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**The effect of LBOs on firm performance**  
**The German case**

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## **ABSTRACT**

Using 46 German deals, we examine the effect of LBOs on firm performance post-buyout relative to their control firms from 2016 to 2020. LBO targets have on average higher employment growth than control firms. Public firms undergoing an LBO have a higher increase in employment and capital employment than private firms. Small firms tend to have more employment growth than medium and large-sized firms, following a buyout. LBOs increase EBITDA margin, showing that acquirers focus on increasing profitability. However, when controlling for pre-LBO growth, we see the following two things. LBO targets have significantly lower growth in firm size post-buyout than their counterparts, following the pre-buyout growth rate. LBOs are associated with a decrease of close to 23 percent in revenue and capital employment, relative to their benchmarks. Both indicate the general downsizing effect of German LBOs. Furthermore, we observe that the effect of LBOs on the EBITDA margin remains significant and increases by 2 percent following an LBO, relative to the controls. This shows that German LBOs focus on increasing profitability through downsizing, a result that is similar to that of the U.S. and the U.K. markets.

**Keywords:** Leveraged buyout, Firm performance, Downsizing, Financial Restructuring

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## **CHAPTER 1 Introduction**

Leveraged buyouts (LBO), characterized by acquiring a company primarily through borrowed funds, represent a compelling avenue for investors to restructure and revitalize businesses. However, the post-acquisition phase often witnesses significant financial, operational, and strategic transformations within the acquired firm. Target firms in public-to-private LBOs generally become profitable due to cost-cutting within the company (Kaplan, 1989). Acquirers tend to decrease investments, selling off assets, while keeping operating income constant. The latter causes an increase in profitability with this acquisition approach. However, this is not always the typical finding in research. A recent study performed in France finds the behaviour of targets post-LBO to be different, in fact boosting the growth and size of the targets (Boucly et al., 2011). Differences in post-LBO behaviour in France, relative to the U.S. and U.K., are believed to be triggered by discrepancies in the fundamentals of the targets. Desbrières (2002) found LBOs in France to be used primarily when they involved a transfer or succession of a family-owned business. Such targets also have a lower overall debt level both pre- and post-LBO, compared to non-family-owned businesses. Currently, both access to debt and a lack of management professionalism are presumed to be the basis for the contradictory results within the LBO growth research.

Past research has laid the groundwork for literature on leveraged buyouts in the U.S. and U.K. Conyon et al. (2004) found that both firms' profitability and employees' wages rise following a merger. This effect was strengthened by a merger within the same industry, compared to those in unrelated acquisitions. However, this research did not capture the full interdependence of wages and employment. Amess & Wright (2007) found that LBOs in the United Kingdom have a significant negative effect on wage growth relative to wage growth in non-LBO firms. Their research did not present any significant effect on employment growth post-LBO in target firms. Davis et al. (2011) found employment to decrease by 3 percent over two years in targets post-buyout. The overall negative effect of LBOs on wages, employment growth, and selling assets can be explained by the decades in which this research was performed. The late 90s were characterized by corporate restructuring, resulting in painful wage- and employment-cutting approaches. Researchers believed that following this era of restructuring, the essence of acquisitions may have transformed into a growth-focused approach, bringing different economic consequences post-LBO. Boucly et al. (2011) found that targets in their research become more profitable, grow much faster relative to controls, issue more debt, and increase capital expenditures. They believe that this could be caused by the relaxation of credit constraints in (family-owned) businesses. Further supporting this result, Gaspar (2012) found that private equity-owned companies in France tend to resist better against the generally observed downward trend in the productivity of French small and medium companies (SMEs). This improved performance relative to peers is instigated by increasing productivity, and lowering labour costs, while not cutting employment. Both papers bring

forth the professionalization of management teams in family-owned businesses as one possible explanatory power, combined with the extension of access to debt.

Until now, besides the U.S. and the U.K., only France has been studied. As there has not been much research affirming the positive effect of LBOs in countries with different accessibility to debt, ownership structure, and employment rigidity, more research is required to confirm the findings of growth LBOs. Since ownership structure could be one explanative factor for whether an LBO has a positive or negative effect on firm behaviour post-merger, it is captivating to conduct research in a field where the share of family-owned businesses is even higher than preceding research. Germany, relative to France, the U.S., and the U.K., has a higher percentage of family-owned SMEs and has not been studied yet. Furthermore, Germany is known for its flexible labour market regulations, as well as its less rigid employment protection laws, relative to France. Therefore, this thesis aims to answer the following research question:

*How do leveraged buyouts (LBOs) affect the target firms' behaviour in Germany post-merger?*

This paper will look at LBOs between January 2016 and December 2020. This specific period is used as target firms require at least two years post-acquisition to show significant changes in behaviour. This data on LBOs will be collected from SCD platinum. SCD platinum will be accessed through the LSEG workspace. Financial statements, the number of employees, fixed assets, working capital, total debt, triple-digit industry classifier, and EBITDA, will be retrieved from Orbis. Profitability, measured as Return on Assets (ROA), will be calculated as EBITDA over assets (fixed assets plus working capital). EBITDA over assets is used as this will, to an extent, mitigate the issue of negative net income. Leverage will be calculated as total debt over total assets. For the control group, a maximum of five companies with the same SIC triple-digit industry classifier will be taken. Similar to Boucly et al. (2011), comparable companies must have a ROA and employment count within the  $\pm 50\%$  bracket of the target company and the primary address must be in Germany. To test the effect of LBOs on firm behaviour post-merger, this paper will run multiple panel data time series regressions (yearly, 2016-2020). A total of eight firm characteristics will be our regressands, with our regressors extracted from Boucly et al. (2011), resulting in the term  $POST_{it}$  times  $LBO_i$ . Where the former depends on whether the target firm has undergone the LBO<sup>1</sup> (1 for post-LBO, 0 otherwise) and the latter depends on whether the observed firm was an LBO target or a control (1 for target LBO, 0 otherwise). A firm being (owning) a subsidiary, legal form, firm size, and pre-LBO growth will be considered as robustness checks in our analysis. We do this since the previous literature has indicated that LBO strategies tend to differ between these different legal forms and firm sizes. Where the latter will be included to separate the preexisting growth from the observed firm performance post-buyout.

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<sup>1</sup> The term  $POST_{it}$  for control firms is equals 1 when their linked target firm has undergone the LBO.

This paper has found that German LBO targets have higher employment growth post-buyout, relative to their counterparts. Public firms tend to have higher growth in employment and capital employment than private firms. Small firms have higher employment growth than medium and large-sized firms post-buyout. However, when controlling for the pre-buyout growth rate, these results become insignificant. When taking growth rate into account, LBOs are in reality associated with a decrease in revenue and capital employment, both close to 23 percent following the three years post-buyout. Furthermore, LBO targets have lower growth in firm size post-transaction relative to the (industry) benchmark, following the pre-LBO growth rate. The EBITDA margin is 2 percent higher for LBO targets following the buyout, relative to the control firms. This shows that German LBOs achieve gains in profitability through downsizing, which is something that has been found in the majority of previous research. Indicating that the German LBO market does not seem to differ that much from that of the U.S. and the U.K.

## CHAPTER 2 Theoretical Framework

This chapter will describe the current literature regarding buyouts so far. It will first go through the literature regarding the nature of LBOs. Then we will discuss the literature regarding studies in the U.S. and the U.K. Following this, we will view the (opposing) literature performed in (Western) Europe. Finally, we will investigate the structure and behaviour of firms in Germany and look at characteristics of German firms that might affect LBOs differently from buyouts performed in non-German markets.

