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Do insiders time management buyouts and freezeouts to buy undervalued targets?☆

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ABSTRACT

We provide evidence that managers and controlling shareholders time management buyouts (MBOs) and freezeout transactions to take advantage of industry-wide undervaluation. Portfolios of industry peers of MBO and freezeout targets show significant alphas of around 1% per month over the 12-month period following the transaction. These returns are not explained by a battery of risk factors or empirical methodologies, but exhibit significant heterogeneity across deals. Additional tests show that, on average, abnormal returns to industry peers are a reliable proxy for those to the target firm. Further, MBOs and freezeouts are announced during troughs of industry profitability.

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1. Introduction

Conflicts of interest on the part of managers and controlling shareholders are widely believed to lead to unfair treatment of public shareholders in management buyouts (MBOs) and minority freezeout transactions. Those in control are motivated to pay the lowest possible share price despite a fiduciary duty to negotiate a high price for selling shareholders. Managers and controlling shareholders have incentives not only to negotiate lower premiums (relative to the current market price) but also to initiate deals when the firm is undervalued according to their private information.[1] In this paper, we examine the timing of MBOs and freezeout acquisitions and assess whether on average they are initiated during periods of industry undervaluation.

The question posed by our title is unanswered by the literature (described below) largely because we cannot directly observe the value of the target had it not been ac-

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[1] For instance, a fund manager commented on the timing of the recent buyout of Dell, Inc.: "Guys like Michael Dell know what's going on better inside the company than anyone on the outside. . . . Management swoops in to get a good deal right before there's a change in the business" (Hoffman, 2016). See the Appendix for details on this deal and the Internet Appendix for several other deals that are informative about conflicts of interest in buyouts and freezeouts.

quired. We establish that, on average, industry peers are undervalued at the time of non-arm's-length acquisitions and that their undervaluation is a reliable proxy for that of the target firm. The results suggest that the average buyout target is also undervalued. This implies, but does not conclusively establish, that managers and controlling shareholders attempt to time buyouts and freezeouts to exploit industry undervaluation. Establishing target shareholder exploitation is more difficult because it could be that management is merely optimistic and is lucky on average or that management and outside shareholders have different beliefs about the prospects of the firm. Stated another way, systematic industry undervaluation is consistent with, but is not equivalent to, systematic exploitation of target shareholders. Our results, however, lead to a broader question: Why do shareholders and courts not see the potential for shareholder exploitation and stop it? We argue that the answer is found in a challenge similar to the one discussed in DeAngelo (1986). Specifically, given the distribution of post-buyout industry peer returns, it is difficult to convince a court of exploitation in a specific case (with a sample size of one). The outcome is that exploitive deals can pool with nonexploitive deals such that exploitation can survive despite the obvious incentives and array of legal barriers to prevent it.

As mentioned, determining (even ex post) whether targets are undervalued or overvalued in a bid is a difficult task because, following an MBO or freezeout, one cannot observe the value the target firm would have had if it had not been acquired. Previous studies have used announcement characteristics, relied on subsamples of firms in which operational data are available, or studied firms in which the buyout bids are withdrawn or rejected. Although such empirical methods can provide evidence of short-run gains to target shareholders or of operational improvements, these studies cannot reject the undervaluation hypothesis. Specifically, if the firm is undervalued when it is acquired, then outside shareholders may still be exploited in the presence of short-run gains and operational improvements.

In this study, we examine the stock returns to industry peers of MBO and minority freezeout targets following acquisition announcements. This approach has several desirable qualities. First, if the pre-buyout stock returns of industry peers are on average a reliable proxy for those of the target, industry peers' post-buyout stock returns give us a means of estimating what stock returns of the average target firm would have been if the buyout or freezeout had not been announced (and thus represent the degree of undervaluation). In addition, investment bankers' fairness opinions use valuation multiples of industry peers to determine whether the offer price is "fair" to the target's outside shareholders. Managers and controlling shareholders should know the industry better than outside shareholders do, and could thus initiate the acquisition at a time of industry undervaluation. If so, the lower valuations will result in lower benchmarks and fairness opinions and thus will not constrain management or controlling shareholders who make offers during these times.

Our method is similar to Yagan (2015), who studies the effects of the 2003 dividend tax cut on investment and employee compensation by comparing firms affected by the tax cut with unaffected firms. Importantly, this methodology does not require random assignment into affected (in our case, acquisition targets) and unaffected firms.[2] It requires only that these groups would have followed similar valuation paths without the acquisition (similar, in spirit, to the parallel trends assumption in difference-in-difference analysis). Consistent with this assumption, we find that, on average, the stock returns of the target firm move 0.90 to 0.95 percentage points and in the same direction of each 1 percentage point move in stock returns of its industry peers before MBOs and freezeout acquisitions and that the association is highly statistically significant. The almost one-to-one relation in expectation indicates that the stock returns of industry peers are, on average, a reliable (albeit noisy) proxy for those of the target firm and can be used to form an expectation of how the target's value would have changed had it not been acquired. But the reliability varies from case to case. In other words, industry peer returns are a reliable proxy for the average sample deal but not necessarily so for every specific deal. This exacerbates the problem facing shareholders trying to detect and prevent exploitation.

We form diversified calendar-time portfolios of all targets' industry peers and examine their risk-adjusted abnormal returns. This approach allows us to draw reliable statistical inferences about the economic magnitude of systematic industry undervaluation at the time of MBOs and freezeout acquisitions (Fama, 1998; Mitchell and Stafford, 2000). The method is especially appropriate for our purpose because the timing of MBOs and freezeouts could be based on observable firm characteristics (which makes characteristic-based methods less likely to detect systematic industry undervaluation). Employing a U.S. sample of 470 MBOs and 518 freezeout acquisitions from 1980 to 2014, we show that four-digit Standard Industrial Classification (SIC) industry peers of target firms have 12-month returns that exhibit significantly positive alphas benchmarked against several sets of commonly used risk factors, consistent with these firms being undervalued.[3] Further analysis reveals that undervaluation is absent in the 1980s MBO wave but is significant through the rest of our sample period. Lack of undervaluation in the 1980s is consistent with DeAngelo (1986), who finds no evidence that management manipulated earnings before MBOs from 1973 to 1982, and with Kaplan (1989), who concludes that better incentives, not shareholder exploitation, explain investment reductions and operational improvements in a sample of MBOs from 1980 to 1986. Below, we discuss factors,

[2] Further, even if assignment into the affected firm group (MBO and freezeout acquisition targets) is based on undervaluation, the most undervalued firms would likely be assigned to the acquisition target group. Thus, peer returns would underestimate the degree of undervaluation and we would be biased against finding evidence of exploitation of public shareholders.

[3] Our sample starts in 1980 because earlier MBO and freezeout data are not available in commercial databases. Importantly, the positive abnormal returns are based on a trading strategy that relies purely on public information. An outsider could therefore identify industry undervaluation on average and capture these gains simply by purchasing the industry peers of MBOs and freezeouts.

such as the collapse of the junk bond market and regulatory changes that could at least partially explain the difference in the extent of industry undervaluation at the time of bids announced before versus after 1990.

The alphas we find persist in the presence of a takeover risk factor or a liquidity factor that addresses the possibility that the market is pricing in an increased chance of takeovers or a change in liquidity. The associated *t*-statistics are greater than three in most of our model specifications. This significantly alleviates the concern that our findings are the result of data mining (Harvey et al., 2016). The abnormal returns after 1990 are economically large, ranging between 0.4% and 1.5% per month, depending on model specifications. In contrast, we do not observe significant long-run abnormal returns to the industry peers of target firms following either arm's-length third-party transactions or randomly generated pseudo-deals, bolstering our interpretation of the source of the returns. Taken together, it is unlikely that the positive abnormal returns we observe are driven by data mining or omitted risk factors.

As discussed above, our analysis relies on the assumption that post-deal industry peer returns are a valid proxy for the target firm's counterfactual returns. We take several steps to draw reliable statistical inferences about the value path of the target firm based on that of its industry peers. First, we estimate the contemporaneous relation between a target firm's stock returns and the returns to the portfolio of its industry peers in linear regressions. We then estimate abnormal returns to the target firms using this relation and the observed contemporaneous abnormal returns to portfolios of their industry peers. Consistent with the calendar-time results, the estimation shows that on average the target firms would also have experienced economically and statistically significant abnormal returns absent the acquisition. The results are robust to a battery of alternate specifications. We also show that the positive abnormal returns are present in deals with both low and high bid premiums and that MBOs and freezeouts have bid premiums similar to those of arm's-length acquisitions. In addition, positive abnormal returns occur regardless of whether the deal is subsequently litigated. This indicates that outside investors do not claw back the expected revaluation from management or controlling shareholder bidders through higher bid premiums or litigation.

We uncover more evidence consistent with the conclusion that managers and controlling shareholders successfully time their acquisition when the industry is undervalued. We find that MBOs and freezeouts tend to occur during a trough in an industry's performance. Specifically, we show that return on assets and profit margin decline before MBOs and freezeouts and increase after the deals. In addition, using the market-to-book ratio decomposition from Rhodes-Kropf et al. (2005), we find that the mean target industry's market-to-book ratio at the time of MBO and freezeout announcements is significantly below its long-term historic average. We do not observe a similar pattern for arm's-length mergers and acquisitions.

Although the statistical and economic significance of the alphas (which represent the average undervaluation of industry peers) from the calendar-time risk-adjusted approach is clear, an examination of the data reveals the difficulty facing investors and courts in establishing undervaluation in a specific deal. The dispersion in post-bid peer returns is substantial: for example, the 25th percentiles of monthly portfolio returns and average peer buy-and-hold returns are negative. On balance, although the results show significant systematic industry undervaluation that characterizes the average deal, heterogeneity in the deals and the motivations behind them mean that many deals, especially those in the earlier wave, are not characterized by undervaluation. The economic significance of the potential undervaluation is thus difficult to detect, and therefore debatable, for any given deal.[4]

Concerns over potential unfair treatment of public shareholders in non-arm's-length acquisitions are not new, and in the 1970s and early 1980s, courts and regulators set procedural safeguards to protect a target firm's shareholders. These safeguards included the formation of special committees of non-interested directors and the necessity of majority approval by minority shareholders. They also established, and adjusted, the burden of proof in justifying a given purchase price. Although these safeguards likely reduce the exploitation of outside shareholders in non-arm's-length acquisitions, their efficacy in protecting outside shareholders is an empirical question.

The conflicts of interest and potential for exploitation have long been known and studied. Yet, three decades of research since DeAngelo et al. (1984) are inconclusive as to whether insiders exploit outside shareholders in non-arm's-length acquisitions. In particular, prior studies (detailed in Section 2) find mixed evidence regarding: (1) whether legal protections (e.g., third-party fairness opinions and shareholder litigation) or market incentives are enough to protect outside shareholders in non-arm's-length acquisitions; and (2) whether operational improvements can be distinguished from value transfers in these acquisitions. We contribute to the literature with new evidence that MBOs and freezeouts are timed to occur when the target firm and industry are undervalued. We also explain why the procedural safeguards do not fully protect outside shareholders from potential exploitation.

2. Background and hypothesis development

The incentives created in MBOs and minority freezeouts caused courts and regulators to develop policy on these transactions during the 1970s and early 1980s (DeAngelo et al., 1984). The courts have focused primarily on freezeouts, in which a controlling shareholder seeks to pressure, or freeze out, minority shareholders to sell in an acquisition in which the acquirer owns less than 90%

[4] We discuss the appropriateness of the calendar-time portfolio approach based on diversified portfolios of industry peers relative to an undiversified buy-and-hold strategy (including the lack of an appropriate benchmark for and the skewness of the buy-and-hold return) in Sections 4.1 and 5.4. We also present summary statistics of deal-level industry peer returns and discuss the implications for the difficulty facing investors and courts and the economic magnitude of systematic industry undervaluation.

of the shares.[5] In *Weinberger v. UOP* (1983), the Delaware Supreme Court ruled that freezeouts must satisfy the exacting entire fairness standard (EFS) to establish that the freezeout is "entirely fair," as opposed to simply satisfying the business judgment rule (BJR). Under the BJR, directors and insiders are presumed to act in good faith on the part of minority shareholders as long as certain procedural safeguards are in place (including evaluation by non-interested directors and valuation by outside financial experts). Practically, the EFS delineates that the controlling shareholders have the burden of proof to establish that both the transaction price and the process for establishing the terms mirror an arm's-length deal and are "entirely fair" to minority shareholders.

This position was upheld in other rulings in the 1980s but changed somewhat in *Kahn v. Lynch Communication Systems* (1994), in which the Delaware Supreme Court established that the burden of proof shifts from management and controlling shareholders to minority shareholders if a freezeout satisfies one of two conditions: (1) the deal is negotiated by a well-functioning special committee (having the power to say no) of disinterested and independent directors; or (2) the deal is conditioned on the approval of the majority of the minority of disinterested shareholders.[6]

During this time, it was unclear whether MBOs that did not involve a controlling shareholder were subject to the BJR or the more exacting EFS. However, in *In re Wheelabrator Technologies, Inc. Shareholders Litigation* (1995), the lower courts established that the approval of the deal by independent directors or disinterested shareholders is sufficient (similar to the BJR). Since then, practitioners have generally structured deals under the assumption of the BJR. Thus, MBO proposals are evaluated by non-interested directors and independent financial and legal advisers. These deals also follow additional procedural norms such as forming a special committee of directors to evaluate the proposal and including a majority of the minority condition (Cain and Davidoff, 2011).

If a shareholder already controls over 90% of a firm's shares, it may initiate a short-form merger, which simply gives the minority shareholders notice, and consideration for their shares, but does not require a vote. Whereas minority shareholders have appraisal rights to protect their interests, their bargaining power is limited because of the lack of a vote. In a freezeout, a controlling shareholder of a public company acquires the equity interest of the minority shareholders, sometimes by merging it into an entity controlled by the same shareholder. Depending on how the freezeout was structured, it could fall under the EFS or under the more deferential BJR.[7] Not until *Kahn v. MandF Worldwide* (2014) did the Delaware Supreme Court establish a unified consideration of all freezeouts. In this ruling, the court established that the EFS can be avoided in favor of the BJR when both a well-functioning special committee of non-interested and independent directors and a majority of the minority condition with respect to the initial tender offer are in place. This standard has also been upheld outside Delaware. For example, the New York Supreme Court established a similar standard in its ruling on *In the Matter of Kenneth Cole Productions, Inc., Shareholder Litigation* (2016).

Given these legal standards and economic incentives to protect outside shareholders from self-dealing during MBO and freezeout bids, management and controlling shareholders may not be able to exploit target shareholders systematically. For example, DeAngelo and DeAngelo (1987) and DeAngelo (1990) discuss the potential for litigation as well as the requirements that independent directors negotiate bids and that target management obtain fairness opinions from third parties to safeguard against the exploitation of outside shareholders. Palepu (1990) points out the potential roles of two other requirements in protecting outside shareholders: that management share projections of future performance with outside bidders and that competing bids are evaluated by outside directors not participating in the deal.

In support of this view, extant studies find ample evidence of operational improvements to the target firm after MBOs. DeAngelo et al. (1984) show significant bid premiums and positive returns around MBO announcements, consistent with potential synergy gains and the conclusion that outside shareholders receive at least part of the synergy gain. Kaplan (1989) reports evidence of productivity gains by buyout targets, but also finds that these operational improvements are less than management forecasts before the buyout, rejecting the hypothesis that managers exploit shareholders by capitalizing on inside information. Similarly, Lichtenberg and Siegel (1990) and Smith (1990) find evidence of operation improvements in buyout firms, supporting the hypothesis that buyouts are value-adding to the target firm. Lee (1992) and Ofek (1994) find that stock prices return to pre-announcement levels if the buyout is withdrawn, canceled, or rejected and that operating performance does not improve for these firms, providing similar evidence in support of the conclusion that buyouts add value to the target. More recently, Bates et al. (2006) find that minority claimants receive a deal surplus allocation at the bid announcement greater than their share of the firm. They take this as evidence of a lack of value transfers from outside shareholders during freezeout bidding.[8]

Several studies find that procedural safeguards seem to increase bid premiums. Cain and Davidoff (2011) show that MBOs involving special committees tend to have higher premiums, and Gogineni and Puthenpurackal (2014) find no evidence that MBOs are associated with statistically

[5] Grossman and Hart (1980) show that permitting raiders to dilute minority shareholders' property rights helps solve the free-rider problem in takeovers. See Cain and Davidoff (2011) for an overview of the legal architecture of MBOs and minority freezeouts. Amihud, Kahan, and Sundaram (2004) provide a theoretical model in support of the freezeout laws discussed below.

