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The Influence of Leveraged Buyouts on Target Firms' Competitors

Non-Technical Summary

The market for Leveraged Buyouts (LBOs) is alive and well. The past year 2014 alone saw a worldwide total of 802 Private Equity sponsored LBOs with a total volume of over 60 billion US dollars. Especially European LBOs have grown increasingly strong after the end of the financial crisis, climbing to an average per-deal volume of 350 million US dollars in 2014, from only 80 million US dollars in 2009. These numbers are reflected in investor sentiment: fundraising for Private Equity funds with a European focus have reached pre-crisis levels with a total of 100 billion US dollars in 2014. Given these magnitudes and the economic relevance of this market for both investors and portfolio companies, an understanding of the mechanisms of LBOs is utmost important. Although past research has shed light on many details of these transactions, one aspect has remained largely opaque: the influence LBOs have on direct competitor companies of the LBO target company. Given the increasing number of deals, and the growing fundraising volumes triggering more LBOs in future years, answers need to be found: are LBOs a desirable activity in financial markets which perhaps cause positive externalities, or are these transactions harmful even for unrelated third parties? This paper attempts to answer these questions.

We use a data set comprised of LBOs in the period 1985-2009 which contains information on the LBOs itself, as well as on the singular restructuring activities performed in the portfolio companies as part of the LBO process. Every LBO is usually conducted in three broad stages: first, the portfolio company is fully "bought out", meaning that the LBO firm acquires all outstanding equity and debt of the portfolio company, to re-lever it using a more desirable and typically strongly leveraged capital structure. In a second step, the LBO firm restructures the operating business of the company, its governance structure, and its strategic direction. This process serves the purpose of creating a cash flow to pay down the newly issued debt, and to increase the economic value of the portfolio company. The final stage is the exit in which the portfolio company is sold, desirably at a premium to the original purchase price. We hypothesize that the acquisition and re-leveraging of the portfolio company as well as the applied restructuring mechanisms affect not only the portfolio company itself, but also all of its director competitors. For example, better governance might benefit the portfolio company to gain a competitive edge in the product market, thereby causing potentially decreasing revenues of the competitors. However, higher cost of capital due to excessive leverage might benefit the competitor companies. Since different LBOs are comprised of different restructuring activities, their influences on competitors might vary as well. We therefore analyze not only the influence an LBO itself has on its direct competitors, but we also differentiate between the different applied restructuring mechanisms and the influences these have on competitors. Our analyses produce two major results. First, LBOs have a strongly significant and negative effect on competitors' revenue growth. This effect is especially pronounced the larger the size of the LBO is. Second, we can show that different restructuring mechanisms in LBOs affect the LBO targets' competitors in different ways. Whereas increases of leverage beyond optimal levels have a negative effect on the competitors, strategic restructuring methods like M&A deals benefit the operating performance of the competitors.

Overall, our results suggest that the single restructuring mechanisms applied in LBOs affect competing companies through product market competition.

From a policy perspective, these results are perhaps interesting. The Private Equity market is largely unregulated, as both investors and PE firms are seen as 'sophisticated' by the regulator. Given the fact that LBOs create strong – sometimes adverse – effects on markets and competing companies, this deregulation should be seen with some scrutiny. After all, the affected companies might not meet the 'sophisticated' standard or be part of this market, yet still be involved in the LBO transactions. However, LBOs can also create desirable effects in markets and might therefore contribute to economic welfare. The fact that these positive effects also benefit other, seemingly unrelated companies, is a new revelation and must be taken into consideration when evaluating the market for LBOs, and especially its regulation.

The Influence of Leveraged Buyouts on
Target Firms' Competitors

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Abstract

This paper analyzes the influence Leveraged Buyouts (LBOs) have on the operating performance of the LBO target companies' direct competitors. A unique and hand-collected data set on LBOs in the United States in the period 1985-2009 allows us to analyze the effects different restructuring activities as part of the LBO have on the competitors' revenues. These restructuring activities include changes to leverage, governance, or operating business, as well as M&A activities of the LBO target company. We find that although LBOs itself have a negative influence on competitors' revenue growth, some restructuring mechanisms might actually benefit competing companies.

Key Words: Competition, Peers, LBOs, Product Market, Restructuring

JEL Classification: D43, G23, G24, G34

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1   Introduction

Leveraged Buyouts (LBOs) are a decisive event in the life-time of a firm. The impact of this event may, however, not be limited to the firm itself but affect its competitors as well. This linkage between the financial structure and corporate governance of LBO firms on the one hand and product market competition on the other hand has been investigated in a number of empirical studies for individual industries (see e.g. Chevalier (1995a) and Pichler et al. (2008)). These studies thereby rely on theoretical papers addressing various mechanisms through which capital structure (and hence LBOs) affect product market competition (see e.g. Glazer (1994) and Brander and Lewis (1986)).

We aim to extend these empirical studies in two directions. First, by using a broad sample of U.S. LBOs we are able to ask for the product market effects across industries rather than focusing on one industry only. Second, rather than relying only on the sheer existence of an LBO and its impact on the leverage of the LBO target in an industry, we address the detailed underlying mechanisms of LBOs on product market competition. Specifically, we observe restructuring mechanisms of target companies affecting their capital structure and operations, to see which influence they might have on competitors. Thereby, we also aim to shed light on various different mechanisms and channels through which LBOs may affect industry structure and most importantly the competitors of LBO targets in particular, most notably their operational performance in the aftermath of an LBO. Our two main

research questions thereby are: for which financial and corporate governance measure do we observe which effects on competitors in the respective industry? And which of these measures have the most immediate and strongest impact on competitors? In trying to find answers to these questions, we aim to open up the "black box" LBO with respect to its impact on the competition and the structure of affected industries and contribute to linking corporate finance with industrial organization. We view LBOs as particular events in which firms do not only potentially change their corporate governance but also their capital structure to a significant degree (following Jensen's original description (1989)). In this sense, LBOs are a particular useful "playing ground" enabling us to investigate the impact of changes in corporate governance and capital structure on competition and competitors.

