Private equity ownership and entrepreneurial firms' crash risk

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Abstract

Private equity (PE) firms are often criticized for their focus on short-term financial gains before seeking exits. We investigate whether stock price crash risk is higher for PE backed than non-PE backed Initial Public Offerings (IPOs). Our initial results show that the crash risk is similar for PE and non-PE backed companies at the time of the listing. Nevertheless, after the PE shareholders exit, PE-backed IPOs are prone to higher crash risk. Further analysis reveals that increased risk is linked to PE-appointed or PE-connected CEOs and short CEO tenure. Following the PE exits, the incidence of delisting and M&A are higher for PE backed IPOs.

Keywords: IPO, Private Equity, Crash Risk, Ownership, CEO

JEL classification: G02, G24, G30, G34

1. Introduction

Private equity (PE) exerts a significant influence on the global market for corporate control[1], and plays a pivotal role in corporate restructuring and acquisitions. Private equity general partners (GPs) engage in the acquisition of companies through buyouts or leveraged buyouts, transitioning these entities into private ownership. This operational paradigm encompasses the privatization of publicly traded companies and the acquisition of privately held firms. The strategic development of these portfolio companies by GPs aims to either reintroduce them to the public market via initial public offerings (IPOs) or divest them to other corporations or investors, thereby generating financial returns for investors within a typical timeframe of five to six years (Jenkinson et al., 2021). Enhancing the performance and growth prospects of these investees is crucial, as it ultimately determines the return on investment and to shareholders. The capital required for the acquisitions and subsequent enhancements is predominantly sourced from a diverse array of investors, who act as limited partners (LPs) within PE funds.

To facilitate acquisitions, value creation, and divestitures, private equity firms cultivate extensive networks of relationships with financiers, investment banks, legal advisors (Siming, 2014), and pools of managerial and executive expertise (Gompers et al., 2016; Gompers et al., 2023). These networks, which include former employees, are engaged and deployed repeatedly for mutual benefit. The reputation of private equity partners and the exchange of information within these networks are bolstered by successful acquisition and exit activities. Limited partners who invest capital in PE funds, seek to achieve financial returns on their investments and are particularly interested in the shareholder value realized upon the firm's exit (Kaplan and Stromberg, 2009).

[1] McKinsey and Company (2022) estimated that PE firms raised $680 billion in funding globally and had $4.5 trillion in assets under their control.

Private equity firms are renowned for their ‘opacity,’ which typically restricts the dissemination of both hard and soft information regarding their investments and portfolio companies exclusively to their limited partners and trusted networks (Garmaise and Moskowitz, 2003). Moreover, criticisms of PE often highlight its propensity for short-termism and excessive risk-taking, as evidenced by the struggles of firms’ post-exit, particularly in highly leveraged buyouts of retail chains in the US and UK Despite these challenges, PE firms manage to make good returns even if their investees are not longer-term viable or prone to bankruptcy after the PE has exited.

A key aspect of the restructuring and resale process, and the focus of this study, involves significant changes in the senior management of portfolio firms, often initiated by PE investors. This includes appointing new directors to the board, new board chairs and CEOs (Lerner et al., 2012; Gompers et al., 2016; Gompers et al., 2022; Gompers et al., 2023). PE firms align the objectives of the portfolio companies with those of the PE-backed firms’ owners and the LPs. Gompers et al. (2023) report that 58% of PE firms have ‘*operating partners*’ within their management teams, who are deployed to achieve the desired objectives in portfolio companies.

Over the past thirty years, scholars have examined how private equity PE ownership influences the behaviour and performance of portfolio firms. Extensive research highlights numerous positive impacts of PE ownership on various firm outcomes and performance metrics. For instance, Lavery and Wilson (2024) and Bernstein *et al.,* (2019), report improved operating performance, growth and resilience to economic downturns. Other studies have reported improvement in various dimensions of performance (Jenkinson *et al* 2021; Wright *et al.,* 2018) after PE ownership. However, there is scant evidence on the performance outcomes of PE-backed firms *after the PE exit*.

This study examines PE-backed enterprises that transition to public ownership through an initial public offering. The extant literature has explored the comparative post-IPO market performance of PE-backed and non-PE-backed IPOs. Research by Von Drathen and Faleiro (2008) indicates superior stock returns for PE-backed IPOs in the UK compared with their market- and non-PE-backed counterparts. Jelic et al. (2005) observe heightened underpricing in PE-backed IPOs, whilst noting no significant long-term performance difference for buyout-backed IPOs. Levis (2011) reports outperformance of PE-backed IPOs in market performance over the initial three-year post-listing period. A recent study by Michala (2019) addresses post-IPO financial distress, revealing that PE-backed firms do not exhibit higher default rates post-IPO than other entities. The US PE landscape diverges from its European counterpart, featuring more substantial leveraged acquisitions (public to private) and a higher frequency of IPO exits. We investigate the implications for IPO companies following PE divestments within this distinct market context. This allows us to explore the extent to which PE backed companies continue to create or destroy value post PE exits. [2]

Our sample of IPOs was collected from the SDC Platinum New Issue database covering the period January 2000 to December 2020. The list of IPO companies backed by PE firms is collected from the Thomson Reuters Eikon database. We have manually collected information from Thomson Reuters Eikon and the 13F databases information related to the length of time that the PE firms were associated with the IPO companies post listing. We tracked each IPO in our sample from the IPO date to the end of 2022 or through the delisting date from the stock market. Information related to the CEO characteristics and whether or not the CEOs are hired by the PEs

[2] A recent interview with a Hedge Fund director revealed growing concerns among Hedge Fund managers regarding the performance of PE backed portfolio companies after exit. This has motivated the current study to explore the performance of PE-backed companies following their exits. We do not examine why the PE exits, which might be endogenously determined, but rather explore the crash risk for PE backed company after the PE exits.

or have previous connection with the PEs are collected from the Execucomp, Thomson Reuters Eikon databases and 10K filings in Edgar database.