[6] See Simpson and Brody (2014) for an in-depth discussion of the requirements and characteristics of these special committees.

[7] See *In re Siliconix Shareholders' Litigation* (2001), *In re Pure Resources Inc. Shareholders' Litigation* (2002), and *In re CNX Gas Corp. Shareholders' Litigation* (2010).

[8] This evidence is consistent with Dodd and Ruback (1977), who find positive and significant abnormal returns to target shareholders in their subsample of 19 completed "clean-up" tender offers, in which the bidder owns the majority of the target's outstanding shares before the offer.

lower announcement and long-run (50-day) returns. These results suggest that target shareholders make gains around MBOs and freezeouts due to the economic incentives and legal framework associated with these deals.

Other studies, however, suggest that legal protection is insufficient to protect outside shareholders completely. Bebchuk and Kahan (1989), Carney (1992), DeAngelo (1990), Elson (1992), and Davidoff (2006) highlight the flaws inherent in fairness opinions, arguing that they accompany most deals and could act as a rubber stamp to insulate directors or to justify managers' offers to outsiders rather than to protect outside shareholders. Kisgen et al. (2009) find that fairness opinions initiated by the target do not influence deal outcomes. The protection provided to outside target shareholders by fairness opinions may therefore be overstated. Further, fairness opinions depend on subjective measurements of the target's fair price, such as valuation multiples, costs of capital, or growth rates from comparable firms. In addition, despite the current legal framework, the vast majority of MBOs and freezeouts involve shareholder litigation.[9] Several researchers suggest that appraisal litigation and activist appraisal arbitrageurs target non-arm's-length going-private transactions and that activist appraisal arbitrage strategies and some litigation strategies are associated with significant gains (Cain and Davidoff, 2011; Jiang et al., 2016; Krishnan et al., 2012; and Jiang et al., 2018).

Easterwood et al. (1994) find evidence that target gains in MBOs are significantly lower not only when managers hold a greater share of the pre-bid firm but also [along with Lowenstein (1985)] when less explicit bidding competition is present. Further, they find no evidence of significant bid revisions in the face of litigation or threat of competition. Their findings are consistent with value transfers from outside target shareholders to management. Consistent with these findings, Officer et al. (2010) document that targets with less bidding competition receive lower premiums. Chen et al. (2011) show that premiums are negatively associated with manager holdings in MBOs, while Cain and Davidoff (2011) find that management-initiated MBOs have lower premiums. More recently, Stafford (2016) finds that private equity funds make money by targeting undervalued firms rather than improving the firms' operating performance after the buyout. Finally, there is some (albeit mixed) evidence that managers intentionally mislead investors to undervalue the target firm before a buyout by systematically managing earnings downward using negative discretionary accruals and negative news releases (DeAngelo, 1986; Hafzalla, 2009; Perry and Williams, 1994).

We hypothesize that the legal framework, including fairness opinions, will not stop the exploitation of outside shareholders if managers and controlling shareholders can initiate a buyout or freezeout when the firm and its industry peers (which are the benchmark for fairness opinions) are undervalued. The key point is that it is possible that exploitation takes place without an apparent relation to reduced deal premiums. Even if managers and controlling shareholders improve the performance of the target firm after the buyout, operational improvements and value transfers from outside shareholders are not mutually exclusive; they can coexist in the same deal. In fact, the prospect of a timing-induced wealth transfer may provide the initial incentive to bid and the added potential gain necessary to implement risky operational changes.

Although researchers can employ statistical tests to discover systematic industry-wide undervaluation at the time of the *average* buyout or freezeout, it is difficult in a *specific* case for attorneys to convince the judge of undervaluation given a sample of one and large variations in post-deal industry returns. This challenge is common when applying academic research to individual cases, as DeAngelo (1986) points out in the case of accounting opportunism. It is difficult to determine ex post whether an individual deal is undertaken when the industry is undervalued even if the target's industry peers experience significant stock price appreciation following the deal. Managers and controlling shareholders can counter that they cannot predict future industry returns. In addition, although on average target industries experience positive and large returns over the year following the sample deals, industry values dramatically decrease following some deals. Ex ante one cannot identify what performance will follow a given deal. We present evidence of this variability in the post-deal industry returns in Table 10 and anecdotal examples in the Appendix and the Internet Appendix to demonstrate the challenge facing investors. Imperfect stock return correlations between the target firm and its peers further exacerbate the challenge.

Taken together, even in the presence of current legal standards, systematic exploitation will still be possible unless the likelihood of (and gain from) successful litigation rises with future industry value increases.[10] Furthermore, for litigation to prevent shareholder exploitation, successful litigation also must strip away managers' and controlling shareholders' opportunistic capture of a higher than warranted share of any gains from the transaction. But because only dissenting shareholders can litigate a deal, a large proportion of them need to dissent for these gains to be stripped away. This happened in response to the 2013 Dell buyout (see the Appendix). In 2016, a judge ruled that Michael Dell and Silver Lake Partners had underpaid for Dell by more than $6 billion (or 22%). Dissenting shareholders, however, received only about $35 million (Hoffman, 2016). Interestingly, by mistakenly voting in favor of the deal, T. Rowe Price was disqualified from receiving $190 million. Even though the dissenting shareholders obtained a favorable outcome, owing to their small num-

[9] Litigation is almost automatic for going-private deals before the 1970s (Borden, 1974). Consistent with this assertion, DeAngelo et al. (1984) find evidence of shareholder litigation for 86% of their sample of going-private transactions over the period 1973–1980. Peck (1996) finds evidence of litigation in about 40% of her MBO sample over the period 1984–1987. More recently, Cain and Davidoff (2011) find that 76.7% of their sample of MBOs between 2003 and 2009 are litigated. Using the Westlaw and Bloomberg Law databases, we find that 57.4% of our sample deals, including both MBOs and freezeouts, are litigated over a similar period (2003–2014).

[10] As described in Section 5, we find that industry peers of target firms experience significantly positive abnormal returns following the announcement of the deal, regardless of whether the deal is litigated.

ber they were able to claw back only a fraction of the $6 billion undervaluation of Dell.

This review of the literature shows that target shareholders obtain significant positive returns on the announcement of an MBO or freezeout. Slovin et al. (1991) find that industry peers of the target firm also experience significantly positive abnormal returns around the announcement of leveraged buyouts (LBOs), some of which could be MBOs. Neither result, however, precludes the possibility that the target or its industry peers are undervalued at the time of the buyout or freezeout announcement. To test this hypothesis, we study the long-run abnormal returns of portfolios of industry peers to determine whether managers and controlling shareholders time their bids when targets (and their industry) are undervalued.

3. Sample construction and descriptive statistics

3.1. Samples

We retrieve MBOs announced between 1980 and 2014 from the Thomson Securities Data Company (SDC) Platinum database. Our sample period starts in 1980 because SDC's coverage starts in that year. We first identify LBOs targeting public U.S. firms classified as mergers (SDC deal form M), acquisitions of majority interest (AM), and acquisitions of assets (AA). After examining the deal synopsis, acquirer name, or investor name, we manually classify a buyout as an MBO if we find that an insider (i.e., an existing manager or executive of the target) is involved in the ownership group of that buyout bid.[11] There are 470 such MBOs in our sample.

Our sample of freezeout acquisitions is also retrieved from the SDC database. Freezeouts are identified following Bates et al. (2006), p. 689). Specifically, we apply three filters when retrieving the sample from SDC: (1) the deal form is either a merger (SDC deal form M) or an acquisition of remaining interest (AR); (2) the target is a public U.S. firm;[12] and (3) the acquirer's ownership in the target firm in the six-month period before the deal announcement is between 50% and 89.5%. We identify 518 such freezeout acquisitions for our sample.

We summarize our samples of MBOs and freezeout deals in Table 1. Panel A shows that the number of MBOs and freezeouts varies considerably over time. For example, there are no MBOs in 1980 and 2009, but there are 90 in 1988. There is one freezeout deal in 1980 and one in 2011, whereas there are 42 in 2000.

Panel B of Table 1 reports the distribution of MBOs and freezeout acquisitions across the Fama and French (1997) 49 industries. MBOs and freezeouts are well distributed across many industries, but variation exists between them. The number of MBOs ranges from zero for tobacco, defense, and mining companies to 53 for retailers. The number of freezeouts ranges from zero for the fabricated products industry to 67 for business services.

We summarize the characteristics of our sample deals in Panel C of Table 1. On average, managers own 7.5% of the target firm's shares six months before the MBO announcement. Freezeout deals, by definition, are associated with higher pre-deal ownership, averaging 67.3%. MBOs and freezeout acquisitions have similar transaction values, bid premiums, and cumulative abnormal returns (CARs) to target firms over the three days surrounding deal announcements. Transaction value averages $436 million and $423 million for MBOs and freezeouts, respectively. MBOs have an average bid premium of 36.9%, while freezeout deals have an average bid premium of 35%. Firms that receive MBO or freezeout offers achieve the same average three-day announcement CARs (16.9%). Almost half (47.4%) of sample MBOs are successfully completed, while three-quarters of freezeout acquisitions are completed. In addition, MBO target firms have on average 31.6 four-digit SIC industry peers before the deal announcement, while the average freezeout target firm has 39.3 industry peers.

3.2. Stock price paths of MBO and freezeout targets and their industry peers

As discussed in the introduction and in further detail below, we adopt an approach similar to Yagan (2015) and use the valuation changes of industry peer firms' shares as an observable proxy for the valuation path that the acquisition target would have followed absent the MBO or freezeout. Informal examinations show evidence supporting this approach, presented in Fig. 1 and Table 2. In Fig. 1, we plot the equal-weighted and value-weighted average returns for the target firms and their four-digit SIC industry peers over the 60-month period before the MBO or freezeout announcement. We present results for sample MBOs, freezeouts, and MBOs and freezeouts. We exclude the month before the announcement because of the potential effect of information leakage before the MBO and freezeout. The average valuation path of targets and industry peers in the five years before the acquisition announcement follows a similar pattern. Despite the similar patterns, the correlation between the two valuation paths is not perfect.

Table 2 reports the summary statistics of correlations between the target's return during this same period and the average return of its industry peers. The median correlation between the monthly returns of the MBO target and those of its equal-weighted (value-weighted) average industry peer in the five years before the deal announcement is 0.39 (0.37). Freezeout targets exhibit similar but slightly lower correlations with their industry peers. There is no absolute metric to gauge whether a return correla-

[11] SDC classifies going-private transactions only involving management and not involving outside private equity firms as LBOs; thus, our sample includes all management-involved going-private transactions, regardless of whether private equity firms are involved.

[12] It is possible that a deal targeting a majority-held private subsidiary of a publicly traded firm could be similar to the freezeouts of public firms in our sample. However, databases lack accurate and consistent industry classifications for private subsidiaries (necessary for our analysis). We are also unable to obtain further data on these subsidiaries for other parts of our analysis, so we focus on transactions for standalone public firms. Nevertheless, in untabulated analysis using the available data and industry classifications, we examine the sample of MBOs and freezeouts targeting private subsidiaries of public firms and find both economically and statistically insignificant abnormal returns to the target's (public) industry peers in the 12 months following the deal announcement.

Table 1
Summary statistics.

Panel A presents the number of MBOs and freezeout deals by year, while Panel B presents the number by industry. Panel C presents the characteristics of the sample deals. Toehold is the acquirer's ownership of the target firm six months before the deal announcement. Transaction value is the size of the acquisition reported in billions of dollars. Bid premium is the ratio of the final offer price to the target stock price four weeks before the announcement date minus one. Target three-day announcement CARs are cumulative abnormal returns over days (−1, +1) around the deal announcement based on the market model (Brown and Warner, 1980), with beta estimated over the period from 42 to 252 days before the announcement date. Completed is a dummy variable that takes the value of one if the deal is successfully completed, and zero otherwise. Our sample includes MBOs and freezeout acquisitions targeting public U.S. firms announced between 1980 and 2014.

Panel A: Number of deals by year

Year	MBO	Freezeout	All
1980	0	1	1
1981	1	6	7
1982	7	10	17
1983	10	6	16
1984	38	14	52
1985	40	7	47
1986	30	7	37
1987	47	14	61
1988	90	27	117
1989	40	33	73
1990	10	26	36
1991	3	20	23
1992	7	16	23
1993	3	12	15
1994	3	20	23
1995	7	14	21
1996	11	18	29
1997	5	23	28
1998	15	25	40
1999	17	22	39
2000	19	42	61
2001	13	23	36
2002	13	27	40
2003	7	17	24
2004	2	11	13
2005	2	16	18
2006	7	4	11
2007	7	14	21
2008	3	8	11
2009	0	16	16
2010	3	9	12
2011	1	1	2
2012	5	4	9
2013	3	2	5
2014	1	3	4
Total	470	518	988

Panel B: Number of deals by target industry

Industry code	Industry name	MBO	Freezeout	All
0		4	6	10
1	Agriculture	1	1	2
2	Food Products	10	11	21
3	Candy and Soda	1	1	2
4	Beer and Liquor	2	3	5
5	Tobacco Products	0	1	1
6	Recreation	7	3	10
7	Entertainment	5	9	14
8	Printing and Publishing	6	3	9
9	Consumer Goods	22	7	29
10	Apparel	17	3	20
11	Healthcare	13	9	22
12	Medical Equipment	6	8	14
13	Pharmaceutical Products	4	17	21
14	Chemicals	7	5	12
15	Rubber and Plastic Products	9	3	12
16	Textiles	13	4	17
17	Construction Materials	23	9	32
18	Construction	9	9	18
19	Steel Works, Etc.	8	8	16

(*continued on next page*)

Table 1 (*continued*)

20	Fabricated Products	2	0	2
21	Machinery	18	14	32
22	Electrical Equipment	7	8	15
23	Automobiles and Trucks	12	3	15
24	Aircraft	3	3	6
25	Shipbuilding, Railroad Equipment	1	1	2
26	Defense	0	1	1
28	Mining	0	4	4
30	Petroleum and Natural Gas	5	28	33
31	Utilities	4	5	9
32	Communication	11	27	38
33	Personal Services	8	15	23
34	Business Services	44	67	111
35	Computers	13	8	21
36	Electronic Equipment	9	10	19
37	Measuring and Control Equipment	9	12	21
38	Business Supplies	4	3	7
39	Shipping Containers	5	2	7
40	Transportation	23	13	36
41	Wholesale	24	21	45
42	Retail	53	32	85
43	Restaurants, Hotels, Motels	23	14	37
44	Banking	3	21	24
45	Insurance	4	24	28
46	Real Estate	1	14	15
47	Finance	14	35	49
48	Other	3	13	16
All		470	518	988

Panel C: Deal characteristics

Variable	*N*	Mean	sd	p5	p25	p50	p75	p95
MBO								
Toehold	470	0.075	0.145	0.000	0.000	0.000	0.066	0.411
Transaction value ($B)	405	0.436	1.797	0.007	0.029	0.077	0.279	1.566
Bid premium	393	0.369	0.294	0.039	0.200	0.315	0.483	0.864
Target 3-day announcement CARs	463	0.168	0.194	−0.067	0.053	0.153	0.255	0.460
Completed	470	0.474	0.500	0.000	0.000	0.000	1.000	1.000
Number of industry peers	470	31.594	70.735	0.000	3.000	8.500	25.000	124.000
Freezeout								
Toehold	518	0.673	0.115	0.510	0.565	0.663	0.784	0.854
Transaction value ($B)	492	0.423	2.388	0.002	0.012	0.043	0.183	1.189
Bid premium	474	0.350	0.421	−0.092	0.116	0.286	0.490	1.017
Target 3-day announcement CARs	510	0.169	0.221	−0.063	0.031	0.138	0.240	0.576
Completed	518	0.751	0.433	0.000	1.000	1.000	1.000	1.000
Number of industry peers	518	39.299	75.799	0.000	4.000	11.000	39.000	176.000
All								
Toehold	988	0.389	0.326	0.000	0.000	0.511	0.671	0.836
Transaction value ($B)	897	0.429	2.140	0.003	0.019	0.059	0.226	1.450
Bid premium	867	0.358	0.369	−0.036	0.152	0.299	0.486	0.943
Target 3-day announcement CARs	973	0.169	0.208	−0.065	0.041	0.145	0.248	0.502
Completed	988	0.619	0.486	0.000	0.000	1.000	1.000	1.000
Number of industry peers	988	35.634	73.498	0.000	3.000	10.000	34.000	142.000

tion is strong or weak. We therefore compare these correlations to those in existing studies. These correlations are in line with the average correlation for large-cap, within-industry firms reported by Chan et al. (2007). The results in Fig. 1 and Table 2 are consistent with the assumption that MBO and freezeout targets and their industry peers follow similar valuation paths.

