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How do leveraged buyouts affect industry peers' performance: Evidence from Europe

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Abstract

This paper analyzes the impact of leveraged buyouts (LBOs) on the profitability of target firms' industry peers in Europe. To address the endogeneity of LBO activity, I employ a control function approach, using the European Takeover Directive as an instrumental variable. The results indicate that peers improve their profitability following LBOs, driven by improved asset utilization and enhanced cost efficiency. Unlike the findings in the US-based literature, my analysis reveals that positive future industry developments also contribute to the overall effect. These findings suggest that the impact of LBOs on industry peers varies to some extent in the European context.

KEYWORDS

control function approach, leveraged buyouts, peer firms, spillover effects

JEL CLASSIFICATION

G23, G34

1 | INTRODUCTION

A growing body of literature examines the impact of private equity (PE) investments on target firms' industry peers. These papers document effects on several dimensions such as corporate governance structure (Harford et al., 2016; Oxman & Yildirim, 2008), industry profitability (Aldatmaz & Brown, 2020; Bernstein et al., 2017), investment strategies (Truong & Walz, 2024), and firm valuation (Chevalier, 1995a; Hsu et al., 2011; Slovin et al., 1991).

Studies analyzing the spillover effects of leveraged buyouts (LBOs) on other firms have predominantly focused on the United States, resulting in a sparse body of research within the European context. However, a comparison of the ratios of PE deal value to the market capitalization of the S&P 500 in the United States and the STOXX Europe 600 in Europe reveals similar patterns over time, as illustrated in Figure 1.

The graphical illustration suggests that PE investments may also influence firms in the European market. Consequently, it is crucial to investigate in more detail whether LBOs harm or benefit target firms' industry peers in Europe. This paper contributes to the literature by analyzing the impact of LBOs on the profitability of industry peers in Europe and the channels through which profitability may be affected.

As PE investors possess private information (e.g., Dittmar et al., 2012), their investments can generate information spillovers that other market participants may use in their decision-making. In this regard, LBOs might signal

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information about follow-on acquisitions, future prospects, agency problems (Slovin et al., 1991), or changes in the competitive environment within the target firm's industry (Harford et al., 2016). A common feature of these informational aspects of LBOs is an increased threat of takeovers for industry peers. If an LBO announcement signals future prospects and follow-on acquisitions, the takeover risk for industry peers increases (Harford et al., 2016). Similarly, industry-wide agency problems arising from the separation of ownership and control may increase the likelihood of takeovers, as inefficiently managed firms become more attractive acquisition targets (e.g., Jensen, 1986, 1993). Finally, LBOs may affect competition (e.g., Bharath et al., 2014; Chevalier, 1995a, 1995b; Kovenock & Phillips, 1997) and increase the takeover threat, as industry peers respond by adjusting their businesses and engaging more actively in acquisitions (Harford et al., 2016). The increased likelihood of being taken over incentivizes managers of industry peers to operate their firms more efficiently to reduce the risk of acquisition, as they typically face the risk of losing their positions if their firms are acquired (Hartzell et al., 2004). Consequently, the impact of LBOs on the peer firms' profitability operates through various channels, and the extent of their adjustments may depend on the information content of the LBOs.

However, the relationship between LBO activity and industry peers' profitability may be spurious. For example, an unobserved industry stimulus could simultaneously influence both LBO activity and industry peers' outcomes, leading to a misleading correlation. To address endogeneity issues, I employ a control function approach (CFA) that uses the European Takeover Directive (ETD) as an instrumental variable in the first-stage regression. Specifically, I model LBO activity as a function of this instrumental variable, control variables, and fixed effects. I then incorporate the residuals from this regression into the second-stage regression, which analyzes peer firms' outcome variables as a function of LBO activity. By including the residuals from the first stage, this approach corrects for the endogeneity of LBO activity (Heckman & Robb, 1985; Wooldridge, 2015).

The ETD aimed to harmonize takeover laws and facilitate takeovers across European Union (EU) countries (Clerc et al., 2012). The directive orients on the UK's takeover law, which, for some, but not all countries, meant significant changes to their takeover laws. Industry peers in countries that adjusted their takeover regulations due to the ETD experienced an increase in LBO activity and the takeover threat relative to those firms in countries without adjustments. Therefore, the ETD exogenously affects LBO activity, which, in turn, influences the behavior of industry peer managers and serves as an instrumental variable in my analysis.

In the context of the CFA approach, an instrument is considered exogenous if it is uncorrelated with the error terms in both the first- and second-stage regressions. The ETD satisfies this condition due to its external imposition by the EU, which was independent of firm-specific or market factors. While individual EU member states had some flexibility in how they transposed the directive into national law and enforced its provisions, the primary goal of the ETD was to

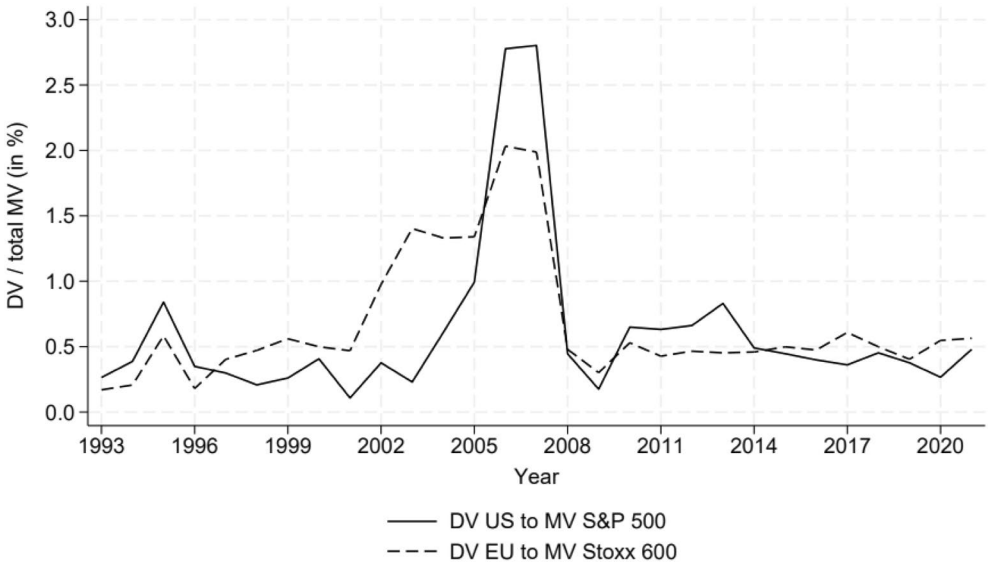

FIGURE 1 PE deal value in relation to the market value of indices (United States vs Europe). This figure displays the development of PE deal value relative to the total market capitalization of two major indices. The solid line represents the total value of US deals relative to the S&P 500, while the dashed line shows the European LBO deal value relative to the market capitalization of the STOXX Europe 600. The x-axis denotes the years from 1993 to 2021 (*Sources*: LSEG Eikon and CRSP).

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harmonize takeover regulations across the EU (Clerc et al., 2012). This harmonization reduces concerns about reverse causality and strengthens the instrument's validity.

Using a sample of private and public LBO deals of the five largest European countries,[i] I find that industry peers' profitability improves significantly following LBOs. Further analysis shows that this effect results from better asset utilization of existing assets and enhanced cost efficiency. However, it also shows that PE investors possess the ability to identify industries when they are at the bottom of their profitability. As a result, these industries present growth opportunities, and investors may fail to fully consider the future operating performance of peer firms. Furthermore, the findings do not offer evidence that industry peers alter their internal corporate governance, investment strategies, or organizational structures.

By conducting a subsample analysis that splits the sample at the median values of various variables, I further explore the heterogeneity of the effect. The findings reveal that smaller firms and firms with lower leverage ratios improve profitability following LBOs. Smaller firms possess higher growth opportunities, while lower leverage ratios provide financial flexibility to capture investment possibilities (e.g., Frank & Goyal, 2009). Additionally, the analysis provides evidence that peers tend to be more sensitive to LBOs in country–industries with higher agency costs and greater growth potential, which relates to the information content of LBOs.

The paper is most closely related to the cross-country studies by Bernstein et al. (2017) and Aldatmaz and Brown (2020), which document positive spillover effects on industry profitability. However, these studies analyze the impact of PE investments at the aggregate level, which may not reveal the complete picture. For example, the aggregation of variables does not control for firm-level influences, which could create an omitted variable bias problem (e.g., Holderness, 2016). Therefore, this study uses the individual peer level to explore the heterogeneity of industry peers and extends our understanding of spillover effects concerning leveraged buyouts (e.g., Feng & Rao, 2022; Harford et al., 2016; Truong & Walz, 2024). Moreover, the results of this study offer an alternative explanation for the positive effect on peers' profitability. Rather than attributing the observed effect primarily to an increase in competition (e.g., Aldatmaz & Brown, 2020; Feng & Rao, 2022), my findings suggest that, in addition to an improvement in efficiency, industry developments also contribute to the overall effect. Further, in contrast to the existing literature, European industry peers do not change their corporate governance or alter their investment strategies, unlike their US counterparts (e.g., Feng & Rao, 2022; Harford et al., 2016; Oxman & Yildirim, 2008). The United States, like the United Kingdom, operates under a common-law system, which is characterized by well-developed capital markets, investor protection, and effective corporate control markets (e.g., Goergen et al., 2005; La Porta et al., 1997, 1998). In contrast, most continental European countries are subject to civil law, which emphasizes stakeholder orientation through codified laws and is accompanied by large shareholders (blockholder-based system) (e.g., Goergen et al., 2005). European firms have a more concentrated ownership structure (e.g., Enriques & Volpin, 2007; La Porta et al., 1997, 1998) and more family-controlled firms (e.g., Faccio & Lang, 2002; Guo et al., 2011). As a result, the managers of industry peers in Europe respond differently to LBO announcements, leading to distinct implications for the effects of LBOs on other firms.

This study also contributes to the literature on the effects of the European Takeover Directive. To the best of my knowledge, this is the first paper to use the ETD in the context of LBOs. Previous empirical studies have primarily focused on the ETD's impact related to merger and acquisition (M&A) deals. While the empirical evidence on takeover efficiency gains is mixed (Dissanaike et al., 2021; Humphery-Jenner, 2012; Wang & Lahr, 2017), I provide evidence that the ETD increased LBO activity in the industries of treated countries relative to those in control countries.

The remainder of the paper is structured as follows. Section 2 develops the study's underlying hypotheses. Section 3 outlines the sample construction. Section 4 details the empirical strategy, while Section 5 presents the results. Section 6 examines the heterogeneity of the LBO effect, and Section 7 provides robustness tests. Finally, Section 8 summarizes and discusses the findings within the broader LBO spillover literature.

2 | DEVELOPMENT OF HYPOTHESES

Literature on the spillover effects of LBOs documents changes in the operations of target firms' industry peers (e.g., Feng & Rao, 2022; Harford et al., 2016; Oxman & Yildirim, 2008). These LBO spillover effects originate from releasing information through PE investment activities. PE investors are informed agents who possess private information (Dittmar et al., 2012) through their sophisticated due diligence process. This information is relevant not only for target firms but also for the entire industry. When they invest in a firm, parts of this information become public and may be utilized by other market participants. In particular, LBOs may signal follow-on acquisitions, future prospects, and agency problems within an industry (Slovin et al., 1991). Moreover, LBOs may also indicate changes in the competitive environment

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(e.g., Bharath et al., 2014; Chevalier, 1995a, 1995b; Kovenock & Phillips, 1997). On average, PE investors enhance the profitability of their target firms (e.g., Acharya et al., 2013; Boucly et al., 2011; Guo et al., 2011), which in turn affects competition within an industry.