### *2.1 Nature of leveraged buyouts*

Leveraged buyouts (LBOs), a lucrative way for private equity firms to cumulate return, have been booming since the 80s. Firms that have either growth potential or promising gains in operational efficiency are targeted by private equity (PE) firms. Typically, more mature firms are the targets for buyouts. As acquirers have greater certainty with a potential boost in operational efficiency, than realising returns stemming from growth opportunities within the firm (Easterwood et al., 1989). Targets that are public, and therefore more likely to be mature, tend to reduce in firm size and investments post-transaction. Whereas private firms, under the supervision of private equity, tend to grow in firm size and increase investments (Chung, 2011). This indicates that PE firms either focus on cutting costs to increase operational efficiency or invest in growing firms, expanding their growth and opportunities.

Management buyouts (MBOs), a form of leveraged buyouts where the existing management takes on debt to seize (full) control over a company, have a slightly different effect on target firms than LBOs. For MBOs, the increase of debt and equity post-acquisition appears to be one of the key propellants for an increase in firm performance. This is natural as the additional burden of debt creates heightened pressure for management, whereas extra equity provides greater incentives, supporting better decisions within the firm (Baker & Wruck, 1989). For MBOs increased incentives, oversight, and a change in the structure of the target firm's governance come across as the stimuli for increased firm performance post-transaction. Whereas for LBOs a change of management, bringing forth (industry) specific expertise of the acquirer, seems to be the catalyst for improving firm performance.

For MBOs, the additional burden of debt is essential as simple organisational restructuring does not clearly enhance firm performance. Investors generally disapprove of situations where a firm's size is reduced without an accompanying buyout. Where the view of investors perhaps can be explained by the external analysis of a third party, confirming that the decision to downsize is justifiable. This does indicate that financial restructuring in combination with a buyout appears to be the best firm alteration for enhancing economic performance (Bowman et al., 1999). Empirical research has confirmed this, as financial restructuring proves to be effective as a matter of fact. Economically significant changes in valuation multiples have been associated with higher operating performance gains post-LBO, relative to their benchmarks (Guo et al., 2011). Asset restructuring, either in sales or acquisitions of assets, is a



conventional method of increasing firm performance in buyouts. Typically, in larger and more mature firms the selling of assets, while keeping operational income constant, is a common strategy for increasing a firm's profitability. Research, however, indicates that studies that have been performed in the late 90s and 2000s might produce different results than studies conducted in later periods. Perhaps this insinuates that the nature of LBOs is everchanging and continuously adapting to the current credit and market conditions.

## *2.2 U.S. and U.K.*

Early literature has primarily studied buyouts in the U.S. and the U.K., in the 80s, and has found positive effects on firm performance. Research that has studied the effect of MBOs on firm performance has pinpointed the positive effect of buyouts on income before depreciation and the negative effect it had on capital expenditures (Kaplan, 1989). These findings sparked the belief that buyouts may focus on operational changes, rather than massive workforce layoffs or insider information exploitation, which were believed to be the main reasons for an increase in firm performance post-transaction. MBOs increase the firm's productivity post-buyout, affirming the idea of gains in operational efficiency rather than extensive job cuts (Amess, 2002; Lichtenberg & Siegel, 1990b). Research has found that MBOs are associated with a slightly higher increase in productivity, in comparison to LBOs (Lichtenberg & Siegel, 1990b). This result could supposedly be explained by the already high influence and familiarity of the target firm by the preexisting management pre-MBO. This perception is somewhat confirmed by Amess (2003), who found that MBOs are associated with an increase in technical efficiency in manufacturing firms post-MBO. Even indicating that there are efficiency gains two years prior to the buyout. This suggests that preliminary to an MBO, the management already starts implementing drastic changes, increasing productivity pre-buyout.

Besides changes in operational performance and productivity, employment and wage growth are affected severely by buyouts. The traditional belief of drastic layoffs in the workforce originates from acute decreases in the employment of LBO firms, especially in the early 80s. However, this idea has somewhat been disproved, as buyouts generate jobs at new establishments during the process of restructuring. When this is considered, LBOs only decrease employment by 1 percent (Davis et al., 2011). Buyouts can be viewed as a catalysator for the process of creative destruction, as the gross job creation and destruction exceeds that of control firms by 13 percent. There has not been a clear effect of buyouts identified on wage growth as the results within the literature contradict each other. Some research suggests that wages increase post-buyout, combined with an increase in profitability (Conyon et al., 2004). Whereas Amess & Wright (2007) did not find a clear effect of LBOs on wage and employment growth, they did find the tendency for target firms to have lower wage growth post-buyout than non-targets. For MBOs, the employment and wage growth of targets appears to be significantly lower than for production plants that did not change management (Lichtenberg & Siegel, 1990a). Both

papers somewhat imply that buyouts to a certain extent focus on cost reduction in labour post-buyout as an attempt to increase operational efficiency. Decreases that take place in employment can possibly be interpreted as a result of the decision of management. Management tends to correct for previous unprofitable expansion. Subsequently leading to both a decrease in sales and employees. More mature firms are more prone to this as young firms typically have more growth opportunities left to explore. Moreover, we observe that buyouts within the same industry in the U.K. and U.S. markets exhibit a more pronounced positive impact on firm performance, suggesting a stronger spillover effect for these acquisitions. Better allocation of labour increases productivity ergo profitability, which further emphasises the importance of management professionalism.

### *2.3 Buyouts in Europe*

Literature that has studied the effect of LBOs on firm behaviour in Europe has found contradicting results to that of the U.S. and the U.K. Since the early 2000s, France has been extensively studied with some findings results analogous to that of the classical cost-cutting LBO. With one paper even contradicting precedent literature, finding the presence of growth LBOs. Early research showed that target firms in France significantly underperform relative to their (industry) counterparts based on return on equity, both pre- and post-buyout (Desbrières & Schatt, 2002). This effect is similarly observed in the return on investments and margin ratios, where again the adverse effects outweigh the positive effects. Perhaps this is caused by the lower debt levels that bring less pressure to ruling management, relative to the debt levels of buyouts in the U.S. and the U.K. Stressing the importance of debt pressure in buyouts once more and showcasing a case where the transactions maintain notably low levels of debt. Remarkably, this underperformance was more severe in family-owned businesses than in formerly owned subsidiaries. Supporting the belief that subsidiaries outperform family-owned businesses, as LBOs offer a chance of expropriation, solving the issue of group integration within the formerly owned (group of) subsidiaries.

Later research has alluded to the fact that buyouts do increase operational performance and shareholder returns. A change in the firm's governance tends to have an overall positive effect on the returns for shareholders. The announcement effect, resulting in abnormal returns, was more potent for firms that were undervalued relative to their industry equivalents (Andres et al., 2007), illuminating the importance of shared sentiment towards the (management of the) firm. Operational inefficiencies combined with potential agency conflicts can be viewed as an argument for this more resilient announcement effect, signalling to shareholders that an LBO will amend these inefficiencies in undervalued firms. Repeatedly accentuating the significance of a qualified management. Along with shareholder returns, later research has indicated that LBOs are associated with an increase in firm performance and multiples (Gaspar, 2012; Acharya et al., 2013). Where the former research indicated that LBOs have positive effects on

operational returns. Likely to be generated by productivity gains, gains in operating margin, and an increase in working capital efficiency. The latter likewise studied the effect of buyouts on operating (EBITDA) margin and showed that the operating margin of LBO targets significantly increases during PE ownership.