This paper focuses on stock price returns, post-PE exit, specifically the crash risk, which is, a sudden collapse in the share price. We focus on crash risk as it reflects the failure of corporate governance control, agency problems and informational asymmetries (see Andreou *et al.*, 2016; Kim and Zhang, 2016; Callen and Fang, 2013). It affects IPO companies post PE exit and can increase the likelihood of the company becoming a takeover target (Carline *et al.,* 2023). We first examine whether PE-backed IPO firms exhibit *higher crash risk* in the years after the IPO. Typically, PE investors often retain their shares after an IPO (and during the lock-up period) or exit their positions gradually. Our initial results show that there is no significant difference in crash risk between PE and non-PE backed IPOs, controlling for various IPOs companies' specific characteristics. However, the crash risk increases as soon as the PE investors sell their holdings, which in many cases, occur much later after the listing. Surprisingly, the crash risk is more likely when the management (CEO) was put in place by the PE firm. In other words, PE-backed firms exhibit higher crash risk post-IPO if the CEO was hired by the PE firm and when the PE firm leaves the company as a stakeholder, *but not before*. This finding is important because it highlights the timing and thus the source of the risk. It is consistent with results in other contexts showing that outside CEOs lead to reduced performance and higher risk (e.g., Cummings and Knott, 2017, and Choi *et al.*, 2023). It is worth noting that an increased crash risk eventually results in the IPO company being delisted from the stock market. Our results show that high crash risk is not linked to IPO companies characteristics such as performance, growth or leverage. Interestingly, the crash risk is observed consistently across all sectors. This evidence is robust controlling for possible endogeneity concerns.

Our study contributes to the literature in a number of ways. First, we extend the existing IPO literature by focusing on the stock price crash risk of IPO firms. To the best of our knowledge, this aspect of post-IPO risk has not been examined, making our study a novel addition to the IPO literature (see for example, Baker et al., 2021; Lee et al., 2023; Liu and Wu, 2021). The evidence that PE-backed firms exhibit higher stock price crash risk post-IPO, particularly when the CEO was appointed by the PE firm and after the PE firm's full exit as a stakeholder, provides new insights into governance risks in IPO firms. Second, we extend private equity literature by linking PE exits to higher crash risk and potential delisting. Our study contributes to the ongoing debate on whether PE-backed IPOs sustain long-term value creation or primarily serve as an exit strategy for investors (Fracassi *et al.,* 2022; Von Drathen and Faleiro, 2008; Jelic *et al.,* 2005; Michala, 2019; Rigamonti et al., 2016). Third, we contribute to the crash risk literature by showing that PE-backed companies are not exempt from this risk. The PE departure after an IPO can lead to increased crash risk and we uncover an important channel through which this occurs (i.e., the CEO appointment). Our findings lend support to the idea that there are more complex agency relationships and incentives between management and shareholders when PE firms are involved. An intriguing issue is the fact that executives seem inclined to act in the interests of a sub-set of shareholders (PE).

In the next section, we review the literature on crash risk, PE-IPOs, and CEO appointments to develop our hypothesis. Section 3 and 4 describes the data and methodology. The results are presented in Section 5. Finally, the conclusions are presented in Section 6.

2. Literature Review

2.1. Determinants of Crash Risk

Extreme negative stock market events can result in significant losses for investors. A share price crash is most often associated with an inflated stock market, although any market can experience a price crash. For an individual firm, stock price crash risk is the frequency of extreme negative stock returns and can be measured by proxies such as negative skewness, and the third moment of stock returns (DeFond *et al.*, 2015)[3].

A growing body of empirical literature investigates the determinants of stock price crash risk, covering *internal factors*, CEO overconfidence, CEO age (Andreou et al 2017) board size and governance, and managerial/board incentives. Also, factors largely outside of the control of the firm, such as changes in accounting standards, analysts' reports, and auditor tenure (Kim *et al.*, 2016; Andreou *et al*., 2016; Xu *et al*., 2014; Kim and Zhang, 2016; He *et al*., 2019; Callen and Fang, 2017). Theories explaining the driving forces of stock price crashes draw on potential informational asymmetries between corporate insiders and external stakeholders. For instance, the 'bad news hoarding theory' (Graham *et al.*, 2005; Kothari *et al.*, 2009) suggests that managers, to protect their own compensation and employment, are motivated to hide unfavorable information for an extended period. If the flow of negative information into the stock market is blocked, then the distribution of stock returns is asymmetric. However, the accumulation of bad news eventually reaches a threshold level (it can no longer be suppressed) and is revealed all at once to market participants. This, result in an abrupt large-scale decline in stock prices, that is, a price crash (Jin and Myers, 2006). Certainly, central to this information-based theory is the importance of the manager's ability and/or incentive to hide information from investors and the stage at which the accumulated 'bad news' is released, causing a stock price crash.

[3] Refer to Habib *et al*. (2018) for a detailed review of the empirical literature on stock price crash risk.

Related studies show that information opacity, low transparency due to *earnings management* and *irregular accounting practices* can lead to greater future crash risk (Hutton *et al*., 2009; Callen and Fang, 2015a). Other studies have examined the determinants of crash risk in relation to the adoption of new accounting standards, such as IFRS (DeFond *et al*., 2015). Moreover, the distinctive characteristics of each individual PE fund's investment procedures significantly impact the quality of the IPO firms accounting information. Notably, Chahine *et al.* (2012) provide evidence indicating that the involvement of multiple PE funds in a syndicate amplifies pre-IPO earnings management, as measured by discretionary current accruals. Interestingly and relevant to this study, Hu *et al.* (2012) emphasize the critical roles of timing and divestment motives in determining earnings management activities within PE-backed companies undergoing IPOs. Their study demonstrates that PE fund involvement mitigates pre-IPO earnings management, but amplifies post-IPO earnings manipulation, aimed at boosting accounting earnings after the lock-up period. These studies indicate that PE-backed firms may have different crash risk levels than their counterpart non-PE-backed companies.