With a correlation coefficient less than one, the value path of industry peers is a noisy proxy for that of the MBO or freezeout target firm. We therefore take several steps to draw reliable statistical inferences about the value path of the average target firm based on that of its peers. Specifically, we estimate the relation between the target firms' stock returns and the returns of their peers in a linear regression. The slope coefficient on the average industry peer return takes into account the stock return correlation between targets and their peers.[13] Combining this slope coefficient estimate with the observed average abnormal returns to the target's industry peers allows us to estimate the target firm's abnormal returns in expectation. These es-

[13] Specifically, from the linear regression of a target firm's stock return on its industry peer portfolio return ($R_{it} = a + bR_{pt} + u_{it}$), the slope coefficient (b) explicitly accounts for the correlation between the target firm's return and its industry peer portfolio return (ρ) in the following equation: $b = \rho(\sigma_i/\sigma_p)$, in which σ denotes stock return standard deviation.

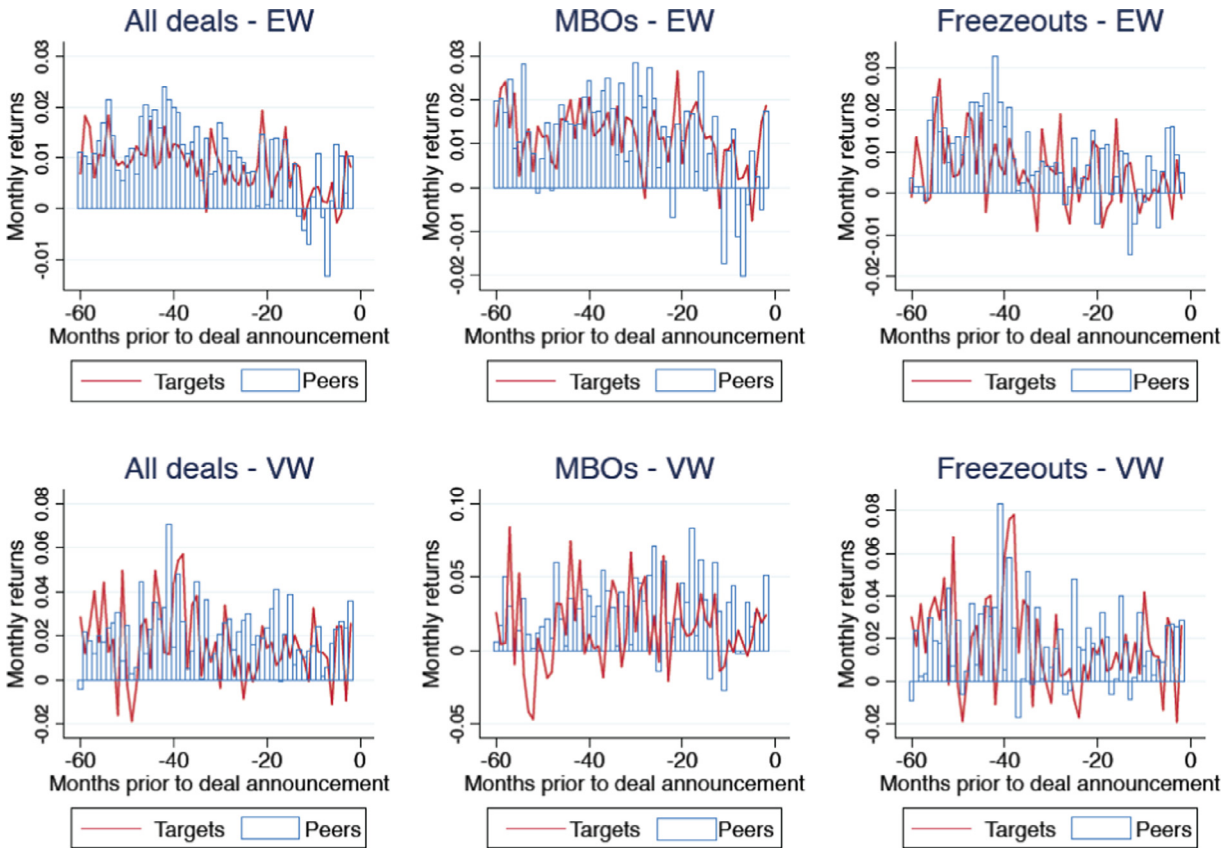

Fig. 1. Target and peer return paths before deal announcements. This figure presents the equal-weighted (EW) and value-weighted (VW) monthly returns of MBO and freezeout targets and the equal-weighted and value-weighted monthly returns of their four-digit SIC industry peers for the 60-month period before the acquisition announcement to the two-month period before the acquisition announcement for all deals over the sample period (1980–2014). Industry peers of the target are included only if the target is publicly traded in a given month before the deal announcement.

Table 2
Return correlations between MBO and freezeout targets and their industry peers.

This table presents the correlations between the monthly returns of MBO and freezeout targets and equal-weighted and value-weighted returns of their four-digit SIC industry peers in the 60-month period before the acquisition announcement. To be included in the analysis, each target must have at least one publicly traded industry peer during a month and there must be at least five months of returns available for the target and its peers before the acquisition. Our sample includes MBOs and freezeout acquisitions targeting public U.S. firms announced between 1980 and 2014.

	N	mean	sd	p5	p25	p50	p75	p95
MBO								
Equal-weighted return correlation	434	0.37	0.20	0.01	0.24	0.39	0.50	0.67
Value-weighted return correlation	434	0.35	0.21	−0.03	0.21	0.37	0.48	0.65
Freezeout								
Equal-weighted return correlation	471	0.33	0.21	0.00	0.19	0.34	0.49	0.66
Value-weighted return correlation	471	0.30	0.22	−0.04	0.15	0.29	0.46	0.69
All								
Equal-weighted return correlation	905	0.35	0.21	0.00	0.22	0.37	0.49	0.66
Value-weighted return correlation	905	0.32	0.22	−0.03	0.17	0.33	0.47	0.66

timates not only implicitly adjust for correlations of less than one but also provide inferences about the statistical reliability of our measure as a proxy for the target firm's abnormal returns. We discuss this methodology in greater detail and present the results in Section 4.2. The results suggest that abnormal returns to the industry peers are on average a reliable proxy for the abnormal returns of the MBO and freezeout target firms.

The correlation between target and peer firm returns is weak for some deals. For example, the 5th percentile of the correlation coefficient is near zero in Table 2. This highlights the difficulty facing investors in establishing undervaluation for many individual deals but does not change our inferences regarding the average deal. Of course, the higher the return correlation, the more reliable the statistical inference. Therefore, we also analyze a subset of in-

dustry peers whose stock return correlation with the target firm is greater than the appropriate sample median. Our main results are robust and the inferences remain unchanged in this subset of industry peers. We thus proceed to examine valuation paths of the industry peers after MBO and freezeout announcements under the assumption that the target firm is expected to follow a similar path had it not become a buyout or freezeout target.

4. Stock returns to industry peers of MBO or freezeout target firms

In this section, we test our hypothesis by examining the stock returns of the target's industry peers over the 12-month period following the deal announcement. The industry peers will earn positive abnormal returns during the year following the deal announcement if managers and/or controlling shareholders attempt to exploit target shareholders by initiating their acquisitions when the target firm and its industry are undervalued.

4.1. Estimated abnormal returns to the industry peers of MBOs and freezeouts

Applying the recommendations of Fama (1998) and Mitchell and Stafford (2000), we use a calendar-time portfolio approach to assess target industry undervaluation by examining the returns to the diversified portfolio of industry peers following MBOs and freezeouts. This method is especially appropriate for our purpose since the timing of these deals can be based on observable firm characteristics. Therefore, characteristics-based benchmarks such as buy-and-hold returns to matching firms are inappropriate for detecting the managerial timing of MBOs and freezeouts. The calendar-time portfolio approach also allows us to adequately benchmark the portfolio returns against relevant risk factors commonly used in the asset pricing literature. Further, it relies on monthly portfolio returns and thus avoids statistical problems associated with long-run buy-and-hold returns, including large skewness, overlapping MBOs and freezeouts, and difficulties in finding an appropriate benchmark (Bessembinder, 2018; Bessembinder and Zhang, 2013; Fama, 1998; Mitchell and Stafford, 2000).[14] We discuss the statistical issues further in Section 5.4.

At the beginning of each month from January 1980 to December 2014, we form a portfolio of firms whose four-digit SIC industry peers became an MBO and/or freezeout target during the preceding 12-month period.[15] Returns to the portfolio of industry peers track the value path of the target industry for the first year after the MBO or freezeout acquisition. Because we employ diversified portfolios, the results reflect the economic magnitude of the systematic, rather than idiosyncratic, undervaluation.

Panel A of Table 3 shows that the portfolio of target industry peers earns economically significant equal-weighted and value-weighted returns following MBOs and freezeouts. Industry peers, on average, earn equal-weighted (value-weighted) returns of 1.51% (1.41%) per month over the 12-month period following the MBO. Following freezeout acquisitions, industry peers earn an average monthly return of 1.75% on an equal-weighted basis and 1.50% on a value-weighted basis. The portfolio of industry peers of MBOs and freezeouts combined earns a monthly return of 1.69% (corresponding to an annualized return of about 22.3% $(=(1+1.69\%)^{12}-1)$) on an equal-weighted basis and 1.43% per month (about 18.6% annualized) on a value-weighted basis. The returns are economically non-trivial. Thanks to diversification inherent in the calendar-time approach, the time series standard deviation of the monthly portfolio return is 7.24% on an equal-weighted basis and 5.86% on a value-weighted basis.[16] The Sharpe ratio (the ratio of annualized excess portfolio return to its standard deviation) is about 0.67 on both an equal- and value-weighted basis. In addition, the median monthly portfolio return is 1.88% (about 25.1% annualized) on both an equal- and value-weighted basis. For comparison, the premier momentum strategy yields an annualized return in excess of the risk-free rate of 17.9% and a Sharpe ratio of about 0.60 over the 1926–2013 period, while the excess market return is 7.7% per year with a Sharpe ratio of 0.41 (Daniel and Moskowitz, 2016). Our trading strategy, based on a portfolio of the industry peers of MBO and freezeout firms, offers raw returns of similar magnitude to the momentum strategy and higher Sharpe ratios. In summary, our trading strategy produces economically large returns.

To obtain an accurate estimate of the risk-adjusted returns of the industry peers of MBO and freezeout firms, we then estimate the alpha of the portfolio benchmarked against three sets of risk factors: Fama and French's (1993) and Carhart's (1997) four factors (MKT, SMB, HML, and UMD), Fama and French's (2015) five factors (MKT, SMB, HML, RMW, and CMA), and Hou et al. (2015) four factors (MKT, IA, ROE, and ME).[17] Specifically, we regress the portfolio return in excess of the risk-free rate on each set of risk factors and present the regression results in Panels B through D of Table 3, respectively.

[14] In addition to the calendar-time portfolio approach, researchers have employed buy-and-hold abnormal returns (BHARs) relative to characteristic-matched control firms to detect post-event abnormal returns. Bessembinder and Zhang (2013) show that matching firms selected on the basis of a few firm characteristics do not actually match the event firm on other important characteristics found to affect stock returns and that BHARs relative to matching firms are biased. We therefore rely on the calendar-time portfolio approach to test whether managers successfully time the MBO or freezeout. Nevertheless, we find positive post-deal abnormal returns (about 0.6% per month) to industry peers of MBO and freezeout targets with respect to expected returns based on comprehensive sets of observable firm characteristics.

[15] Even though one might expect that the effects of MBOs and freezeouts on industry peers will be more pronounced using narrower industry definitions because their businesses are closer to each other, our inferences remain unchanged when we define industries at the SIC three-digit or Fama French 48-industry levels.

[16] We discuss the variation of post-deal industry peer returns in greater detail in Section 5.4.

[17] MKT is aggregate market return. The other risk factors are constructed as return spreads between stocks with different firm characteristics. SMB and ME are return spreads between small and big firms, HML is return spread between firms with high versus low book-to-market ratios, UMD is return spread between firms that have high versus low stock returns in the previous twelve months, RMW and ROE are return spreads between firms with high and low profitability, and CMA and IA are return spreads between firms with low and high asset growth rates.

Table 3
Long-run abnormal returns to industry peers of MBO and freezeout targets.