The common feature of the potential information content of LBOs is an increased threat of takeovers. Regarding follow-on acquisitions and future prospects, existing literature shows that PE-backed industries grow more quickly (Bernstein et al., 2017; Boucly et al., 2011). Financial and strategic investors try to capture these growth opportunities by taking over firms in these specific industries (e.g., Slovin et al., 1991). As a result, the risk of being acquired increases for industry peers (Harford et al., 2016).

If LBOs are associated with industry-wide agency problems arising from separating ownership and control, the likelihood of takeovers might also increase. Firms with higher agency costs do not operate at their optimal efficiency level owing to managers' inefficient use of free cash flows (e.g., Jensen, 1986, 1993). In general, corporate governance issues are correlated across firms within an industry. For example, firms in competitive industries tend to have lower agency costs (e.g., Chhaochharia et al., 2017; Giroud & Mueller, 2010). Empirical literature indicates that firms with weak corporate governance structure show negative abnormal returns (e.g., Bebchuk et al., 2008; Gompers et al., 2003). Due to their poor performance, these firms may be easier to take over (e.g., Lel & Miller, 2015). Moreover, PE investors are particularly interested in poorly performing firms because of their restructuring skills (e.g., Gorbenko & Malenko, 2014), which contributes to increased industry takeover activity.

LBOs may increase the competition within an industry (e.g., Feng & Rao, 2022). Consequently, industry peers may alter their business and intensify their acquisition activity to reduce competitive pressure, leading to more takeovers (Harford et al., 2016).

From a theoretical perspective, LBOs intensify takeover activity within an industry. Empirical evidence elucidates an increase in bidders after acquisitions of financial investors (Dittmar et al., 2012). Additionally, Harford et al. (2016) demonstrate that LBOs predict future takeovers and increase the takeover threat of industry peers. The increased threat of takeovers signaled by LBOs incentivizes the managers of industry peers to run their firms more efficiently, as these transactions often result in the replacement of the target firm's chief executive officers (CEO) (Hartzell et al., 2004; Kaplan & Stromberg, 2009). In this context, corporate control markets can discipline managers (e.g., Denis & Serrano, 1996; Holmstrom & Kaplan, 2001; Kaplan, 1989; Martin & McConnell, 1991; Morck et al., 1989), particularly if firms operate inefficiently.

Building on this, the incentive structure for managers should positively affect the profitability of industry peers. In the US context, studies indicate that industry peers become more profitable after LBOs (Feng & Rao, 2022; Truong & Walz, 2024) and hostile takeovers (Servaes & Tamayo, 2014). A similar rationale should apply in the European context, leading to the following hypothesis.

Hypothesis 1. *LBOs signal an increased likelihood of takeovers for target firms' industry peers, incentivizing managers to enhance their firms' performance to reduce the threat of being taken over.*

If managers of industry peers improve their firms owing to the increase in the takeover risk following LBOs, it becomes essential to ascertain the alterations they implement to their firms associated with the LBO signal. One possible way is to use their assets more efficiently or to cut operational expenses. Through both ways, industry peers increase their efficiency to reduce future takeover threats and competitive pressure. Feng and Rao (2022) show positive spillovers on operating efficiency after PE investments. The present study assumes similar effects on European industry peers. Thus, the next hypothesis is as follows.

Hypothesis 2a. *LBOs positively impact the operating efficiency of industry peers.*

LBOs might indicate industry-wide agency problems (Slovin et al., 1991). To improve the internal corporate governance structure and create value in target firms, PE investors provide strong incentives to CEOs, reduce board size, and closely monitor the management (e.g., Cornelli & Karakaş, 2012; Nikoskelainen & Wright, 2007). Likewise, industry peers might implement these changes, resulting in a positive relationship. Oxman and Yildirim (2008) empirically confirm the positive association, whereas Harford et al. (2016) document a negative one. Given that LBOs increase the incentive to improve corporate governance by reducing the likelihood of a takeover, I propose the following hypothesis.

Hypothesis 2b. *LBOs positively impact the corporate governance of industry peers.*

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However, European firms generally exhibit a more concentrated ownership structure than their US counterparts (e.g., Enriques & Volpin, 2007). As a result, the separation between ownership and control may be less problematic in Europe, potentially diminishing the impact of LBOs on the corporate governance structure of industry peers.

To mitigate competitive pressure and the risk of takeovers, industry peers may adjust their business operations to the new competitive environment (e.g., Feng & Rao, 2022). At the aggregated level, in a cross-country study, Aldatmaz and Brown (2020) show that investments within the industry increase following PE investments. These adjustments may also include increasing the R&D expenses of industry peers, as target firms tend to become more innovative (e.g., Lerner et al., 2011; Ughetto, 2010). In addition, LBO targets often restructure their assets (e.g., Denis, 1994; Muscarella & Vetsuypens, 1990). Thus, industry peers may also refocus their organizational structure to become more efficient and competitive. From these arguments, I derive the following hypothesis.

> **Hypothesis 2c.** *LBOs positively impact the adjustment of industry peers' businesses by increasing their investment or refocusing their organizational structure.*

PE investors may strategically select profitable industries. Slovin et al. (1991) suggest that LBOs indicate favorable industry prospects, and Harford et al. (2019) argue that industries are undervalued during management buyouts. Thus, PE investors may leverage their industry expertise (Kaplan & Stromberg, 2009) and private information (Dittmar et al., 2012) to time their entry into a particular industry. In this context, LBO activity coincides with the improvement in industry peers' profitability. The increased takeover activity results from less informed market participants entering a merger sequence, of which PE investors tend to be first movers (Harford et al., 2016). Therefore, the hypothesis reads as follows.

> **Hypothesis 3.** *Private equity investors can identify industries where profitability improvements are likely to occur, regardless of their involvement.*

The central assumption of this study is that an increase in the takeover threat, signaled by LBOs—whether through information about industry-wide agency problems, changes in competition, or follow-on acquisitions—incentivizes managers of industry peers to operate their firms more efficiently. While all hypotheses suggest an increase in takeover activity within an industry, they are not mutually exclusive. However, the implications of the takeover threat generated by LBOs are distinct from the observed actions of industry peers, which helps to disentangle the effect and uncover the underlying mechanism between LBOs and industry peers' profitability.

3 | DATA AND SAMPLE CONSTRUCTION

I retrieve LBO deals from LSEG (formerly Refinitiv) Eikon. The sample covers private and public deals from 1993 to 2021 and focuses on the five largest European countries in terms of their GDPs, that is, France, Germany, Italy, Spain, and the United Kingdom. Other European countries are significantly smaller and have less developed PE markets. Therefore, it is more likely to observe effects on the profitability of industry peers in these countries. Furthermore, I exclude target firms belonging to the utility industry (SIC codes 4900–4999), the financial industry (SIC codes 6000–6999), and government entities (SIC codes >9000) (e.g., Leary & Roberts, 2014). In addition, I ensure that PE funds have a majority interest (>50%) in the firm to implement their value-creating strategies. After applying these filters, the sample contains 10,656 LBO deals.

Table 1 presents descriptive statistics for the LBO sample. Panel A shows that the United Kingdom accounts for a significant proportion of the sample, representing over 50% of the number of deals (*No. of deals*) and nearly half of the *Total deal value*. LBO deals in Germany are larger on average (*Mean deal value*).[ii] Italy and Spain exhibit considerably lower figures in terms of both *Total deal value* and *No. of deals*. The proportion of public deals (*Ratio of public deals*) ranges from 2% to 4% compared to the entire LBO sample, indicating that most PE funds acquire private targets. Panel B of Table 1 illustrates the distribution of LBO deals across industries, revealing that PE investors primarily invest in the *Manufacturing* and *Services* industries within the sample countries.

The firms in my sample (peer firms) are obtained from the Compustat Global database, comprising all non-financial, non-utility, and non-government firms from the five analyzed countries in this study between 1993 and 2021. Industries are classified using three-digit SIC codes (e.g., Grennan, 2019) within each country. Based on this classification, I merge

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TABLE 1 Descriptive statistics of target firms.

Panel A—LBO characteristics	**Country**					
Variables	**France**	**Germany**	**Italy**	**Spain**	**United Kingdom**	**LBO sample**
Total deal value (bn $)	123.73	165.52	52.02	45.23	381.43	767.93
No. of deals	2100	1781	573	386	5816	10,656
Mean deal value (mio $)	283.77	656.84	376.98	373.82	153.31	223.56
Ratio public deals (%)	2.71	2.92	3.84	2.85	3.94	3.48
Panel B—No. of deals per industry	**Country**					
Industry	**France**	**Germany**	**Italy**	**Spain**	**United Kingdom**	**LBO sample**
Mining	0	3	1	0	41	45
Construction	60	23	5	8	149	245
Manufacturing	1007	1025	397	139	2358	4926
Transportation and public utilities	110	62	18	36	278	504
Wholesale trade	101	77	7	6	506	697
Retail trade	102	57	21	16	397	593
Services	720	534	124	181	2087	3646

Note: This table presents descriptive statistics for LBO targets in France, Germany, Italy, Spain, the United Kingdom, and the overall sample ("LBO sample") from 1993 to 2021. Panel A shows the *Total deal value (bn$)*, *No. of deals*, *Mean deal value (mio $)*, and *Ratio public deals (%)*. Panel B illustrates the *No. of deals* for different industries based on the major groups of the Standard Industrial Classification (SIC). LBO targets in the utility and financial industries, as well as government entities, are excluded.

the primary dataset with the LBO sample. The final sample consists of 5695 firms and 62,727 firm-years, of which 30,983 are impacted by LBO announcements.[iii]

Peer firm characteristics are obtained from Compustat Global, Datastream, Capital IQ, and Boardex Europe. This study employs control variables similar to those in Harford et al. (2016), with all values converted to US dollars. Table 2 presents summary statistics for the characteristics of peer firms. The columns labeled "All firms" report variable statistics for the entire sample.[iv]

This study focuses on the perspective of peer firms and their response to LBO activity within their industry. In the panel setting, a peer firm may encounter LBOs in some years and none in others. Accordingly, the column labeled "LBO" provides variable statistics for years when a firm faces an LBO announcement within its country-industry, while the "Non-LBO" column reports statistics for years without such activity. The final column compares the mean differences between the "LBO" and "Non-LBO" groups for statistical significance. At this point, I highlight a few observations.

First, Table 2 shows that firms' profitability (e.g., *EBITDA-to-assets*) is significantly lower in country–industry–years with LBO activity compared to those without. Second, firms in the "LBO" column tend to be smaller (*Log(1 + Assets)*) but exhibit higher valuations (*M/B-ratio*) and lower leverage ratios (*Book leverage*) than those in the "Non-LBO" group. These initial findings reveal notable differences between the two groups.