Further, Carline et al (2023) investigate the association between firms' ex-ante stock price crash risk and their propensity to become takeover targets. The hypothesis positing that elevated crash risk results in acquisition is predicated on the notion that firms exhibiting higher ex-ante risk of a stock price crash are more susceptible to being selected as takeover targets. This is because of the substantial decrease in a firm's stock price, thereby creating an incentive for bidders to acquire the firm at an opportunistic price. Furthermore, firms with higher crash risk often exhibit greater information asymmetry and uncertainty regarding their future performance, which diminishes their bargaining power in deal negotiations and renders them more attractive to bidders seeking to exploit undervalued opportunities. The hypothesis is corroborated by empirical evidence (Carline et al 2023) indicating that higher crash risk leads to increased takeover target likelihood, particularly in firms characterised by inferior managerial quality and greater managerial discretion concerning financial accruals. In addition to crash risk, we investigate the timing of delisting and acquisition in our sample of PE backed IPO's.

2.2. Private equity ownership, CEO appointment and stock price crash risk

As discussed above, the conventional explanation in the literature for stock price crashes is that they frequently occur due to the failure of corporate governance control systems in addressing agency problems. Scholarly works by authors such as Andreou et al. (2016), Callen and Fang (2013), Hutton et al. (2009), Kim et al. (2011a), and Kim and Zhang (2016) support this notion. However, despite the emphasis on agency problems, this literature predominantly focuses on firm attributes, neglecting the agency problems associated with CEO characteristics.

A characteristic of the PE model of creating investment value is that it utilises experienced interim managers and executives to implement the requisite operational and managerial changes to drive performance and returns to their investors. PE firms frequently possess internal teams - referred to as "operating partners"- to provide dedicated assistance to portfolio companies to help them maximise their performance. This includes strategies and tactics employed by PE investors to enhance performance metrics such as EBITDA (Jelic et al., 2021). A crucial appointment for PE investors, post-buyout, may be to replace the incumbent CEO with a CEO networked to CEOs in other portfolio companies to facilitate the sharing of best practices and provide mutual support. It is observed that CEOs of PE-backed IPOs have a relatively short tenure and may be appointed for the specific purpose of preparing the company for IPO and/or PE shareholder exit. They are likely oriented towards improving the optics of the business prior to PE share sale and the timing of announcements. Although the extant literature suggests that, in general, CEOs with shorter tenures may have stronger incentives to manage risk effectively to maintain their reputation and job security, decreasing the likelihood of stock price crashes (Brochet et al 2021). PE appointed CEOs who perceive a short tenure with the company, i.e. they expect to depart the company after the IPO mission is accomplished, have a greater incentive to maximise the short-term pre-sale values of the company.

Having an internal (PE) team to manage the target company, creates a link between the two, in contrast to the cases where the PE firm retains the current management. However, in terms of post-IPO risk, the two situations may diverge. Indeed, IPO firms ***not*** managed by operating partners may be perceived as more independent from the PE firms, so when they depart the firms, the trust in them may remain. In contrast for operating partners, crash risk may increase because they aligned more with the PE firms and perhaps not significantly with the remaining shareholders once the PE shareholders have exited the company. The PE-hired CEO builds reputation with the PE (not the company), and they are hired by the PE to perform a specific function (e.g., prepare the company for IPO). This may include aspects of earnings management, but the PE may hire and redeploy them in other deals in the future. Hence, they are committed to the PE investors' interests rather than the long-term prospects of the IPO or building a reputation with the wider shareholders.

In the broader context of CEO appointments, empirical evidence from various studies substantiates this assertion. For example, Choi et al. (2023) demonstrate that internally promoted CEOs are less prone to precipitate stock price crashes compared to their externally hired counterparts. Further analyses reveal that the disparity in stock price crash risk between insider and outsider CEOs is more pronounced during the initial years of their tenure. Since PE firms are newcomers when they acquire the company, their appointed CEO is also often an external.

According to Gompers *et al.* (2023), 71% of companies hire a new CEO when acquired by a PE firm, with two third being externally hired. Their other findings suggest there is an active and large market for CEOs by PE firms. Kotter and Larkin (2024) further find that board internals are able to hire better CEOs, suggesting that PE firms (who just recently arrived and thus are externals) hire CEOs with greater risk. Finally, although their analysis is not on PE per se, Cummings and Knott (2017) find that outside CEOs tend to underperform, mostly because of their lack of focus on innovation and technological knowledge. As mentioned earlier, CEOs hired by PE firms might be required, as the main priority, to focus on listing the company in a stock market, which could come at the cost of the CEO's technological focus.

To summarize these findings, we expect company risk such as crash risk to increase when the PE firm leaves the company, particularly when the incumbent CEO is hired by the PE. However, if the CEOs are not hired by the PE firm, we would not expect an increase in risk post PE exits. This prediction will be tested in the multivariate analysis.

3. Data and Methodology

3.1. Data

Our sample of IPOs is collected from the SDC Platinum New Issue database covering January 2000 and December 2020. The list of IPO companies backed by PE firms is collected from the Thomson Reuters Eikon database. Consistent with the IPO literature, we excluded closed-end funds, rights offerings, unit offerings, American Depositary Receipts (ADR), Real Estate Investment Trusts (REIT), and financial companies (e.g., Gounopoulos and Pham, 2018; Hasan *et al.*, 2011). We excluded IPO companies with an offer price below $5.00 following Loughran and McDonald (2013). To be included in the sample, we require that accounting information and market data be available from the CRSP and Compustat databases. After this restriction, we are left with a panel sample of 9271 IPOs with complete data. To eliminate the impact of outliers, we winsorized all the firm-level variables at the 1% level. We use Thomson Reuters Eikon and 13F databases to manually collect information related to the length of time that the PE firms were associated with the IPO companies post listing. Specifically, we collected PE fundraising data from Thomson Reuters Eikon and PE investors' managers' names from 13F database. We track PE investors from the 13F to examine their holding post IPOs. Ownership data are collected from the 14A filling to complement the data from the 13F and are used to assess whether the PEs are involved or exited the IPO company. Each IPO in our sample is tracked from the IPO date to the end of 2022 or the delisting date from the stock market. Information related to the CEO characteristics and whether or not the CEOs are hired by the PEs or have previous connection with the PEs are collected from the Execucomp, Thomson Reuters Eikon databases and 10K filings in Edgar database.