At the beginning of each month from January 1980 to December 2014, we form a portfolio of stocks whose four-digit SIC industry peer was a target in our sample of MBO or freezeout deals announced during the preceding 12 months. Panel A presents the monthly portfolio returns. Panels B–D present the OLS regression results in which the dependent variable is the equal-weighted (EW) or value-weighted (VW) portfolio return in excess of the risk-free interest rate. The independent variables are the four risk factors—MKT, SMB, HML, and UMD—constructed by Fama and French (1993) and Carhart (1997), the Fama-French (2015) five factors (MKT, SMB, HML, RMW, and CMA), and the Hou et al. (2015) four factors (MKT, IA, ROE, and ME), respectively. Panel E presents the estimated alpha in the 1980s and post-1990. All model specifications employ robust standard errors. *t*-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Monthly portfolio returns

	N	mean	sd	p5	p25	p50	p75	p95
MBO								
Equal-weighted portfolio return	385	1.51	8.32	−12.33	−2.69	1.67	5.38	12.92
Value-weighted portfolio return	385	1.41	7.65	−10.93	−2.28	1.95	5.41	12.31
Freezeout								
Equal-weighted portfolio return	410	1.75	7.34	−9.35	−2.20	2.08	5.38	13.71
Value-weighted portfolio return	410	1.50	5.87	−8.19	−1.67	1.87	4.72	11.17
All								
Equal-weighted portfolio return	410	1.69	7.24	−9.99	−1.89	1.88	5.19	12.58
Value-weighted portfolio return	410	1.43	5.86	−9.18	−1.58	1.88	4.54	10.90

Panel B: Fama-French-Carhart four-factor alpha

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Excess portfolio return					
	MBO		Freezeout		All	
	EW	VW	EW	VW	EW	VW
MKT	0.93***	1.06***	0.97***	1.05***	0.98***	1.03***
	(12.80)	(16.17)	(19.82)	(27.85)	(21.01)	(31.26)
SMB	1.14***	0.38***	1.09***	0.11	1.08***	0.14**
	(9.77)	(2.69)	(14.05)	(1.53)	(14.26)	(2.47)
HML	−0.18	−0.29**	−0.15*	−0.17**	−0.19**	−0.27***
	(−1.52)	(−2.27)	(−1.73)	(−2.43)	(−2.12)	(−4.34)
UMD	−0.42**	−0.12	−0.25***	−0.05	−0.25***	0.02
	(−2.51)	(−0.56)	(−2.83)	(−0.93)	(−2.70)	(0.41)
Alpha	0.77**	0.50	0.84***	0.54***	0.79***	0.48***
	(2.57)	(1.60)	(3.78)	(3.32)	(3.73)	(3.17)
Observations	385	385	410	410	410	410
Adjusted R^2	0.644	0.541	0.759	0.723	0.788	0.753

Panel C: Fama-French (2015) five-factor alpha

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Excess portfolio return					
	MBO		Freezeout		All	
	EW	VW	EW	VW	EW	VW
MKT	0.93***	1.03***	0.95***	1.01***	0.93***	0.96***
	(10.12)	(11.26)	(19.52)	(25.10)	(20.36)	(28.94)
SMB	0.93***	0.34**	0.80***	−0.02	0.80***	−0.00
	(6.17)	(2.14)	(10.34)	(−0.28)	(10.02)	(−0.01)
HML	0.09	−0.09	−0.04	−0.03	−0.00	−0.09
	(0.38)	(−0.37)	(−0.46)	(−0.31)	(−0.04)	(−1.23)
RMW	−0.64***	−0.18	−0.84***	−0.35***	−0.83***	−0.40***
	(−4.79)	(−1.30)	(−7.85)	(−3.51)	(−8.11)	(−4.84)
CMA	−0.45*	−0.44*	−0.10	−0.22	−0.29*	−0.37***
	(−1.68)	(−1.80)	(−0.60)	(−1.61)	(−1.68)	(−2.94)
Alpha	0.83***	0.61**	1.04***	0.71***	1.04***	0.76***
	(2.91)	(2.37)	(4.89)	(3.89)	(5.17)	(4.88)
Observations	385	385	410	410	410	410
Adjusted R^2	0.613	0.542	0.778	0.735	0.804	0.772

(*continued on next page*)

Table 3 (*continued*)

Panel D: Hou et al. (2015) four-factor alpha

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Excess portfolio return					
	MBO		Freezeout		All	
	EW	VW	EW	VW	EW	VW
MKT	0.88***	1.04***	0.93***	1.04***	0.92***	1.00***
	(11.36)	(13.41)	(17.76)	(25.92)	(18.81)	(29.65)
ME	0.77***	0.28***	0.77***	−0.00	0.75***	0.03
	(7.97)	(2.62)	(12.62)	(−0.01)	(11.93)	(0.45)
IA	−0.47**	−0.46*	−0.30**	−0.20*	−0.45***	−0.46***
	(−2.18)	(−1.94)	(−2.01)	(−1.77)	(−2.96)	(−4.38)
ROE	−0.97***	−0.32	−0.84***	−0.21**	−0.83***	−0.20**
	(−4.49)	(−1.25)	(−6.53)	(−2.44)	(−6.55)	(−2.41)
Alpha	1.24***	0.72**	1.26***	0.70***	1.27***	0.75***
	(3.87)	(2.43)	(5.16)	(3.78)	(5.30)	(4.44)
Observations	385	385	410	410	410	410
Adjusted R^2	0.661	0.550	0.784	0.719	0.811	0.752

Panel E: Subperiod alphas: 1980–1989 and 1990–2014

	(1)	(2)	(3)	(4)
	1980–1989		1990–2014	
	EW	VW	EW	VW
	MBOs			
FFC	−0.02	0.35	0.87**	0.46
	(−0.09)	(1.30)	(2.39)	(1.17)
FF5	0.12	0.47	0.85**	0.49
	(0.38)	(1.53)	(2.42)	(1.50)
HXZ	0.22	0.43	1.36***	0.67*
	(0.67)	(1.38)	(3.58)	(1.76)
	Freezeouts			
FFC	−0.11	0.39	1.04***	0.49***
	(−0.39)	(1.35)	(3.94)	(2.61)
FF5	−0.16	0.36	1.28***	0.70***
	(−0.55)	(1.06)	(5.02)	(3.42)
HXZ	0.14	0.44	1.47***	0.64***
	(0.40)	(1.24)	(5.10)	(3.02)
	MBOs and freezeouts			
FFC	−0.04	0.32	0.92***	0.39**
	(−0.19)	(1.49)	(3.66)	(2.18)
FF5	0.11	0.49*	1.17***	0.68***
	(0.44)	(1.83)	(4.86)	(3.76)
HXZ	0.25	0.51*	1.40***	0.66***
	(0.85)	(1.74)	(5.05)	(3.29)

The portfolio of target peers is associated with statistically and economically significant alphas across all three sets of risk factors. The portfolio of MBO target peers is associated with an equal-weighted alpha ranging from 0.77% per month with respect to the Fama-French-Carhart factors to 1.24% with respect to the Hou-Xue-Zhang factors. The alpha is always statistically significant. It is smaller but still economically large on a value-weighted basis, ranging from 0.50% to 0.72%. The alpha on a value-weighted basis is statistically significant for the Fama-French five factors and the Hou-Xue-Zhang factors; it is marginally significant against the Fama-French-Carhart factors, with an associated *t*-statistic of 1.60.

Turning to the portfolio of industry peers of the freezeout target firms, the estimated alpha ranges from 0.54% on a value-weighted basis against the Fama-French-Carhart factors to 1.26% on an equal-weighted basis against the Hou-Xue-Zhang factors. It is always statistically significant, with *t*-statistics greater than 3.3. Combining the portfolios of MBO and freezeout target peers yields estimated alphas between 0.48% and 1.27%. The alpha is always statistically significant, with large *t*-statistics ranging from 3.17 to 5.30.

Overall, Table 3 shows that the industry peers of MBO and freezeout targets have estimated alphas ranging from 0.50% to 1.25% per month, depending on the weighting scheme and benchmark risk factors. The large alphas are almost always statistically significant, with associated *t*-statistics greater than three in most cases. This largely alleviates the concern that our findings are the result of data mining. Economically, we estimate that industry peers experience significant abnormal (risk-adjusted) increases in value of 6% to 15% on average over the 12 months following the announcement of an MBO or freezeout.

The large alphas are consistent with the inference that the target industries are on average significantly undervalued at the time of the acquisition announcement. This is also consistent with the hypothesis that managers and controlling shareholders time their MBOs and freezeouts when the firm and its industry are undervalued. An implication of this hypothesis is that managers and controlling shareholders can on average extract value from outside shareholders through this market timing. An additional implication is that a careful outside investor can obtain the abnormal increase in industry value following the trading rule described above.

Due to prior findings discussed in the introduction, as well as suggestive evidence about the clustering of MBOs in the 1980 s (presented in Table 1), we further investigate the abnormal returns to industry peers using a subperiod analysis. In Panel E of Table 3, we show that the significant alphas are largely found only post-1990 and, at least for MBOs, are partly driven by small firms, as evidenced by comparing the equal-weighted versus value-weighted results.[18]

The concentration of abnormal returns following the 1980s could be due to several significant changes in the takeover market in the late 1980s. The junk bond market collapsed with the bankruptcy of Drexel Burnham Lambert in February 1990. Hostile takeovers decreased with the advancement of the poison pill. Classified boards, in turn, became more important by blunting the effectiveness in proxy fights focused on removing the poison pill. These changes led to reduced competition in a given deal (Andrade et al., 2001), which might have made managerial market timing more likely to succeed. In addition, the 1989 Delaware *Mills Acquisition Co. v. Macmillan, Inc.* decision required directors not only to obtain the highest price in an auction environment but also to oversee the entire auction process to prevent self-interested management from unfairly influencing auctions (Johnson, 1990). Initiating bids during periods of industry undervaluation (when peers are also undervalued) enabled managers and controlling shareholders to meet these conditions and appear fairly priced to an independent review. The combination of these factors could have resulted in a larger proportion of MBOs and freezeouts taking place when the industry was undervalued.

4.2. Estimated abnormal returns to MBO and freezeout targets based on industry peers' abnormal returns

Table 3 shows positive abnormal returns to the target's industry peers following MBOs and freezeouts. As discussed above, returns to industry peers are a noisy proxy for returns to the target firm. With a potentially unreliable proxy, we cannot draw dependable conclusions regarding the undervaluation of a particular target firm at the time of the MBO or freezeout. However, regardless of the unobservable level of undervaluation at the target firm, in Table 3 we find evidence of significant, and observable, undervaluation on average at the industry level at the time of these acquisitions (and significant abnormal increases in value following these deals).

We next assess whether the observable average industry peer undervaluation reliably proxies for the target's undervaluation. Suppose that the target firm's stock return (R_i) and its industry peers' portfolio return (R_p) follow a bivariate normal distribution. Then the conditional expected target return is a linear function of industry peer returns (see Hogg and Craig, 1995, p. 148; and Angrist and Pischke, 2009, p. 38):

$$E(R_i|R_p) = a + bR_p. \tag{1}$$

We estimate the relation specified in Eq. (1) in the following regression over the 60-month period before the MBO or freezeout announcement and among the four-digit SIC industries in which an MBO or freezeout occurred over our sample period:[19]

$$R_{it} = a + bR_{pt} + u_{it}, \tag{2}$$

where R_{it} is stock return to firm i in month t, and R_{pt} is the return to the portfolio of firm i's four-digit SIC industry peers in the same month. Importantly, the slope coefficient (b) explicitly accounts for the correlation (ρ) between the target firm's return and its industry peer portfolio return in the following equation: $b = \rho(\sigma_i/\sigma_p)$. It is clear that the higher the correlation, the larger the regression coefficient, ceteris paribus. Therefore, the estimated relation based on b incorporates the effect of stock return correlations. The close relation between b and ρ demonstrates that the reliability of industry peer returns as a proxy for target returns increases with both the return correlation and the estimated slope coefficient b.

We present the pooled ordinary least squares (OLS) regression results in Table 4, Panel A, in which the standard errors are clustered by month following the procedure delineated by Petersen (2009). Unsurprisingly, we observe positive and significant coefficients on industry peer returns. The coefficient is 0.90 on an equal-weighted basis and 0.79 on a value-weighted basis. That is, for each 1% move in stock prices of its industry peers, the target firm's stock prices on average move 0.79% to 0.90% in the same direction.

Note that the estimated coefficients on peer returns are smaller than one, which could occur if the portfolio of industry peers still contains idiosyncratic risk because it is not sufficiently diversified. The median MBO or freezeout target has only ten industry peers (see Table 1, Panel C), thus R_{pt} is likely to contain both industrywide and idiosyncratic risks.[20] At the end of the section, we present results supporting this reasoning, as well as results indicating that

[18] For brevity and to be conservative, we only report the results based on the whole sample in the tables below. Throughout the rest of the tables, the untabulated post-1990 results remain qualitatively consistent with those here.

[19] The results remain similar if we estimate the regression over the one month or 12 months before the deal announcement and if we use all industries in the Center for Research in Security Prices (CRSP) universe to estimate the relation.

[20] It is important to note that the coefficient on R_{pt} may be less than one for reasons unrelated to noisy risk measurement, such as differences in the leverage ratio or growth rate between the target firm and its industry peers.

Table 4
Long-run abnormal returns to MBO and freezeout targets based on the abnormal returns to their industry peers.

We estimate the relation between a firm's returns and returns to its four-digit industry peers based on the following regression: $R_{it} = a + b * R_{pt} + u_{it}$, in which R_{it} is firm i's stock return in month t and R_{pt} is the equal- or value-weighted returns to firm i's four-digit SIC industry peers in month t. We estimate the regression using the data of all industries in our MBO/freezeout sample over the 60 months before the announcement of the MBO or freezeout. Panel A reports the OLS regression results, where the standard errors are clustered by time. We then estimate the abnormal returns of the target firms based on the regression results in Panel A and the estimated alphas to the industry peers (reported in Panels B–D of Table 3): alpha of the target firms $\equiv E[R_i|R_p] - E(R_i) = b*[R_p - E(R_p)]$ as shown in Eq. (4). Thus, we impose an intercept of zero from the estimation for Panel A and use the estimated b coefficient along with the peer portfolio's abnormal returns to estimate what the target firm's contemporaneous abnormal return would have been. t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Panel B reports the estimated alpha of the target firms, along with the 95% confidence interval of the estimated alpha of target firms in brackets.

Panel A: Regression results of a firm's stock return on returns to its industry peers

	(1)	(2)
Dependent variable	R_{it}	
R_{pt}, equal-weighted	0.90***	
	(69.78)	
R_{pt}, value-weighted		0.79***
		(19.37)
Constant	0.12**	0.16
	(2.39)	(0.69)
Observations	2094,021	2094,021
R^2	0.135	0.092

Panel B: Estimated alpha of the target firms and the confidence interval

	(1)	(2)	(3)	(4)	(5)	(6)
	MBO		Freezeout		All	
	EW	VW	EW	VW	EW	VW
	Fama-French-Carhart alpha					
Estimated alpha of targets	0.69	0.39	0.75	0.42	0.71	0.38
95% C.I.	[0.67, 0.71]	[0.35, 0.43]	[0.73, 0.77]	[0.38, 0.47]	[0.69, 0.73]	[0.34, 0.42]
	Fama-French five-factor alpha					
Estimated alpha of targets	0.74	0.48	0.93	0.56	0.93	0.60
95% C.I.	[0.72, 0.76]	[0.43, 0.53]	[0.91, 0.96]	[0.50, 0.62]	[0.91, 0.96]	[0.54, 0.66]
	Hou-Xue-Zhang alpha					
Estimated alpha of targets	1.11	0.57	1.13	0.55	1.14	0.59
95% C.I.	[1.08, 1.14]	[0.51, 0.62]	[1.10, 1.16]	[0.49, 0.61]	[1.11, 1.17]	[0.53, 0.65]

our main findings are robust to using only industries with many firms.

Although the estimated coefficients on peer returns are less than one, the associated t-statistics are large (indicating small standard errors and tight confidence intervals), approximately 70 on an equal-weighted basis and 20 on a value-weighted basis (recall that these are contemporaneous, not predictive, estimations). The results show that on average the target return is significantly correlated with its industry peers' returns, both economically and statistically. In this sense, industry peer returns provide a reliable, albeit still noisy, proxy for target returns on average. An economically and/or statistically insignificant coefficient would indicate the opposite. Because small standard errors create large t-statistics in this case, these t-statistics indicate that the estimated coefficient is more accurate (i.e., likely deviates less from the unobservable true value) than one with small t-statistics. A more accurate coefficient estimate implies a more accurate estimate of the relation between industry peer returns and target returns.

Given the relation between the target firm's return and that of its industry peers, as well as the estimated abnormal returns to the industry peers, we next estimate the abnormal returns of the target firms. Taking the expectation on both sides of Eq. (1) yields:

$$E(R_i) = a + bE(R_p). \tag{3}$$

Subtracting each side of Eq. (3) from the corresponding side of Eq. (1) yields:

$$E(R_i|R_p) - E(R_i) = b[R_p - E(R_p)]. \tag{4}$$

That is, the expected abnormal returns of the target firm equal b times the abnormal returns to the target's industry peers. Based on this reasoning, we estimate what the average target firm's abnormal returns would have been using the estimated average abnormal returns of its industry peers and the estimated coefficient on industry peer returns (i.e., $\hat{b}$). This methodology allows us to estimate both the average abnormal returns of the target firm, as well as the confidence intervals of the estimates (i.e., the reliability of the average abnormal returns of industry peers as a proxy for the average undervaluation of target firms).