Supposedly the most opposing results were brought forth in a study that examined France, suchlike the precedent mentioned papers. LBOs were associated with an increase in firm performance, capital expenditures, sales, employment, and capital employment. These results induced the notion that LBOs could perhaps be considered as propellants for growth within the target firm, contrary to the prevalent belief of buyouts resulting in cost-cutting and thus downsizing. There are two compelling explanations for this firm behaviour. First, in the studied period (1994 to 2004), most (family-owned) firms in France had rigorous credit constraints, limiting expansion contingencies. Second, as a large share of France SMEs was family-owned, a lack of management professionalism could have embedded operational inefficiencies within the firm. As both are practically alleviated post-buyout (given that the acquirer is credible and has expertise), growth is ignited and thus results in French target firms growing post-buyout (Boucly et al., 2011). Overall, within the research regarding Europe, the widespread view has slightly altered, leaning towards growth LBOs. Although not much research has been conducted on other firm traits, beyond firm performance, the true effect of buyouts on other features may be unrevealed. It is important to note that with takeovers, the inherent nature is dynamic, adapting perpetually to ongoing credit and market conditions. Which could perhaps explain the divergent results within the existing literature.

#### *2.4 Target firms in Germany*

For the time being, there has not been any research performed on the effect of German LBOs on firm behaviour. Looking into the firm structure while simultaneously examining the German economic conditions may be worthwhile, as both elements play a considerable role in takeovers and firm performance. First and foremost, Germany is an extremely bank-based economy, implying that credit is easily accessible for both public and private firms. A dissimilarity to the markets of France, the U.S., and the U.K., where the former does not have effortless access to debt, and where the latter two are more equity-based. One question that arises, is if German firms have plenty of growth opportunities pre-buyout, given that debt is accessible. If profitable expansion is guaranteed, independent from a buyout, the nature of LBOs may differ from that of France. Without apparent expansion contingencies, acquirers may target more mature firms and focus on increasing operational efficiency (via downsizing).

Given the easily accessible debt, we still observe differences in the capital structure of small and large German firms. We see that larger German firms tend to have a lower long-term debt-over-asset ratio, relative to small firms (Wald, 1999). A plausible explanation for this would be the behaviour of German

banks. Bank-influenced firms pay substantially higher rent on their credit than firms that are not influenced by banks (Agarwal & Ann Elston, 2001). Hence, German firms first resort to debt to capitalise their growth potential. After German firms get more mature and are credible for funding through equity, debt is lowered to decrease interest expenses (as the cost of equity, or dividends, is lower than that of debt). Even if larger firms have less debt, banks still have a high influence. We see that in the larger German firms, we also see a high stake of bank ownership in equity. Though the big influence of banks within the German economy brings capital-related benefits, there is no clear indication that the high bank influence leads to higher profitability and growth rates.

Along with firm size, firm governance tends to have an important effect on the leverage ratio. In German family-owned businesses with families still having a considerable amount of control within the firm, the leverage is substantially lower than that of non-family-owned businesses (Ampenberger et al., 2013). To some degree, this suggests that family members may not always opt for profit-maximising financial decisions and are cautious about taking on more liability (given that firm size is considered).

The corporate structures of German firms are virtually equivalent to that of the U.S. and the U.K. First, we have GmbH (Gesellschaft mit beschränkter Haftung), which resembles a private limited company. Second, we have a Non-listed AG (Aktiengesellschaft), which is comparable to a public limited company not listed. Third, we have a Listed AG (Aktiengesellschaft), which corresponds to a public limited company listed. Ownership power varies among firms between each corporate structure. In Table 1, we see that the proportion of the type of ownership varies between the three different legal entities. For GmbHs, ownership (measured as voting power) tends to be more held by non-financial firms. This perhaps could be explained by the fact that most GmbHs are subsidiaries, and thus owned ultimately by a parent company. If the parent company is not engaged in business activities related to financial services, ownership would be classified as a non-financial firm. Furthermore, we see that German firms have unexplored gains in firm performance as an increase in management ownership of up to 80 percent within the firm tends to increase firm performance (Müller & Spitz-Oener, 2001). This leaves room for potential increases in profitability in firms where ownership is highly dispersed, such as non-listed and listed AGs.

When analysing the specifics of German LBOs, we see that buyouts focused on growth firms are associated with higher levels of debt. Indicating that for financing, the offset of higher debt will be compensated by future cash flows. Signalling that information asymmetry between the parties involved in an LBO might not play that big of a role (Achleitner et al., 2018).

**Table 1.**

Shareholders categorised that have voting power using the Cubbin and Leech index. Firms that have no larger shareholder or firms with no shareholder with voting power according to the Cubbin and Leech index, are categorised as 'dispersed'.

In percent	GmbH	Non-listed AG	Listed AG	Weighted Average <sup>1</sup>
Dispersed Shares	14.75	19.21	37.70	20.65
Individuals	2.83	11.78	10.60	6.39
Non-Financial Firms	67.92	58.81	41.18	60.25
State	2.80	1.59	0.83	2.13

Financial Enterprises	0.18	0.42	3.81	0.98
Foreigners	11.53	8.19	5.88	9.61
Total	100.00	100.00	100.00	100.00
Number of Observations <sup>2</sup>	3357	1197	1207	5788

*Source:* Köke (2001). *Notes:* <sup>1</sup> Including Kommanditgesellschaft auf Aktien (KGaA). <sup>2</sup> KGaA does not have a separate category as the number of observations was too low (27).

## CHAPTER 3 Data

The data used in this paper was retrieved from SDC Platinum and Orbis. SDC Platinum was used to retrieve all transactions that became effective in the period from January 2016 until December 2020, combined with the following requirements: The primary address of the target firm had to be in Germany. The transaction had to be classified as a leveraged buyout by SDC Platinum. This query resulted in a total of 742 transactions. Slightly more than half of our sample is classified as private firms by SDC Platinum, the other half consists of mostly subsidiaries, with a very small percentage of public firms. We obtained financial statements from Orbis. Since we are using two distinct databases, with different company identifiers, we had to match company names between the databases. One issue that arose was that the name of the company could change over time or that the company was identified in Orbis under a shorter or different name. We dealt with this problem mainly by using company websites, Orbis' company name information, and North Data. The latter provided us with general information on the company's history. During these sets of steps, we also made sure that no holding company was selected. This was done by looking at the financial and employment information of the target company. With this, we ensured that the entities with the most financial activity were selected. After matching we filtered on active companies. Furthermore, companies that could not be matched or were clear divisional buyouts, were removed. This process of matching and filtering subsequently led to a sample of 550 companies. Following this, we filtered on available accounting data. We required our target firms to have non-missing accounting data on the year of the buyout and for at least 2 years before and after the LBO<sup>2</sup>. Subsequently leading to a sample size of 55 after this process. This vast drop in sample size happened due to Orbis's lack of available accounting data for many private firms for the needed fiscal years. From Orbis, we retrieved the following variables: non-current assets, working capital, number of employees, total assets, current liabilities, non-current liabilities, EBITDA, operating revenue, industry classification (SIC triple-digit), legal form, and number of owned subsidiaries. It is important to note that a decent share of our sample had missing data on operating revenue. But this is taken into account when trying to infer an effect from our results. Profitability is measured as Return on Assets (ROA). This is calculated as EBITDA over capital employment. Capital employment is calculated as non-current assets plus working capital. Leverage is calculated as the sum of current and non-current liabilities, divided by total assets. The leverage that we point to is the target firm's leverage. Similarly to Boucly et al. (2011), we will also look at the target firm's ability to raise debt post-LBO. EBITDA margin is calculated as EBITDA over revenue. All ratios are winsorized at the median plus or minus five times the interquartile range.