We start by investigating the general effects of LBOs on the respective competitors of LBO targets by running a number of preliminary univariate and bivariate tests using a broad sample of 653 LBOS in the U.S. in the period of 1985 to 2009. This exercise clearly reveals that LBOs in a particular industry have a (negative) impact on the competitors of the LBO target. In a next step of our analysis, we pursue an in-depth investigation of the restructuring mechanisms of the LBOs in the target companies and their impact in competitors. With this step we use a subsample of 216 LBOs for which we are able to obtain the information on the details of the restructuring mechanisms undertaken in the course of the LBO. This subsample comprises LBOs which were exited by way of Initial Public Offering (IPO). The required filings with

the Securities and Exchange Commission (SEC) as part of an IPO process in the U.S. allow for a most detailed analysis of the restructuring the companies underwent as part of the LBO. Collecting this data therefore lets us determine all changes to the leverage and governance structures, as well as to other operating business activities of the targets. To analyze the effects of these changes on the targets' peers, we match the LBO target and its peer companies in a three-stage matching process. The actual effects are then measured by using the changes in peers' revenues. The change in these variables is measured in a symmetric time window of 3 years around the LBO (using quarterly data). We choose this variable because we think that it provides the best feasible measure for our competitive effects we aim to look at. Since we lack direct information on prices we proxy the effects of competitive forces on prices and market share of the competitors with our revenue growth variable. We measure the changes in two subsequent test stages. In univariate tests, we run difference-in-medians and AR(1)-process tests to obtain a first understanding of the effects. In the second step, our main analysis is comprised of a multivariate pooled OLS regression model in which we also control for size and competition effects.

Our analyses generate two major results. First, LBOs have a strongly significant and negative effect on competitors' revenue growth. This effect is especially pronounced the larger the size of the LBO is. Second, we can show that different restructuring mechanisms in LBOs affect the LBO targets' competitors in different ways. Whereas increases of leverage beyond optimal levels have a negative effect on the competitors, strategic restructuring methods like M&A deals benefit the operating performance of

the competitors. Overall, our results suggest that the single restructuring mechanisms applied in LBOs affect competing companies through product market competition.

This paper offers two specific contributions. First, we add further insight into the external effects of LBOs and thereby contribute to and connect with a most recent body of literature analyzing the effects LBOs have on the real economy, such as Davis et al. (2014) or Bernstein et al. (2015). Second, we detail the restructuring activities Private Equity firms undertake in their portfolio companies to generate returns from LBOs, including re-leveraging, M&A transactions, and governance changes, thereby extending the research of e.g. Muscarella and Vetsuypens (1990), Hotlhausen and Larcker (1996), Bruton, Keels, and Scifres (2002), Murray, Niu, and Harris (2006), Kaplan and Strömberg (2008), Demiroglu and James (2010), or Ivashina and Kovner (2011).

The paper is structured as follows: part 2 contains a literature review and hypotheses development. Part 3 introduces the data set, with special regard to the peer selection process. Part 4 explains the uni- and multivariate analyses and all results. Part 5 discusses several robustness tests, and the final part 6 concludes.

2   Theoretical Background and Hypotheses Development

Our paper is based on the body of literature analyzing external effects of LBOs. Slovin et al. (1991) were the first to show that going private transactions, many of

which are LBOs, have a positive effect on the stock prices of the competing companies in the LBO targets' industries. A first empirical paper analyzing the effects of LBOs on the business model of LBO target companies' competitors is Chevalier (1995a). She shows that LBOs in the supermarket industry lead to overall prince changes in the respective industry. In a follow-up paper, Chevalier (1995b) also shows that the market structure is changed through an LBO. LBOs make it easier for competing companies to enter into the local market of the respective LBO target. In a very general sense, these papers are the first to shed light on the effects an LBO can have on the competing firms and on the market structure they operate in. Kovenock and Phillips (1997) built on these results by analyzing the external effect of one specific core component of an LBO, debt. They show that a high increase in the LBO target companies' debt levels cause competing companies to increase their investment levels in order to grow, especially when the market share of the LBO target company is higher. Hsu et al. (2012) find that peers suffer from decreasing stock prices and operating performance after an LBO and analyze these effects based on cross sectional differences among competitors; however, they do not take into account differences among LBO targets.

All these analyses are based on a theoretical literature in the field of industrial organization which investigates the linkage between capital structure, competition and peer reaction. The general idea behind all these theoretical papers is that capital structure changes alter the way firms compete in product markets. An increase in leverage makes firms more (see e.g. Brander and Lewis (1986)) or less aggressive (see

e.g. Glazer (1994)). This in turn, affects competitors negatively, or positively. Other papers in this literature consider the impact of capital structure on entry deterrence (see e.g. Bolton and Scharfstein (1990)) or the impact of leverage on product quality rather than only stressing the price-quantity channel. Whereas the channels differ depending on the precise dynamic structure of firms in oligopolistic industries, all these papers argue that more leverage affects the strategic interaction between firms and hence product market competition and outcome. Obviously, LBOs are a perfect playing ground to investigate the link between capital structure and product market competition.

More recently, Brown et al. (2009) and Bernstein et al. (2015) indirectly analyze the external effects of LBOs. Brown et al. (2009) show that LBOs hurt the bargaining power of the LBO target companies' suppliers, leading to potentially lower production costs for the target, which should have an influence on the competitors. Bernstein et al. (2015) show that industries in which LBOs take place have higher productivity and employment growth as compared with other industries. Taken together, the entire existing body of literature suggests that LBOs not only influence the LBO target itself, but also via the product market the targets' competitors and thereby the whole industry they operate in. Based on this literature, we therefore formulate our first hypothesis which establishes in a very general sense that LBOs influence the performance of the target companies' competitors.