4 | EMPIRICAL STRATEGY

This study employs the following baseline model to examine the impact of LBOs on peer firms:

$$y_{c,i,j,t+1} = \alpha + \beta_1 LBO_{c,j,t} + \beta_2 X_{c,i,j,t} + \beta_3 I_{c,j,t} + \beta_4 M_{c,t} + \gamma_c + \eta_j + \delta_t + \epsilon_{c,i,j,t} \quad (1)$$

where c denotes country, i the firm, j the industry, and t the year. The dependent variable $y_{c,i,j,t+1}$ represents firm $i's$ characteristics (e.g., profitability) in the subsequent period. The variable of interest, $LBO_{c,j,t}$, captures the leveraged buyout activity in industry j and country c at time t. I proxy this variable as the number of leveraged buyouts divided by the number

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TABLE 2 Summary statistics of peer firms.

	All firms				LBO	Non-LBO	LBO versus non-LBO
Variables	**Obs.**	**Mean**	**Median**	**SD**	**Mean**	**Mean**	**Diff. mean**
Profitability and control variables							
EBITDA-to-assets	62,727	0.041	0.088	0.227	0.028	0.053	−0.025***
Operating margin	58,482	0.039	0.094	0.407	−0.013	0.063	−0.076***
Return-on-assets	54,641	−0.011	0.028	0.164	−0.022	−0.008	−0.014***
M/B-ratio	62,727	2.531	1.562	3.941	2.870	2.201	0.669***
Log(1 + Assets)	62,727	5.092	4.867	2.228	4.741	5.435	−0.694***
Net PPE-to-assets	62,727	0.225	0.161	0.216	0.187	0.262	−0.075***
Book leverage	62,727	0.203	0.163	0.221	0.171	0.211	−0.040***
Log(1 + Cash)	62,727	2.896	2.597	2.035	2.706	3.082	−0.376***
Operating efficiency							
Turnover ratio	62,899	1.034	0.922	0.762	1.054	1.015	0.039***
Current asset turnover ratio	62,891	2.190	1.915	1.640	2.174	2.204	−0.030**
Expense ratio	60,330	1.343	0.909	2.782	1.529	1.281	0.248***
SG&A margin	59,663	0.458	0.175	1.617	0.586	0.401	0.185***
Corporate governance							
Log(1 + Board size)	31,777	1.511	1.609	0.657	1.446	1.548	−0.102***
Fraction independent directors	9090	0.296	0.286	0.206	0.286	0.290	−0.004
Log(1 + Cash compensation)	35,744	0.634	0.484	0.669	0.604	0.617	−0.013*
Stock options-to-SHO	31,062	0.010	0.000	0.020	0.010	0.008	0.002***
Investment and asset sales							
CAPX-to-assets	57,198	0.048	0.031	0.054	0.044	0.052	−0.008***
R&D-to-assets	21,787	0.077	0.032	0.122	0.093	0.042	0.051***
Asset sales	31,288	0.010	0.002	0.024	0.009	0.011	−0.002***
Misvaluation and growth opportunities							
Times-series industry error	26,483	−0.009	−0.007	0.516	0.001	−0.020	0.021***
Long-run to book value	26,483	0.676	0.694	0.639	0.766	0.463	0.303***
Firm-specific error	26,483	0.000	0.000	0.631	−0.001	0.010	−0.011

Note: This table presents summary statistics for all non-financial, non-utility, and non-government firms from the Compustat Global database between 1993 and 2021 for the five largest EU countries—France, Germany, Italy, Spain, and the United Kingdom—based on their GDP. The "LBO" column displays the mean values of various variables for firms exposed to an LBO announcement in their country–industry–year, while the "Non-LBO" column shows the mean values of these variables for firms in country–industry–years without LBO exposure. The "LBO vs Non-LBO" column reports the differences between these mean values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-sided *t*-test. All variables are winsorized at the 1% level. For variable descriptions, see Table A1.

of firms within a country–industry–year to account for the intensity of the LBO signal. This definition captures the idea that more deals in a small industry have a different impact than a few deals in industries with many firms.[v] Control variables include firm-level characteristics ($X_{c,i,j,t}$), industry-level factors ($I_{c,j,t}$), and macroeconomic conditions ($M_{c,t}$), which vary over time across countries. Country (γ_c) and industry (η_j) fixed effects account for unobserved time-invariant differences across these dimensions, while year effects (δ_t) capture common trends and market conditions. These fixed effects help control for institutional differences and country-specific confounders. Standard errors are clustered at the firm level to account for within-firm correlation and heteroskedasticity (Petersen, 2009).

In Equation (1), a key concern is the potential endogeneity of the LBO variable. For example, a third variable, such as an unobserved industry stimulus, may affect both LBO activity and the outcome variables of industry peers. As a result,

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LBOs may not cause changes in the operations of industry peers. To mitigate endogeneity concerns, I employ a control function approach. Specifically, I first model $LBO_{c,j,t}$ as a function of an instrument variable z, as well as control variables and fixed effects. Second, I use the residuals (ν) of the first stage and plug those in Equation (1) (structural equation) to correct for the endogenous variable *LBO*. To be a valid instrument in the CFA context, z must be correlated with LBO activity while satisfying the conditions $E(z'\varepsilon) = 0$ and $E(z'\nu) = 0$ (Heckman & Robb, 1985; Wooldridge, 2015). These conditions establish the exogeneity of z, ensuring that it is uncorrelated with the error terms in both the first-stage regression and the structural equation.

Building on the argumentation in Section 2, this study employs the European Takeover Directive as an exogenous shock to LBO activity and the takeover threat exerted by financial investors within an industry. The directive attempted to harmonize and improve takeover rules within the EU. As a result, some countries had to change their takeover regulations significantly, while other countries' regulations remained unchanged (Clerc et al., 2012; Dissanaike et al., 2021). To examine the effect of LBOs on industry peers, I use the ETD as an instrumental variable within the CFA framework. By exploiting ETD's exogenous variation in LBO activity, the CFA accounts for unobserved factors that may influence both LBO activity and industry peers' outcomes, thereby addressing potential endogeneity.

The ETD was promulgated on April 21, 2004, with EU Member States required to implement it into national law by May 21, 2006. The directive set minimum takeover requirements,[vi] based on the UK's takeover regulations, intending to standardize rules across the EU (e.g., Clerc et al., 2012; Dissanaike et al., 2021; Humphery-Jenner, 2012). The specific objectives of the ETD are stated in Clerc et al. (2012, p. 11–12): *(i) legal certainty on the takeover bid process and Community-wide clarity and transparency with respect to takeover bids; (ii) protection of the interests of shareholders, in particular, minority shareholders, employees, and other stakeholders when a company is subject to a takeover bid for control; and (iii) reinforcement of the freedom for shareholders to deal in and vote on securities of companies and prevention of management action that could frustrate a bid*. These objectives should facilitate takeover bids, increase the takeover threat (i and iii), and protect firm stakeholders (ii).

The ETD altered the takeover laws in the sample countries in different ways. France, Italy, and the United Kingdom experienced no significant changes, so firms in these countries are included in the control group, as the new regulation did not affect LBO activity. In contrast, Germany and Spain made substantial changes to their takeover laws. Both countries introduced the squeeze-out and sell-out rules (Clerc et al., 2012; Dissanaike et al., 2021). The squeeze-out rule gives the controlling shareholder the right to squeeze out minority shareholders if the bidder acquires a certain percentage of a firm's shares. The sell-out right gives minority shareholders the right to demand a fair price for their shares from the controlling shareholders, subject to the same conditions as in the squeeze-out right (e.g., Goergen et al., 2005). From a PE perspective, the introduction of squeeze-out rights is particularly relevant, as PE funds typically acquire all assets.[vii] Moreover, in Spain, the mandatory bid rule, which forces the bidder to make a binding bid to all shareholders at an equitable price, may not be as effective as in other countries. This is because shareholders can waive the mandatory bid rule (Dissanaike et al., 2021), and the private benefits of controlling shareholders, which amplify the cost of a mandatory bid rule, are considerably lower compared to other European countries (e.g., Italy) (Dyck & Zingales, 2004). In Germany, the equitable price mitigated the strength of the cross-shareholdings as a takeover defense tool (Dissanaike et al., 2021). Overall, the change in takeover rules facilitated acquisitions and reduced their costs in Germany and Spain, making firms in these countries part of the treatment group.[viii] To address endogeneity in the LBO variable, I exploit the relative change in LBO activity between firms in treated and control countries.

In Figure 2, I show how the ETD changed the LBO activity of industries in treated countries compared to industries of control countries by displaying yearly regression coefficient estimates. The dependent variable, *LBO,* is defined as the number of LBO deals divided by the number of firms within a country–industry–year. It is regressed on the binary variable *Treat,* which equals one for industries in treated countries and zero otherwise.

Before the announcement of the ETD in 2004, industries in treated countries exhibited considerably lower LBO activity than those in control countries, illustrated by the negative coefficients around −0.06. Following the implementation of the new legislation in the treated countries, which occurred on July 8, 2006, in Germany and on April 13, 2007, in Spain,[ix] the disparity in LBO activity between the two groups diminished and leveled out to similar intensities.

In this regard, Figure 2 illustrates that the ETD positively affects LBO activity for firms in treated countries compared to those in control countries and demonstrates its relevance to PE investors and their takeover activity. Thus, I model LBO activity in the first stage of the CFA as follows:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t} \quad (2)$$

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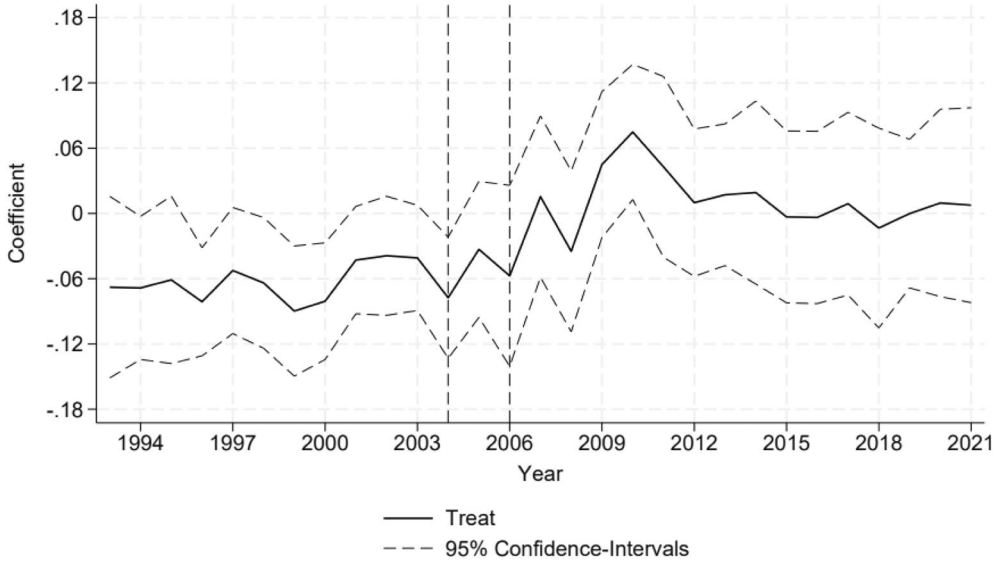

FIGURE 2 LBO activity around the ETD. This figure displays the yearly regression coefficient estimates around the European Takeover Directive (ETD), regressing the variable *LBO* on the binary variable *Treat*. The solid line illustrates the progress of the coefficients. *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. *Treat* equals one for industries in treated countries (Germany, Spain) by the ETD and zero for industries in control countries (France, Italy, and the UK). Standard errors are clustered at the industry level. The x-axis denotes the years from 1993 to 2021. The horizontal lines represent the ETD's promulgation in 2004 and its subsequent implementation into national law by countries in 2006.

