thomson One Banker
Relative size	The transaction size divided by the acquirer's market value at T ₂₁	Datastream
Cross-border	Variable to analyze if target and acquirer have different home countries	Thomson One Banker
Target public / private status	Measure if the target company was publicly listed or was in private ownership	Thomson One Banker

Table V

Description of continuous and binary variables.

This table describes the data collected for the description of industry characteristics and control variable characteristics. Proportions are reported for binary variables. Mean, median, standard deviation, minimum and maximum are reported for continuous variables. A description of the individual variables and the respective data sources is contained in table IV.

Variable name	N	Proportion	Mean	Median	Stdev.	Minimum	Maximum
<i>Industry characteristics</i>							
Ind. concentr. high	64	19.4%	-	-	-	-	-
Ind. concentr. low	266	80.6%	-	-	-	-	-
Change of ind. concentration	288	-	0.8%	2.1%	12.4%	-47.1%	60.0%
Industry growth	330	-	6.1%	5.2%	15.0%	-77.1%	112.4%
<i>Control variable characteristics</i>							
Transaction size	330	-	241.4	68.2	903.8	20.0	14,051.7
Relative size	317	-	32.5%	11.9%	72.6%	0.2%	861.1%
Cross-border	144	43.6%	-	-	-	-	-
National	186	56.4%	-	-	-	-	-
Target public	58	17.6%	-	-	-	-	-
Target private	272	82.4%	-	-	-	-	-

Table VI

Excess stock returns to machinery mergers

This table shows the average cumulative abnormal return for the total sample of 330 mergers in the machinery industry during 1997-2007 for six different event windows. Statistical significance at the 1%, 5%, and 10% level is denoted with ***, **, and *. The statistical significance is tested using the test-statistics of Boehmer, Musumeci et al. (1991) (z-statistic).

Panel A: Total Sample

Event window	Target (N = 58)		Acquirer (N = 309)		Combined Entity (N = 56)		Rivals (N = 287)	
	CAAR	z-statistic	CAAR	z-statistic	CAAR	z-statistic	CAAR	z-statistic
[-1/+1]	17.43%	7.17***	1.67%	4.65***	2.84%	2.67**	-0.12%	-0.63
[-3/+1]	19.15%	7.42***	1.91%	5.06***	2.78%	2.38**	0.08%	0.47
[-3/+3]	19.08%	6.95***	1.96%	5.54***	2.51%	2.47**	0.02%	0.48
[-5/+1]	20.74%	6.60***	2.21%	5.16***	3.71%	2.73***	0.18%	0.58
[-5/+5]	20.50%	6.13***	2.28%	4.23***	3.50%	2.35**	0.10%	0.50
[-10/+10]	21.21%	6.83***	1.76%	2.94***	3.35%	2.15**	0.91%	1.96*

Table VII
Subsample analysis of excess stock returns to machinery mergers

This table shows the average cumulative abnormal return for the subsample analysis of 330 mergers in the machinery industry during 1997-2007. The statistical significance is tested using the test-statistics of Boehmer, Musumeci et al. (1991) (z-statistic). Statistical significance at the 1%, 5%, and 10% level is denoted with ***, **, and *.

Panel B: Subsample analysis CAARs for the [-1;1] event window – for rival CAARs we additionally report the [-10;10] event window

Subsample	N	Target		Acquirer Returns			CER			Rivals [-1;1]			Rivals [-10;10]	
		CAAR	z-stat.	N	CAAR	z-stat.	N	CAAR	z-stat.	N	CAAR	z-stat.	CAAR	z-stat.
<i>Subsample High Industry Concentration</i>														
Average CARs	11	19.46%	3.82***	52	1.38%	2.22**	11	3.90%	2.21*	54	-0.58%	-1.75*	-0.28%	-0.56
Change industry concentration high	2	-	-	15	-0.11%	-0.18	2	-	-	14	-0.99%	-1.58	-0.43%	-1.04
Change industry concentration low	8	19.95%	3.96***	33	2.94%	3.45***	8	5.24%	2.39*	30	-0.46%	-1.27	-0.91%	-1.19
Positive industry growth	8	21.96%	3.41**	39	1.17%	1.72*	8	4.74%	2.16*	37	-0.88%	-1.80*	-1.12%	-1.42
Negative industry growth	3	12.77%	1.53	19	1.79%	1.418	3	1.67%	1.10	18	0.03%	-0.34	-0.14%	-0.17
<i>Subsample Low Industry Concentration</i>														
Average CARs	47	16.96%	6.10***	251	1.74%	4.10***	45	2.58%	1.85*	232	-0.01%	0.01	-0.01%	0.01
Change industry concentration high	28	17.81%	5.04***	135	1.37%	2.50**	28	2.18%	1.29	117	0.12%	0.43	2.08%	2.34**
Change industry concentration low	15	11.57%	3.28***	86	1.98%	2.44**	14	4.06%	1.65	86	-0.17%	-0.39	0.53%	1.07
Positive industry growth	26	17.05%	4.68***	170	1.66%	3.20***	24	1.39%	0.12	157	0.01%	0.35	1.05%	1.76*
Negative industry growth	21	16.85%	3.88***	81	1.92%	2.72***	21	3.95%	2.97***	75	-0.05%	-0.56	1.49%	1.63

Table VIII
Independent subsample analysis.