Hypothesis H$_1$: LBOs do have an influence on the performance of the target company's competitors.

Next to establishing the fact that LBOs have some kind of influence on the target company's competitors, we also ask of which nature this influence is and even more importantly through which particular mechanism and channel this effect operates. Specifically, we are interested in one question: which particular activities undertaken in the course of an LBO do have a positive or negative influence on the target company's competitors' operating business? This question has never been formally answered in the prior research on this topic. Prior research (see e.g. Kovenock and Phillips (1997) and Chevalier (1995a)) has only looked into the combined effects of LBOs rather than breaking-up the black box.

The LBO- literature distinguishes two main aspects of LBOs. For example, in his seminal work on LBOs, Jensen (1989) states that an LBO changes two major things in a target company: its leverage and its governance structure. The leverage is usually increased and the governance structure optimized to solve agency costs through incentives. We treat these two main channels through which the LBO affects competitors separately: the restructuring mechanism and the capital structure (leverage) channel. The first mechanism through which the LBO target is affecting its competitors, the restructuring process, is basically resting on changes in the cost of the LBO target. The application of a standard model of oligopolistic interaction (see e.g. Tirole (1988)) leaves us to believe that such cost reductions always lead to a lower

level of profitability and revenues with the competitors of the LBO target (see the Appendix of the paper for an analysis of the cost reduction effect in the two work horse models of oligopolistic competition, the Cournot and the Bertrand model). This effect is more pronounced if the number of competitors in a particular industry is small (see Appendix) and/or if asymmetries prevail. The larger the LBO target the more pronounced the negative effects on the competitors. Against the background of our idea we hence formulate our second hypothesis.

Hypothesis H_2: A better LBO-induced governance structure of the target company should have a negative influence on the target company's competitors. This effect is more pronounced the more concentrated the industry is and the larger the size of the LBO target.

In a further hypothesis, we account for additional restructuring activities an LBO might trigger in a target company: M&A deals. M&A deals aim to exploit further synergies with the merged company. In that sense, we should expect not only higher market shares of the newly merged companies but also, via the exploitation of synergies, lower costs. At the same time, mergers, most particular horizontal mergers in a particular industry may very well affect the intensity of competition (see Farrell and Shapiro (1990) and Salant et al. (1983) for classical treatments and Bernile et al. (2012) for a more recent analysis). Depending on whether the cost or the competition effect prevails we should expect a negative or positive effect on competitors. Since with vertical mergers, the competition effect is typically absent, the negative effect should dominate.

Hypothesis H₃: LBO-induced M&A deals within the target company have a potential cost as well as competition effect. Given that both effects point in opposite direction, we should typically expect a positive effect on competitors if the competition effect dominates.

The second channel through which LBOs affect competitors, the leverage effect, works through the strategic interaction on the product market (see e.g. Glazer (1994) and Maksimovic (1988) for the first theoretical studies on these strategic interactions). Higher leverage implies a contractual commitment for management to repay a fixed amount of its cash to debtors and either leaves less free cash flow on the table or forces firms to earn more cash. Models which depict the impact of leverage on competition and hence on the competitors stress not only different mechanisms but also reach different conclusions. Some stress a negative impact of higher LBO target leverage on market price and competitor revenue (see e.g. Brander and Lewis (1986) and Bolton and Scharfstein (1990)) since in these models higher leverage makes the management of the LBO target to act more aggressively (hence leading to more aggressive pricing or less incentives to collude (see Maksimovic (1988)). Other models' set-up focus on the higher risk of bankruptcy associated with higher leverage. Higher bankruptcy risks associated with higher leverage make the LBO target less aggressive (see e.g. Povel and Raith (2004)). This, in turn, allows us to expect a positive effect on competitors associated with an increase in leverage with the LBO target. Based on this notion, we formulate our fourth hypothesis:

Hypothesis H₄: An increase in leverage of the LBO target company to the optimal debt levels has an ambiguous effect on the target company's competitors.

3   Data Set

3.1   Data Collection and Peer Identification

In order to investigate our broader question, namely whether and which effects LBOs have on their competitors per se (Hypothesis 1) we employ a data set which comprises 653 LBOS in the United States in the period of 1985 to 2009. Out of these 653 LBOs we use 216 LBOs for which we have detailed information on their activities around the LBO process (see details below) which allows us to test our hypotheses 2-4. The remaining 437 LBOs have been identified as all deals in Thomson SDC Platinum that are flagged as LBO or going private transaction with an acquirer having a typical leveraged buyout company SIC code[5]. Buyouts of financial institutions, without existing Compustat data or without matchable peers have been deleted from the original dataset.

For our main analysis we use a subsample of our main sample which consists of 216 LBOs in the United States in the period 1993 to 2006. This sample is comprised only of LBOs which were exited by way of Initial Public Offering on U.S. stock exchanges. With this subsample we are able to obtain the necessary information about restructuring processes as part of the LBO are mentioned in the S-1 stock offering

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[5] Typical leveraged buyouts SIC codes are e.g. 6211, 6282, 6719, 6722, 6726 and 6799.

prospectuses the IPO companies have to file with the SEC during the going public process. We make use of these prospectuses (and the post-IPO updated 424-B filings) by hand-collecting the information given therein about the changes made to the companies during the LBO investment process, in particular governance changes, M&A transactions or capital structure adjustments. This information allows us to analyze the effect of the details of the LBO processes on the peers in the respective industry. An overview of the collected information per deal along with summary statistics is given in Table 2 Panel C of the paper.