3.2. Crash risk measures

We compute firm-specific crash risk using three measures following Kim *et al.*'s (2011b) approach. We first estimate weekly returns for each firm as the natural log of one plus the residual return from the following market model:

$$r_{j,T}=\alpha_j+\beta_{1j}r_{m,t-2}+ \beta_{2j}r_{m,t-1} + \beta_{3j}r_{m,t}+ \beta_{4j}r_{m,t+1}+ \beta_{5\varepsilon j}r_{m,t+2}+\varepsilon_{jT} \qquad (1)$$

where $r_{j,T}$ is the return on stock *j* in week *T* and $r_{m,t}$ is the return on the CRSP value weighted market index in week *T*. The lead and lag terms for the market index returns are included to allow for nonsynchronous trading (Kim *et al*., 2011b; Dimson, 1979). The firm-specific weekly return for firm *j* in week *T*, denoted as $W_{J,T}$, is measured by the natural log of one plus the residual return estimated from Eq. (1), that is, $W_{J,T}= \ln(1+ \varepsilon_{jT})$.

Following Hutton *et al*. (2009) and Kim *et al*. (2011b), we define crash weeks for an IPO firm in a given fiscal year as weeks in which the IPO experiences weekly returns of 3.2 standard deviations below the mean weekly returns. Our first measure *CRASH* is a dummy variable that equals one when a firm experiences one or more crashes during the fiscal year and zero otherwise. The second measure is the *NCSKEW*, computed as the negative conditional return skewness, similar to that used by Kim *et al*. (2011b). For a given firm in a fiscal year, NCSKEW is calculated as the negative third moment of firm-specific weekly returns divided by the weekly standard deviation of the returns raised to the power of 3. The third measure is *DUVOL*, which measures the down-to-up volatility of the crash likelihood, as in Chen *et al*. (2001) and Kim *et al*. (2011b). To calculate this measure, for each IPO firm *j* over a fiscal-year period *t*, we separate all the weeks with firm-specific weekly returns below the annual mean ("down" weeks) from those with firm-specific returns above the annual mean ("up" weeks) and calculate the standard deviation for each of these subsamples separately. The *DUVOL* is the log of the ratio of the standard deviation of the down weeks to the standard deviation of the up weeks. The firm-specific variables used in the analysis are all defined in the Appendix Table1A.

3.3. Methodology

To examine the effect of PE backing and PE exit on IPO firm crash risk we use panel logistic regression analysis, where the dependent variable is a *CRASH* dummy. We estimated the likelihood of *CRASH* as follows:

$$P(CRASH_{i,t} = 1 \middle| \mathrm{X}_{i,t}) = 1/\{1 + \exp\left[-\left(\beta_0 + \beta_1 X_{i,t} + \beta_2 X_{i,t} + \cdots + \beta_n X_{i,t} + u_{i,t}\right)\right]\} \qquad (2)$$

where $P(CRASH_{i,t} = 1 | X_{i,t})$ is the crash risk probability, β is the vector of unknown regression parameters, X is a vector of explanatory variables, and $u_{i,t}$ is the error term. Next, we use panel OLS regression analysis to model the impact of PE backing and exits on *NCSKEW* and *DUVOL* using the following model specification.

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 X_{i,t} + \cdots + \beta_n X_{i,t} + u_{i,t} \tag{3}$$

where $Y_{i,t}$ is either *NCSKEW* or *DUVOL*. β is the vector of unknown regression parameters, X is a vector of explanatory variables, including industry and year, and $u_{i,t}$ is the error term.

Finally, we use the accelerated failure time (AFT) model to examine the effect of PE exit on IPOs' time to delist or time to M&A. The AFT allows us to measure the impact of the independent variables on the time to a specific event of interest. As the dependent variable is the logarithm of time, the standard OLS model is not appropriate in our setting, which justifies the choice of using the AFT model. The time to exit is defined as the time that elapsed between the IPO date and the delisting date from the market, regardless of the reason for delisting. IPOs that remained trading until the end of 2022 were classified as censored IPOs. In the AFT model, $\exp(\beta_i X_i)$ is the *"acceleration factor"*. The effect of a covariate is to extend or shrink the length of time to survive by a constant relative amount $\exp(\beta_i X_i)$. When $\exp(\beta_i X_i) > 1$, the survival time increases, whereas when $\exp(\beta_i X_i) < 1$, the survival time decreases (Bradburn *et al.*, 2003). We use the AFT model in a panel setting to examine the dynamic effect of the explanatory variables over time. The panel data allow us to measure the covariates up to the exit or censored, whichever occurs first. The AFT model is expressed as a log-linear function with respect to time (see, e.g., Hensler *et al.*, 1997; Bradburn *et al.*, 2003) and is estimated using the following equation.

$$Ln(T_{jt}) = \beta_0 + \beta_1 X_{1t} + \cdots + \beta_p X_{pt} + \varepsilon_{jt} \quad (4)$$

Because the AFT is a parametric model, it is necessary to specify the distribution of the baseline survival function. We use the likelihood ratio or Wald tests to determine the appropriate distribution for our data. These distributions include the exponential, Weibull, gamma log-normal, and log-logistic distributions. Based on the AIC test, we use a log-logistic distribution for the AFT model.