Subsequently, a control group was created to isolate the effect of an LBO on a target firm's (financial) behaviour. Control firms were required to meet the following criteria: the primary address needed to be

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<sup>2</sup> We use the financial data for 3 years before and after the LBO date to capture the full effect of buyouts. Most of our target and control group have available data for this.

in Germany. Control firms have the same triple-digit SIC code as target firms. The ROA and number of employees for controls needed to be within the  $\pm 50\%$  brackets of those of the target firms in the year before the LBO. Lastly, control firms were not in any LBO activity in the years prior to the target firm's buyout. If there were more than five control firms that met these requirements, the closest control firms were chosen<sup>3</sup>. Nine firms did not have at least one control firm and were therefore dropped from our sample, resulting in a final sample of 46 deals. From these 46 deals, only 12 target firms (were not a subsidiary) did not own one or more subsidiaries. One issue with a firm being (owning) a subsidiary is that post-buyout the subsidiaries could be merged into one corporation, automatically increasing revenue, the number of employees, and capital employment. Even though including subsidiaries may lead us to overestimate the effect, decreasing our sample even more would result in the chance of having too few observations for an inference of any kind. Therefore, we opted to leave them in our sample and instead use this subsidiary data as a standard robustness check.

We obtained a total of 180 control firms, as depicted in Table 3, or an average of 3.91 control firms per target firm. One concern that arises when having a target group with LBO activity and a control group with none, is the growth of the target pre-LBO. If private equity (PE) firms target firms with high growth, not accounting for this may lead to an inaccurate inference, either overestimating a positive or underestimating a negative effect. As shown by Table 2, we see that our target firms have a significantly higher median (mean) revenue growth rate than our control group. Supporting the belief that high growth firms are targeted for buyouts. We will take this into account by adding pre-LBO as a robustness check. Furthermore, we see that leverage is slightly higher for our treatment group than for our control group. Somewhat insinuating that credit constraints may not be that severe for German firms as we would expect leverage to be substantially lower if debt was not freely accessible.

Considering the noticeable difference between LBO strategies in small (private) and large (public) firms, we checked for the distribution of legal structures in our sample for both our target and control groups. For classifying whether a firm is private or public, we used Orbis's assigned legal forms. As depicted by Table 3, we see that both our target and control groups mainly consist of private limited companies (GmbHs). For our target group, the remaining share of firms are (listed) public limited companies ((non) listed AGs). For our controls, the remaining companies are mostly (listed) public limited companies, with a few being partnerships or foreign companies.

We examine the pre-LBO characteristics per legal structure for the target and control firms combined, as depicted in Table 4. Looking at private and public firms, we see that private firms have higher pre-LBO ROA, leverage, and capital employment growth. However, public firms are significantly larger in size, having more than six times the number of employees and four times the revenue of private firms. Suggesting that the public firms in our sample are more mature (as the firm size grows with maturing) and therefore more prone to downsizing post-buyout, as indicated by previous literature.

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<sup>3</sup> The firms were handpicked based on the closest ROA. If controls had a similar ROA (within the same decile as one another), the firm with the closest number of employees was chosen.

When looking at deal specific characteristics, we see that besides the year 2020, the number of LBOs per year is relatively stable, as depicted in Figure 1. The decrease in the number of LBOs in the last year is surely induced by the uncertain economic circumstances, ignited by the start of the COVID-19 pandemic. Private equity firms disfavour to partake in acquisitions in uncertain times, a tendency that has been found as well in research with a timeframe around Black Monday and the Dotcom bubble (Amess, 2002; Guo et al., 2011). Deal size is similar to that of previous research conducted in France, the U.S., and the U.K., with a median (mean) of \$62.8 (\$91.91) million in our sample. However, deal size availability is severely limited on SDC Platinum, so a comparison might not be completely accurate.

**Table 2.**

Descriptive statistics that are pre-LBO for targets and control firms. The timespan before the LBO is 3 years. The Target group has one extreme outlier that has been omitted. Capital employment is calculated as fixed assets plus working capital. ROA is calculated as EBITDA over capital employment. All the other variables are self-explanatory. All ratios are winsorized at the median plus or minus five times the interquartile range. The target group has one extreme outlier for revenue growth (>10), which has been omitted.

Variable	Median	Mean	Standard Dev.	Q1	Q3	Num. of Observations
<b>Panel A: Target Firms</b>						
Revenue(€k)	68355	118588.1	186065.9	26989.16	102181.9	119
Employee	152	692	2304	97	315	133
Capital Employment(€k)	20698.52	95357.18	201968.4	10881.52	91513.18	133
Revenue Growth	.085	.231	.549	.022	.139	117
CE Growth	.02	.211	1.091	-.047	.199	122
ROA	.166	.271	.373	.071	.366	133
Leverage	.738	.732	.307	.547	.865	136
<b>Panel B: Control Firms</b>						
Revenue(€k)	52664.09	163308.3	376007.1	21241.89	134948.1	320
Employee	140	493	1442	91	242	512
Capital Employment(€k)	10464.52	51113.97	115400.9	5295.525	25957.52	521
Revenue Growth	.035	.054	.121	.006	.087	330
CE Growth	.019	.17	.807	-.077	.146	476
ROA	.24	.299	.339	.109	.391	516
Leverage	.608	.598	.259	.4	.798	525

Notes: Data retrieved from Orbis.

**Table 3.**

Distribution of legal forms in our sample. Private Limited Companies are GmbHs. Public Limited Companies are (non-)listed AGs.

Legal Form	Target group	Control Group
Private Limited Company	42	157
Public Limited Company	4	19
Partnerships	0	3



Foreign Companies	0	1
<b>Total</b>	<b>46</b>	<b>180</b>

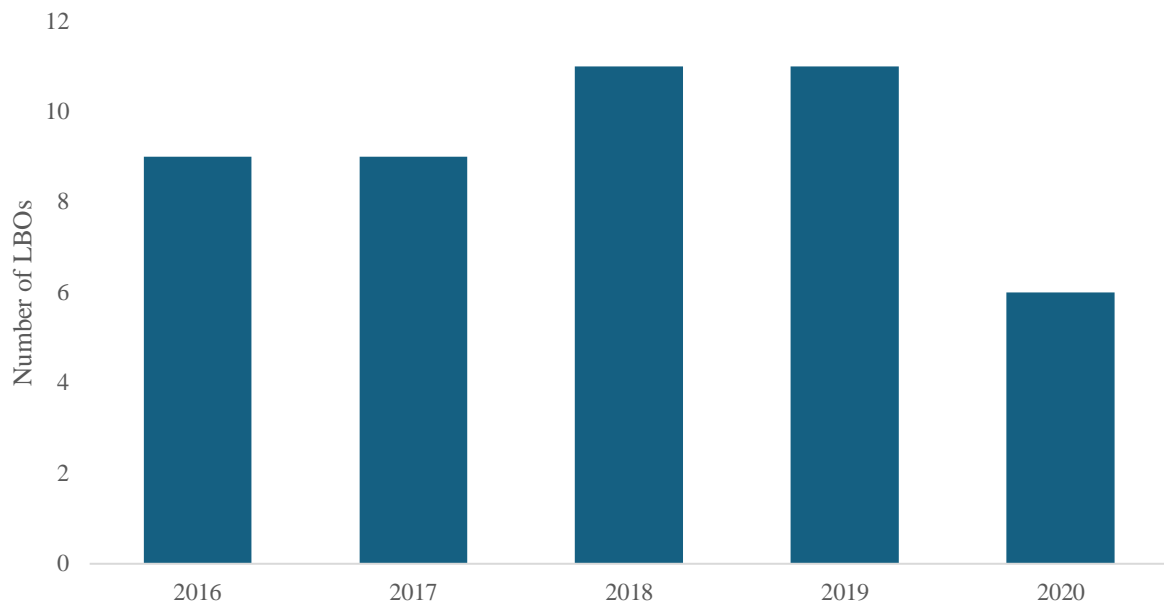
Notes: Targets retrieved from SDC Platinum with non-missing financial data in Orbis. Legal forms are appointed by Orbis.

**Table 4.**

Pre-LBO means for descriptive statistics variables per legal form (classified by Orbis) for both targets and controls. The timespan before the LBO is 3 years. The legal form group 'Private Limited Company' has one extreme outlier for Revenue growth (>10), which has been omitted. All ratios are winsorized at the median plus or minus five times the interquartile range. The legal structure foreign companies has missing data for the number of employees.