Pivotal for our analysis is the correct identification of the LBO companies' peers. Potential peers are classified in industries using the Global Industry Classification Standard (GICS) which has been developed by Standard & Poor's and Morgan Stanley Capital International Inc. As shown by Bhojraj et al. (2003) this classification standard is superior to other standards (SIC, NAICS or Fama and French (1997)) when analyzing capital market or accounting variables. To ensure that we only take closest peers into account, we use the most granular GICS code available and match on 8-digit GICS codes which classify all firms available into 154 sub-industries.

In the matching process, we perform a 3-step procedure: First, we start with the entire Compustat universe without financial institutions and with existing GICS code (18,984 unique companies). Second, we take only the companies into account that have the same GICS codes as our LBO targets (17,988 remaining unique companies). Finally, we drop all companies which have missing values for our quarterly

measured variables within the period of 3 years before and after the LBO (3,588 remaining unique companies).

3.2 Summary Statistics

The summary statistics of our data set are presented in Table 2. The average LBO target in our sample is rather large with 1.06 bn. USD in assets and 229 mn. USD in revenues. However, comparing mean and median numbers shows a considerable heterogeneity in the data set, especially in size and profitability. Median assets and revenues are at 214 mn. USD and 60.3 mn. USD, respectively. Going forward in our analyses, we will have to control for these differences diligently. Of greater importance to our analyses is the comparison of the LBO targets and their peers, as also presented in Table 2. For 653 LBOs we obtain 3,588 unique peers in total and 13,021 matched observations, as shown Panels A and B. These peers do show statistically significant differences from the LBO targets with regard to revenues, assets, long-term debt as well as leverage at LBO as shown by the difference-in-medians test in the right-most column of Panel A, Table 2. While this is not too surprising for the long-term debt and leverage variables, it is to be expected that the LBO targets exhibit much larger debt and leverage numbers than their peers since high leverage is a unique feature of LBOs. But with respect to the other variables this indicates a potential selection effect, an important finding for our analysis which needs to be taken into account in later steps of the analysis.

Finally, Panel C reports summary statistics on the actual restructuring activities in the LBOs of our subsample (216 LBOs). We see that the LBO firms hold the majority of the board seats in a fifth of the LBO targets (46), the management is replaced in 55 targets and almost half of the targets are restructured using M&A deals (106). Also, management is awarded ownership in almost all targets (202). An increase in leverage from pre- to post-LBO can also be seen. These numbers suggest that the LBO targets undergo strong restructuring following the LBO, especially by means of governance and leverage. Our data set therefore seems suitable to test the postulated hypotheses, as all LBO-typical features are seen in our in-sample LBOs and might therefore perhaps also influence the LBO targets' peers.

4 Methodology and Results

4.1 Methodology

We perform a two-step procedure to test the postulated hypotheses. In a first step, we run a number of simple univariate tests to measure the general influence an LBO in general can have on peers' revenue growth. We use a difference-in-medians analysis comparing the change in revenue growth of the peers from before to after the LBO (see Panel A of Table 3). We also run an AR(1) process to calculate median forecast errors following standard earnings surprise literature as in Kothari et al. (2006). Using the same methodology, we estimate AR(1) processes for quarterly revenue growth for every single peer using data up until the LBO date. The revenue

growth variable is seasonally adjusted. In a next step, we calculate fitted values from the LBO date onwards using the coefficients estimated in the AR(1) process and calculate forecast errors by taking the difference between realized values and fitted values. The median forecast error of all peers is then tested for being different from zero using a Wilcoxon matched-pairs signed-ranks test. A negative median forecast error would therefore be evidence for a worse development of the peers compared to what could have been expected from their past performance. Results can be found in Panel B of Table 3. As further analysis, we run a pooled cross-sectional OLS regression model with all revenue growth as being our dependent variables. As independent variables we use an LBO dummy which equals 1 from the time of LBO onwards and the lag of the dependent variable in order to control for other factors. Results can be found in table 4. With all these steps, we address hypothesis 1 from different angles.

In order to address hypotheses 2-4 we open up the black-box of LBO activities and undertake a multivariate regression as pooled cross-sectional OLS with the same three dependent variables. We include, additionally to the LBO dummy, proxies for corporate governance changes and restructuring measures as well as leverage and size variables. To measure corporate governance changes, we include a majority of board seats dummy which equals 1 if the PE company holds more than the majority of board seats from the LBO onwards. Additionally, we take CEO and CFO changes within 180 days after the LBO (CxO change dummy equaling 1 from the change date onwards) and management share ownership (in % of total shares) as well as an

earnings management dummy equaling 1 if the LBO target undertook earnings management (e.g. working on depreciations and amortizations or capital expenditures) into account . Our proxy for restructuring measures consists of an M&A deal dummy which equals 1 in quarters where the LBO target undertook majority stake acquisitions. As leverage variable we take the industry adjusted LBO leverage ratio over time. As control variables, we used several peer variables measuring size, leverage, financial constraints and M&A activities of peers, industry variables (proxies for competition, valuation and earnings volatility) and capital market variables (e.g. high yield spread and S&P 500 returns). Results can be found in table 5.

4.2   Univariate Results

The first set of univariate results is presented in Table 3. Panel A contains the results of a simple Wilcoxon-Ranksum test comparing the median numbers of our revenue growth variable from before to after the LBO. The numbers show that the LBO target peers' revenues grew significantly stronger in the 12 quarters prior to the LBO than after the LBO. Quarterly revenue growth dropped by 0.72 percent to 2.05 percent for the entire sample and by 0.66 percent to 2.4 percent for our subsample.. These results suggest – disregarding any restructuring activities or other influences – two things: first, that the LBO targets peers' exhibit a reduced growth in operating strength in our observation window, and second, that perhaps the LBO might have something to

do with this reduction. This might be a first tentative indication the LBOs do influence the operating strength of the targets' peers.