The instrument variable is $Treat \times Post$, representing the interaction of the binary variables *Treat* and *Post*. *Treat* equals one for treated industries and zero for industries in control countries. The variable *Post* covers the period between 1999 and 2011. It equals one for industries in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; May 20, 2006) to the end of the year 2011. It equals zero between 1999 and the day before each sample country implemented the ETD.

$M_{c,t-1}$ represents lagged macroeconomic variables that are time-variant and vary across countries. Axelson et al. (2013) and Gorbenko and Malenko (2014) show that LBO activity correlates with broader economic conditions. $I_{c,j,t-1}$ captures industry-specific variables that relate to the determinants of PE investors selecting target firms, reflecting industry averages. These determinants include firm size, valuation, growth opportunities (e.g., Stafford, 2021), and leverage (e.g., Gorbenko & Malenko, 2014). Finally, the model incorporates fixed effects for countries (γ_c), industries (η_j), and time (δ_t).[x]

Table 3 presents the regression results for Equation (2) and its alternative specifications. In columns (1) and (2), the dependent variable is *LBO*, as defined earlier in this section. Columns (3) and (4) show the results with LBO (binary) as the dependent variable, which equals one in the event of an LBO announcement within a country–industry–year and zero otherwise.

The results indicate that the interaction term is positive and highly statistically significant across all models with LBO variables. This suggests that, on average, industries in treated countries experienced a greater differential change in LBO activity from the pre- to post-treatment period compared to industries in control countries, highlighting its strong relevance in this context.

For the empirical analysis in Section 5, I use the residuals from the model in Column (2) to account for the endogeneity of the variable *LBO*, resulting in Equation (3).

$$y_{c,i,j,t+1} = \alpha + \beta_1 LBO_{c,j,t} + \beta_2 X_{c,i,j,t} + \beta_3 I_{c,j,t} + \beta_4 M_{c,t} + \rho \nu_{c,j,t} + \gamma_c + \eta_j + \delta_t + \epsilon_{c,i,j,t} \quad (3)$$

By including $\nu_{c,j,t}$, Equation (3) obtains a new error term, $\epsilon_{c,i,j,t}$, which is uncorrelated with the instrument, as the instrument is uncorrelated with the error terms in Equations (1) and (2). Furthermore, the new error term is uncorrelated with all independent variables. The inclusion of $\nu_{c,j,t}$ controls for the endogeneity of $LBO_{c,j,t}$.

Argumentatively, the ETD can be considered as an exogenous event due to its regulatory intervention nature. First, the EU imposed the directive externally and was not influenced by firm-specific or market-driven factors, making it likely

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TABLE 3 The ETD and LBO activity.

	LBO	LBO	LBO (binary)	LBO (binary)
	(1)	(2)	(3)	(4)
$Treat \times Post_t$	0.0438***	0.0351***	0.0594***	0.0544**
	(3.34)	(2.69)	(3.34)	(2.91)
$EBITDA\text{-}to\text{-}assets_{t-1}$		0.0856**		−0.0024
		(1.99)		(−0.04)
$M/B\text{-}ratio_{t-1}$		−0.0023*		−0.0008
		(−1.82)		(−0.42)
$Log(1+Assets)_{t-1}$		0.0079		0.0139
		(1.23)		(1.58)
$Net\ PPE\text{-}to\text{-}assets_{t-1}$		−0.0033		−0.0012
		(−0.09)		(−0.03)
$Book\ leverage_{t-1}$		0.0076		−0.0322
		(0.23)		(−0.82)
$Log(1+Cash)_{t-1}$		−0.0000		−0.0060
		(−0.00)		(−0.84)
$Herfindahl\ index_{t-1}$		0.1605***		−0.0911***
		(7.54)		(−3.20)
$10\text{-}year\ government\ bond\ rate_{t-1}$		−0.0055		−0.0125
		(−0.57)		(−1.15)
$GDP\ per\ capita_{t-1}$		0.0018		0.0049*
		(0.89)		(1.68)
$Unemployment\ rate_{t-1}$		−0.0105***		−0.0111***
		(−4.43)		(−3.53)
$Inflation\ rate_{t-1}$		−0.0187***		−0.0231***
		(−3.28)		(−2.98)
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observation	7922	7922	7922	7922
Adj-R^2	0.225	0.242	0.347	0.350

Note: This table presents the results from fixed effects regressions. Columns (1) and (2) use *LBO* (the ratio of LBO deals to the number of firms per country–industry–year) as the dependent variable, while columns (3) and (4) use *LBO (binary)*, which is one for country–industry–years with an LBO announcement and zero otherwise. The binary variable *Treat* equals one for industries in treated countries (Germany, Spain) affected by the European Takeover Directive (ETD) and zero for industries in control countries (France, Italy, and the United Kingdom). *Post* is a binary variable that equals one for industries in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. *Treat* × *Post* is the interaction of the two binary variables. Control variables represent the average value for each country–industry–year. For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. All regressions include a constant. Standard errors are clustered at the industry level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

independent of the endogenous variables. Second, its implementation across EU member states followed a timeline set by political and legislative processes. Third, while the ETD influences corporate takeover activity, its introduction and legislative framework were not driven by firm performance or market trends but rather by harmonization efforts at the EU level. Finally, although EU member states had some flexibility in how they implemented and enforced the directive into their national laws, the main objective of the ETD was to create uniformity in takeover regulations across the EU (Clerc et al., 2012). This standardization helps mitigate concerns about reverse causality. Thus, these characteristics make the ETD a plausible and valid instrument in the context of this study.

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5 | RESULTS

5.1 | LBOs and peers' profitability

As discussed in Section 2, LBOs intensify the takeover threat within an industry, pressuring peer firms' managers to improve efficiency to mitigate takeover risk. In Table 4, I investigate the relationship between LBO activity and the profitability of industry peers. Columns (1)–(3) employ OLS regressions covering the period from 1993 to 2021 ("Whole sample—OLS"), while the models in Columns (4)–(6) use the CFA within a restricted sample around the ETD from 1999 to 2011. The one-lead dependent variables are different proxies for a firm's profitability and are indicated at the top of the table. The main variable of interest is *LBO*, defined as the number of LBO deals divided by the number of firms within a country–industry–year.

The results demonstrate a positive and highly statistically significant relationship between *LBO* and a firm's profitability across all models. When firms encounter LBO deals in their industry, they become more profitable. Specifically, a one percentage point increase in LBO activity within a country–industry–year leads to a 2.25–7.57 percentage points increase in a firm's profitability. The CFA models, which incorporate the residuals from Equation (2) to address the endogeneity of the LBO variable, show stronger effects on the dependent variables. The coefficients of *Residuals (first-stage)* are statistically significant in Columns (4) and (5). A key advantage of the CFA is that it generates a regression-based Hausman (1978) test, which assesses whether the variable of interest is exogenous (Wooldridge, 2015). The significant coefficients from the Hausman test suggest that LBO is indeed endogenous and that it is necessary to correct it.[xi] The effects of the control variables employed in Table 4 on the dependent variables are comparable with those used in previous studies on performance measurement within the LBO context (e.g., Feng & Rao, 2022; Harford et al., 2016).

Overall, the results support hypothesis 1 and are consistent with previous findings in the LBO literature (e.g., Aldatmaz & Brown, 2020; Feng & Rao, 2022; Truong & Walz, 2024).

5.2 | LBOs and peer-specific adjustments

The previous analysis demonstrates an improvement in the profitability of industry peers following LBOs. To better understand the sources of these efficiency gains, this section examines the channels identified in Section 2 that are related to the potential information content of LBOs.

5.2.1 | Operating efficiency

To mitigate the takeover threat, industry peers might try to become more efficient by using their assets more efficiently or cutting operating costs. In Table 5, I empirically test whether LBO activity changes the operating efficiency of industry peers by applying the same empirical setting as in Section 5.1.

As dependent variables, I employ the *turnover ratio*, *current asset (CA) turnover ratio, expense ratio*, and *selling general and administrative (SG&A) margin*. The turnover ratio, calculated as sales to assets, assesses how effectively management utilizes current and non-current assets to generate revenue (e.g., Chhaochharia et al., 2017). This metric provides insight into overall asset utilization. Additionally, I also use the CA turnover ratio, which is defined as sales over current assets, to specifically assess a firm's efficiency in using its short-term assets—such as cash, receivables, and inventory—to generate revenue. The expense ratio, which is calculated as operating expenses to sales, reflects a firm's cost-effectiveness (e.g., Ang et al., 2000). Furthermore, I examine the SG&A margin, calculated as SG&A expenses divided by net sales, to assess the efficiency of a firm in managing overhead and sales-related costs.

The findings of Table 5 indicate that *LBO* has a highly statistically significant impact on the operating efficiency of industry peers. More specifically, on average, industry peers use their assets more efficiently for the OLS regressions (Columns (1) and (2)) as well as for the CFA models (Columns (5) and (6)). Regarding the dependent variables *Expense ratio* and *SG&A margin*, LBO activity exhibits a significant negative relationship in the relevant regression models. That means industry peers are more cost-efficient following LBOs within their industry. Additionally, Columns (5)–(8) report significant coefficients for *Residuals (first-stage)*, indicating the endogeneity of the variable LBO. As in the previous analysis, including these residuals addresses endogeneity concerns, enhancing the reliability of the estimates.

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TABLE 4 Profitability.

	EBITDA-to-assets$_{t+1}$	*Operating margin*$_{t+1}$	*Return-on-assets*$_{t+1}$	*EBITDA-to-assets*$_{t+1}$	*Operating margin*$_{t+1}$	*Return-on-assets*$_{t+1}$
	Whole sample—OLS			**Restricted sample around ETD—CFA**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
LBO	0.0228***	0.0242***	0.0225***	0.0524***	0.0757***	0.0434***
	(5.55)	(3.01)	(4.66)	(5.76)	(3.75)	(3.00)
M/B-ratio	−0.0002	−0.0012	0.0001	−0.0008	−0.0006	−0.0002
	(−0.38)	(−1.27)	(0.19)	(−1.07)	(−0.55)	(−0.22)
Log(1 + Assets)	0.0584***	0.0919***	0.0529***	0.0601***	0.0898***	0.0506***
	(25.63)	(18.02)	(20.38)	(22.09)	(15.54)	(16.37)
Net PPE-to-assets	0.1421***	0.2395***	0.1167***	0.1378***	0.2472***	0.1169***
	(14.28)	(9.79)	(10.42)	(11.26)	(8.56)	(8.10)
Book leverage	−0.1579***	−0.1101***	−0.2065***	−0.1417***	−0.0547	−0.1773***
	(−10.34)	(−3.11)	(−11.01)	(−7.57)	(−1.53)	(−7.67)
Log(1 + Cash)	−0.0262***	−0.0509***	−0.0204***	−0.0273***	−0.0539***	−0.0180***
	(−14.59)	(−11.44)	(−9.74)	(−12.43)	(−10.04)	(−6.99)
Herfindahl index	−0.0107	−0.0007	−0.0059	−0.0112	−0.0047	−0.0124
	(−1.26)	(−0.04)	(−0.60)	(−1.09)	(−0.24)	(−1.05)
Residuals (first-stage)				−0.0318***	−0.0498**	−0.0242
				(−3.38)	(−2.40)	(−1.63)
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,727	58,482	54,641	32,403	30,389	28,691
Adj-R^2	0.278	0.168	0.193	0.255	0.158	0.174

Note: This table presents ordinary least squares (OLS) and control function approach (CFA) estimations, with the one-year lead dependent variables *EBITDA-to-assets*, *Operating margin*, and *Return-on-assets*. Columns (1)–(3) cover the whole sample from 1993 to 2021. Columns (4)–(6) focus on the period from 1999 to 2011, which is around the implementation of the ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis of Columns (4)–(6) to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the UK). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Macro controls include *10-year government bond rate*, *GDP per capita*, *Unemployment rate*, and *Inflation rate*. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels, respectively.