Legal structure	ROA	Revenue Growth	Capital Employment (€k)	Employment	CE Growth	Leverage	Revenue(€ k)
Private Limited Company	.288 (.379)	.083 (.362)	49427.07 (127023.46)	361 (920)	.185 (.911)	.632 (.281)	111715.09 (161767.6)
Public Limited Company	.254 (.318)	.167 (.741)	128027.57 (183082.78)	2140 (4179)	.166 (.57)	.586 (.224)	440031.9 (797446.7)
Partnerships	.108 (.043)	.044 (.074)	243938.96 (204906.47)	116 (114)	-.013 (.024)	.51 (.179)	56740.58 (50931.4)
Foreign Companies	.125 (.058)	-.065 (.061)	13473.12 (2546.77)		-.028 (.466)	.661 (.065)	33403.81 (3476.03)

Notes: Data retrieved from Orbis.



**Figure 1.** Number of LBOs per year. The sample size is 46, which includes the total amount of LBOs with non-missing accounting data. LBO data retrieved from SDC Platinum.

## CHAPTER 4 Method

### 4.1 Standard Errors Adjustments

The most recent literature with panel data has adjusted its standard errors to ensure validity by mitigating possible heteroskedasticity or autocorrelation. Even though literature provides robust standard errors against heteroskedasticity and autocorrelation, attempts at minimising cross-sectional dependence are limited and thus cross-sectional or ‘spatial’ dependence is still heavily ignored (Driscoll & Kraay, 1998; Rafael E De & Sarafidis, 2016). Cross-sectional units that experience the same impact of (micro) macro-economic changes have a higher chance of exhibiting cross-sectional dependence. All our target firms are in Germany, leaving our dataset vulnerable to this possible spatial dependence. Moreover, cross-sectional dependence frequently exists in biased samples. Since our sample size depended on whether Orbis had non-missing accounting data for our target firms, the chance of spatial dependence increases even more. We will attempt to estimate whether any other adjustments to our standard errors are necessary. Pesaran (2004, 2015) describes the cross-sectional dependence (CD) test as a reliable method for revealing cross-sectional dependency. It checks for spatial dependence of the residuals across different cross-sectional units using pairwise correlation coefficients. With the null hypothesis being cross-sectional independence, we see that our dataset exhibits strong temporal dependence (Appendix A). To mitigate this problem, we will use Driscoll & Kraay's standard errors in our panel regression with both firm and time-fixed effects. The first was proposed by Driscoll & Kraay (1998), and the latter was recommended by Bertrand et al. (2004).

### 4.2 Firm Behaviour

To analyse the effect of LBOs on firm performance we will look at the following firm characteristics in our analysis: ROA (1), log of EBITDA (2), EBITDA (3), log of number of employees (4), log of revenue (5), log of capital employment (6), leverage (7), and EBITDA margin (8). It is important to note that we include EBITDA as a continuous variable (3) as well. With this, we can ensure that the effect of LBOs on the log of EBITDA (2) is not caused by omitting negative EBITDA values. Besides profitability, we examine the effect of LBOs on EBITDA margin (8) to see if LBOs affect labour costs and operational expenses through potential cost-cutting techniques. This feature is added to investigate whether the results of Acharya et al. (2013) also hold in our sample. First, we will look at the general effect of LBOs on firm performance, without any robustness checks. We formalise our regression as follows:

$$Y_{it} = \alpha_i + \delta_t + POST_{it} + POST_{it} \times LBO_i + \varepsilon_{it}$$

Where  $Y_{it}$  is one of the eight described firm characteristics.  $POST_{it}$  is a dummy variable which equals 1 for targets from the year of the LBO and the three years after the LBO became effective. It equals 0 for

the three years preceding the LBO.  $POST_{it}$  equals 1 for control firms when their linked LBO-target's buyout became effective in that year and the three years after the transaction. It equals 0 for the three years preceding the LBO.  $LBO_i$  is a dummy variable that equals 1 for targets and 0 for control firms. The term  $POST_{it}$  will represent the change in firm performance for all firms post-transaction. The term  $POST_{it} \times LBO_i$  will reflect the effect of LBOs on firm performance.

#### 4.2.1 Subsidiaries

Since most of our target firms are (own) a subsidiary, we will have to separate non-subsidiaries from subsidiary firms. Not accounting for this may result in us over or underestimating the genuine effect of LBOs on firm performance. Group subsidiaries may be integrated, resulting in a mechanical increase in revenue, employees, and capital employment. To moderate this, we incorporate a standard interaction effect of subsidiaries with the terms  $POST_{it} \times LBO_i$  and  $POST_{it}$  as a robustness check moving forward. With this, we can segregate this probable issue of consolidation of subsidiaries. We create a dummy  $Subsidiaries_i$ , which equals 1 when a target or control firm (is a subsidiary) has one or more subsidiaries, and 0 otherwise. The term  $POST_{it}$  in combination with  $Subsidiaries_i$  resembles the overall effect of subsidiaries on firm performance post-transaction for both target and control firms. The term  $POST_{it} \times LBO_i$  interacted with  $Subsidiaries_i$  will be an indication of the general effect of an LBO on firms (being a subsidiary) owning one or more subsidiaries. We add the terms and end up with the following regression:

$$Y_{it} = \alpha_i + \delta_t + POST_{it} + POST_{it} \times Subsidiaries_i + POST_{it} \times LBO_i + POST_{it} \times LBO_i \times Subsidiaries_i + \varepsilon_{it}$$

#### 4.2.2 Legal Structure

As indicated by previous literature, strategies used by PE firms tend to differ based on whether the firm is private or public (Chung, 2011). We will examine the effect of LBOs on each legal structure. We create a dummy  $Public_i$  which equals 1 if the target or control firm is a public firm, as indicated by Orbis, and 0 otherwise. We create an interaction effect between this dummy and the terms  $POST_{it}$  and  $POST_{it} \times LBO_i$ . Where  $POST_{it}$  in combination with  $Public_i$  captures the overall firm performance of public firms post-buyout. The term  $POST_{it} \times LBO_i$  with  $Public_i$  will captivate the effect of LBOs on public firms, relative to private firms. We include this effect and formalise our regression:

$$Y_{it} = \alpha_i + \delta_t + POST_{it} + POST_{it} \times Subsidiaries_i + POST_{it} \times Public_i + POST_{it} \times LBO_i + POST_{it} \times LBO_i \times Public_i + POST_{it} \times LBO_i \times Subsidiaries_i + \varepsilon_{it}$$

### 4.2.3 Firm Size

Small and medium-sized firms are more likely to have severe credit constraints pre-buyout and will therefore generally have a greater increase in capital employment, sales, and workforce post-LBO. Although Germany has an intense bank-based economy, which logically does not result in firms having credit constraints, investigating whether smaller firms behave differently post-LBO might be intriguing, as it could confirm the existence of growth LBOs in Germany. We categorise firm size based on European standards. It is important to note that this paper will only look at the number of employees in the year before the LBO and not at turnover or balance sheet total. We do this as not all firms have available data for revenue (or balance sheet total) for all years, which would result in firms not being categorised. We define small firms whenever the number of employees is below 50 in the pre-buyout year. Firms were classified as medium-sized if they had between 50 and 250 employees in the year before the LBO. Finally, if a firm had more than 250 employees in the year before the LBO, it was classified as large. Similarly to  $Public_i$ , we create an interaction effect between  $Firm Size_i$  and the terms  $POST_{it}$  and  $POST_{it} \times LBO_i$ . Where the interaction effect between  $POST_{it}$  and  $Firm Size_i$  will show the general firm performance post-buyout for all firm sizes. The interaction between  $POST_{it} \times LBO_i$  and  $Firm Size_i$  will represent the effect of LBOs on each distinct firm size. Large firms are omitted to prevent multicollinearity. We end up with the following regression:

$$Y_{it} = \alpha_i + \delta_t + POST_{it} + POST_{it} \times Firm Size_i + POST_{it} \times Subsidiaries_i + POST_{it} \times LBO_i \\ + POST_{it} \times LBO_i \times Firm Size_i + POST_{it} \times LBO_i \times Subsidiaries_i + \varepsilon_{it}$$