4. Descriptive Statistics

Table 1 (Panel A) presents the descriptive statistics for the full sample of IPOs listed from 2000 to 2020, obtained from the panel data. The variables are reported as mean, median, and standard deviation. The mean log of size (the market value of equity reported in millions) for the sample is 6.3, equivalent to a market value of 550 million dollars. The average ROA (industry-adjusted) is 0.008, while the mean leverage (LEV) is 0.469. In our sample, the mean MTB ratio was 1.860 with a median of 1.11. The average change in monthly share turnover (DTURN) was 0.045, the median was -0.007, and the standard deviation was 2.882. The mean NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal year period, was 0.038, while the median was − -0.04 and the standard deviation was 1.018. The mean and median values for MEANRET, which is the mean of firm-specific weekly returns, were -0.002 with the standard deviation of 0.015. Finally, the standard deviation of firm-specific weekly returns over the fiscal year (SIGMA) is 0.067, the median is 0.056, and the standard deviation is 0.044. Overall, our descriptive statistics are consistent with those of previous studies of IPOs. Panel B of Table 1 shows the descriptive statistics for the subsample of IPOs backed by the PE firms. It is evident from the table that PEs accounted for 29% of the companies that received backing at the time of listing. The mean change in the percentage of PE ownership was 9% and the median change was 4.1%. The mean and median CEO tenures for PE-backed IPOs are six and five years, respectively. Interestingly, 49% of the CEOs associated with PE-backed IPOs are appointed by PE firms. Panel B shows that PE firms invested on average 62 million in IPOs, compared to a medium of 44.5 million. The capital under management for PE firms in our sample was 4.9 billion, with a median of 35 billion. The average number of PEs in our sample was 43, with a median of 35. The smaller number of PE firms is consistent with the fact that PEs are often invest in multiple companies.

(Table 1 here)

Table 2 reports descriptive statistics for the subsamples of PE- and non-PE-backed IPOs from 2000 through 2020. The variables are reported as the mean and median values. The last two columns of the table report the t test and rank test results based on the differences in means and median values between the two subsamples of IPO companies. Panel A shows that PE-backed firms are generally larger in size than non-PE-backed IPOs, as measured by the market value of equity. Similarly, the ROA is significantly higher (both mean and median) for PE-backed firms than for non-PE-backed firms. With respect to leverage (LEV) and the market-to-book ratio (MTB), the table shows that PE-backed IPOs are associated with higher leverage and growth opportunity on average than non-PE-backed IPOs are. The differences in the mean and median values are not significant for leverage but are highly significant for the market-to-book ratio. In terms of DTURN, measured as the change in average monthly share turnover, the mean and median values are different between PE- and non-PE-backed IPOs, as shown in the table. Finally, NCSKEW (negative skewness of firm-specific weekly returns), MEANRET (mean of firm-specific weekly returns), and SIGMA (the standard deviation of firm-specific weekly returns) are significantly higher for PE-backed than for non-PE-backed companies. Overall, the table shows that PE-backed IPOs are different from non-PE-backed IPOs in terms of companies' characteristics. Panel B of Table 2 shows the PE-backed characteristics of CEOs appointed versus those not appointed by PE firms. Panel B shows that size, growth as measured by the market-to-book ratio and PE exits are greater for IPOs in which CEOs are appointed by PE firms. Interestingly, capital under management, investments in IPOs and the reputation of PE firms are larger when PE firms appoint CEOs. Overall, the results show that the characteristics of PE-backed IPOs differ for those in which the CEOs are appointed by PE firms. In the next section, we examine the impact of PE presence and exits on IPO crash risk.

(Table 2 here)

5. Multivariate analysis

5.1 Effect of PE backing on crash risk

Table 3 reports the regression results showing the impact of PE presence on stock price crash risk for IPO companies. Model 1 reports the logistic panel regression results. The dependent variable (CRASH) takes a value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. Typically, 3.2 standard deviation is chosen to generate a 0.1% frequency in the normal distribution during the fiscal-year period. The variable of interest is PE-backed, which is a dummy variable that takes the value of one for IPOs backed by PE firms and zero otherwise. Model 1 shows that after controlling for IPO companies' characteristics (i.e., size, ROA, Lev, MTB, DTURN, MEANRET, and SIGMA), the likelihood of crash risk is not different between IPOs backed and those unbacked by PE firms, as shown by the nonsignificant coefficient of the PE indicator. The results show that the likelihood of crash risk is higher for IPOs associated with higher detrended stock trading volume (DTURN), but lower for IPOs with higher ROA. Similarly, Chen *et al*. (2001) and Kim *et al*. (2011b) find that detrended stock trading volume is associated with high crash risk, while high ROA is related to low crash risk. Model 2 reports the OLS panel regression results where the dependent variable is NCSKEW, measured as the negative skewness of firm-specific weekly returns over the fiscal-year period. Model 2 clearly shows that the crash risk is lower for IPOs backed by PE firms. The lower crash risk for IPOs associated with PE firms is also robust and significant when DUVOL is used as an alternative measure of crash risk (i.e., Model 3). Other IPO characteristics affecting crash risk include size, ROA, MEANRET and SIGMA. Our results for size are consistent with those of Kim *et al*. (2014). Overall, the results of Table 3 show that the probability of a stock crash is similar between IPOs backed and unbacked by PE firms using the CRASH as dependent variable. Nevertheless, using an alternative measure of crash risk, the results show that crash risk is lower for IPOs associated with PE firms than for non-backed IPOs (when NCSKEW and DUVOL are used as dependent variables). This evidence is robust controlling for IPO characteristics, industry and year fixed effects.