Based on the results in Table 5, this section supports hypothesis 2a, suggesting that industry peers improve their operating efficiency to mitigate the takeover threat posed by PE investors. These findings are consistent with prior evidence from the US context (e.g., Feng & Rao, 2022).

5.2.2 | Corporate governance

Another potential source of efficiency gains could be improvements in firms' internal corporate governance structures, particularly if the LBO is perceived as a signal of industry-wide agency problems (Slovin et al., 1991).

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TABLE 5 Operating efficiency.

	Turnover ratio$_{t+1}$	*CA turnover ratio*$_{t+1}$	*Expense ratio*$_{t+1}$	*SG&A margin*$_{t+1}$	*Turnover ratio*$_{t+1}$	*CA turnover ratio*$_{t+1}$	*Expense ratio*$_{t+1}$	*SG&A margin*$_{t+1}$
	Whole sample—OLS				**Restricted sample around ETD—CFA**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
LBO	0.0619***	0.0969***	−0.1788***	−0.0985***	0.1234***	0.2991***	−0.4747***	−0.2581***
	(3.60)	(2.97)	(−3.52)	(−3.52)	(4.07)	(4.36)	(−4.91)	(−4.58)
Residuals (first-stage)					−0.0550*	−0.1492**	0.2395**	0.1265**
					(−1.75)	(−2.17)	(2.53)	(2.29)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,899	62,891	60,330	59,663	32,488	32,483	31,337	30,953
Adj-R^2	0.370	0.455	0.139	0.153	0.341	0.463	0.136	0.151

Note: This table presents ordinary least squares (OLS) and control function approach (CFA) estimations, with the one-year lead dependent variables *Turnover ratio, Current asset (CA) turnover ratio, Expense ratio*, and *SG&A margin*. Columns (1)–(4) cover the whole sample from 1993 to 2021. Columns (5)–(8) focus on the period from 1999 to 2011, which is around the implementation of the ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis of Columns (5)–(8) to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Control and macro control variables correspond to those in Table 4. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

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Table 6 examines whether industry peers apply changes to their supervisory boards and incentive structure for the management.[xii] For board size and fraction of independent directors, I use *Log(1 + Board size)*, which represents the logarithm of one plus the number of board members, and *Fraction independent directors*, which measures the fraction of independent directors on the board. To assess management compensation, I use *Log(1 + Cash component)*, capturing the non-performance-based component of top executives' compensation, and *Stock-options-to-SHO*, defined as the number of stock options relative to a firm's outstanding shares, reflecting the performance-based component. Generally, management compensation that aligns with a firm's upside potential positively influences management's action (e.g., Coles et al., 2006).

The analysis presented in Table 6 reveals a deterioration of peer firms' internal corporate governance following LBOs in some models. Specifically, the non-performance component (Column (3)) increases, while the performance component (Columns (4) and (8)) decreases. This suggests that LBOs do not lead industry peers to enhance the incentive structure of top executives' compensation.

Furthermore, in the restricted sample, the coefficient of *LBO* with the dependent variable *Fraction of independent directors (Frac. ind. directors)* is negative and significant. This result also indicates a deterioration in corporate governance, as reducing the number of independent board members allows CEOs to more easily extract personal benefits (e.g., Strebulaev & Yang, 2013).

The findings in this section do not support hypothesis 2b and provide evidence that industry peers do not enhance their internal corporate governance structure. Therefore, corporate governance does not contribute to the profitability gains observed among industry peers. While Oxman and Yildirim (2008) and Feng and Rao (2022) document a positive effect of LBOs on corporate governance among US industry peers, Harford et al. (2016) show the opposite. They attribute the decline in corporate governance to increased competitive pressure, which, in turn, increases the takeover risk.

5.2.3 | Investments and asset sales

LBOs may intensify competition within an industry, thereby increasing the takeover risk (e.g., Harford et al., 2016). Industry peers may opt to increase their investment activities or refocus their organizational structure to improve their businesses. Table 7 investigates this in more detail. For a firm's investment activity, this analysis employs *CAPX-to-assets* and *R&D-to-assets*. To account for the disposal of fixed assets, I use the variable *Asset sales*, which is defined as the ratio of fixed asset sales to total assets (Strebulaev & Yang, 2013). This variable serves as a proxy for asset refocusing and potential changes in organizational structure.

The results in Table 7 do not indicate that LBO activity has a positive effect on peer firms' investment activity or liquidation of fixed assets. On the contrary, there is weak evidence that *CAPX-to-assets* (Column (1)) and *R&D-to-assets* (Column (5)) decrease with *LBO*.

Therefore, this section does not support hypothesis 2c and contradicts previous findings that show a positive relationship between LBO activity and changes to the investment activity of industry peers (e.g., Feng & Rao, 2022; Harford et al., 2016; Truong & Walz, 2024). In this context, European peer firms do not become more efficient through changes in their investment policies or by refocusing on their organizational structure.

Section 5.2 documents that LBO activity causes industry peers to use their existing assets more efficiently and become more cost-efficient, contributing primarily to the observed improvement in their profitability. Other potential channels do not appear to contribute to this effect.

5.3 | LBOs and industry developments

LBOs may signal future industry prospects (Slovin et al., 1991) or undervaluation (Harford et al., 2019). Consequently, PE investors may select these industries because of their favorable conditions, and industry peers may respond to the same industry conditions. Higher LBO activity would coincide with industry peers' profitability in this context.

Figure 3 illustrates the potential selection skills of PE investors by showing the average country–industry profitability around LBOs. The x-axis represents the time (in years) relative to an LBO announcement. The solid (dashed) line illustrates the average *EBITDA-to-assets (Operating margin)* development. Both profitability measures decline until $t = 0$, representing the LBO announcements. After that, the measures increase, suggesting that PE investors can identify industries when they are at the bottom.

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TABLE 6 Corporate governance.

	Log(1 + Board size)$_{t+1}$	*Frac. ind. directors*$_{t+1}$	*Log(1 + Cash comp.)*$_{t+1}$	*Stock options-to-SHO*$_{t+1}$	*Log(1 + Board size)*$_{t+1}$	*Frac. ind. directors*$_{t+1}$	*Log(1 + Cash comp.)*$_{t+1}$	*Stock options-to-SHO*$_{t+1}$
	Whole sample—OLS				**Restricted sample around ETD—CFA**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
LBO	0.0288	−0.0148	0.0605***	−0.0015***	0.0231	−0.0846**	−0.0018	−0.0022**
	(1.35)	(−1.43)	(3.06)	(−2.97)	(0.62)	(−2.10)	(−0.05)	(−1.99)
Residuals (first-stage)					0.0302	0.0909**	0.0745**	−0.0007
					(0.82)	(2.38)	(2.26)	(−0.63)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31,777	9090	35,744	31,062	17,596	3995	19,440	17,211
Adj-R^2	0.395	0.366	0.350	0.247	0.342	0.406	0.306	0.259

Note: This table presents ordinary least squares (OLS) and control function approach (CFA) estimations, with the one-year lead dependent variables *Log(1 + Board size), Fraction independent (Frac. ind.) directors, Log(1+Cash component)*, and *Stock options-to-shares outstanding (SHO)*. Columns (1)–(4) cover the whole sample from 1993 to 2021. Columns (5)–(8) focus on the period from 1999 to 2011, which is around the implementation of the ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis of Columns (5)–(8) to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Control and macro control variables correspond to those in Table 4. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels, respectively.

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TABLE 7 Investments and asset sales.

	CAPX-to − assets$_{t+1}$	*R&D-to − assets*$_{t+1}$	*Asset sales*$_{t+1}$	*CAPX-to − assets*$_{t+1}$	*R&D-to − assets*$_{t+1}$	*Asset sales*$_{t+1}$
	Whole sample—OLS			**Restricted sample around ETD—CFA**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
LBO	−0.0025**	−0.0039	0.0003	−0.0009	−0.0214**	−0.0012
	(−2.54)	(−1.42)	(0.53)	(−0.35)	(−2.41)	(−0.47)
M/B-ratio	0.0007***	0.0022***	−0.0000	0.0006***	0.0022***	−0.0000
	(9.77)	(5.25)	(−0.37)	(6.11)	(3.94)	(−0.02)
Log(1 + Assets)	−0.0045***	−0.0351***	−0.0010***	−0.0039***	−0.0346***	−0.0005*
	(−11.55)	(−17.21)	(−3.86)	(−8.20)	(−13.22)	(−1.75)
Net PPE-to-assets	0.0938***	−0.0449***	0.0089***	0.0964***	−0.0382**	0.0116***
	(27.99)	(−3.45)	(4.53)	(23.20)	(−2.12)	(4.98)
Book leverage	−0.0069***	0.0515***	0.0095***	−0.0075***	0.0523***	0.0086***
	(−3.41)	(3.36)	(5.94)	(−2.88)	(2.94)	(4.58)
Log(1 + Cash)	0.0042***	0.0245***	−0.0005**	0.0042***	0.0241***	−0.0006**
	(10.62)	(13.71)	(−2.16)	(8.88)	(10.44)	(−2.19)
Herfindahl index	−0.0037*	−0.0024	0.0000	−0.0026	−0.0113	0.0011
	(−1.95)	(−0.33)	(0.01)	(−1.07)	(−1.17)	(0.74)
Residuals (first-stage)				−0.0031	0.0199**	0.0012
				(−1.27)	(2.05)	(0.49)
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	57,198	21,787	31,288	30,412	9997	17,897
Adj-R^2	0.250	0.339	0.086	0.241	0.318	0.086

Note: This table presents ordinary least squares (OLS) and control function approach (CFA) estimations, with the one-year lead dependent variables *CAPX-to-assets*, *R&D-to-assets*, and *Asset sales*. Columns (1)–(3) cover the whole sample from 1993 to 2021. Columns (4)–(6) focus on the period from 1999 to 2011, which is around the implementation of the European ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + v_{c,j,t}$$

The residuals ($v_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis of Columns (4)–(6) to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

To test empirically whether the graphical illustration reflects growth opportunities or provides a beneficial industry valuation for PE investors, I employ the M/B decomposition of Rhodes-Kropf et al. (2005). It decomposes the M/B ratio into three distinct components. The M/B ratio is often used as a proxy for a firm's growth opportunities (e.g., Frank & Goyal, 2009) or firm valuation (e.g., Pástor & Pietro, 2003).[xiii] The first component, *Firm-specific error (FSE)*, measures firm-specific deviations from the fundamental value implied by industry multiples. The second component, *Time-series industry error (TSIE)*, examines short-term industry-level deviations from their long-run values. Both components capture the mispricing part of the M/B ratio. In particular, *TSIE* provides information on the misvaluation of firms regarding their industry valuation error. The third component, *Long-run to book value (LRtB)*, indicates a firm's growth potential, as it measures the long-run average growth rates for an average firm in an industry.