### 4.2.4 Pre-buyout Growth

To ensure that firm behaviour post-transaction is not a continuation of growth prior to the LBO, we will include pre-LBO growth as a robustness check. We calculate the average three-year pre-LBO revenue growth for target and control firms and standardise this variable (standard deviation of .297). To capture the effect of pre-LBO firm growth, we create an interaction effect between both  $POST_{it}$  and  $POST_{it} \times LBO_i$  with  $Revenue Growth_i$ . Where the interaction effect of  $POST_{it}$  and  $Revenue Growth_i$  will capture the overall effect of pre-buyout growth on firm performance post-LBO. The interaction effect between the terms  $POST_{it} \times LBO_i$  and  $Revenue Growth_i$  will capture the additional effect of pre-LBO revenue growth on the firm performance of LBO targets post-transaction. We formalise our regression and obtain the following:

$$Y_{it} = \alpha_i + \delta_t + POST_{it} + POST_{it} \times Revenue Growth_i + POST_{it} \times Subsidiaries_i \\ + POST_{it} \times LBO_i + POST_{it} \times LBO_i \times Subsidiaries_i \\ + POST_{it} \times LBO_i \times Revenue Growth_i + \varepsilon_{it}$$

## CHAPTER 5 Results & Discussion

We start our analysis by looking at the effect of LBOs on each of our key firm characteristics. We obtain the results, depicted in Table 5. We observe that the overall effect for profitability (1) (measured as ROA) appears to be negative and statistically insignificant. This is similar for revenue (5), working capital (6), and leverage (7). Unexpectedly, profitability tends to decrease within our sample post-transaction. However, this may be due to the size of our sample, which is significantly smaller than that of previous research (Boucly et al., 2011; Davis et al., 2011). Nevertheless, we do observe that LBOs have a positive effect on employment (4) post-transaction, significant at the 10 percent level. We see that target firms undergoing an LBO are associated with a 6.6 percent increase in employment post-transaction, relative to the controls. There seems to be an increase in EBITDA (2), yet it shows the opposite when we look at EBITDA (3) as a continuous value. Affirming our precautionary measure of including both EBITDA measurements to prevent inaccurate estimates. Furthermore, we also observe that EBITDA margin (8) tends to be slightly lower for LBOs relative to controls, but this is insignificant and close to negligible.

**Table 5.**

Fixed-effects regression on the sample with LBO targets and their controls. The sample period is 2016-2020. All regressions include firm and time-fixed effects. Post is a dummy which equals 1 for the three years following the LBO for both LBO targets and controls. It equals 0 for the three years preceding the LBO, both for targets and controls. LBO is a dummy which equals 1 for LBO targets, and 0 for controls. Driscoll-Kraay standard errors are used.

	ROA (1)	Log(EBITDA) (2)	EBITDA (3)	Log(Employment) (4)	Log(Revenue) (5)	Log(FA + WC) (6)	Leverage (7)	EBITDA Margin (8)
Post x LBO	-.033 (.045)	.125** (.046)	-1268.7 (1337.335)	.066* (.032)	-.004 (.041)	-.056 (.036)	-.010 (.013)	-.002 (.008)
Post	-.016 (.031)	-.0.17 (.054)	163.13 (1160.9)	.047* (.025)	.018 (.017)	.037 (.023)	-.009 (.010)	.002 (.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,485	1,361	1494	1,489	1,001	1,492	1,512	993
Within R <sup>2</sup>	.013	.042	.023	.018	.09	.085	.02	.009

Notes: \*\* means significant at the 5% level. \* means significant at the 10% level.

Moving forward, we investigate the effect of subsidiaries on firm performance post-LBO. We will include this robustness check in each of our regressions to prevent an over or underestimation of the LBO effect. Following the addition of this robustness check, we obtain the findings in Table 6. We see that the positive effect of LBOs on employees still holds for non-subsidiaries. Strangely, the effect has increased and has now become significant at the 5 percent level. Indicating that subsidiaries in our sample are not integrated on a group level post-LBO, which would result in an increase in employment. However, we do see that subsidiaries tend to have higher revenue growth (5) in our sample. Furthermore, subsidiaries are associated with a 3.4 percent decrease in EBITDA margin (8) post-buyout. This is an effect that is contrary to the effect we would expect following a buyout. However, we should take into consideration that a few years of our financial data is during COVID-19, a crisis that has lowered operating income (and margins) for most firms. This could have impacted the few firms in our treatment

group and not the control group by coincidence as quick adaption to the current environment was crucial, minimising financial losses.

**Table 6.**

Fixed-effects regression on the sample with LBO targets and their controls. The sample period is 2016-2020. All regressions include firm and time-fixed effects. Post is a dummy which equals 1 for the three years following the LBO for both LBO targets and controls. It equals 0 for the three years preceding the LBO, both for targets and controls. LBO is a dummy which equals 1 for LBO targets, and 0 for controls. ‘Subsidiaries’ is a dummy which equals 1 if the target (is a subsidiary) owns 1 or more subsidiaries, 0 otherwise. Driscoll-Kraay standard errors are used.

	ROA (1)	Log(EBITDA) (2)	EBITDA (3)	Log(Employment) (4)	Log(Revenue) (5)	Log(FA + WC) (6)	Leverage (7)	EBITDA Margin (8)
Post x LBO x Subsidiaries	.002 (.064)	.156 (.136)	-3409.2 (2489.04)	-.075 (.069)	.157 (.122)	-.011 (.105)	.008 (.024)	-.034* (.017)
Post x LBO	-.05 (.073)	-.022 (.09)	348.96 (755.4)	.126** (.044)	-.113 (.104)	-.041 (.093)	-.015 (.009)	.022 (.012)
Post x Subsidiaries	.07** (.028)	.12* (.056)	3935.68*** (1114.91)	-.017 (.036)	-.079 (.046)	-.031 (.023)	-.007 (.009)	.016* (.008)
Post	-.049 (.04)	-.075 (.062)	-1855.77 (1439.04)	.056 (.033)	.066* (.035)	.053* (.028)	-.006 (.011)	-.008 (.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,485	1,361	1494	1,489	1,001	1,492	1,512	993
Within R <sup>2</sup>	.018	.046	.029	.019	.094	.085	.021	.013

Notes: \*\*\* means significant at the 1% level. \*\* means significant at the 5% level. \* means significant at the 10% level.

We then continue our analysis by looking at the specific differences between public and private firms post-LBO. We incorporate the dummy  $Public_i$ , to capture the effect of LBOs on both private and public firms, and obtain the results depicted in Table 7. LBOs are still associated with an increase in employment (4), significant at the 5 percent level. Oddly, public firms are associated with an additional increase of 13.2 percent, significant at the 10 percent level. A result we would not expect as public firms would be more prone to downsizing, following previous research (Chung, 2011). A similar unexpected result is that public firms are associated with an increase of 14 percent in capital employment (6) post-buyout. A plausible explanation for both results would be the fact that our treatment group experienced higher pre-buyout revenue growth and that the increase in firm size is merely a continuation of precedent growth and thus not caused by the LBO itself. Even if insignificant, there is a tendency in our sample for public firms to have higher profitability (1) post-buyout than private firms. Similar to ROA, we see that the operating margin (8) increases for public firms in our sample, possibly not significant due to our sample size. However, this result does slightly indicate the general objective of a buyout, namely increasing profitability. Besides these features, the effect of public firms on the other firm traits (2 & 3 & 5 & 7) is inconsiderable. We still see that subsidiaries are associated with a decrease in operating margin (8), significant at the 10 percent level.