Table 4, Panel B, presents the estimated abnormal returns to target firms based on the estimated alphas of their industry peers (reported in Panels B-D of Table 3). These estimated abnormal returns remain economically large. For example, the MBO and freezeout targets have abnormal returns of 0.71% – 1.14% per month on an equal-weighted ba-

sis and between 0.38% and 0.60% per month on a value-weighted basis, as seen in Columns 5 and 6 of Table 4, Panel B. In addition, we estimate the 95% confidence intervals for the estimated target firm abnormal returns and report them in the last row of the panel. The confidence intervals are all tight, consistent with the conclusion that, given the abnormal returns of industry peers, the target firms on average would have also experienced significant abnormal returns absent the MBO or freezeout. In other words, industry peer abnormal returns are a reliable proxy for the target firm's abnormal returns.

According to Eq. (4), the accuracy of the industry peers' abnormal returns as a proxy for the target firm's abnormal returns increases with the estimated coefficient $\hat{b}$, which in turn increases with the size of the industry, as discussed above. That is, the abnormal returns of a portfolio of industry peers are likely a more reliable proxy for the abnormal returns of the target firm in industries with more firms. We therefore estimate Eq. (2) and the average abnormal returns of the target firm using MBO or freezeout industries that have at least 20 firms, as a robustness check of the results in Table 4. The results remain robust when requiring at least 50 firms or when performing industry-by-industry analysis on all industries.

Panel A of Table 5 presents the estimation results of Eq. (2) for the industries of at least 20 firms. As expected, $\hat{b}$ increases to 0.95 on an equal-weighted basis from 0.90 in Table 4, Panel A, and to 0.84 from 0.79 on a value-weighted basis. The associated t-statistics remain large: 144 and 19 on an equal- and a value-weighted basis, respectively. These results indicate that peer returns of large industries are a more reliable proxy for the average target firm's return. In addition, we estimate Eq. (2) within industry for each of the 90 unique large industries and present the distributions of $\hat{b}$ in Panel B of Table 5. The mean $\hat{b}$ is 0.80 on an equal-weighted basis, while the median is 0.84, with a standard deviation of 0.15 and the 5th percentile is 0.53. On a value-weighted basis, the mean and median of $\hat{b}$ are both around 0.69 and the 5th percentile is 0.38. The results in Panel B suggest that, although there is variation in $\hat{b}$ across industries and industries with more constituents have higher return correlations, industry peer returns are a reliable proxy for the average target firm's returns in most industries.

We then estimate the alpha of the portfolio of the target's industry peers for the 12-month period following the MBO or freezeout announcement. We construct the portfolio in the same way as for Table 3, except that we only include target industries with at least 20 firms. The estimated alpha remains statistically and economically significant in 17 of the 18 model specifications in Table 5, Panel C. Economically, the estimated alpha ranges from 0.31% per month for the MBO sample on a value-weighted basis to 1.42% on an equal-weighted basis for the MBO sample. The results indicate that the significant abnormal returns of the target's industry peers are robust in large industries.

With the results in Panels A and C of Table 5, we proceed to estimate the average abnormal return of the MBO or freezeout target firm, which we present in Table 5, Panel D. Compared to Table 4, Panel B, which is based on all MBO or freezeout industries, the estimated average abnormal return of the target firm remains large. For instance, it is between 0.46% and 1.27% per month for the MBO and freezeout targets combined, as shown in Columns 5 and 6 of Table 5, Panel D. In addition, the 95% confidence intervals are still tight, indicating that the abnormal return of the industry peers is a reliable proxy for the average abnormal return of the MBO and freezeout targets.

The results in Tables 4 and 5 are based on the MBOs and freezeouts over the whole sample period. In untabulated results, we find that the estimated coefficients (i.e., $\hat{b}$s) for deals in the 1980s or after 1990 have similar economic magnitudes and standard errors as in the whole sample period. That is, on average industry peer abnormal returns are a reliable proxy for target abnormal returns in both periods. Therefore, the inferences regarding the undervaluation of target peers carry over to the average target. Specifically, the average target firm after 1990 is expected to earn significant abnormal returns had the deal not been announced, whereas the average target in the 1980s is not (see Table 3, Panel E).

Taken together, the results show that, on average, target firms would have experienced economically and statistically significant abnormal returns absent the MBO or freezeout, consistent with the conclusion that the average target firm is undervalued at the time of an MBO or freezeout.[21]

4.3. Additional evidence and robustness

We conduct a battery of tests on the full sample of industry peers to examine the robustness of the positive abnormal returns.

4.3.1. Completed versus withdrawn deals

We first examine the alphas of industry peers following completed versus withdrawn acquisitions. An MBO attempt could fail for a variety of reasons, including shareholders demanding higher bid premiums when the industry is undervalued. Similarly, a freezeout bid may be withdrawn in response to minority shareholders' resistance. Lee (1992) and Ofek (1994) use rejected and withdrawn MBO deals to test whether they add value following the deal or simply select into undervalued firms. They find that target values decline back to pre-bid levels in rejected or withdrawn MBOs. Ex ante, it is unclear whether the abnormal returns will concentrate in completed or withdrawn deals. A completed deal could imply that managers or controlling shareholders successfully time the market and that other shareholders do not realize that the firm is undervalued. A withdrawal, in contrast, could suggest either that the managers or controlling shareholders realize after the bid that the firm is not undervalued or that the outside shareholders, aware of the firm's undervaluation,

[21] As an alternative methodology to incorporate the correlations of industry peers with those of target firms, in untabulated results we find that the portfolio of industry peers of MBO and freezeout firms with higher than the median pre-deal return correlations is associated with abnormal returns similar to those reported in Table 3. The results are also consistent with the abnormal returns of industry peers reliably proxying for the abnormal returns of target firms.

Table 5
Long-run abnormal returns to MBO and freezeout targets based on abnormal returns to their industry peers: robustness check with large industries only.

We estimate the relation between a firm's returns and returns to its four-digit industry peers based on the following regression: $R_{it} = a + b * R_{pt} + u_{it}$, in which R_{it} is firm i's stock return in month t and R_{pt} is the equal- or value-weighted returns to firm i's four-digit SIC industry peers in month t. We estimate the regression using the industries in our MBO/freezeout sample with at least 20 firms and over the 60-month period before the announcement of the MBO or freezeout. Panel A reports the pooled OLS regression results, where the standard errors are clustered by time. We also estimate the regression for each of the 90 unique industries that satisfy our data requirements, and report summary statistics of the regression estimates of $\hat{b}$ in Panel B. Panel C presents the estimated alphas to the portfolios of the MBO/freezeout target's industry peers, in which the portfolios are formed in the same way as in Table 3 except that only industry peers of large industries with at least 20 firms are included. We then estimate the abnormal returns of the target firms based on the regression results in Panel A and the estimated alphas to the industry peers (reported in Panel C): Alpha of the target firms $\equiv E[R_i|R_p] - E(R_i) = b*[R_p - E(R_p)]$ as shown in Eq. (4). Thus, we impose an intercept of zero from the estimation for Panel A and use the estimated b coefficient along with the peer portfolio's abnormal returns to estimate what the target firm's contemporaneous abnormal return would have been. Panel D reports the estimated alpha of the target firms, along with the 95% confidence interval of the estimated alpha of target firms. t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Regression results of a firm's stock return on returns to its industry peers

	(1)	(2)
Dependent variable	R_{it}	
R_{pt}, equal-weighted	0.95*** (144.36)	
R_{pt}, value-weighted		0.84*** (19.00)
Constant	0.06** (2.25)	0.06 0.26)
Observations	1848,721	1848,721
R^2	0.144	0.097

Panel B: Summary statistics of regression estimates across industries

Variable	N	mean	sd	p5	p25	p50	p75	p95
Based on equal-weighted peer returns								
$\hat{b}$	90	0.80	0.15	0.53	0.74	0.84	0.90	0.96
Based on value-weighted peer returns								
$\hat{b}$	90	0.68	0.18	0.38	0.59	0.69	0.80	0.94

Panel C: Estimated alphas to portfolios of the MBO/freezeout target's industry peers

(1)	(2)	(3)	(4)	(5)	(6)
MBO		Freezeout		All	
EW	VW	EW	VW	EW	VW
Fama-French-Carhart alpha					
0.84***	0.31	0.74***	0.45**	0.80***	0.54***
(2.71)	(1.11)	(3.10)	(2.52)	(3.48)	(3.35)
Fama-French-five-factor alpha					
1.03***	0.52*	1.03***	0.63***	1.13***	0.88***
(3.55)	(1.82)	(4.63)	(3.15)	(5.31)	(5.32)
Hou-Xue-Zhang alpha					
1.42***	0.58*	1.25***	0.60***	1.34***	0.82***
(4.38)	(1.89)	(4.92)	(2.95)	(5.38)	(4.53)

Panel D: Estimated alpha of the target firms and the confidence interval

	(1)	(2)	(3)	(4)	(5)	(6)
	MBO		Freezeout		All	
	EW	VW	EW	VW	EW	VW
	Fama-French-Carhart alpha					
Estimated alpha of targets	0.80	0.26	0.70	0.38	0.76	0.46
95% C.I.	[0.79, 0.81]	[0.23, 0.29]	[0.69, 0.71]	[0.34, 0.42]	[0.75, 0.77]	[0.41, 0.50]
	Fama-French-five-factor alpha					
Estimated alpha of targets	0.98	0.44	0.98	0.53	1.07	0.74
95% C.I.	[0.97, 0.99]	[0.39, 0.48]	[0.97, 0.99]	[0.48, 0.59]	[1.06, 1.09]	[0.66, 0.82]
	Hou-Xue-Zhang alpha					
Estimated alpha of targets	1.35	0.49	1.19	0.51	1.27	0.69
95% C.I.	[1.33, 1.37]	[0.44, 0.54]	[1.17, 1.20]	[0.45, 0.56]	[1.26, 1.29]	[0.62, 0.76]

Table 6
Long-run abnormal returns to industry peers of MBO and freezeout targets: robustness checks.

At the beginning of each month from January 1980 to December 2014, we form a portfolio of stocks whose four-digit SIC industry peer was a target in our sample of MBO or freezeout deals announced during the preceding 12 months. We present alphas estimated from OLS regressions in which the dependent variable is the equal-weighted (EW) or value-weighted (VW) portfolio return in excess of the risk-free interest rate. The independent variables are the four risk factors—MKT, SMB, HML, and UMD—constructed by Fama and French (1993) and Carhart (1997), the Fama-French (2015) five factors, and the Hou et al. (2015)) four factors, respectively. Columns 1–4 of Panel A present alphas following completed versus withdrawn deals; and Columns 5–8 present alphas by the bid premium of the MBO or freezeout. Panel B presents the results when the "takeover factor" constructed by Cremers et al. (2009) is added to the model. At the beginning of each month from January 1980 to December 2014, we also form a portfolio of stocks whose four-digit SIC industry peer was a target in our sample of club LBO deals, which have more than one private equity firm as acquirer, announced during the preceding 12 months. Columns 9–10 of Panel A present the estimated alphas of the portfolio against the Fama-French-Carhart four factors, the Fama-French five factors, and the Hou-Xue-Zhang factors. All model specifications employ robust standard errors. *t*-statistics are reported in the parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Alpha following completed versus withdrawn deals, deals with low or high bid premiums, or club deals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Completed deal		Withdrawn deal		Low premium		High premium		Club LBOs	
	EW	VW	EW	VW	EW	VW	EW	VW	EW	VW
FFC	0.72***	0.44***	0.67*	0.35	0.85***	0.33*	0.78***	0.49**	0.32	−0.15
	(3.29)	(2.73)	(1.92)	(1.23)	(3.01)	(1.79)	(3.58)	(2.43)	(0.81)	(−0.37)
FF5	1.04***	0.77***	0.68*	0.30	1.10***	0.68***	1.05***	0.75***	0.39	0.18
	(5.00)	(4.69)	(1.84)	(1.03)	(4.08)	(3.76)	(4.91)	(3.60)	(0.94)	(0.42)
HXZ	1.26***	0.78***	1.00**	0.35	1.44***	0.76***	1.17***	0.68***	0.48	0.10
	(5.18)	(4.43)	(2.43)	(1.15)	(4.33)	(3.97)	(5.34)	(2.94)	(1.08)	(0.24)

Panel B: Alphas with additional controls of the takeover factor

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Excess portfolio return					
	EW	VW	EW	VW	EW	VW
	Fama-French-Carhart		Fama-French 5		Hou-Xue-Zhang	
MKT	0.97***	1.05***	0.89***	0.97***	0.90***	1.02***
	(20.22)	(32.09)	(17.50)	(29.47)	(17.04)	(30.84)
SMB	1.08***	0.10*	0.80***	−0.02		
	(13.80)	(1.80)	(10.54)	(−0.35)		
HML	−0.27***	−0.30***	−0.10	−0.11		
	(−2.65)	(−4.50)	(−1.06)	(−1.46)		
UMD	−0.21**	0.04				
	(−2.43)	(0.77)				
RMW			−0.84***	−0.37***		
			(−8.65)	(−4.37)		
CMA			−0.40**	−0.39***		
			(−2.29)	(−3.09)		
ME					0.76***	−0.00
					(12.02)	(−0.05)
IA					−0.50***	−0.41***
					(−2.77)	(−3.75)
ROE					−0.84***	−0.20***
					(−7.22)	(−2.63)
Takeover factor	0.21*	−0.05	0.36**	−0.04	0.07	−0.18**
	(1.85)	(−0.56)	(2.52)	(−0.56)	(0.59)	(−2.37)
Alpha	0.66***	0.46***	0.89***	0.75***	1.25***	0.81***
	(3.35)	(2.76)	(5.31)	(4.66)	(6.20)	(4.71)
Observations	396	396	396	396	396	396
Adjusted R^2	0.796	0.766	0.821	0.783	0.818	0.766

bargain too hard. However, outsider shareholders' awareness of their own firm's undervaluation is unlikely to alter the valuation paths of peer firms.[22]

Columns 1–4 of Panel A in Table 6, present estimated alphas for the portfolio of the industry peers of the target firm following completed or withdrawn MBOs and freezeouts. The alpha is positive and always statistically significant following completed acquisitions. For the sample of withdrawn MBOs and freezeouts, the estimated alphas become economically smaller and statistically insignificant on a value-weighted basis; they remain positive and significant on an equal-weighted basis.[23] In short, alphas tend to

[22] It is possible that investors might learn the information and incorporate it into industry peers' stock prices and thus alter their valuation paths. However, we find evidence inconsistent with this possibility in Section 5.3.3.

[23] We also estimate alphas for the portfolio of target firms in failed bids. Since the stock returns of target firms are observable following the acquisition, this approach provides a direct measure of the abnormal returns of target firms and thus is not affected by stock return correlations between the target and its industry peers. However, this approach has its own problems. Bids fail for endogenous reasons, and withdrawals themselves are negative news to shareholders. This approach is therefore unlikely to yield reliable results regarding firm valuation at the time of a

be more significant following completed acquisitions, consistent with the findings of Lee (1992) and Ofek (1994).

4.3.2. Robustness to bid premiums

Bid premiums represent the gains of outside shareholders relative to pre-announcement market values and may vary based on the characteristics of MBOs and freezeouts (see, e.g., Cain and Davidoff, 2011). If target shareholders can identify bids that are motivated by industry undervaluation, they can negotiate for a higher bid premium. Therefore, despite being undervalued at the time of the bid announcement, outside shareholders can prevent expropriation through higher bid premiums relative to the (undervalued) market value of the firm. Empirically, this will concentrate high post-deal abnormal industry returns in high bid premium deals. To test this prediction, we sort the industry peers into two groups based on the bid premium of the MBO or freezeout bid. In Columns 5 – 8 of Table 6, Panel A, we find positive alphas of similar magnitude for the two groups. That is, the post-deal abnormal returns do not appear to vary based on the bid premium. The results suggest that the target shareholders do not obtain larger gains through higher bid premiums (and thus prevent exploitation) when post-deal industry abnormal returns are higher and industries are potentially undervalued.