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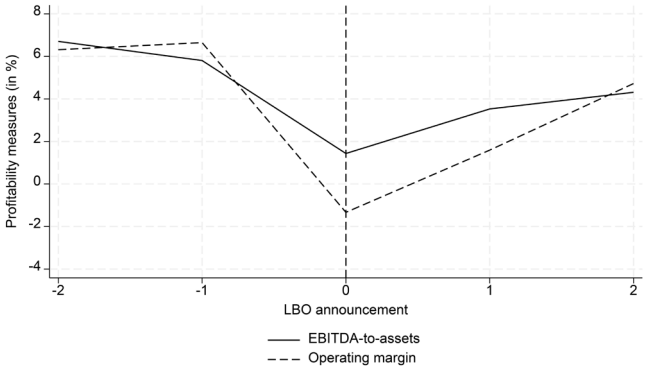

FIGURE 3 Industry profitability. This figure displays the development of the average profitability within a country–industry–year. The x-axis indicates the years relative to the year of an LBO announcement. The solid (dashed) line depicts the average industry *EBITDA-to-assets* (*Operating margin*). For variable descriptions, see Table A1.

Table 8 uses these three components as dependent variables. However, instead of using continuous component variables, I create binary variables to categorize firms into growth and undervalued firms.[xiv] First, *TSIE (binary)*, which equals one if short-term levels are below their long-run values, indicates industry undervaluation. Second, *LRtB (binary)* equals one if the long-run values are above the current book value, implying growth opportunities for a firm. Finally, *FSE (binary)* is one if the market value is below the firm's fundamental value. These variables are equal to zero if the respective condition of the variable is not met. Importantly, I use these dependent variables contemporaneously because PE investors likely possess an information advantage. In the case of industry undervaluation, this advantage would likely diminish rapidly if markets are efficient and would not be observable in the subsequent period.

Column (1) indicates that the likelihood of the short-term value implied by industry multiples of an industry peer being below its long-run value increases significantly with an increase in LBO activity. Furthermore, industry peers also exhibit significantly higher growth potential (long-run values are above the current book value) when exposed to LBOs (Column (2)). However, in the CFA models, which correct for the endogeneity of LBO, only the effect on the undervaluation of an industry peer at the industry level (Column (4)) remains significant. The results in Table 8 also suggest that the firm-specific undervaluation (market value of a peer is below its short-term value implied by industry multiples) of industry peers (Columns (3) and (6)) does not play a role in this context.

These findings support hypothesis 3, indicating that industry peers' performance improvement can also be attributed to industry developments, specifically industry undervaluation. In this regard, investors do not account fully for future operating performance, and PEs are able to select those industries.

These results are consistent with rational models in which PE investors possess private information that is not part of the information set of other investors at time t (e.g., Rhodes-Kropf & Viswanathan, 2004).

Existing literature contributions do not attribute the improvement in industry peers' profitability to the selection skills of PE investors (e.g., Aldatmaz & Brown, 2020; Feng & Rao, 2022). They argue that competitive spillovers cause industry peers to adjust their business. This section provides evidence that the timing of LBOs is a crucial factor in explaining the overall effect.

6 | HETEROGENEITY IN THE PROFITABILITY OF INDUSTRY PEERS

6.1 | Firm-level

In this section, I perform several subsample analyses to gain deeper insights into the positive impact of LBOs and to identify the firms that are most affected. To achieve this, I split the sample at the median of the variables *Log(1 + Assets)*, *M/B-ratio*, *Book leverage*, and *Ownership concentration*.[xv] More specifically, I examine whether firm size, growth opportunities, financial flexibility, and ownership structure play a role in this context.

In Table 9, the one-year lead dependent variables are *EBITDA-to-assets* and *Operating margin*. The analysis focuses on the "restricted sample" around the ETD, applying CFA regressions.

In Panel A, although all coefficients of *LBO* are positive and statistically significant, the effect is more pronounced in magnitude for firms that are equal to or below the sample median of "Log(1 + Assets)" (Columns (1) and (2)), and for firms above the sample median of the "M/B-ratio" (Columns (7) and (8)).

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TABLE 8 LBOs and industry developments.

	TSIE (binary)$_t$	*LRtB (binary)*$_t$	*FSE (binary)*$_t$	*TSIE (binary)*$_t$	*LRtB (binary)*$_t$	*FSE (binary)*$_t$
	Whole sample—OLS			**Restricted sample around ETD—CFA**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
LBO	0.0403**	0.0327**	−0.0181	0.1476***	−0.0018	−0.0261
	(2.00)	(2.29)	(−0.91)	(3.84)	(−0.07)	(−0.63)
Log(1 + Assets)	−0.0057**	0.0200***	−0.0005	0.0018	0.0219***	0.0021
	(−2.20)	(7.42)	(−0.18)	(0.55)	(6.55)	(0.58)
Net PPE-to-assets	−0.0035	−0.0399**	−0.0136	0.0156	−0.0488**	−0.0216
	(−0.25)	(−2.13)	(−0.92)	(0.89)	(−2.22)	(−1.16)
Book leverage	0.0229	−0.1552***	0.0367**	−0.0356	−0.1674***	0.0241
	(1.32)	(−8.64)	(1.98)	(−1.55)	(−7.56)	(1.00)
Log(1 + Cash)	−0.0038	−0.0055**	−0.0048*	−0.0049	−0.0061*	−0.0091**
	(−1.47)	(−2.07)	(−1.69)	(−1.45)	(−1.95)	(−2.55)
Herfindahl index	0.0069	−0.0677***	−0.0037	0.0416	−0.0627**	−0.0098
	(0.30)	(−3.41)	(−0.15)	(1.23)	(−2.18)	(−0.29)
Residuals (first-stage)				−0.0769*	0.0260	0.0141
				(−1.93)	(0.94)	(0.33)
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
M/B decomposition	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,848	28,848	28,848	15,256	15,256	15,256
Adj-R^2	0.575	0.459	0.577	0.596	0.466	0.587

Note: This table presents ordinary least squares (OLS) and control function approach (CFA) estimations, with binary-dependent variables based on the M/B-decomposition of Rhodes-Kropf et al. (2005). *TSIE (binary)* equals one if a firm's implied short-term value is below its implied long-run value, both based on industry multiples. *LRtB (binary)* equals one if the implied long-run value of a firm is above its current book value. *FSE (binary)* is equal to one if a firm's market value is below its short-term value. These variables are zero if the conditions are not met. Columns (1)–(3) cover the whole sample from 1993 to 2021. Columns (4)–(6) focus on the period from 1999 to 2011, which is around the implementation of the ETD. The variable LBO is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis of Columns (4)–(6) to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Smaller firms tend to have higher growth opportunities, for which the results find some evidence of higher LBO activity in the previous section. Moreover, these firms are likely easier to take over because of their size. Thus, if LBOs signal follow-on acquisitions, managers of small industry peers and those with high growth opportunities may be more incentivized to reduce the takeover risk and run their firms more efficiently than managers of larger industry peers. Furthermore, smaller firms are less followed by analysts (e.g., Bhushan, 1989; Lobo et al., 2012), which may support the undervaluation argument in Section 5.3, as more analysts provide more meaningful information (e.g., Li et al., 2019).

Firms with lower leverage ratios have greater financial flexibility, enabling them to capture investment possibilities (e.g., Frank & Goyal, 2009). Moreover, a higher takeover threat may positively affect the leverage ratio since debt can be

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TABLE 9 Heterogeneity in industry peers' profitability—Firm-level.

	EBITDA-to−assets$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$
	Log(1+Assets)				*M/B-ratio*			
	≤Median		>Median		≤Median		>Median	
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LBO	0.0777***	0.1158***	0.0180***	0.0265**	0.0213*	0.0481**	0.0650***	0.0880***
	(4.43)	(2.78)	(3.14)	(2.37)	(1.89)	(2.17)	(4.35)	(2.90)
Residuals (first-stage)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,152	14,237	16,246	16,146	17,236	16,334	15,158	14,046
Adj-R^2	0.277	0.179	0.144	0.108	0.247	0.115	0.288	0.202
	EBITDA-to−assets$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$
	Book leverage				*Ownership concentration*			
	≤Median		>Median		≤Median		>Median	
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LBO	0.0694***	0.0910***	0.0269***	0.0328	0.0287**	0.0496	0.0494***	0.0683**
	(4.52)	(3.34)	(2.86)	(1.44)	(2.36)	(1.60)	(3.38)	(2.37)
Residuals (first-stage)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,606	14,889	15,535	15,320	12,803	11,926	13,050	12,321
Adj-R^2	0.269	0.188	0.185	0.133	0.302	0.204	0.252	0.127

Note: This table presents subsample analyses using control function approach (CFA) estimations, with the one-year lead dependent variables *EBITDA-to-assets* and *Operating margin*. The analysis uses the restricted sample from 1999 to 2011, which is around the implementation of the ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). Panel A splits the sample based on the median values of *Log(1 + Assets)* and the *M/B-ratio*, while Panel B splits the sample at the median values of *Book leverage* and *Ownership concentration*. For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Control and macro control variables correspond to those in Table 4. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

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used as a defense tool (e.g., Garvey & Hanka, 1999; Safieddine & Titman, 1999) and improve profitability if firms use debt conservatively (e.g., Graham, 2000). In line with this reasoning, Panel B indicates that the positive LBO effect is more pronounced for peer firms with equal or below-median "Book leverage."

European firms tend to have higher ownership concentration than US firms (e.g., Enriques & Volpin, 2007), making them more difficult to take over (e.g., Holderness & Sheehan, 1988; La Porta et al., 1999). However, the results in Columns (5)–(8) suggest that peer firms with larger shareholders (Columns (7) and (8)) benefit more from LBO activity. Large shareholders may enhance the monitoring of managers (e.g., Agrawal & Mandelker, 1990; Shleifer & Vishny, 1997), thereby incentivizing managers to improve firm performance.

6.2 | Industry-level

This section offers a more in-depth analysis of the LBO channels and their impact on the takeover threat in relation to the profitability of industry peers. Similar to the subsample analysis in Section 6.1, I divide the sample based on the median values of the following variables at the country–industry level: the *No. of LBO deals*, *Turnover ratio*, *Herfindahl index*, and *M/B ratio*. These variables serve as proxies for the various aspects of the takeover threat generated by LBO activity.

Columns (1)–(4) of Panel A in Table 10 account for the low or high levels of follow-on acquisitions, while Columns (5)–(8) capture these levels for industry-wide agency problems. I use the turnover ratio at the county-industry level as a proxy for the agency costs, as a higher turnover ratio indicates more efficient asset utilization and suggests an inverse relationship with agency costs (e.g., Ang et al., 2000). The results suggest that industry peers with fewer LBO deals in their industry tend to have a slightly stronger LBO effect on their profitability. Moreover, industry peers with turnover ratios equal or below their country–industry median, indicating higher agency costs, demonstrate a more pronounced effect with LBO activity. Even though Table 6 does not indicate an improvement in the internal corporate governance structure, industry peers with higher agency costs are more sensitive to LBOs in enhancing their profitability.

In Panel B of Table 10, Columns (1)–(4) show similar effects on industry peers in the competitive and non-competitive subsamples. The competition channel is associated with an increase in investment activity or changes in the organizational structure of industry peers, which Section 5.2 does not support. Regarding the subsamples of the country–industry M/B ratio, the magnitude of *LBO* on the dependent variables appears to be more pronounced in the high-M/B ratio subsample (Columns (7)–(8)), which aligns with the results in Table 9.