(Table 3 here)

Thus far, the results in Table 3 show that IPOs backed by PE firms are associated with lower crash risk. It is not clear whether the low crash risk is due to PE firms' presence or the IPO characteristics. To disentangle the question of whether lower crash risk is due to PE presence and not to the characteristics of the IPO companies, we use propensity score matching (PSM). We match PEs backed with non-PE-backed IPOs using observable IPO characteristics (see matching characteristics in Appendix Table A2). Provided that the lower crash risk is due to IPO characteristics, we do not expect any difference in crash risk between backed and unbacked IPO companies. Our matching procedure involved one-to-one matching with a calliper width of 0.001, consistent with previous studies (eg Amini et al 2023). We re-estimate Table 3 using a matched sample and report the results in Table 4. It is evident from the results reported in Table 4 that the indicator for the presence of PE is not statistically significant at any conventional level. This suggests that low crash risk associated with PE-backed IPOs is due to IPO characteristics and not PE involvement with IPO companies. Together, the results in Table 4 suggest that crash risk is the same for IPOs backed and non-backed by PE firms. It is evident that low crash risk in IPOs occurs because of IPO characteristics, and not because of the PE firms backing. The results reported in Table 4 indicates that there is no significant difference between PE- and non-PE-backed IPO firms in terms of stock price crash risk.

(Table 4 here)

5.2 Effect of PE exit on crash risk

We explore the possibility that crash risk might be higher or lower for IPOs post-PE firms exits. As argued in Section 2, we expect shifts in risk taking place not at the time of IPO but at time PE firms sell their shares in the companies. We anticipate an increase in crash risk for IPOs backed companies where the CEO was appointed by the PE firms. These CEOs might temporarily reduce crash risk to align with PE investors' interests, which could lead to an increase in crash risk after the PE firms exit.

First, we examined the overall effect of PE exit. We track each IPO backed by PE firms and examine whether the crash risk is greater after the PE exit. Table 5 reports the crash risk results when PEs exit from IPO companies. Model 1 reports the results of the logistic regression using the CRASH dummy, whereas Models 2 and 3 use NCSKEW and DUVOL, respectively. The PE exit is an indicator that takes the value of one when the PE firms exit and zero otherwise. It is evident from the results reported in Table 5 that the crash risk is greater for IPOs post-PE exits across all three measures of crash risk when we control for IPO characteristics, industry and year fixed effects.[4]

It is not clear whether the PE exits or if the characteristics of IPO companies lead to a higher crash risk after the PE exits. To explore this possibility, we use PSM and match IPOs where PEs exited (i.e., treatment) with IPOs in which PEs are present (i.e., control) using various IPO characteristics (see the matching variables in Appendix Table A3). Provided that higher crash risk is due to IPO characteristics and not because of the PE firm exiting, we expect the PE exit indicator to be statistically insignificant. The results in Table 6 show that crash risk is higher for IPOs in which the PE exits than for those where the PE is present controlling for IPO characteristics. This is shown by the highly significant coefficients of the PE exit indicator. It is clear from the results that higher crash risk is attributable to PE exits and not to IPO characteristics. Overall, the results in Tables 5 and 6 show that the IPO crash risk is greater when the PE exits using alternative measures of crash risk and model specifications. These findings are unlikely to be influenced by unobservable endogeneity concerns, as we are not modelling PE exits. Investigating the reasons for PE exits might introduce endogeneity, whereas examining crash risk during periods when the PE firms are not involved with the IPO companies could be exogenous by research design. This justifies our choice to focus on PSM instead of IV model in dealing with possible endogeneity concerns.

[4] An alternative factor could be the departure of the CEO, who (as we have shown) is often put in place by the PE firms. If the CEO typically leaves about the same time as the PE firm, our analysis would not disentangle the two factors. We therefore investigated this further by manually searching in our data whether CEOs leave shortly after the PE firms. However, our data shows that this event occurred only in two cases during our sample period. Thus, we can exclude this alternative channel.

(Tables 5 & 6 here)

5.3 PE backing, PE exit and additional tests

Our sample of PE-backed IPOs includes both a sample in which some of the PEs exited and a sample in which the PEs are yet involved with the IPO companies. Our objective in this subsection is exploring the joint effects of PE exits and PE backing on IPO crash risk. We undertake a number of additional tests and report the results in the appendix. Table 7 reports the estimates that examine the joint effects of PE backing and PE exit on crash risk. Model 1 shows the results of the logistic regression, whereas Models 2 and 3 show the results of the OLS regressions. Model 1 clearly shows that the likelihood of crash risk is lower when PEs are present, but the evidence is not statistically significant, similar to the baseline results reported in Table 3. Models 2 and 3 show that the presence of PE backing significantly reduces the IPO crash risk. Nevertheless, the evidence of higher crash risks post-PE exits remains robust and statistically significant at the 5 percent conventional level. Interestingly, although the presence of PE firms reduces crash risk, the effect of higher crash risk post-PE exit remains robust. Together, the results in Table 7 indicate that the crash risk is greater after PE firm exits IPO companies, although it is lower when PE firms are involved with IPOs. In the next section, we examine the channels through which IPO characteristics moderate higher stock price crash risk.

(Tables 7 here)

5.4. Possible channel: CEOs appointments and CEO turnover

So far, our results show that the crash risk is lower for PE-backed firms than non-PE-backed. Nevertheless, the results also suggests that the crash risk is higher when the PE exit the IPO companies. In Table 8, we explore the source of high crash risk associated with PE backed companies. Typically, PE firms often bring in an internal team (so-called “operating partners”) to manage the target company. It is likely that the crash risk is due to the team, specifically the CEO, who is either appointed by the PE firm or has prior connections with the PE firm, while serving in the IPO company. It can be argued that the CEOs appointed by the PEs or with prior connection with PE are left unsupervised and hence, taking decisions that increase the overall riskiness of the IPO company. By contrast, CEOs that are not appointed by the PEs or with no prior tie with PE are seen as independent from the PE firms and the exits of the PE firms might not have any impact on the riskiness of the IPO company. We consider CEOs appointed by the PEs as external, while those not appointed by the PEs as internal. Previous studies (e.g. Choi *et al*. 2023) show that internally promoted CEOs are unlikely to trigger stock crashes compared to those appointed externally. Similarly, Cummings and Knott (2017) find that outside CEOs tend to underperform, mostly because of their lack of focus on innovation and technological knowledge.