**Table 7.**

Fixed-effects regression on the sample with LBO targets and their controls. The sample period is 2016-2020. All regressions include firm and time-fixed effects. Post is a dummy which equals 1 for the three years following the LBO for both LBO targets and controls. It equals 0 for the three years preceding the LBO, both for targets and controls. LBO is a dummy which equals 1 for LBO targets, and 0 for controls. ‘Subsidiaries’ is a dummy which equals 1 if the target (is a subsidiary) owns 1 or more

subsidiaries, 0 otherwise. The term Public is a dummy that equals 1 if the firm is public, and 0 otherwise. Driscoll-Kraay standard errors are used.

	ROA (1)	Log(EBITDA) (2)	EBITDA (3)	Log(Emplo ymen) (4)	Log(Revenue) (5)	Log(FA + WC) (6)	Leverage (7)	EBITDA Margin (8)
Post x LBO x Public	.035 (.072)	-.058 (.335)	-9116.13 (6445.57)	.132* (.072)	-.018 (.162)	.14* (.076)	-.006 (.024)	.023 (.019)
Post x LBO x Subsidiaries	-.002 (.069)	.163 (.138)	-2214.69 (2614.16)	-.092 (.074)	.162 (.119)	-.027 (.113)	.01 (.027)	-.037* (.018)
Post x LBO	-.05 (.073)	-.019 (.09)	614.39 (861.17)	.125** (.043)	-.107 (.105)	-.04 (.092)	-.013 (.009)	.022 (.012)
Post x Public	.011 (.023)	.08** (.031)	7660.32* (4002.85)	-.042 (.038)	.123*** (.029)	.025 (.057)	.054*** (.014)	-.001 (.007)
Post x Subsidiaries	.063* (.03)	.11* (.056)	2927.28*** (835.65)	-.011 (.039)	-.097* (.044)	-.034 (.022)	-.014 (.009)	.016* (.008)
Post	-.049 (.04)	-.079 (.063)	-2215.36 (1543.33)	.058 (.032)	.059 (.036)	.052 (.029)	-.008 (.012)	-.008 (.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1485	1361	1494	1489	1001	1492	1512	993
Within R <sup>2</sup>	.018	.047	.038	.02	.099	.086	.027	.014

Notes: \*\*\* means significant at the 1% level. \*\* means significant at the 5% level. \* means significant at the 10% level.

To examine the effect of firm size on performance post-buyout, we will include the categorical variable  $Firm\ Size_i$ , as depicted in Table 8. We see that the effect on employment has increased but has become less significant. LBOs are now associated with an increase of 22.2 percent in employment (4). This effect has increased as medium-sized firms tend to experience a decrease in employment post-buyout in our sample. An effect which is more consistent with the effect of LBOs in the U.S. and the U.K. Logically, we observe that small firms even have an additional increase in employment (4) post-buyout, 31.2 percent, significant at the 10 percent level. There is also, even if not significant, quite an inclination for small firms to have higher revenue (5) and capital employment (6) post-LBO, relative to medium and large-sized firms. This comes naturally, as small firms have more unexplored growth opportunities, relative to larger firms. Although this result could be caused similarly to the results of Table 7, specifically pre-LBO firm growth. Furthermore, we see that large (and small and medium-sized) firms are associated with an increase of 2.8 percent in operating margin (8) post-buyout. Showing that German LBOs focus on increasing profitability ratios. Large firms are also associated with a decrease in EBITDA of nearly €5.9 million, which could be due to either one of the two following explanations. LBOs tend to result in a financial restructure (selling assets), which lowers income. The other explanation would be that the uncertain economic conditions caused a temporary decrease in EBITDA, which we measured by coincidence. Contrary to this, we see that medium-sized firms have an increase in EBITDA post-buyout close to €7.3 million, respectively to large LBO firms. However, the effect on medium-sized firms may again be due to unstable economic circumstances caused by COVID-19. Subsidiaries are still associated with a decrease in operating margin, significant at the 5 percent level. All other firm characteristics that remain undiscussed do not tend to differ within (outside) our sample following a buyout. The fact that leverage does not increase in small firms' post-LBO does confirm our belief that credit constraints may not be that severe for German firms as opposed to French firms in the late 90s

and early 2000s. Supposedly, this may be the reason why there is no clear effect of LBOs on the performance of small firms as only a restructuring of management takes place.

**Table 8.**

Fixed-effects regression on the sample with LBO targets and their controls. The sample period is 2016-2020. All regressions include firm and time-fixed effects. Post is a dummy which equals 1 for the three years following the LBO for both LBO targets and controls. It equals 0 for the three years preceding the LBO, both for targets and controls. LBO is a dummy which equals 1 for LBO targets, and 0 for controls. Firm size is a categorical variable based on the number of employees the year before the LBO. It equals 'Small' for < 50 employees, 'Medium' for between 50 and 250, and 'Large' for more than 250 employees. 'Subsidiaries' is a dummy which equals 1 if the target (is a subsidiary) owns 1 or more subsidiaries, 0 otherwise. 'Large' is omitted to prevent multicollinearity. Driscoll-Kraay standard errors are used.

	ROA (1)	Log(EBITDA) (2)	EBITDA (3)	Log(Employment) (4)	Log(Revenue) (5)	Log(FA + WC) (6)	Leverage (7)	EBITDA Margin (8)
Post x LBO x Subsidiaries	-.038 (.065)	.164 (.135)	-1531.15 (1770.9)	-.112 (.084)	.145 (.127)	-.021 (.113)	.000 (.033)	-.037** (.015)
Post x LBO	.054 (.071)	-.096 (.152)	-5895.89* (2903.72)	.222* (.105)	-.121 (.112)	-.038 (.113)	.013 (.037)	.028** (.012)
Post x LBO x Firm Size								
Small	-.122 (.095)	.492 (1.16)	8046.56 (13793.48)	.312* (.139)	.486 (.521)	.291 (.175)	-.007 (.079)	.005 (.079)
Medium	-.119 (.093)	.103 (.137)	7289.14* (3958.49)	-.117 (.077)	.012 (.055)	-.001 (.077)	-.037 (.038)	-.008 (.024)
Post x Subsidiaries	.062* (.032)	.126* (.059)	2563.39*** (569.135)	.006 (.047)	-.099* (.051)	-.028 (.022)	-.006 (.009)	.019** (.008)
Post x Firm Size								
Small	.091 (.067)	.172 (.134)	-4572.11* (2140.66)	.001 (.08)	-.034 (.026)	.027 (.036)	-.044* (.02)	.008 (.015)
Medium	-.022 (.034)	.006 (.075)	-5300.97** (2315.03)	.103 (.062)	-.058* (.028)	.012 (.031)	.01 (.015)	.008** (.003)
Post	-.034 (.062)	-.087 (.091)	2868.96* (1541.05)	-.032 (.078)	.115** (.049)	.042* (.023)	-.012 (.016)	-.015* (.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,485	1,361	1494	1,489	1,001	1,492	1,512	993
Within R <sup>2</sup>	.024	.049	.038	.025	.101	.086	.025	.014

Notes: \*\*\* means significant at the 1% level. \*\* means significant at the 5% level. \* means significant at the 10% level.