We further investigate this with our second univariate test, as presented in Panel B of Table 2. The median forecast error of the AR(1) model shows negative coefficients for our revenue growth variables. These fitted values from the LBO onwards also suggest that revenues growth slowed down significantly after the LBO. This is true once again for our entire sample as well as the subsample. Therefore, these numbers provide additional support for the results of Panel A.

Finally, Table 4 contains the last set of preliminary results providing further support for our hypothesis 1. We report results of a bivariate regression analysis, in which we explain the movement in our three main variables using just an LBO dummy variable and the lagged values of the dependent variables to control for possible momentum effects. The results also show statistically highly significant and negative coefficients of the LBO dummy variable in all three models. This means that the LBO provided a strong enough shock to the time series of revenues to significantly influence the variables negatively. This is further support for the results of Table 3, showing how an LBO might influence the targets' peers in their revenues and profitability. Although only tentative due to the descriptive nature of the tests, we believe these results might be a first indication to support our hypothesis H_1 that LBOs have the potential to affect the targets' peers. Building on these indications, we will further explore this in the subsequent parts.

4.3   Multivariate Results

In Table 5 we report our multivariate regression results. We run a pooled cross-section OLS model. The left-hand side variable is the growth rate of our revenue variable for the peers of the LBO target. We include on the right-hand side our proxies for LBO governance, restructuring and leverage measures. We control for characteristics of the peer companies as well as for industry specific characteristics, capital market variables and LBO year fixed effects.

We address the corporate governance process of the LBO target in various dimensions. We use LBO majority of board seats, LBO management shares after LBO, LBO new CxO (insider as well as in general), and LBO earnings management and restatement as our proxies for governance mechanisms which are employed in the course of the LBO. Our findings are consistent with our hypothesis 2. Better corporate governance of the LBO target leads to more competitive pressures on the industry peers and a declining growth rate in revenues. This is in particular true for the incentive mechanism of management on the peers' growth rate of revenues. The same is true if the LBO target is actively replacing its CEO with an industry insider. We interpret our two other variables, the replacement of the CEO per se, as well as earnings management and restatement as proxies for corporate governance problems of the LBO target having a positive and statistically significant impact on peers' revenue growth, thereby once again confirming our hypothesis 2. The fact that the PE exerts strong influence on the LBO target via a majority of board seats, however, has

no significant influence on competitors even though the sign of the relationship is pointing to the right direction.

The M&A effect on competitors is ambiguous. This, in a sense reflects the ambiguous prediction of the theory (see hypothesis 3). We find a negative statistically non-significant impact on competitor's revenue growth thereby pointing to the fact that the cost synergies seem to weakly dominate the potential competition effects in our sample, however, in a non-significant manner. In terms of leverage, our multivariate analysis indicates that higher leverage levels of the LBO target have a positive and significant effect on revenue growth of competitors. We thereby measure leverage not in absolute terms but relative to the total assets of the LBO target. Levering LBO targets up seems to make them less aggressive in the product markets.

Up to now we have, however, not at all taken the potential selection effect into account which seems to be very apparent from our findings in Table 2. In order to do so we employ a Heckman selection model. For the first stage of the two-stage selection model we use a number of firm characteristics to estimate the selection of a LBO target. We employ lagged observation of key firm variables, namely firm age, M&A activities in the last ten years, leverage ratio, cash-to-assets, log assets as well as return on assets. In the second stage of the Heckman model we use the same variables as in our previous analysis (see Table 6). It turns out that the results of the OLS estimation deviates only rather little vis-à-vis the Heckman model which takes the selection effect into account. This is true not only for the statistical significance

but also with respect to the sign of the coefficients. Hence, we get a strong confirmation of our previous findings when accounting for selection effects.

6   Conclusion

This paper analyzes the influence Leveraged Buyouts (LBOs) have on the operating strength of the LBO target companies' peers. Using two data set of a large number of LBOs in the United States over the period 1985-2009, we are able to distinguish two effects an LBO might have on the peers. First, the general shock an LBO itself has on the operating strength of the peers, and second, the effects single restructuring activities within LBOs have on the peers. Specifically, we analyze how changes to the targets' leverage and governance structures as well as business restructurings through M&A deals have on the target peers' revenues. Our results show that LBOs have a strongly significant and negative effect on competitors' revenue growth. Also, we can show that different corporate governance mechanisms in LBOs can lead to different impacts on peers' operating performance. Whereas increases to leverage have a positive effect on the competitors, strategic restructuring methods like M&A deals have an ambiguous impact on revenue growth of the competitors. We show that correcting for endogeneity of LBO target selection with the help of a two-stage Heckman regression approach leaves our main results unchanged.

In running these analyses, our paper contributes to the existing body of literature in two ways. First, by using a broad sample of U.S. LBOs across various industries, we

can analyze product market effects across industries rather than focusing on one industry only. Second, by addressing the detailed underlying restructuring mechanisms within LBOs, we can analyze the effects that changes to governance and leverage structures as well as M&A deals have on product market competition. Thereby, we also aim to shed light on various different mechanisms and channels through which LBOs may affect industry structure and most importantly the competitors of LBO targets in particular. Our results are perhaps also relevant for regulators. In the aftermath of the recent financial crisis, regulators have put the Private Equity sector under heightened scrutiny. The results of this paper might help in better understanding the externalities of LBO deals and how to better deal with them in the future.

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Table 1   Variable Descriptions

The table contains a list of all variables used in the analyses of the paper. Presented are the names of the variables, along with units and descriptions.