4.3.3. Club deals

Next, we test whether there are abnormal post-deal returns to the industry peers of other types of LBO targets, in which the incentives to time the market are less likely to be strong. We analyze LBOs with several private equity sponsors co-investing in the same deal (also known as club deals). Officer et al. (2010) find that club deals pay significantly lower premiums than other deals. They interpret this evidence as consistent with the conclusion that private equity bidders collude to reduce competition for LBO targets, and thus reduce target premiums. Collusion has the potential to directly affect the level of competition, preventing private equity funds from driving up the premium to the point where the target is no longer undervalued. It is less clear, however, how collusion would assist private equity firms in identifying undervalued targets. In Columns 9 and 10 of Table 6, Panel A, we do not find that the targets of club deals are significantly undervalued at the time of the acquisition announcement. Thus, if collusion does occur, it does not appear to involve colluding to time the market.

4.3.4. Robustness to including other factors

As an additional robustness test, we examine whether the positive alphas are due to a higher likelihood of acquisition activity in the industry by using the takeover factor proposed by Cremers et al. (2009). They construct the takeover factor by buying (selling) firms with high (low) estimated takeover likelihood. When we control for the takeover factor in the regression, we continue to find significant alphas, as shown in Panel B in Table 6. In untabulated results, we also find that the positive abnormal returns are unaffected by including the liquidity factor constructed by Pástor and Stambaugh (2003).

In summary, we find that the positive alphas are larger following completed MBO and freezeout bids, do not depend on the bid premium, are not driven by industry peers with low prior returns correlation, are not associated with club deals, and are not driven by the takeover factor or the liquidity factor.

5. Explanations for the positive abnormal returns

There are at least three possible explanations for the positive abnormal returns to the industry peers of MBO and freezeout targets: data mining, omitted risk factors, or managers and controlling shareholders successfully timing the acquisition to when the industry is undervalued. In this section, we assess these three explanations. Our results are most consistent with the market timing explanation.

5.1. Data mining

As noted above, the concern over data mining is significantly alleviated by the large alpha and large associated *t*-statistics (Harvey et al., 2016). If the positive abnormal returns are the result of data mining, then one could expect randomly chosen pseudo-MBO and freezeout industries also to be associated with positive long-run abnormal returns. We designate 988 randomly chosen four-digit SIC industry-months over the whole sample period as industries in which a pseudo-MBO or freezeout occurred. We treat these industries as if an MBO or freezeout actually did occur and form a monthly portfolio of the industries over the first 12 months following the pseudo-event. We repeat the simulation 500 times. If our results are due to data mining rather than acquisition timing, the portfolio of pseudo-industry peers will also be associated with positive abnormal returns. In unreported results, we find that the pseudo-portfolios are largely associated with insignificant abnormal returns.

5.2. Omitted risk factors and counterfactual tests

The second explanation relates to omitted risks. We alleviate this concern by benchmarking the portfolio return with respect to Fama and French's (1993) and Carhart's (1997) four factors, Fama and French's (2015) five factors, and Hou et al. (2015) four factors and find significant alphas against all three models. In addition, neither the takeover factor nor the liquidity factor reduces the significance of the positive alphas. Despite these controls, our results could be driven by an omitted risk factor common to the industry peers of all takeover targets and not unique to targets of MBOs or minority freezeouts. We test this alternative explanation in this subsection. All potential acquirers have incentives to initiate an acquisition when the target is undervalued. However, managers and controlling shareholders are intensively involved with the daily operations of the target firm and thus could have better information about its value. If the information of management and controlling shareholders is necessary to time the

general MBO or freezeout acquisition. Unsurprisingly, we find negative but insignificant alphas for the target firms in failed bids.

Table 7
Long-run abnormal returns to industry peers of non-MBO and non-freezeout targets.

At the beginning of each month from January 1980 to December 2014, we form a portfolio of stocks whose four-digit SIC industry peer was a target in the sample of non-MBO and non-freezeout deals announced during the preceding 12 months. A firm is excluded from the portfolio if it also shows up in our MBO-freezeout target peer portfolio as described in Table 3. This table presents the OLS regression results in which the dependent variable is the equal-weighted (EW) or value-weighted (VW) portfolio return in excess of the risk-free interest rate. The independent variables are the four risk factors—MKT, SMB, HML, and UMD—constructed by Fama and French (1993) and Carhart (1997), the Fama-French (2015) five factors, and the Hou et al. (2015)) four factors, respectively. All model specifications employ robust standard errors. *t*-statistics are reported in the parentheses below each coefficient. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Excess portfolio return					
	EW	VW	EW	VW	EW	VW
	Fama-French-Carhart		Fama-French 5		Hou-Xue-Zhang	
MKT	0.93***	0.98***	0.94***	0.99***	0.92***	0.99***
	(37.36)	(103.57)	(33.28)	(104.23)	(30.51)	(91.96)
SMB	0.80***	−0.02	0.74***	−0.03*		
	(15.43)	(−1.00)	(12.88)	(−1.72)		
HML	0.12**	0.01	0.16**	0.03		
	(2.57)	(0.79)	(2.43)	(1.45)		
UMD	−0.21***	−0.03***				
	(−5.79)	(−3.19)				
RMW			−0.24***	−0.03		
			(−3.46)	(−1.57)		
CMA			−0.07	−0.00		
			(−0.71)	(−0.06)		
ME					0.63***	−0.03**
					(10.00)	(−2.03)
IA					0.06	0.02
					(0.71)	(0.90)
ROE					−0.40***	−0.01
					(−5.64)	(−0.69)
Alpha	0.15	−0.02	0.13	−0.02	0.28**	−0.01
	(1.60)	(−0.43)	(1.14)	(−0.65)	(2.06)	(−0.17)
N	418	418	418	418	418	418
Adjusted R^2	0.906	0.977	0.890	0.977	0.894	0.974

bid successfully, industry peers of target firms would not have positive abnormal returns after arm's-length acquisition announcements.

We test this prediction with a sample of non-MBO and non-freezeout acquisitions acting as a placebo for the sample of MBOs and freezeouts. To be comparable to our samples of MBOs and freezeout acquisitions, we require that the acquisition targets are public U.S. firms and take the form of a merger (SDC deal form M), acquisition of majority interest (AM), acquisition of partial interest (AP), or acquisition of assets (AA). A deal is excluded from the control sample if it is included in our MBO or freezeout sample. Our control sample consists of 23,675 mergers and acquisitions occurring in the 1980–2014 period.

For each month from January 1980 to December 2014, we form a portfolio of firms whose four-digit SIC industry peer became an acquisition target over the preceding 12 months. To avoid contamination from MBOs and freezeout acquisitions, we exclude a firm from the portfolio if it is also in our MBO or freezeout trading portfolio as constructed for Table 3. Table 7 presents our estimates of the strategy's alphas with respect to the three sets of risk factors. The estimated alphas are economically small, ranging from −0.02% to 0.28%. They are statistically significant only when benchmarked against the Hou-Xue-Zhang factors and only on an equal-weighted basis. On balance, the target firm's industry peers of non-MBO and non-freezeout acquisitions are not associated with post-announcement abnormal returns. The results further alleviate the concern that our main results stem from omitted risks common to all takeover industries.

5.3. Timing of MBOs and freezeouts

The remaining explanation is that managers and controlling shareholders successfully time their bids and initiate the acquisition when the target firm's industry is undervalued.[24] The abnormal returns occur because other investors fail to fully incorporate the informational content of the MBO or freezeout announcement.

5.3.1. Industry undervaluation before MBO or freezeout announcements

According to the timing-based explanation, managers and controlling shareholders initiate the announcements of MBO and freezeout bids when the target firms and their respective industries are undervalued. We use the market-to-book ratio decomposition from Rhodes-Kropf et al. (2005) to provide further evidence on potential undervaluation of the MBO or freezeout target indus-

[24] Consistent with this explanation, in untabulated tests we find that the estimated industry peer abnormal returns are weakened following MBO and freezeout acquisitions of targets with large institutional investor holdings. In addition, although we do not observe the degree of management holdings post-MBO (potentially capturing the incentive of management to bid when the industry is undervalued), we note that our findings are significant in the freezeout sample when the controlling shareholder's holdings post-bid are large and known.

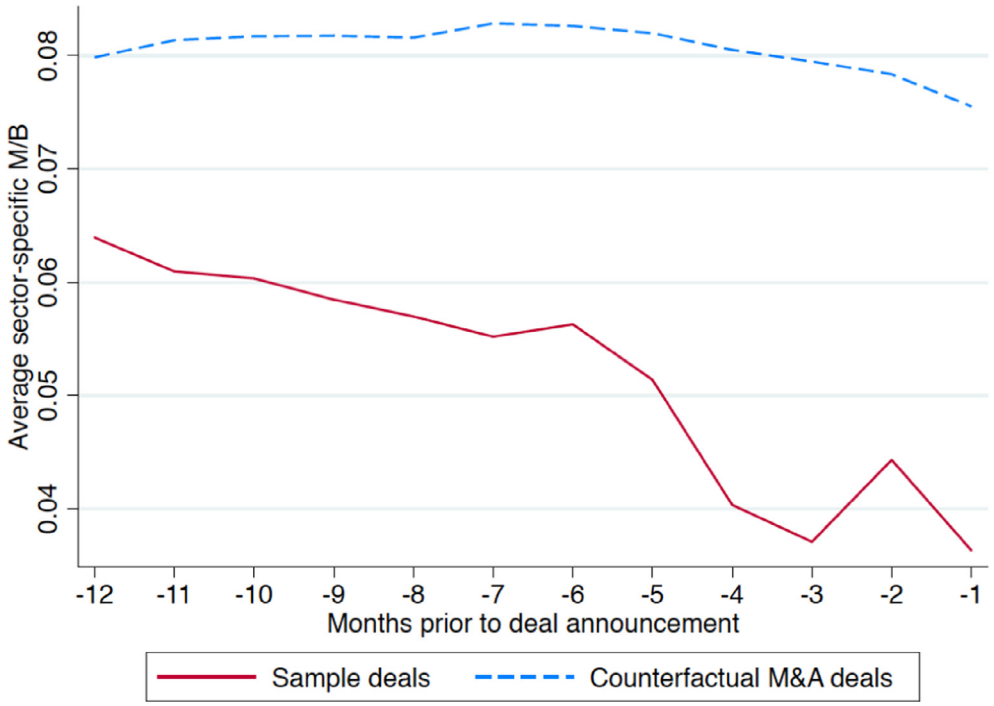

Fig. 2. Were MBO/freezeout targets undervalued before their bid announcements? This figure presents the equal-weighted average monthly sector-specific error of the market-to-book ratio of MBO and freezeout targets and the equal-weighted average monthly sector-specific error of market-to-book ratio of counterfactual arm's-length merger and acquisition deals from the 12-month period before the acquisition announcement to the one-month period before the acquisition announcement. Monthly sector-specific errors of the market-to-book ratio are estimated following Rhodes-Kropf et al. (2005) using monthly Fama-French 12-industry-level cross-sectional regressions of the natural log of the market value of equity of a given month on the book value of equity in a given year and a constant. The monthly sector-specific error of the market-to-book ratio is equal to the sector-month coefficients multiplied by a given target's book value of equity minus the average coefficients over the sample period (1980–2014) multiplied by a given target's book value of equity.

tries before the bid announcement.[25] In Fig. 2, we present the average monthly sector-specific error of the market-to-book ratio (the difference in the natural logarithm of the market-to-book ratio from current sector valuation multiples deviating from long-run sector valuation multiples) in each of the 12 months preceding the bid announcement for sample MBO and freezeout targets.

As can be seen in Fig. 2, the average sector-specific error becomes significantly more negative (representing sector undervaluation compared to long-run multiples) over the 12 months before the bid announcement for MBO or freezeout targets. We perform a similar analysis of arm's-length mergers and acquisitions (the sample is described in Section 5.2), but do not observe a similar undervaluation or a similar decrease in sector-specific errors before the bid. In addition, the difference between the average sector-error of arm's-length mergers and acquisitions and our sample bids is marginally significant (a *t*-statistic of less than 1.9) at the 12th month before the bid, but increases dramatically in the months near the bid, with *t*-statistics exceeding 4.0. These results support our hypothesis that managers and controlling shareholders attempt to exploit target shareholders by timing MBOs and freezeout acquisitions when the industry is significantly undervalued.

5.3.2. Industry operating performance around MBOs and freezeouts

One outcome of timing would be that MBOs and freezeouts are initiated when the target firms and their respective industries are at the bottom of the industry's business cycle. Unexpected (to outsiders) improvements in industry profitability would generate the observed positive abnormal returns of industry peers presented in Table 3. We thus examine the profitability (proxied by return on assets (ROA)) and profit margin of the target's industry peers over the 11 years surrounding the MBO or freezeout.

Fig. 3 shows that both ROA and profit margin steadily decrease over the five-year period preceding the deal and then steadily increase over the five-year period after the deal. The pattern suggests that, on average, managers and controlling shareholders successfully time the MBO or freezeout when the industry's product market conditions are at a low and are about to improve. In unreported figures, we find that the V-shaped patterns are weak in

[25] For each month, we estimate cross-sectional regressions at the Fama-French 12-industry level of the natural log of the market value in a given month regressed on the natural log of book value in a given year. To compute the sector-specific error of the market-to-book ratio, we compute the difference between sector-month valuation multiples on a firm's book value and the average sector valuation multiples (computed over our sample period, 1980–2014) on a firm's book value. In untabulated analysis, our results are robust to computing long-run multiples from 1962 to 2014 and to performing the analysis at the annual level.

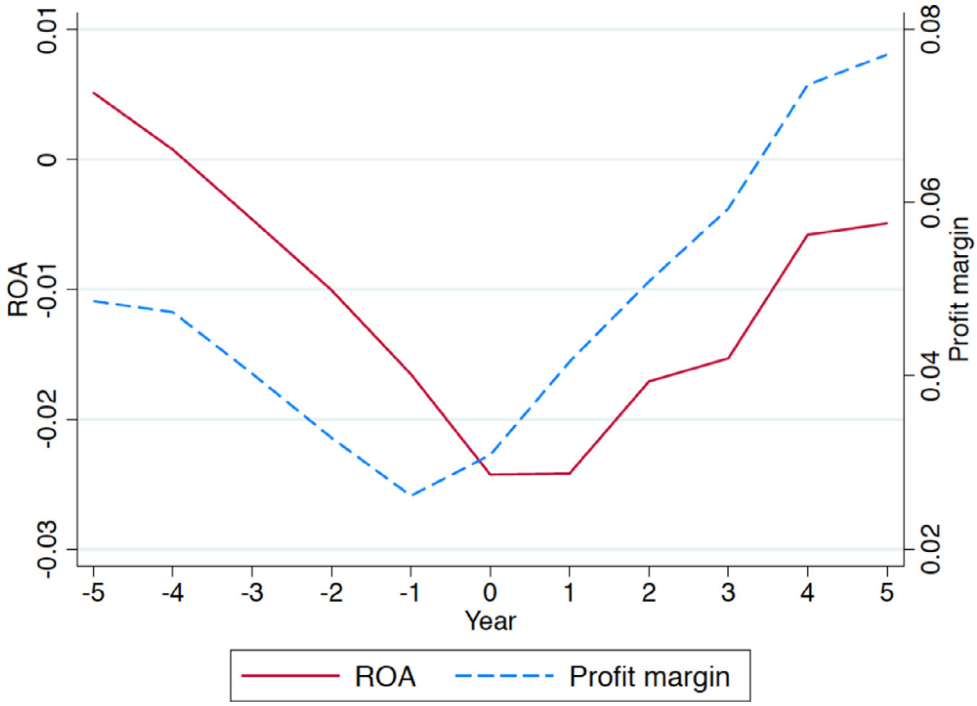

Fig. 3. Industry business cycle around MBOs and freezeouts. This figure presents the average return on assets (ROA) and the average profit margin of the target's industry peers over the 11-year period surrounding the MBOs and freezeouts. ROA is the ratio of income before extraordinary items (Compustat item *ib*) to total assets (*at*) at the end of the last fiscal year. Profit margin is the ratio of operating income before depreciation (*oibdp*) to sales (*sale*). We winsorize ROA and profit margin at the top and bottom 2.5% to prevent potential impacts of extreme values.

the 1980s and are more pronounced after 1990, consistent with the results in Table 3.