Panel C 1 and C 2 show the independent-sample t-test testing the significance of the difference between two sample means. In Panel C 1 we test whether the two subsamples of concentrated and fragmented industries statistically differ for various subsamples based on different cut-off points (HHI-concentration ratio) to define concentrated versus fragmented industries. Panel C 2 shows a mean difference test of the subsamples high and low industry concentration change within fragmented industries. We compare various subsamples with different number of transactions with highest and lowest change in industry concentration. Both tables show the results of acquirer and competitor CARs. The descriptive table displays the mean difference, standard error difference, and the respective t-statistics. Statistical significance at the 1%, 5%, and 10% level is denoted with ***, **, and *.

Panel C 1: Mean difference test subsample fragmented and concentrated subsamples [-1;1]

Subsample criterion ind. concentration (HHI)	CAR acquirer			CAR competitor		
	Mean difference	Std. error difference	t-value	Mean difference	Std. error difference	t-value
0,17	0.0008	0.0084	0.095	0.0058	0.0035	1.653*
0,175	0.0033	0.0079	0.419	0.0057	0.0037	1.551
0,18	0.0037	0.0080	0.460	-0.0057	0.0038	-1.518
0,185	0.0031	0.0081	0.386	0.0065	0.0038	1.710*
0,19	0.0041	0.0083	0.488	0.0069	0.0038	1.804*
0,195	0.0026	0.0087	0.303	0.0074	0.0040	1.843*
0,20	0.0043	0.0090	0.048	0.0055	0.0042	1.314

Panel C 2: Mean difference test high vs. low change of industry growth in fragmented industries [-1;1]

Subsample criterion No. of transactions with highest and lowest change of industry concentration	CAR acquirer			CAR competitor		
	Mean difference	Std. error difference	t-value	Mean difference	Std. error difference	t-value
40	-0.0165	0.0192	0.860	0.0098	0.0062	1.580
45	-0.0193	0.0173	-1.115	0.0137	0.0066	2.064**
50	-0.0134	0.0161	-0.834	0.0113	0.0063	1.800*
55	-0.0176	0.0150	-1.173	0.0083	0.0064	1.287

Table IX

Multivariate analysis of acquirer and rival returns.

This table shows estimation results for OLS regression models with acquirer and rival cumulative abnormal returns as dependent variable in the [-1;+1] event window. We test the influence of industry characteristics to measure the impact on merger motives as well as defined control variables. The test statistic is computed using White's (1980) heteroskedasticity-consistent covariance matrix. Statistical significance at the 1%, 5%, and 10% level is denoted with ***, **, and *.

Panel D: Cross-sectional regression analysis

Variable name	Acquirer Excess Returns			Rival Excess Returns		
	CAR Total	CAR Subgroup concentrat ed industry	CAR Subgroup fragmented industry	CAR Total	CAR Subgroup concentrat ed industry	CAR Subgroup fragmented industry
Intercept	0.021 <i>1.670*</i>	0.082 <i>1.765*</i>	0.025 <i>1.606</i>	-0.001 <i>-0.141</i>	-0.006 <i>-0.212</i>	-0.002 <i>-0.353</i>
<i>Industry characteristics</i>						
Industry concentration	-0.028 <i>-0.553</i>	-0.201 <i>-1.255</i>	-0.122 <i>-1.192</i>	-0.021 <i>-1.045</i>	-0.000 <i>-0.183</i>	0.000 <i>0.003</i>
Change in ind. concentration	-0.009 <i>-1.089</i>	-0.030 <i>-1.948*</i>	-0.000 <i>-0.103</i>	0.003 <i>0.806</i>	-0.001 <i>-0.167</i>	0.003 <i>0.879</i>
Industry growth	0.030 <i>0.660</i>	-0.062 <i>-0.709</i>	0.043 <i>0.885</i>	0.004 <i>0.312</i>	-0.025 <i>-0.897</i>	0.010 <i>0.810</i>
<i>Control variables</i>						
Transaction size	-0.000 <i>-1.423</i>	-0.000 <i>-3.139***</i>	-0.000 <i>-1.219</i>	-0.000 <i>-0.664</i>	0.000 <i>1.695*</i>	-0.000 <i>-1.497</i>
Relative size	0.025 <i>1.747*</i>	0.024 <i>1.843*</i>	0.026 <i>1.607</i>	0.001 <i>0.687</i>	0.009 <i>2.103**</i>	0.000 <i>0.177</i>
Cross-border	-0.008 <i>-1.065</i>	0.000 <i>0.000</i>	-0.013 <i>-1.414</i>	0.001 <i>0.264</i>	0.007 <i>0.684</i>	-0.001 <i>-0.124</i>
Target public / private	-0.008 <i>-0.747</i>	0.005 <i>0.210</i>	-0.010 <i>-0.811</i>	0.001 <i>0.264</i>	-0.015 <i>-1.763*</i>	0.002 <i>0.320</i>
N	267	48	219	237	42	195
Adj. R squared	0.035	0.088	0.038	-0.019	0.003	-0.002

Figure I

Cumulative average abnormal returns

This figure shows the cumulative abnormal returns around the announcement date over the period from T_{-10} to T_{+10} for acquirer, target, combined entity and rivals firms. Combined entity returns are calculated as the sum of the value weighted returns of target and bidder based on the market capitalization at T_{-21} . The rival portfolio is composed of a weighted firm portfolio in the four digit SIC code, where acquirer and bidder overlap.