In Panel A of Table 8, we examine the impact of PE exit on crash risk for IPOs where the CEOs are appointed by the PE firms versus CEOs that are not appointed by the PE firms. The results show that the high crash risk for IPOs following the PE exits is restricted only to a sample of IPOs in which the CEOs are appointed by the PE firms. Interestingly, PE exits has no impact on crash risk when the CEOs are not appointed by the PEs. This is consistent with the previous studies on the importance of CEOs appointed internally. In addition, in Panel B of Table 8, we examine the impact of PE exit on crash risk for IPOs where the CEOs had previous connection with PE firms. The results show that the high crash risk for IPOs following the PE exits is also restricted only to sample of IPOs in which the CEOs had prior connection the PE firms. The results imply that CEOs without prior ties to the PEs, are likely to be operating independently of the PE's interests, and as such the exits of the PE firms do not significantly influence the riskiness of the company. Overall, our results show that the higher crash risk for PE backed companies is due to CEOs appointments by PE and their prior connection with the PE firms. Specifically, the crash risk is higher when CEOs are appointed by the PE firms or have pre-existing connections with them. These results are consistent with our expectations as outlined in section 2.2.

(Table 8 here)

In Table 9 we control for the potential effect CEO tenure on stock price crash risk by splitting the sample based on high and low CEO tenure, where high (low) tenure is when CEO tenure is above (below) median tenure in the sample. The extant literature suggests that firms with powerful CEOs are associated with higher crash risk (Mamun *et al.*, 2020). Assuming that CEOs appointed by PE are associated with low tenure and are more powerful, we expect to see significant crash risk for this sub-sample. Based on this expectation, the results show that PE exit increases crash risk only for the subsample of firms with shorter CEO tenures.

(Table 9 here)

In Table 10, we examine whether PE reputation contributes to higher crash risk when the PE exits the IPO company. Typically, exits of more reputable PEs should not escalate the crash risk. In Panel A, we measure PE reputation using capital under management for the PE firms. The results presented in Models, 1,2 and 3, suggest no effect of reputable PE on stock crash risk. In Panel B, we measure PE reputation using the number of previous investments in IPOs. More specifically, those PE firms with above-median investments in IPOs are classified as reputable IPOs consistent with the measure reported in the previous studies (e.g Nahata 2008). The results presented in Panel B show that reputable PE firms do not affect stock crash risk across all three models. In Panel C, we measure PE reputation using the PEI 300 ranking, which measures the fundraising totals of the largest private equity firms over the past five years. Consistent with the reported results in Panel B, it is evident that reputable PE firms do not affect stock crash risk across all three models.

(Table 10 here)

5.5 Effect of PE exit on time to delist and time to M&A

It is evident from the above results that PE exits increase the crash risk for IPO companies. In this subsection, we examine whether PE exits accelerate or decelerate the time needed to remain listed on the stock market. If PE exits have adverse effects on IPO companies, it is likely that the time to delist from the stock market will be shorter after PE exits. Using the AFT model, we use the accelerated failure time (AFT) model to test whether PE exits shorten or lengthen the time to delist from the stock market, and the results are reported in Table 11. In Model 1, the dependent variable is the logarithm of the time to delist, defined as the time that elapses between the IPO date and the date on which the IPO is delisted from the market for any reason other than M&A. In Model 2, the dependent variable is the logarithm of the time needed to delist from the stock market due to only M&As. It is clear from the results reported in Table 11 that PE exits shorten the time needed to remain listed on the stock market. This finding suggests that when PEs exist, IPO companies are likely to be delisted from the stock market, whether because of M&As or for any other reasons. This evidence is robust when controlling for IPO characteristics and industry and year fixed effects. The results also show that the time to exit from the stock market is shorter for IPOs with higher leverage and MTB, but longer for IPOs with higher market value, consistent with the findings of previous studies (e.g., Amini *et al.*, 2023). Overall, the results of the Table 11 show that PE exits not only increase crash risk, but are also associated with a shorter time to remaining listed on the stock market for IPO companies. Therefore, PE exits could be a concern for IPOs due to increased crash risk.

(Table 11 here)

5.6 Potential alternative channels

The elevated crash risk may be attributable to the substantial share divestitures by private equity (PE) firms at exit points. Empirical data indicate that some PEs liquidate their holdings incrementally. We calculate the percentage change in PE ownership as the difference between current and previous year holdings, adjusted by the previous year's holdings. Typically, this ratio is negative, reflecting the gradual liquidation by PEs. In essence, PEs sell fewer shares in the current period compared to the previous period.

In Appendix Table A4, Panel A, we investigate whether the crash risk is more pronounced when PEs gradually divest their holdings prior to exit. The data reveal that crash risk is heightened at the point of exit but not during gradual share sales, as evidenced by the non-significant interaction terms. The coefficient for the change in PE holdings percentage is insignificant, indicating no differential crash risk when PEs sell fewer shares at exit. Overall, the findings in Panel A of Appendix Table A4 demonstrate that crash risk is unaffected by the percentage of shares sold by PEs at exit. However, introducing a variable for CEO appointments by PEs reveals a significant positive effect, which we explored further in section 5.4.

To examine alternative channels through which PE exits influence IPO crash risk, we consider IPO companies characteristics as moderating factors. These characteristics include leverage, profitability (measured by ROA), and size (measured by total assets). To determine if the heightened crash risk post-PE exits is consistent across all IPO companies, we interact the PE exit indicator with bottom quartile leverage, top quartile ROA, and top size quartile. A statistically insignificant interaction term suggests that IPO characteristics do not moderate the increased crash risk following PE exits. Appendix Table A5 presents the interaction term results for various crash risk measures. Panel A shows results for bottom quartile leverage, Panel B for top quartile ROA, and Panel C for top size quartile. The interaction terms are not statistically significant across all panels, indicating that higher crash risk post-PE exits is not uniform across all IPOs and that IPO characteristics do not mitigate the associated crash risks. The results in Appendix Table A5 demonstrate that low-levered, profitable, and large IPOs face similar crash risks as their peers post-PE exits. This evidence is robust to interactions of PE exits with indicators for leverage, ROA, and size.