Variable	Unit	Description
Operating Performance Variables		
Quarterly revenues growth	%	Revenues this quarter minus revenues last quarter divided by the revenues last quarter and winsorized at the 1% level.
Difference quarterly revenues growth post/pre LBO	%	Average quarterly revenues growth post LBO minus average quarterly revenues growth pre LBO.
Main LBO Factors influencing Competitors		
LBO dummy	Dummy	Equals 1 from the LBO date onwards.
LBO majority of board seats	Dummy	Equals 1 if majority of members of the board of directors belong to PE investor.
LBO shares mgmt after LBO	Dummy	Equals 1 if the top-level management ownership after LBO (and before IPO) is greater than 0.
LBO new CxO industry insider if new CxO within 180 days	Dummy	Equals 1 if a CEO or CFO change occurs within 180 days after LBO and if the CEO or CFO already worked in the same industry in the past.
LBO new CxO within 180 days	Dummy	Equals 1 if a CEO or CFO change occurs within 180 days after LBO.
LBO M&A frequent transactions	Dummy	Equals 1 if the LBO target is engaged in more than one M&A events after LBO (and before IPO), source: Thomson One.
Leverage (%)	%	Long-term debt divided by total assets.
LBO earnings mgmt & restatements	Dummy	Equals 1 if the LBO target is engaged in accrual-based earnings management or if the LBO target restated its earnings.
Further Control Variables		
Log assets	Log (USD mn)	Natural logarithm of total assets.
Return on assets	%	Is calculated as operating income before depreciation and amortization divided by total assets.
Cash to assets	%	Is calculated as cash and short-term investments divided by total assets.
HHI at LBO	Index	Sum of squared market share based on peer group market share incl. LBO sales.

(continued)

Table 1 - continued

Industry-median ROIC volatility	%	ROIC volatility is first calculated as 8-quarter moving standard deviation of ROIC (ROIC is calculated as EBIT/(common equity + long-term debt), afterwards the median is calculated based on the same quarter and GICS sub-industry classification.
High yield spread	%	Difference of Merrill Lynch US high yield and US 3months LIBOR, before 1986 the US 3months LIBOR is approximated by the US 3months constant maturity treasury yield (source Datastream).
S&P 500 return	%	Quarterly percentage change of the S&P500 (source Compustat).
Inflation	%	CPI (source ALFRED St. Louis Fed).
Log age	Log	Natural logarithm of age. Age has been calculated using the founding dates provided by either Jay Ritter's IPO database (http://bear.warrington.ufl.edu/ritter/FoundingDates.htm) or Bloomberg BusinessWeek's database.
Count M&A events in the past 10 years	Number	Count of M&A events in the past 10 years, source: Thomson One.
Peer dummy	Dummy	Equals 1 if company is a peer and 0 if it is a LBO target.

Table 2 Summary Statistics

The following table contains summary statistics for our data set. Panel A of the table contains characteristics of the LBO target companies and their respective competitor companies for the full dataset at LBO. The table contains balance sheet and P&L summary statistics, also including information about our main dependent variable in the paper (Revenues). For all variables we report mean, median, standard deviation (measured in percent for leverage ratio and in mn USD for all remaining variables) as well as a difference-in-medians test to compare the characteristics of the targets and their peer companies (p-value shown in table). Panel B contains industry information of the targets and competitors for the full dataset. Panel C contains summary statistics of the LBO restructuring activities for the subsample as described in section 3.1 (all variables are dummy variables unless otherwise indicated). We report the type of restructuring activity as well as information about the number of LBO firms that were subject to the respective restructuring activities.

Panel A (full dataset)

	LBO Targets			Target Competitors			P values
	Mean	Median	SD	Mean	Median	SD	Diff. in medians
Revenues	229.27	60.28	725.88	371.24	44.75	1,533.80	0.0243
Assets	1,064.25	214.13	3,933.93	1,616.11	174.25	7,400.94	0.0449
Long-term debt	391.70	60.90	1,424.42	392.99	10.35	2,384.16	0.0000
Leverage (%) (at LBO)	39.93	31.41	46.27	18.13	11.81	27.14	0.0000
Observations	653			13,021			

Panel B (full dataset)

	LBO Targets		Target Competitors			
	# Targets	% Targets	# Peers	% Peers	# Unique Peers	% Unique Peers
Energy	38	5.82%	1,248	9.58%	319	8.89%
Materials	35	5.36%	450	3.46%	186	5.18%
Industrials	142	21.75%	2,400	18.43%	617	17.20%
Consumer discretionary	200	30.63%	2,970	22.81%	765	21.32%
Consumer staples	41	6.28%	650	4.99%	167	4.65%
Health care	51	7.81%	1,496	11.49%	469	13.07%
Information tech.	122	18.68%	3,283	25.21%	857	23.89%
Telecommunications	14	2.14%	183	1.41%	67	1.87%
Utilities	10	1.53%	341	2.62%	141	3.93%
Total	653	100.00%	13,021	100.00%	3,588	100.00%

Panel C (subsample)

Instrument	Mean	Median	SD	# LBO Targets
LBO majority of board seats	0.21	0.00	0.41	46
LBO shares mgmt after LBO	0.94	1.00	0.25	202
LBO new CxO industry insider if new CxO within 180 days	0.24	0.00	0.43	52
LBO new CxO within 180 days	0.25	0.00	0.44	55
LBO M&A frequent transactions	0.18	0.00	0.39	39
LBO leverage (%)	67.09	59.14	61.63	216
LBO earnings mgmt & restatements	0.34	0.00	0.47	73

	Mean	Median	SD	# LBO Targets

Table 3 Univariate Results

The presented table shows results of two preliminary univariate analyses: in Panel A, a univariate difference-in-medians analysis of the main operating performance variable of the LBO target companies' competitors for the full dataset and the subsample. We report the median numbers for quarterly revenues growth of the target competitors in the 12 months before and after the LBO in their industry took place. The diff-in-medians tests show the results of the difference-in-medians Wilcoxon ranksum test. Panel B shows results of an AR(1) process estimation for the main operating performance variable of the LBO target companies' competitors for the full dataset and the subsample. Using the quarterly revenues growth rate, AR(1) processes for each peer have been estimated using the period until LBO in order to calculate fitted values for the period from the LBO onwards. Surprising developments are then detected by analyzing whether the difference of realized and fitted values (called median forecast error) is significantly different from zero using a Wilcoxon matched-pairs signed-ranks test. Asterisks indicate statistical significance at the 10% level (*), 5% level (**) and 1% level (***).