As discussed in the Introduction, an outsider can use publicly available MBO and freezeout announcements to identify an undervalued industry and industry business cycle troughs. An investor may be able to profit from purchasing the industry peers of these targets. However, it is possible that industry peers learn from, or react to, the deal itself. Therefore, the observed improvements in the target firm or its industry may in part be the result of the deal. For example, the evidence suggests that LBOs significantly affect the employment, productivity, merger activity, and governance of industry peers (Bernstein et al., 2017; Harford et al., 2016).[26]

5.3.3. Stock returns to the targets' industry peers around MBO and freezeout announcements

According to the timing-based explanation, investors do not fully respond to the information content of the MBO or freezeout announcement. We investigate stock returns to the target firm's industry peers around the deal announcement. In Table 8, we find that the MBO target industry peers experience an average cumulative abnormal return (CAR) of 0.23% over the three-day period surrounding the announcement, while the freezeout target industry peers experience three-day CARs of 0.19%. Both CARs are statistically insignificant. The insignificant announcement returns and positive post-announcement abnormal returns are consistent with the timing hypothesis.

5.3.4. Do MBOs and freezeouts have higher premiums?

The results so far indicate that managers and controlling shareholders successfully time their acquisitions, which may enable them to pay lower prices to outside or minority shareholders. There is a possibility, however, that bid premiums already incorporate managers' and controlling shareholders' incentives to time acquisitions. As discussed earlier, we do not find evidence that the estimated positive abnormal industry peer returns are centered in deals with high bid premiums. Thus, it does not appear that cross-sectional differences in industry undervaluation lead to differential bid premiums among deals in our sample. In Section 2, we discuss the process for this bargaining, including special committees coupled with the potential leverage shareholders have through their threat of litigation and appraisal rights. Existing evidence studying premiums suggests that special committees are effective in attaining higher premiums (Cain and Davidoff, 2011) but that premiums are generally lower in deals with greater manager holdings and when managers initiate the MBO (Cain and Davidoff, 2011; Chen et al., 2011).

To test whether industry undervaluation is generally incorporated into higher bid premiums, we compare the bid premiums of MBOs, freezeout acquisitions, and the sample of control acquisitions. As can be seen in Table 9, Panel A, bid premiums are comparable across the three samples: MBOs are associated with an average bid pre-

[26] Note that the focus of these studies is on LBOs generally, whereas in this study we analyze MBOs, a subset of LBOs, as well as minority freezeouts.

Table 8
Returns to industry peers of MBO and freezeout deal target firm around deal announcement.

This table presents abnormal stock returns to four-digit SIC industry peers of MBO or freezeout targets over the 11 days surrounding the deal announcement. Abnormal returns are computed based on the market model (Brown and Warner, 1980), with beta estimated over the period from 42 to 252 days before the announcement date. We require at least 20 data points during the estimation window to have an accurate beta estimation. Our sample includes MBOs and freezeout deals targeting public U.S. firms announced between 1980 and 2014. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	MBO			Freezeout			All		
Day	N	Return	*t*-statistic	N	Return	*t*-statistic	N	Return	*t*-statistic
−5	436	−0.05	(−0.689)	470	−0.05	(−0.591)	907	−0.05	(−0.902)
−4	436	−0.06	(−0.613)	470	−0.03	(−0.299)	907	−0.04	(−0.637)
−3	437	−0.18**	(−2.109)	470	0.14	(1.581)	907	−0.01	(−0.219)
−2	437	−0.04	(−0.491)	470	0.01	(0.048)	907	−0.02	(−0.260)
−1	437	0.03	(0.314)	470	0.19	(1.595)	907	0.11	(1.447)
0	437	0.19**	(2.062)	470	−0.25***	(−2.828)	907	−0.04	(−0.572)
1	437	0.00	(0.001)	470	0.25***	(3.034)	907	0.13**	(2.007)
2	437	0.00	(0.012)	470	−0.04	(−0.525)	907	−0.02	(−0.364)
3	437	0.17*	(1.910)	470	0.03	(0.357)	907	0.10	(1.574)
4	437	0.03	(0.329)	470	0.06	(0.742)	907	0.05	(0.745)
5	437	0.24**	(2.239)	470	0.02	(0.308)	907	0.13*	(1.962)
(−1, 1)	437	0.23	(1.478)	470	0.19	(1.234)	907	0.21*	(1.908)

Table 9
Are MBOs and freezeout deals associated with larger bid premiums?

Panel A presents the bid premium for three types of merger and acquisitions: MBOs, freezeouts, and other deals. Panel B presents the OLS regression results for bid premium. Hostile deal is an indicator that takes the value of one if the acquisition is perceived as hostile by the target management, and zero otherwise. Diversifying deal is a dummy variable that takes a value of one if the acquirer and the target are in different Fama-French 48 industries, and zero otherwise. All cash (stock) deal is an indicator that takes the value of one if the deal is financed with all cash (acquirer's stocks). All model specifications employ robust standard errors. *t*-statistics are reported in the parentheses below each coefficient. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Summary statistics of bid premium for three types of deals

Type	N	Mean	sd	p5	p25	Median	p75	p95
MBO	393	0.3687	0.2940	0.0390	0.2000	0.3151	0.4825	0.8638
Freezeout	474	0.3497	0.4208	−0.0925	0.1163	0.2857	0.4902	1.0174
Others	15,314	0.3627	2.1146	−0.1769	0.0534	0.2320	0.4681	1.0370
Total	16,181	0.3624	2.0590	−0.1724	0.0582	0.2376	0.4694	1.0298

Panel B: Regression results

	(1)	(2)
Dependent variable	Bid premium	
MBO	0.01	0.03
	(0.27)	(1.31)
Freezeout	−0.01	0.00
	(−0.50)	(0.21)
Log(Transaction value)		0.01
		(1.25)
Hostile deal		0.09***
		(4.95)
Diversifying deal		−0.06*
		(−1.96)
All cash deal		−0.10*
		(−1.78)
All stock deal		−0.04
		(−1.09)
Constant	0.36***	0.41***
	(21.22)	(5.24)
Observations	16,181	16,138
Adjusted R^2	−0.000	0.001

mium of 36.9%, freezeout deals with 35.0%, and the control sample with 36.3%. In Table 9, Panel B, we present the results of regressing the bid premium on an MBO dummy, a freezeout acquisition dummy, and other deal characteristics. The coefficients on the two dummy variables are economically small and statistically insignificant. Overall, managers and controlling shareholders pay bid premiums that are similar to those of other acquirers. Our findings indicate that despite the legal architecture in place to protect them, outside shareholders do not systematically capture the industry undervaluation component through higher bid premiums at the time of the MBO or freezeout bid.

5.3.5. Does litigation prevent managers and controlling shareholders from timing acquisitions?

As discussed in Section 2, managers and controlling shareholders likely make gains even in the presence of litigation. For example, according to Delaware law, only shareholders who vote against a deal are eligible to receive compensation in the event that a judge rules that the deal was undervalued. If, however, litigation is more likely when industry peers experience significant abnormal returns, then this will limit the gains that managers and controlling shareholders can make in these deals. We use the Westlaw and Bloomberg Law databases to identify which MBOs and freezeouts in our sample were litigated. In untabulated robustness results, we continue to find positive and significant abnormal returns for deals without litigation. The magnitude of the abnormal returns is similar to those of deals in which litigation did occur. These findings indicate that litigation does not completely protect outside shareholders against exploitation.

In summary, we find that investors respond to MBO and freezeout announcements with small positive stock returns to the target firm's industry peers. The MBO or freezeout target firm's shareholders are unable to bargain for higher premiums than those for arm's-length acquisitions. In addition, non-MBO and non-freezeout acquisitions are not associated with positive post-announcement abnormal returns to the target firm's industry peers. Furthermore, managers and controlling shareholders successfully time the deal when the industry is at the bottom of the industry cycle. Last, we find evidence of positive post-announcement abnormal peer returns in deals without litigation. Taken together, the results support the timing hypothesis: on average, managers and controlling shareholders initiate the acquisition when the target firm is undervalued.

5.4. The challenge facing shareholders of target firms

We expand on the target shareholder's inferential challenge discussed in the Introduction. Although we can show statistically that on average MBOs and freezeout acquisitions occur when the target and its industry are undervalued to an economically meaningful degree, it is difficult for shareholders and courts to conclusively identify and stop specific undervalued deals. In Table 10, we present statistics that describe the distributions of the market and average industry peer BHRs over 12-month intervals before and after the MBO and freezeout acquisitions. Since the calendar-time portfolio results show that the post-deal industry peer abnormal returns are statistically significant only after 1990 (Table 3, Panel E), we present the BHRs for the 1980 s and post-1990 deals in Panels A and B, respectively, and focus our discussion on the latter sample. These returns are presented to describe the raw data and highlight the fact that negative industry returns followed a substantial proportion of the deals. This helps to explain the magnitude of the challenge facing investors and litigants in a specific deal. The standard deviations of the post-deal peer BHRs range from 30% to 54%, depending on the sample, and the 25th percentile is always negative.

The results in Table 10 show the dramatic dispersion of the average industry peer returns following each deal. For the MBO acquisitions after 1990, the mean industry peer BHR is 14.1%; however, the 5th percentile is −40.9% and the 95th percentile is 89.0%. The post-1990 freezeout sample's industry peer returns demonstrate a similar dispersion, with a mean BHR of 20.4% but a 5th percentile of −36.6% and a 95th percentile of nearly 100%. Overall, the mean industry peer BHR for the average deal after 1990 is 18.5%, with a 5th percentile of −38.7% and a 95th percentile of 91.1%. In addition, the variability of the relation between the target firm's stock return and its industry peers' returns (as discussed above and can also be seen in the correlations reported in the first row of each sample) exacerbates the inferential challenge faced by investors in a specific deal.[27]

Thus, although one can see that the post-deal BHRs to industry peers of MBOs and freezeouts are on average positive (and at the median), they vary significantly. This highlights the inferential challenge faced by shareholders and courts: by using a large sample of deals, researchers have the potential to conclude that on average industry peers of target firms are undervalued at the time of the deal announcement. However, the large variances demonstrate that the deals are heterogeneous. As DeAngelo (1986) emphasizes, it is difficult for outside stockholders or judges to conclude that there is undervaluation in a specific deal, where they must draw conclusions based on data for a sample of one. In the Appendix and the Internet Appendix, we provide case-based evidence on the average industry BHRs around selected deals to further demonstrate this difficulty.

Consistent with Table 3, Panel E, the average MBO's (freezeout's) post-deal peer BHRs outpace the market by 6% (11%) after 1990. In the 1980 s, however, the average freezeout firm's post-deal peer returns are 1% above the market return, while the average MBO firm's peers underperform the market. Although these BHRs are interesting and useful in explaining the challenges facing courts and shareholders, and in corroborating the results of the alpha analysis, several issues render them uninformative as to the substantive issue of whether, in a statistically defensible sense, the average target was undervalued. First, as Fama (1998) points out, no asset pricing model is designed to explain returns over the long run. The bad-model problem is especially serious for long-run BHRs because benchmark errors compound over long horizons.[28] Further, the

[27] Note that the correlation reported here is the average return correlation between the target and each of its industry peers. It is different from that reported in Table 2, which is the return correlation between the target and the portfolio of its industry peers.

[28] We report market-adjusted returns for illustrative purposes only. Market returns are not an appropriate benchmark for individual stock BHRs for several reasons. First, market returns are less volatile than individual stock returns (as can be seen in Table 10). As a result, the BHRs of individual firms tend to be smaller than compound market returns for the same average simple return. Second, the rebalancing bias arises because the market index often involves periodic rebalancing (Barber and Lyon, 1997). Third, the target's industry peers do not necessarily have a market beta of one, and relatedly, it is necessary to control for risks other than market risk. The results in Table 3 show that, by and large, industry peers have negative loadings on the risk factors related to stock valuation,

Table 10
Summary statistics of the average 12-month buy-and-hold returns to the industry peers of the MBO/freezeout target and stock return correlations between the target and its industry peers.

For each deal, we compute the average stock return correlation between the target and its individual industry peers over the 60-month period before the deal, the average 12-month buy-and-hold returns to its individual industry peers, and the average 12-month market returns, and present the deal-level summary statistics in the table. Panel A (B) is for the deals over the period 1980–1989 (1990–2014). Monthly market returns are retrieved from Kenneth French's website. We require at least five months of stock returns when calculating the stock return correlations. We truncate the 12-month buy-and-hold returns to individual industry peers and the corresponding 12-month market returns if the industry peers do not have available returns in the CRSP database throughout the first 12 months after the deal or throughout the 12 months before the deal.

Panel A: Summary statistics for deals, 1980–1989

	N	Mean	sd	Skew	p5	p25	p50	p75	p95
MBO									
60-month pre-deal return correlation	281	25.56	12.52	−0.03	5.94	17.93	24.93	33.84	45.78
12-month pre-deal peer return	286	5.52	30.43	1.29	−33.41	−15.64	2.40	22.74	55.56
12-month pre-deal market return	286	10.53	16.81	0.20	−10.78	−6.64	14.09	25.02	36.77
12-month pre-deal peer ret., mkt-adj.	286	−5.01	24.92	1.48	−40.49	−18.06	−6.67	4.48	31.24
12-month post-deal peer return	286	12.00	29.65	1.29	−27.63	−6.63	11.87	24.65	58.64
12-month post-deal market return	286	17.22	15.40	−0.39	−11.93	10.84	18.96	29.19	36.54
12-month post-deal peer ret., mkt-adj.	286	−5.22	26.95	0.98	−43.66	−19.37	−6.38	6.12	31.89
Freezeout									
60-month pre-deal return correlation	113	23.35	15.79	−0.24	1.27	14.30	22.47	30.50	51.22
12-month pre-deal peer return	116	11.14	30.73	1.56	−29.85	−10.16	10.65	24.47	57.34
12-month pre-deal market return	116	13.41	16.68	0.03	−11.59	−4.42	16.59	25.22	36.35
12-month pre-deal peer ret., mkt-adj.	116	−2.27	23.94	2.34	−29.30	−14.46	−5.55	6.57	32.34
12-month post-deal peer return	116	15.60	42.04	1.91	−30.84	−8.14	10.29	30.43	90.02
12-month post-deal market return	116	14.61	15.79	0.08	−11.81	5.32	15.83	25.06	38.14
12-month post-deal peer ret., mkt-adj.	116	0.99	36.13	1.54	−43.17	−20.24	−6.87	15.64	55.79
All									
60-month pre-deal return correlation	394	24.92	13.56	−0.17	3.18	17.36	24.22	32.93	47.26
12-month pre-deal peer return	402	7.14	30.59	1.36	−32.48	−14.25	4.61	22.82	55.56
12-month pre-deal market return	402	11.36	16.80	0.14	−11.30	−6.09	15.02	25.02	36.53
12-month pre-deal peer ret., mkt-adj.	402	−4.22	24.64	1.70	−38.36	−17.14	−6.42	5.04	31.97
12-month post-deal peer return	402	13.04	33.68	1.74	−27.63	−7.14	11.44	25.23	63.75
12-month post-deal market return	402	16.47	15.54	−0.25	−11.81	7.98	17.57	28.46	36.54
12-month post-deal peer ret., mkt-adj.	402	−3.43	29.97	1.36	−43.17	−19.40	−6.62	9.29	42.38