Overall, this section provides evidence that, first, firms characterized by small size, growth potential, financial flexibility, and concentrated ownership tend to gain mostly from LBO activity. Second, peer firms in industries with high agency costs and strong growth opportunities, which are also related to the potential signals of LBOs, tend to exhibit a more pronounced response to LBOs.

7 | ROBUSTNESS TESTS

Using the ETD as an instrumental variable in the first stage of the CFA regressions corrects for the potential endogeneity of LBO activity, thereby helping to investigate the impact of LBOs on their industry peers. In addition to the argumentation in Section 4 regarding the exogeneity of the ETD, it is essential to consider a firm's institutional and legal context (Karpoff & Wittry, 2018) owing to omitted variables. In this context, it is possible that unrelated court decisions around the ETD in EU Member States may have influenced the institutional environment (Dissanaike et al., 2021) and, in turn, impacted the LBO market within these countries. However, the ETD offers several benefits regarding the institutional framework compared to changes in business combination laws in the US context. First, the legislative power of court decisions in the EU is comparatively weaker than in the United States. Second, the ETD covers several different regulatory elements, while these elements are distinct laws in the United States that are more challenging to account for (Dissanaike et al., 2021; Karpoff & Wittry, 2018). Furthermore, the empirical models used in the first-stage regressions include country, industry, and time fixed effects, which account for institutional and country-specific differences.

To empirically test whether other events or court decisions around the ETD influence the performance of firms, I run two placebo tests in Panel A of Table A3 (Appendix A). More specifically, the implementation dates in the countries were shifted to both ends within my sample. In Columns (1)–(3), the placebo ETD covers the years 1993 to 2002 ("Before"), and Columns (4)–(6) cover the years from 2012 to 2021 ("After").

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TABLE 10 Heterogeneity in industry peers' profitability—Industry-level.

	EBITDA-to−assets$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$
	Country–industry – *No. of LBO deals*				Country–industry – *Turnover ratio*			
	≤Median		>Median		≤Median		>Median	
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LBO	0.0388***	0.0780***	0.0465***	0.0460	0.0462***	0.1264**	0.0344***	0.0197*
	(3.02)	(3.20)	(3.25)	(1.40)	(2.62)	(2.25)	(3.27)	(1.74)
Residuals (first-stage)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,980	15,955	15,421	14,431	14,446	12,786	17,942	17,588
Adj-R^2	0.239	0.141	0.297	0.200	0.229	0.120	0.279	0.183
	EBITDA-to−assets$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$	*EBITDA-to−assets*$_{t+1}$	*Operating margin*$_{t+1}$
	Country–industry – *Herfindahl index*				Country–industry – *M/B-ratio*			
	≤Median		>Median		≤Median		>Median	
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LBO	0.0481***	0.0735**	0.0446***	0.0561***	0.0312***	0.0354**	0.0667***	0.1023***
	(3.06)	(2.41)	(4.02)	(2.58)	(2.91)	(2.29)	(4.00)	(2.72)
Residuals (first-stage)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,453	16,150	14,944	14,235	17,271	16,672	15,124	13,708
Adj-R^2	0.239	0.141	0.297	0.200	0.229	0.120	0.279	0.183

Note: This table presents subsample analyses using control function approach (CFA) estimations, with the one-year lead dependent variables *EBITDA-to-assets* and *Operating margin*. The analysis uses the restricted sample from 1999 to 2011, which is around the implementation of the ETD. The variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. For the CFA estimations, the following first-stage regression is applied:

$$LBO_{c,j,t} = \alpha + \beta_1 Treat_{c,j} \times Post_t + \beta_2 M_{c,t-1} + \beta_3 I_{c,j,t-1} + \gamma_c + \eta_j + \delta_t + \nu_{c,j,t}$$

The residuals ($\nu_{c,j,t}$) from this regression, referred to as *Residuals (first-stage)*, are included in the analysis to correct for the endogenous variable *LBO*. The binary variable *Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date. The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. $M_{c,j,t-1}$ represent lagged macroeconomic variables, while $I_{c,j,t-1}$ captures industry-specific variables. γ_c, η_j, and δ_t denote country, industry, and time fixed effects, respectively (see Table 3, Column (2) for the regression results). Panel A splits the sample based on the country–industry median values of *No. of LBO deals* and the *Turnover ratio*, while Panel B splits the sample at the country–industry median values of the *Herfindahl index* and the *M/B-ratio*. For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Control and macro control variables correspond to those in Table 4. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

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The results display insignificant coefficients for *Treat* × *Post* in all columns except for Column (1), which shows a significantly negative coefficient. This suggests that other events surrounding the ETD do not significantly impact the behavior of firms. Therefore, the positve and significant effect observed in the main results reflect the ETD's impact on industry peers' profitabilty by altering LBO activity and the takeover threat in treated countries. Furthermore, LBO activity consistently shows a positive and statistically significant relationship with the dependent variables across all models.

Panel B of Table A3 presents alternative proxies for the *LBO* variable. Columns (1)–(3) employ *V-activity*, defined as the log of one plus the total deal value within a country–industry–year (e.g., Haddad et al., 2017). In Columns (4)–(6), *VB-activity* is used, which is the ratio of *V-activity* to the number of firms within a country–industry–year. Both proxies capture, to some extent, the value component of LBO deals, with larger deals likely having stronger implications for industry peers. In all models, I employ CFA regressions, using the residuals from the first stage of the respective LBO proxy. The findings from this analysis further demonstrate a significant effect of these alternative proxies on the profitability of industry peers, reinforcing the main results presented in Section 5.1.

I also analyze M&A deals[xvi] instead of LBOs, applying the same definition for M&A activity as for LBO activity. Since LBOs may signal the start of a merger sequence (Harford et al., 2016), which could also contribute to an increased takeover threat within an industry. Consequently, industry peers might respond to M&A activity. However, I do not find a positive relationship between M&A activity and the profitability of industry peers (Table B3, Appendix A in Appendix S1). Additionally, I investigate whether the ETD influences M&A activity, but I find no evidence to suggest that the ETD impacts M&A activity (Table B2, Appendix A in Appendix S1). This finding may help explain the mixed evidence in the literature regarding ETD and takeover efficiency gains (Dissanaike et al., 2021; Humphery-Jenner, 2012; Wang & Lahr, 2017).

8 | CONCLUDING REMARKS AND DISCUSSION

This study examines the impact of leveraged buyouts on industry peers within the European context. Currently, only cross-country studies on the aggregate industry level (Aldatmaz & Brown, 2020; Bernstein et al., 2017) exist that investigate the research question in more detail. I provide new evidence at the individual peer level, demonstrating that LBO announcements positively influence industry peers' profitability. Using CFA regressions, I employ the ETD as an instrument in the first-stage regression and use the residuals to correct for the endogeneity of LBO activity. The findings suggest that the improvement in profitability is attributed to industry peers' more efficient asset utilization and increased cost efficiency.

However, it also shows that the timing of PE investors plays a crucial role as they select industries when they are at the bottom of their average profitability. In this context, industry developments, such as growth opportunities and especially undervaluation, are important factors in explaining the overall effect.

In particular, the attribution of the selection channel differs from other studies in the LBO context, which primarily link the improvements to positive competitive spillovers (e.g., Aldatmaz & Brown, 2020) that also strengthen corporate governance (e.g., Feng & Rao, 2022). However, this study finds no evidence that European peer firms adjust their operations in response to variables that are more susceptible to these channels.

European firms generally have a less dispersed ownership structure than US firms (e.g., Enriques & Volpin, 2007). Consequently, the problem of separation between ownership and control is less pronounced in Europe; therefore, peer firms do not need to improve their internal corporate governance structures. Furthermore, the subsample analyses in Section 6 indicate that firms with larger shareholders benefit more from LBOs, suggesting that enhanced monitoring activities may incentivize managers to run their firms efficiently. While industry peers, on average, do not make specific adjustments to their corporate governance, they tend to show greater improvements when operating in a country–industry with high agency costs. This suggests that the enhancements observed among industry peers may stem from efforts to reduce agency costs.

Additionally, European LBO deals tend to be smaller than US LBO deals,[xvii] which could influence peers differently. First, larger deals are more likely to impact competition within an industry. Second, the takeover threat is probably limited to smaller firms. The subsample analysis reveals that the positive effect is more pronounced in the sample of firms with below-median size. However, there is no evidence of a reduced skillset of PE investors in Europe compared to the US. Thus, PE investors can exploit favorable market and industry conditions.

In addition to the different sample focus (United States vs Europe) and using individual peers instead of aggregation, the difference could also result from analyzing all LBO deals rather than focusing exclusively on public-to-private

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transactions. Research on the spillover effects of LBOs has primarily focused on public-to-private transactions (e.g., Feng & Rao, 2022; Harford et al., 2016; Oxman & Yildirim, 2008; Truong & Walz, 2024). However, private deals may have different implications for industry peers. For instance, studies find a positive impact on the valuation of target firms' peers when the sample includes only public-to-private LBOs (e.g., Feng & Rao, 2022; Slovin et al., 1991), but a negative impact when the majority of deals are private-to-private transactions (e.g., Hsu et al., 2011; Kathan & Tykvová, 2024).

Studies that include private deals, such as Kathan and Tykvová (2024), find a negative operating performance of industry peers after LBOs. Their analysis is limited to a restrictive sample of US deals, excluding many transactions. This restriction may understate the positive implications of LBO activity on industry peers. Moreover, their findings suggest that the negative effect becomes considerably smaller when these restrictive assumptions are relaxed.

A potential limitation of my study is the relatively limited data coverage for European firms compared to that for US firms. However, I address some of these data limitations by focusing on the largest European economies, which account for most of Europe's GDP. Nevertheless, this approach may restrict the generalizability of the results.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from WRDS and LSEG Eikon. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the author(s) with the permission of WRDS and LSEG Eikon.

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Endnotes

[i] The study includes the five largest countries in terms of their GDPs in Europe: France, Germany, Italy, Spain, and the United Kingdom. They also provide the most buyout capital invested in Europe (Aldatmaz & Brown, 2020). Additionally, the data coverage for the variables used in this study is significantly more complete for the selected countries compared to other European countries.

[ii] Note, a substantial proportion of private deals do not disclose their deal value. Table 1 reports the average deal value of the available data, which is driven by public and large private deals.

[iii] Descriptive statistics on the distribution of peer firms across countries and industries are provided in the Appendix A, Table A2.

[iv] The number of observations varies across variables due to differences in the availability of data for each respective variable.

[v] For the empirical analysis, I use *LBO* for LBO activity because many private deals do not provide a deal value.

[vi] Minimum rules concerning mandatory bid rule, breakthrough rule, board neutrality rule, squeeze-out right, and sell-out right. For more information on the minimum rules, see Goergen et al. (2005) and Clerc et al. (2012).

[vii] PE funds aim to acquire full ownership in the majority of deals within the sample, resulting in an average ownership stake of 96.78%.

[viii] I closely follow Dissanaike et al. (2021), who rely on the classification of Clerc et al. (2012) to map ETD-related changes to the countries and specify the treatment and control group accordingly.

[ix] For the control countries, the implementation dates were May 20, 2006, in France and the United Kingdom, and July 19, 2007, in Italy (Wang & Lahr, 2017).