Panel A

	Quarterly Revenues Growth	Quarterly Revenues Growth
Median 12 Quarters before LBO	2.77	3.06
Median 12 Quarters after LBO	2.05	2.40
Diff-in-Medians	-0.72***	-0.66***
Number of LBOs	653	216
Number of Peers	13,021	4,740
Observations	325,525	118,500

Panel B

	Quarterly Revenues Growth	Quarterly Revenues Growth
Median Forecast Error	-2.01***	-1.77***
Number of LBOs	653	216
Number of Peers	13,021	4,740
Observations	325,525	118,500

Table 4   Bivariate Regression Model Results

The presented table shows the results of a bivariate regression analysis for the full dataset and the subsample, using the main dependent variable quarterly revenues growth of the LBO target competitors. The explanatory variables are the LBO Dummy variable indicating that and when an LBO took place in the respective industry and the lag of the dependent variable to control for momentum effects or balance sheet targeting of the competitors. Robust standard Errors are in parentheses. Asterisks indicate statistical significance at the 10% level (*), 5% level (**) and 1% level (***).

	Quarterly revenues growth		Quarterly revenues growth	
	Coef.	Se.	Coef.	Se.
LBO dummy	-1.41***	(0.08)	-1.10***	(0.14)
Lag dependent variable	-0.16***	(0.00)	-0.15***	(0.01)
Constant	8.39***	(0.97)	9.39***	(2.59)
LBO year fixed effects	Yes		Yes	
Industry fixed effects	Yes		Yes	
Number of LBOs	653		216	
Number of peers	13,021		4,740	
Observations	325,525		118,500	
Adj. R-squared	0.03		0.03	

Table 5   Multivariate Regression Results

The following table contains results of a pooled cross-sectional OLS regression model. The dependent variable is the difference between post-LBO average quarterly revenues growth and pre-LBO average quarterly revenues growth and is measured for each LBO peer company over a designated time window before and after the LBO took place (12 quarters pre- to 12 quarters post-LBO). Explanatory variables are: (1) LBO-specific restructuring variables, (2) peer-specific control variables, and (3) additional control variables. All variables are defined in Table 1. Robust standard Errors are reported in parentheses. Asterisks indicate statistical significance at the 10% level (*), 5% level (**) and 1% level (***).

Variables	Difference quarterly revenues growth post/pre LBO	
	Coef.	Se.
LBO Restructuring Proxies		
Governance mechanics		
LBO majority of board seats	-0.55	(0.41)
LBO shares mgmt after LBO	-1.27**	(0.59)
LBO new CxO industry insider if new CxO within 180 days	-2.21***	(0.78)
LBO new CxO within 180 days	3.05***	(0.74)
LBO earnings mgmt & restatements	0.65***	(0.25)
LBO M&A activities		
LBO M&A frequent transactions	-0.22	(0.38)
LBO capital structure decisions		
LBO leverage (%)	0.01***	(0.00)
LBO Control Variables		
LBO log assets	0.27**	(0.11)
LBO return on assets	-0.66	(1.55)
LBO cash to assets	0.36	(0.79)
Peer Control Variables		
HHI at LBO	-1.45	(1.48)
Industry median ROIC volatility	-14.92	(21.48)
Peer leverage (%)	0.00	(0.01)
Peer log assets	-0.21***	(0.06)
Peer return on assets	-3.43***	(1.00)
Peer cash to assets	1.50*	(0.85)
Additional Control Variables		
High yield spread	-0.07	(0.20)
S&P 500 return	0.03*	(0.02)
Inflation	-0.90***	(0.33)
LBO year fixed effects	Yes	
Industry fixed effects	Yes	
Number of LBOs	216	
Number of Peers	4,740	
Observations	4,740	
Adjusted R-squared	0.13	

Table 6   Heckman selection model

Panel A presents descriptive statistics for key variables for the dataset in Panel B which consist of LBO targets with available data one year prior LBO and all peer companies. Panel B contains results of a Heckman selection model. The dependent variable for the 2nd stage is the difference between post-LBO average quarterly revenues growth and pre-LBO average quarterly revenues growth and is measured for each LBO peer company over a designated time window before and after the LBO took place (12 quarters pre- to 12 quarters post-LBO). The dependent variable for the first stage is a dummy which equals 1 for peers and 0 for LBO targets. The model includes all peers in the estimation and all LBO targets for which we could find pre-LBO data for the 1st stage estimation. Explanatory variables are: (1) LBO-specific restructuring variables, (2) peer-specific control variables, and (3) additional control variables. All variables are defined in Table 1. Robust standard Errors are reported in parentheses. Asterisks indicate statistical significance at the 10% level (*), 5% level (**) and 1% level (***).