Panel B: Summary statistics for deals, 1990–2014

	N	Mean	sd	Skew	p5	p25	p50	p75	p95
MBO									
60-month pre-deal return correlation	152	15.66	14.31	0.87	−4.60	7.31	14.20	23.43	39.78
12-month pre-deal peer return	153	16.97	46.09	1.88	−42.26	−12.82	12.32	32.81	103.33
12-month pre-deal market return	153	11.15	15.65	−0.56	−16.10	3.38	14.20	22.28	32.35
12-month pre-deal peer ret., mkt-adj.	153	5.82	45.37	1.91	−48.72	−21.32	−1.12	23.18	97.24
12-month post-deal peer return	153	14.11	40.53	0.83	−40.94	−14.81	9.55	37.18	89.03
12-month post-deal market return	153	8.18	18.19	−0.68	−25.26	−8.40	13.39	21.87	31.58
12-month post-deal peer ret., mkt-adj.	153	5.93	36.17	0.99	−39.77	−16.98	−2.21	26.98	73.57
Freezeout									
60-month pre-deal return correlation	357	17.43	13.03	0.35	−1.60	8.55	16.04	25.73	39.00
12-month pre-deal peer return	358	12.61	44.31	1.96	−40.71	−16.83	5.94	26.64	98.14
12-month pre-deal market return	358	9.14	17.31	−0.61	−22.19	0.36	12.99	20.29	32.35
12-month pre-deal peer ret., mkt-adj.	358	3.47	40.74	2.34	−41.32	−21.33	−5.03	16.85	75.32
12-month post-deal peer return	358	20.43	54.03	3.62	−36.63	−9.74	12.45	35.56	98.60
12-month post-deal market return	358	9.36	17.66	−0.45	−24.35	−3.09	12.63	21.91	34.59
12-month post-deal peer ret., mkt-adj.	358	11.07	48.99	3.66	−39.17	−15.45	1.93	26.82	79.99
All									
60-month pre-deal return correlation	509	16.90	13.44	0.51	−2.60	8.34	15.69	24.85	39.05
12-month pre-deal peer return	511	13.92	44.85	1.94	−40.71	−15.11	6.93	30.24	98.14
12-month pre-deal market return	511	9.74	16.84	−0.61	−20.96	1.61	13.15	21.22	32.35
12-month pre-deal peer ret., mkt-adj.	511	4.17	42.15	2.19	−42.67	−21.33	−4.02	18.40	80.08
12-month post-deal peer return	511	18.54	50.41	3.28	−38.65	−11.35	12.11	36.37	91.10
12-month post-deal market return	511	9.00	17.81	−0.52	−24.35	−4.07	12.80	21.89	33.05
12-month post-deal peer ret., mkt-adj.	511	9.53	45.56	3.37	−39.53	−15.67	0.92	26.89	78.55

momentum returns, profitability, and investment. Without adjusting with respect to these risk factors, the market-adjusted BHRs tend to underestimate the performance of industry peers.

large skewness of long-run BHRs and the clustering and overlap of MBO and freezeout deals in time (see Table 1, Panel A) make it even more difficult to draw statistical inferences from them (Mitchell and Stafford, 2000). In par-

ticular, comparing the median deal BHR to the market return is misleading due to the skewness problem (as well as other problems detailed in the last footnote). The small or negative median market-adjusted returns highlight the difficulty for outsiders and judges to conclude industry undervaluation when assessing the median case. However, they do not contradict the evidence of systematic industry undervaluation for the average deal based on diversified calendar-time portfolios. We therefore present the long-run BHRs, not to draw statistical inferences from them, but to illustrate this difficulty.

6. Conclusion

We present evidence on the question of whether managers can buy a company at a discount to its fair value in MBO or freezeout transactions, thus exploiting the outside shareholders to whom they owe a fiduciary duty. The conflicts of interests in these transactions have resulted in significant case law development of protections for outside shareholders, including special committees, majority of minority transaction approval requirements, and appraisal rights. Nonetheless, the extant empirical evidence on the question of whether outside shareholders are systematically exploited is mixed.

We conclude that, on average, managers time these bids to take advantage of industry-level undervaluation. In this way, not only do the deal valuations appear fair but the managers can capture the difference between the target's value and its bid price. Across a battery of tests, including long-run abnormal returns, counterfactual tests, and industry valuation and operating performance, the results are consistent with our hypothesis. While our findings are consistent with the exploitation of public shareholders in the average MBO or freezeout acquisition, our data are silent about the extent of such exploitation in any one particular non-arm's-length transaction.

Appendix. The MBO of Dell Inc

On February 5, 2013, Dell Inc., a well-known computer technology company, announced that it had entered into an agreement to be acquired by Michael Dell (Dell's Founder, Chairman, and Chief Executive Officer) and Silver Lake Partners, a private equity firm.[29] The deal was completed in October of the same year and the final price was $13.96 per share (including a special dividend), valuing the firm at over $24.5 billion, and represented a 28% premium over Dell's stock price in January. In the 12-month period prior to the announcement, the average returns for peers in Dell's four-digit SIC industry had been positive (9%) but lower than that of the market (17%). Before the buyout, Dell and its peers had experienced disappointing earnings news, and analysts and commentators regarded the market for Dell's primary product, Windows PCs, as "in free fall" and Dell as "fundamentally flawed" (Parloff, 2016). During the five-year period prior to the announcement, the average return correlation between Dell and its peers was 0.35. Following the special committee of the board of directors' recommendation, the majority of shareholders voted in favor of the deal. Additionally, prominent proxy advisory firms (Institutional Shareholders Services and Glass Lewis), as well as a rating agency (Egan-Jones Rating Co) supported the deal.

Despite this situation, several dissenting shareholders, including hedge fund Magnetar Capital LLC, filed an appraisal lawsuit in Delaware, seeking to obtain a "fair value" of Dell from the courts.[30] In the year following the deal announcement, Dell's peers experienced a significant resurgence, with the average industry returns of 38%. In 2016, the Vice Chancellor J. Travis Laster found that the fair value of Dell was $17.62 per share using a discounted cash flow approach, indicating that Dell had been undervalued by over $6 billion. However, under Delaware law only dissenting shareholders are able to receive compensation, and therefore Michael Dell and Silver Lake were liable for only $35 million in total. T. Rowe Price, which had not supported the deal, had mistakenly voted in favor of it. This disqualified it from receiving about $190 million for its shares as a part of the lawsuit.

In the Internet Appendix, we also highlight an MBO (Sierracin) whose target industry peers experienced similar pre-announcement returns as Dell's peers, but significantly different post-announcement returns. In addition, we also highlight several pairs of MBOs and freezeouts with similar pre-announcement returns to industry peers, but differing post-announcement returns. These deals serve to highlight the difficulty facing investors in identifying undervaluation for a specific deal.

References

Angrist, J., Pischke, J., 2009. Mostly Harmless Econometrics. Princeton University Press, Princeton, NJ.
Amihud, Y., Kahan, M., Sundaram, R., 2004. The foundations of freezeout laws in takeovers. J. Finance 59, 1325–1344.
Andrade, G., Mitchell, M., Stafford, E., 2001. New evidence and perspectives on mergers. J. Econ. Perspect. 15, 103–120.
Barber, B., Lyon, J., 1997. Detecting long-run abnormal stock returns: the empirical power and specification of test statistics. J. Financ. Econ. 43, 341–372.
Bates, T., Lemmon, M., Linck, J., 2006. Shareholder wealth effects and bid negotiation in freeze-out deals: are minority shareholders left out in the cold? J. Financ. Econ. 81, 681–708.
Bebchuk, L., Kahan, M., 1989. Fairness opinions: How fair are they and what can be done about it? Duke Law J. 1989, 27–53.
Bernstein, S., Lerner, J., Sørensen, M., Strömberg, P., 2017. Private equity and industry performance. Manage. Sci. 63, 1198–1213.
Bessembinder, H., 2018. Do stocks outperform treasury bills? J. Financ. Econ. 129, 440–457.
Bessembinder, H., Zhang, F., 2013. Firm characteristics and long-run stock returns after corporate events. J. Financ. Econ. 109, 83–102.
Borden, A., 1974. Going private—Old tort, new tort, or no tort? New York Univ. Law Rev. 49, 987–1042.
Brown, S., Warner, J., 1980. Measuring security price performance. J. Financ. Econ. 8, 205–258.

[29] Information for this section is taken from Hoffman (2016) and Parloff (2016), and the court filing *In Re: Appraisal of Dell Inc.*

[30] This type of lawsuit, and the "appraisal arbitrage" strategy it produces [studied by Jiang et al. (2016)], is increasingly common and does not require the litigants to show there was an explicit breach in fiduciary duty on the part of the directors, special committees, or advisors. In fact, Vice Chancellor J. Travis Laster of the Delaware Chancery Court praised the conduct of the board, special merger committee, and company advisors, but found that the auction process did not provide shareholders with the firm's intrinsic fair value.

Cain, M., Davidoff, S., 2011. Form over substance? The value of corporate process and management buyouts. Delaware J. Corp. Law 36, 849–902.
Carhart, M., 1997. On persistence in mutual fund performance. J. Finance 52, 57–82.
Carney, W., 1992. Fairness opinions: How fair are they and why we should do nothing about it. Washington Univ. Law Q. 70, 523–540.
Chan, L., Lakonishok, J., Swaminathan, B., 2007. Industry classifications and return comovement. Financial Anal. J. 63, 56–70.
Chen, K., Kim, Y., Marcus, R., 2011. Hands in the cookie jar? The case of management buyouts. International review of accounting. Bank. Finance 3, 43–69.
Cremers, K., Nair, V., John, K., 2009. Takeovers and the cross-section of returns. Rev. Financ. Stud. 22, 1409–1445.
Daniel, K., Moskowitz, T., 2016. Momentum crashes. J. Financ. Econ. 122, 221–247.
Davidoff, S., 2006. Fairness opinions. Am. Univ. Law Rev. 55, 1557–1625.
DeAngelo, H., DeAngelo, L., 1987. Management buyouts of publicly traded corporations. Financ. Anal. J. 43, 38–49.
DeAngelo, H., DeAngelo, L., Rice, E., 1984. Going private: minority freezeouts and stockholder wealth. J. Law Econ. 27, 367–401.
DeAngelo, L., 1986. Accounting numbers as market valuation substitutes: a study of management buyouts of public stockholders. Acc. Rev. 61, 400–420.
DeAngelo, L., 1990. Equity valuation and corporate control. Acc. Rev. 65, 93–112.
Dodd, P., Ruback, R., 1977. Tender offers and stockholder returns: an empirical analysis. J. Financ. Econ. 5, 351–373.
Easterwood, J., Singer, R., Seth, A., Lang, D., 1994. Controlling the conflict of interest in management buyouts. Rev. Econ. Stat. 76, 512–522.
Elson, C., 1992. Fairness opinions: are they fair or should we care? Ohio State Law J. 53, 951–1003.
Fama, E., 1998. Market efficiency, long-term returns, and behavioral finance. J. Financ. Econ. 49, 283–306.
Fama, E., French, K., 1993. Common risk factors in the returns on stocks and bonds. J. Financ. Econ. 33, 3–56.
Fama, E., French, K., 1997. Industry costs of equity. J. Financ. Econ. 43, 153–193.
Fama, E., French, K., 2015. A five-factor asset pricing model. J. Financ. Econ. 116, 1–22.
Gogineni, S., Puthenpurackal, J., 2014. Target-management-involved buyouts: impact on takeover competition, litigation risk, and shareholder returns. J. Financ. Res. 38, 323–356.
Grossman, S., Hart, O., 1980. Takeover bids, the free-rider problem, and the theory of the corporation. Bell J. Econ. 11, 42–64.
Hafzalla, N., 2009. Managerial incentives for discretionary disclosure: evidence from management leveraged buyouts. Rev. Acc. Stud. 14, 507–533.
Harford, J., Stanfield, J., and Zhang, F. (2016). How does an LBO impact the target's industry? Unpublished working paper. University of Washington.
Harvey, C., Liu, Y., Zhu, H., 2016. … and the cross-section of expected returns. Rev. Financ. Studies 29, 5–68.
Hoffman, L. (2016). Judge finds Michael Dell, Silver Lake underpaid for Dell in 2013. Wall Street Journal, June 1.
Hogg, R., Craig, A., 1995. Introduction to Mathematical Statistics. Prentice Hall, Englewood Cliffs, NJ.
Hou, K., Xue, C., Zhang, L., 2015. Digesting anomalies: an investment approach. Rev. Financ. Stud. 28, 650–705.
Jiang, W., Li, T., Mei, D., 2018. Influencing control: jawboning in risk arbitrage. J. Finance forthcoming.
Jiang, W., Li, T., Mei, D., Thomas, R., 2016. Appraisal: shareholder remedy or litigation arbitrage? J. Law Econ. 59, 697–729.
Johnson, W., 1990. Mills acquisition Co. v. Macmillan, Inc.: corporate auctions now require sharper supervision. Am. Univ. Law Rev. 39, 721–764.
Kaplan, S., 1989. The effects of management buyouts on operating performance and value. J. Financ. Econ. 24, 217–254.
Kisgen, D., Qian, J., Song, W., 2009. Are fairness opinions fair? The case of mergers and acquisitions. J. Financ. Econ. 91, 179–207.
Krishnan, C., Masulis, R., Thomas, R., Thompson, R., 2012. Shareholder litigation in mergers and acquisitions. J. Corp. Finance 18, 1248–1268.
Lee, D., 1992. Management buyout proposals and inside information. J. Finance 47, 1061–1079.
Lichtenberg, F., Siegel, D., 1990. The effects of leveraged buyouts on productivity and related aspects of firm behavior. J. Financ. Econ. 27, 165–194.
Lowenstein, L., 1985. Management buyouts. Columbia Law Rev. 85, 730–784.
Mitchell, M., Stafford, E., 2000. Managerial decisions and long-term stock price performance. J. Bus. 73, 287–329.
Ofek, E., 1994. Gains in unsuccessful management buyouts. J. Finance 49, 637–654.
Officer, M., Ozbas, O., Sensoy, B., 2010. Club deals in leveraged buyouts. J. Financ. Econ. 98, 214–240.
Palepu, K., 1990. Consequences of leveraged buyouts. J. Financ. Econ. 27, 247–262.
Parloff, R. (2016). How Michael dell shortchanged shareholders while doing nothing wrong. Fortune (June 2, 2016).
Pástor, L., Stambaugh, R., 2003. Liquidity risk and expected stock returns. J. Polit. Econ. 111, 642–685.
Peck, S., 1996. The influence of professional investors on the failure of management buyout attempts. J. Financ. Econ. 40, 267–294.
Perry, S., Williams, T., 1994. Earnings management preceding management buyout offers. J. Acc. Econ. 18, 157–179.
Petersen, M., 2009. Estimating standard errors in finance panel data sets: comparing approaches. Rev. Financ. Stud. 22, 435–480.
Rhodes-Kropf, M., Robinson, D., Viswanathan, S., 2005. Valuation waves and merger activity: the empirical evidence. J. Financ. Econ. 77, 561–603.
Simpson, S., Brody, K., 2014. The evolving role of special committees in M&A transactions: seeking Business Judgment Rule protection in the context of controlling shareholder transactions and other corporate transactions involving conflicts of interest. Bus. Lawyer 69, 1117–1145.
Slovin, M., Sushka, M., Bendeck, Y., 1991. The intra-industry effects of going-private transactions. J. Finance 46, 1537–1550.
Smith, A., 1990. Corporate ownership structure and performance. J. Financ. Econ. 27, 143–164.
Stafford, E., 2016. Replicating private equity with value investing, homemade leverage, and hold-to-maturity accounting. Harvard Business School Unpublished working paper.
Yagan, D., 2015. Capital tax reform and the real economy: the effects of the 2003 dividend tax cut. Am. Econ. Rev. 105, 3531–3563.