Finally, we will include pre-LBO revenue growth as a robustness check. We include the average pre-LBO revenue growth and standardise this variable. We obtain the results depicted in Table 9. Intuitively, we see that pre-LBO growth affects firm size (4 & 5 & 6) positively. We see that for firm's post-buyout, one standard deviation (.297) is associated with an increase of 36.3 percent in both employment (4) and revenue (5) and an increase of 27.2 percent in capital employment (6). However, when looking at the effect of pre-LBO growth on the firm size of LBO targets, we see the contrary. One standard deviation (.297) is associated with a decrease in employment of 29 percent, relative to control firms experiencing the same growth, significant at the 1 percent level. Similarly for revenue, we observe a decrease of 23.4 percent per one standard deviation, relative to control firms, significant at the five percent level. Indicating that the employment and revenue growth of LBO targets post-transaction is significantly lower than that of control firms, following the pre-LBO revenue growth rate. German LBOs are now associated with a decrease of 22.6 percent in revenue (5), significant at the five percent level. Similarly,



target firms are associated with a decrease of 22.8 percent in capital employment (6) post-buyout, significant at the 1 percent level. Furthermore, when controlling for pre-transaction growth rate, we see that LBOs remain associated with an increase in operating margin (8). Although the effect has decreased to 2 percent, still significant at the 5 percent level. There is still no clear indication if LBOs increase profitability (1), but it is likely that this result would have been obtained given a larger sample size. The positive effect of LBOs on employment has now become insignificant, indicating that the previously obtained substantial effect was purely continuity of prior growth. LBOs still do not seem to have any effect on leverage, confirming the absence of credit constraints in German firms. Subsidiaries are still associated with a decrease in operating margin (8), significant at the 5 percent level. Both the effect of the pre-buyout growth rate and the general effect of LBOs show that the focus of German LBOs tends to be on downsizing, resulting in an increase in EBITDA margin (8). The fact that LBOs tend to decrease firm size, when controlling for pre-buyout growth, and result in an increase in operating margin (8), is consistent with previous literature conducted in the U.S. and the U.K. This shows that German LBOs are more in accordance with the conventional LBO and not that of the French LBO market. This is perhaps due to German firms having no harsh credit constraints pre-buyout, resulting in no straightforward unexplored growth opportunities due to the lack of debt. Even if our results follow those of previous U.S. and U.K. literature, more research on the German market should be conducted as a larger sample size may produce different results.

**Table 9.**

Fixed-effects regression on the sample with LBO targets and their controls. The sample period is 2016-2020. All regressions include firm and time-fixed effects. Post is a dummy which equals 1 for the three years following the LBO for both LBO targets and controls. It equals 0 for the three years preceding the LBO, both for targets and controls. LBO is a dummy which equals 1 for LBO targets, and 0 for controls. ‘Subsidiaries’ is a dummy which equals 1 if the target (is a subsidiary) owns 1 or more subsidiaries, 0 otherwise. One observation from pre-LBO revenue growth is omitted to prevent inaccurate estimators (see Tables 2 & 4). Pre-LBO revenue growth is standardised, with a standard deviation of (.297). Driscoll-Kraay standard errors are used.

	ROA (1)	Log(EBITDA ) (2)	EBITDA (3)	Log(Emp loyment) (4)	Log(Reven ue) (5)	Log(FA + WC) (6)	Leverage (7)	EBITDA Margin (8)
Post x LBO x Revenue Growth	.016 (.022)	-.2 (.17)	-2269.16 (1783.89)	-.29*** (.065)	-.234** (.075)	-.079 (.078)	.005 (.012)	-.001 (.009)
Post x LBO x Subsidiaries	-.102 (.078)	.317* (.173)	-5599.86 (3206.49)	-.041 (.076)	.188 (.12)	.08 (.072)	-.009 (.033)	-.036** (.015)
Post x LBO	.053 (.066)	-.24* (.11)	246.08 (1280.16)	.026 (.042)	-.226** (.087)	-.228*** (.048)	.019 (.017)	.02** (.009)
Post x Revenue Growth	-.008 (.02)	.3 (.187)	3007.31 (2015.69)	.349*** (.058)	.349*** (.065)	.272*** (.062)	-.009 (.013)	.01 (.01)
Post x Subsidiaries	.042 (.03)	.013 (.06)	5367.87*** (1460.67)	.001 (.053)	-.077 (.048)	-.034 (.039)	.007 (.007)	.018** (.008)
Post	-.026 (.034)	.07 (.066)	-2209.79 (1993.48)	.106* (.049)	.097** (.043)	.07 (.042)	-.027* (.014)	-.01 (.009)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	988	887	993	986	926	995	1003	918
Within R <sup>2</sup>	.012	.062	.041	.057	.166	.154	.029	.02

Notes: \*\*\* means significant at the 1% level. \*\* means significant at the 5% level. \* means significant at the 10% level.

## CHAPTER 6 Conclusion

Considerable research has been conducted regarding LBOs, with varying results. Early research has found an overall negative effect on firm size, following the buyouts. A recent study in France has shown that leveraged buyouts might drive firm growth, contrary to the cost-cutting mechanism that the conventional LBO strategies utilise. This paper analysed the effect of LBOs on firms in Germany. Our results indicate that LBO targets have more employment growth relative to their control firm's post-buyout. Contrary to the literature, we found that public firms have a larger increase in employment and capital employment in comparison to private firms. Furthermore, we found that small firms tend to experience more growth in employment post-transaction. Operating margin tends to increase as well post-buyout for target firms, relative to their counterparts. However, when controlling for pre-LBO growth, we see that the general effect of LBOs on employment has become insignificant. When taking the pre-buyout growth of target firms into account, we see two key highlights. First, per one standard deviation, employment and revenue tend to be 29.0 and 23.4 percent lower, respectively, than for non-LBO firms. Significant at the 1 and 5 percent level, respectively. This indicates that growth slows down significantly following a buyout. Second, German LBOs are associated with a substantial decrease in revenue and capital employment when controlling for pre-buyout growth. Both revenue and capital employment decreased by close to 23 percent, significant at the 5 and 1 percent level, respectively. Furthermore, LBOs are associated with a 2 percent increase in EBITDA margin, significant at the 5 percent level, showing that acquirers focus on increasing margins through downsizing. An effect that has been found in previous studies conducted in the U.S. and U.K. The fact that leverage does not seem to increase post-buyout shows that credit constraints are not that severe for German firms. This implies that the unusual results of Boucly et al. (2011) perhaps mainly originated from the fact that French firms had severe credit constraints in the late 90s and early 2000s. Even if our research indicates the German LBO market does not differ that much from the U.S. and U.K. markets, which had primarily been studied in previous literature, different results may have been found if a bigger German sample size could have been obtained. Future research should investigate the following two things. First, whether the results found in this paper hold as well with a larger sample size. Second, if the results found in this paper would have been different if the timeframe had been in the late 90s and early 2000s. The last point is important as the European credit and equity market was not as developed as that of the U.S. and U.K. markets in this specific period. This would logically explain somewhat the geographic differences in results as growth LBOs tend to be (partly) caused by the alleviation of credit constraints. Additional evidence for this plausible explanation would be beneficial for markets where access to credit currently remains relatively restricted.

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## APPENDIX A

### Appendix 1. Cross-sectional dependence test.

Cross-sectional dependence test, as suggested by Pesaran (2004, 2015). All ratios are winsorized at the median plus or minus five times the interquartile range.

Variable	CD-Test	p-value	Average Joint T	Mean $\rho$	Mean abs( $\rho$ )
Log(Employee)	33.065	0.000	8.54	0.07	0.52
Log(Revenue)	71.692	0.000	7.25	0.11	0.27
Log(EBTIDA)	27.9	0.000	7.48	0.06	0.38
Log(Capital Employment)	37.897	0.000	8.68	0.08	0.46
EBITDA	21.943	0.000	8.62	0.05	0.37
Leverage	9.107	0.000	9.04	0.02	0.45
ROA	5.621	0.000	8.49	0.01	0.36
EBITDA Margin	1.56	0.119	7.22	0.00	0.19