Panel A

	LBO Targets			Target Competitors			
	Mean	Median	SD	Mean	Median	SD	Diff.
Log age (1 year prior LBO)	2.90	3.04	1.12	3.32	3.22	0.79	0.0000
Age (1 year prior LBO)	29.36	20.00	31.45	36.87	24.00	31.97	0.0000
Count M&A events in past 10 years	1.61	0.00	3.47	3.60	2.00	6.54	0.0000
Leverage (%) (1 year prior LBO)	43.44	28.91	90.31	18.06	12.33	21.16	0.0000
Cash to assets (1 year prior LBO)	0.10	0.03	0.28	0.16	0.07	0.19	0.0000
Log assets (1 year prior LBO)	4.93	5.11	1.83	5.05	5.00	2.12	0.9054
Assets (1 year prior LBO)	672.98	244.31	1,820.05	1,417.85	148.68	6,085.97	0.0371
Return on assets (1 year prior LBO)	-0.02	0.01	0.25	0.03	0.03	0.15	0.0000
Leverage (%) (at LBO)	69.04	58.67	63.54	18.72	12.08	30.60	0.0000
Cash to assets (at LBO)	0.10	0.04	0.22	0.16	0.07	0.20	0.0000
Log assets (at LBO)	5.51	5.69	1.56	5.15	5.14	2.14	0.0092
Assets (at LBO)	682.99	297.21	1,219.53	1,633.51	171.08	7,165.24	0.0092
Return on assets (at LBO)	-0.02	0.02	0.54	0.03	0.03	0.14	0.0037
Observations		158			4,740		

Panel B

	Heckman - 1st stage		Heckman - 2nd stage	
	Peer dummy		Difference quarterly revenues growth post/pre LBO	
Variables	Coef.	Se.	Coef.	Se.
LBO Restructuring Proxies				
Governance mechanics				
LBO majority of board seats	-	-	-0.55	(0.41)
LBO shares mgmt after LBO	-	-	-1.29**	(0.58)
LBO new CxO industry insider if new CxO within 180 days	-	-	-2.15*	(1.19)
LBO new CxO within 180 days	-	-	3.00***	(1.17)
LBO earnings mgmt & restatements	-	-	0.67***	(0.25)
LBO M&A activities				
LBO M&A frequent transactions	-	-	-0.21	(0.38)

(continued)

Table 6 Panel B - continued

LBO capital structure decisions				
LBO leverage (%)	-	-	0.01***	(0.00)
LBO Control Variables				
LBO log assets	-	-	0.27**	(0.11)
LBO return on assets	-	-	-0.65	(1.49)
LBO cash to assets			0.39	(0.69)
1st Stage Control Variables				
Log age (1 year prior LBO)	0.27***	(0.05)	-	
Count M&A events in past 10 years	0.05***	(0.01)	-	
Leverage (%) (1 year prior LBO)	-0.01***	(0.00)	-	
Log assets (1 year prior LBO)	-0.02	(0.02)	-	
Return on assets (1 year prior LBO)	0.46*	(0.25)	-	
Cash to assets (1 year prior LBO)	0.86***	(0.21)	-	
Peer Control Variables				
HHI at LBO	-	-	-1.59	(1.44)
Industry median ROIC volatility	-	-	-14.04	(19.60)
Peer leverage (%)	-	-	0.00	(0.00)
Peer log assets	-	-	-0.24***	(0.05)
Peer return on assets	-	-	-3.53***	(0.77)
Peer cash to assets			1.07*	(0.65)
Additional Control Variables				
High yield spread	-	-	-0.07	(0.19)
S&P 500 return	-	-	0.03*	(0.02)
Inflation	-	-	-0.92***	(0.34)
LBO year fixed effects	-	-	Yes	
Industry fixed effects	-	-	Yes	
Lambda	-	-	-7.17***	(2.04)
Number of LBOs		158		
Number of Peers		4,740		
Observations		4,898		
Adjusted (pseudo) R-squared	0.11			

Appendix   Theoretical Model

In this appendix we investigate the consequences of cost reduction of the LBO target on all the other competitors in an oligopolistic setting with N firms. We look at both, price (Bertrand) as well as quantity (Cournot) competition. In both cases we denote the LBO target as being firm 1 with potentially different costs whereas all other firms (N-1) are symmetric. We assume throughout our analysis, in order to facilitate matters and to receive explicit solutions, a linear demand function.

Cournot competition:

The industry is populated by N firms of which firm 1 is the LBO target with costs c_1 and N-1 firms with costs c. The demand function of all consumers for the homogenous good is:

$$(1) p = A - (N - 1)x - x_1$$

whereby x_1 denotes the quantity produced by firm 1 while x_i stands for the individual quantities produced by all other firms. Hence, the profit functions can be written as:

$$(2) P_i = (A - (N - 1)x - x_1 - c_i)x_i$$

$$(3) P = (A - (N - 2)x - x - x_1 - c)x$$

Hence, from (2) and (3) we can derive the first-order conditions and hence the reaction functions as:

$$(4) x_1 = \frac{(A - (N - 1)x - c_i)}{2}$$

$$(5) x = \frac{(A - (N - 2)x - x_1 - c)}{2}$$

Hence, we get in the Cournot-Nash equilibrium the following equilibrium quantities for the competitors:

$$(6) x = \frac{(A - c - c_1)}{(N + 1)}$$

And hence the competitors' profits:

$$(7) P = \frac{(A - c - c_1)^2}{(N + 1)^2}$$

Hence, we find that lower costs of the LBO target affect the competitors' profits negatively and this effect is the more pronounced the more concentrated the industry is (the lower N is)

Bertrand competition

Firms act against the background of the following linear demand functions:

$(1) x = A - p + (N - 2)p + p_1$

$(2) x_1 = A - p_1 + (N - 1)p$

with x_1 (p_1) and x (p) denoting the quantity (price) of the LBO target and its competitors. Hence, profit function of the firms read:

$(3)\ P = (p - c)(A - p + (N - 2)p + p_1)$

$(4) P_1 = (p_1 - c_1)(A - p_1 + (N - 1)p)$

By taking first-order derivatives we can derive the reaction functions:

$(5) A - 2p + (N - 2)p + p_1 + c = 0$

$(6) A - 2p_1 + (N - 1)p + c_1 = 0$

And hence the equilibrium profit functions for the LBO competitors:

$(7) P = \dfrac{(A - c(N - 1) + c_1)^2}{(N + 1)^2}$

Once again, we that lower costs of the LBO target affect the competitors' profits negatively and this effect is the more pronounced the more concentrated the industry is (the lower N is).