[x] The variables *Treat* and *Post* are collinear with the fixed effects.

[xi] In untabulated results, I also perform the Oster (2019) diagnostic test for unobserved factors and coefficient stability in the second-stage regression. The "Breakdown Delta" for an R^2 of 1.00, which is 71.6%, provides evidence that the findings are not sensitive to omitted variable bias.

[xii] Corporate governance variables are retrieved from Capital IQ and Boardex Europe. Note that Boardex Europe does not cover firms from the United Kingdom.

[xiii] I show the formal derivation of the M/B decomposition in the Appendix B in Appendix S1.

[xiv] The components show the deviations between a firm's actual and implied value, which can be above or below the actual value. However, this analysis focuses on firms categorized as growth or undervalued firms.

[xv] I retrieve ownership data from Datastream.

[xvi] Table B1 and Appendix A in Appendix S1 provides descriptive statistics for M&A target firms.

[xvii] In untabulated results, the mean deal value of US targets is 690.24 mio $ compared to 223.56 mio $ in Table 1.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

TABLE A1 Definition of variables.

Variable	Description
LBO (M&A) variables	
LBO	*LBO* is calculated as the number of leveraged buyouts divided by the number of firms within a country–industry–year
LBO (binary)	*LBO (binary)* equals one for firms with an LBO announcement in their country–industry–year, and zero otherwise
LBO (V-activity)	*LBO (V-activity)* is the natural logarithm of one plus the total LBO deal values within a country–industry–year
LBO (VB-activity)	*LBO (VB-activity)* is the natural logarithm of one plus the total LBO deal values within a country–industry–year divided by the number of firms within a country–industry–year
M&A (M&A activity)	*M&A* is calculated as the number of M&A deals divided by the number of firms within a country–industry–year
The European takeover directive	
Treat	*Treat* equals one for firms in treated countries (Germany, Spain) from the ETD and zero for firms in control countries (France, Italy, and the United Kingdom)
Post	*Post* equals one for firms in France (Germany, Italy, Spain, and the United Kingdom) from the implementation date of May 20, 2006 (July 8, 2006; July 19, 2007; April 13, 2007; and May 20, 2006) to the end of the year 2011. It is zero from 1999 until the day before each country's ETD implementation date
Profitability	
EBITDA-to-assets	*EBITDA-to-assets* is calculated as the ratio of a firm's operating income to total assets
Operating margin	*Operating margin* is calculated as the ratio of a firm's operating income to net sales for firms with net sales over 1 million $
Return-on-assets	*Return-on-assets* is calculated as the ratio of a firm's net income to total assets
Operating efficiency	
Turnover ratio	*Turnover ratio* is calculated as the ratio of a firm's net sales to total assets
Current asset turnover ratio	*Current asset turnover ratio* is calculated as the ratio of a firm's net sales to current assets
Expense ratio	*Expense ratio* is calculated as the ratio of a firm's operating expenses to net sales
SG&A margin	*Selling, General and Administrative (SG&A) margin* is calculated as the ratio of a firm's SG&A expenses to net sales

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TABLE A1 (Continued)

Variable	Description
Corporate governance	
Log(1 + Board size)	*Log(1 + Board size)* is calculated as the natural logarithm of one plus a firm's number of board directors
Fraction independent directors	*Fraction of independent directors* (Frac. ind. board) is calculated as the fraction of a firm's independent (no insider and non-affiliated) directors on the board
Log(1 + Cash compensation)	*Log(1 + Cash compensation)* is calculated as the natural logarithm of one plus a firm's cash payment to the top executive management
Stock options-to-SHO	*Stock options-to-shares outstanding (SHO)* is calculated as the ratio of the number of top executive management's stock options to total shares outstanding
Investments and asset sales	
CAPX-to-assets	*CAPX-to-assets* is calculated as the ratio of a firm's capital expenditures to total assets
R&D-to-assets	*R&D-to-assets* is calculated as the ratio of a firm's research and development expenses to total assets
Asset sales	*Asset sales* is calculated as the ratio of a firm's disposal of fixed assets to total assets
Control variables	
M/B-ratio	*M/B ratio* is calculated as the ratio of a firm's market capitalization to book equity
Log(1 + Assets)	*Log(1 + Assets)* is calculated as the natural logarithm of one plus a firm's total assets
Net PPE-to-assets	*Net PPE-to-assets* is calculated as a firm's net property, plant, and equipment (PPE) to total assets
Book leverage	*Book leverage* is calculated as the ratio of a firm's total debt to total assets
Log(1 + Cash)	*Log(1 + Cash)* is calculated as the natural logarithm of one plus a firm's cash and short-term investments
Macro control variables	
10-year government bond rate	*Ten-year government bond rate* refers to the yield on a country's 10-year government bond for a given country–year, which serves as a benchmark for long-term interest rates. This data is obtained from the World Bank Group
GDP per capita	*GDP per capita* refers to the total economic output (Gross Domestic Product) of a country divided by its population for a given country–year, representing the average income per person. This data is obtained from the World Bank Group
Unemployment rate	*Unemployment ratio* refers to the percentage of the labor force that is out of work but actively seeking employment for a country–year. This data is obtained from the World Bank Group
Inflation rate	*Inflation rate* refers to the percentage increase in the general price level of goods and services over a country–year. This data is obtained from the World Bank Group
M/B decomposition	
TSIE (binary)	*TSIE (binary)* equals one if a firm's *Time-series industry error* is negative. Otherwise, it is zero. Time-series industry error is calculated from the M/B decomposition of Rhodes-Kropf et al. (2005) (see Appendix B in Appendix S1—M/B decomposition)
LRtB (binary)	*LRtB (binary)* equals one if a firm's *Long-run to book value* is positive. Otherwise, it is zero. Long-run to book value is calculated from the M/B decomposition of Rhodes-Kropf et al. (2005) (see Appendix B in Appendix S1—M/B decomposition)
FSE (binary)	*FSE (binary)* equals one if a firm's *Firm-specific error* is negative. Otherwise, it is zero. Firm-specific error is calculated from the M/B decomposition of Rhodes-Kropf et al. (2005) (see Appendix B in Appendix S1—M/B decomposition)
Subsample analysis	
Ownership concentration	*Ownership concentration* is calculated by a firm's fraction of closely held shares as defined in (Thomsen et al., 2006)
No. of LBO deals (country–industry)	*No. of LBO deals (country–industry)* is the sum of all LBO deals within a country–industry–year
Turnover ratio (country–industry)	*Turnover ratio (country–industry)* is the average turnover ratio within a country–industry–year

(Continues)

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TABLE A1 (Continued)

Variable	Description
Herfindahl index (country–industry)	*Herfindahl index* is calculated as the sum of the quadratic market shares of all firms within a country–industry–year. Market shares are calculated as a firm's net sales over total country–industry–year net sales. Country–industry is based on the country and three-digit SIC codes
M/B-ratio (country–industry)	*M/B-ratio (country–industry)* is the average M/B-ratio within a country–industry–year

TABLE A2 Descriptive statistics of peer firms.

	Country							
Industry	France	Germany	Italy	Spain	United Kingdom	Entire sample	LBO	Non-LBO
Agriculture, forestry and fishing	174	71	44	16	284	589	0	589
Mining	195	83	54	59	3418	3809	503	3306
Construction	340	210	202	349	997	2098	524	1574
Manufacturing	6656	7265	2748	1465	10,499	28,633	13,039	15,594
Transportation and public utilities	726	794	447	270	1673	3910	1021	2889
Wholesale trade	597	412	157	77	1203	2446	1050	1396
Retail trade	759	506	143	77	2535	4020	1610	2410
Services	3722	3436	738	475	8851	17,222	13,236	3986
No. of firm-years	13,169	12,777	4533	2788	29,460	62,727	30,983	31,744
No. of firms	1109	1023	468	218	2877	5695		

Note: This table presents the distribution of firm-years and firms across industries, categorized by major groups within the Standard Industrial Classification (SIC) and countries. It includes all non-financial, non-utility, and non-government firms from the Compustat Global database between 1993 and 2021 for the five largest EU countries—France, Germany, Italy, Spain, and the United Kingdom—based on their GDP. The column labeled "LBO" reports the number of firm-years within a country–industry where an LBO announcement occurred, while the "Non-LBO" column indicates the number of firm-years for country–industries without LBOs.

TABLE A3 Robustness tests.

	$EBITDA\text{-}to-assets_t$	$Operating\ margin_t$	$Return\text{-}on-assets_t$	$EBITDA\text{-}to-assets_t$	$Operating\ margin_t$	$Return\text{-}on-assets_t$
	Before			After		
Panel A—Placebo test	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	−0.0250***	−0.0010	−0.0005	0.0025	0.0114	0.0078
	(−4.04)	(−0.08)	(−0.05)	(0.37)	(0.74)	(1.38)
LBO	0.0210***	0.0462***	0.0173***	0.0109*	0.0289**	0.0121**
	(3.84)	(4.35)	(3.09)	(1.82)	(2.27)	(2.44)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,320	19,781	12,740	23,908	21,406	22,623
Adj-R^2	0.245	0.192	0.218	0.378	0.197	0.250

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TABLE A3 (Continued)

Panel B—LBO proxies	*EBITDA-to − assets*$_{t+1}$	*Operating margin*$_{t+1}$	*Return-on − assets*$_{t+1}$	*EBITDA-to − assets*$_{t+1}$	*Operating margin*$_{t+1}$	*Return-on − assets*$_{t+1}$
	V-activity			*VB-activity*		
	(1)	(2)	(3)	(4)	(5)	(6)
LBO	0.0010**	0.0008	0.0011**	0.0107***	0.0173***	0.0084***
	(2.56)	(0.95)	(2.06)	(5.64)	(4.92)	(3.17)
Residuals (first-stage)	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,980	24,292	22,891	25,980	24,292	22,891
Adj-R^2	0.261	0.151	0.181	0.262	0.151	0.182

Note: This table presents ordinary least squares (OLS) in Panel A and control function approach (CFA) estimations in Panel B, with the dependent variables *EBITDA-to-assets*, *Operating margin*, and *Return-on-assets*. In Panel A, the variable *LBO* is defined as the ratio of LBO deals to the number of firms within a country–industry–year. In the "Before" columns ("After" columns), the binary variable *Post* equals one for the years from 1998 to 2002 (2017 to 2021) and zero for the period of 1993 to 1997 (2012 to 2016). The binary variable *Treat* equals one for firms in treated countries (Germany, Spain) affected by the ETD and zero for firms in control countries (France, Italy, and the United Kingdom). *Treat* × *Post* is the interaction of the two binary variables. Panel B focuses on the period from 1999 to 2011, which is around the implementation of the European Takeover Directive (ETD), and employs the same setting as in Table 4. However, Columns (1)–(3) use as a proxy for the variable *LBO*, *V-activity*, which is the natural logarithm of one plus the total LBO deal values within a country–industry–year. In Columns (4)–(6), *VB-activity* is used as a proxy for *LBO*, which is *V-activity* divided by the number of firms within a country–industry–year. The residuals from the first-stage regressions are adjusted according to the respective LBO definitions. For variable descriptions, see Table A1. Firms in the utility and financial industries, as well as government entities, are excluded. All continuous variables are winsorized at the 1% level at both ends. Control and macro control variables correspond to those in Table 4. All regressions include a constant. Standard errors are clustered at the firm level, and *t*-values are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

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