Subsequently, we assess whether crash risk is sector-specific or a general concern across all IPO sectors. PEs typically invest heavily in the technology sector, potentially leading to higher crash risk for high-tech IPOs compared to low-tech IPOs. A significant interaction term would suggest higher crash risk for high-tech IPOs. Appendix Table A6 shows the interaction term results between PE exit and the high-tech dummy. Models 1 through 3 indicate that the interaction term is not significant across all crash risk measures, suggesting that crash risk is comparable between high- and low-tech IPOs. Overall, the results in Appendix Table A6 indicate that crash risk is not sector specific.

6. Conclusions

Private equity firms are entities that acquire companies financially, holding them for a limited period, often engaging in restructuring, and eventually selling them. They frequently face criticism for their short-term perspective in preparing these companies for the IPO, with a focus on maximizing their value at the time of exit. This study investigates the comparison of risk levels between IPO companies backed by PE and those without such backing, both at the time of IPO and post PE exits. Our preliminary findings suggest that, in general, PE-backed IPO companies do not inherently carry higher levels of risk than none-PE backed IPOs. However, a noteworthy pattern emerges once the PE shareholders exits the IPO companies. Specifically, we find that the stock price crash risk is significantly higher for PE backed IPOs following the PE investors exits. To comprehend this rise in crash risk, we analyse the distinguishing features of various IPOs and PE firms.

Our analysis shows that the appointment of CEOs by private equity (PE) firms and the brevity of CEO tenures as factors associated with increased risk following a PE exit. This observation is consistent with the common practice of PE firms appointing "*operating partners*" as CEOs upon acquiring companies, individuals who maintain close affiliations with the PE firm (Gompers et al., 2022). Consequently, when this connection is severed due to the PE firm's withdrawal as a shareholder, the market perceives heightened risk factors for the company. We do not find any evidence suggesting that high crash risk is linked to IPO company characteristics such as performance, growth or leverage. Interestingly, the crash risk only increases when the PE firms fully exit the IPO companies and this is consistent across all sectors. This evidence is robust controlling for possible endogeneity.

Our findings have important practical implications. From an investor perspective, our results highlight the necessity of incorporating PE exit timing into risk assessments, as stock price crash risk does not materialize immediately after an IPO but becomes significant upon full PE divestment. Understanding this dynamic can help investors make more informed decisions when evaluating PE-backed IPOs. In addition, PE firms must recognize that their exit strategies impact stock price stability, which could, in turn, affect their reputation and ability to raise future funds. As such, they should consider extending their involvement or implementing staggered exit strategies to mitigate adverse market reactions. From a regulatory standpoint, our study underscores the need for enhanced transparency in PE exit disclosures. Regulators may consider policies that require clearer reporting on PE divestment plans, enabling investors to better assess potential risks. Furthermore, promoting governance structures that support long-term firm resilience, particularly in cases where CEOs are appointed by PE investors, may help mitigate the destabilizing effects associated with abrupt PE exits.

Our data on the PE backed portfolio firms is restricted to post IPO period and we have no information on the accounting performance of the private firms in the lead up to IPO. Consequently, we are unable to unravel what actions PE appointed CEOs undertake in preparation for listing. This is an interesting future research question but can only be explored in jurisdictions where private company, pre-IPO, data is more widely available.

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Table 1. Descriptive statistics

PANEL A: Full sample of IPOs	N	Mean	Median	STD
$Size_{t-1}$	9271	6.317	6.325	1.561
ROA_{t-1}	9271	0.008	0.000	0.180
LEV_{t-1}	9271	0.469	0.214	0.523
MTB_{t-1}	9271	1.860	1.111	2.540
DTURN	9271	0.045	-0.007	2.882
$NCSKEW_{t-1}$	9271	0.038	-0.040	1.018
$MEANRET_{t-1}$	9271	-0.002	-0.002	0.015
$SIGMA_{t-1}$	9271	0.067	0.056	0.044
PANEL B: Subsample of PE backed IPOs				
PE_exited	3331	0.291	0.000	0.454
Change in percentage PE ownership	3331	-0.091	-0.041	0.1422
CEO tenure	3331	6.326	5.000	5.545
CEO appointed by PE	3331	0.493	0.000	0.117
PE investment in IPO	3331	62.527	44.514	50.191
PE capital under management (millions)	3331	4950	3520	23500
PE reputation (ranking)	3331	43.221	35.121	25.058

This table shows the descriptive statistics for the full sample of IPOs listed from 2000 to 2020 using panel data. The variables are reported as the mean, median, and standard deviation. The definitions of the variables are provided in Appendix Table A1.

Table 2. Descriptive statistics for the subsamples according to PE backing (Panel Data)

Panel A	PE-backed		Non-PE backed			
	Mean	Median	Mean	Median	T test	Rank-test
$Size_{t-1}$	6.792	6.760	6.036	6.067	-24.215***	-23.766***
ROA_{t-1}	0.016	0.000	0.003	0.000	-3.671***	-1.993*
LEV_{t-1}	0.698	0.614	0.328	0.154	-29.405***	-29.775***
MTB_{t-1}	2.250	1.427	1.194	0.837	-20.562***	-22.948***
DTURN	0.071	0.004	0.032	-0.010	-0.696	-1.166
$NCSKEW_{t-1}$	0.085	-0.013	0.015	-0.054	-3.522***	-3.369***
$MEANRET_{t-1}$	-0.002	-0.001	-0.002	-0.002	-1.662*	-3.056***
$SIGMA_{t-1}$	0.060	0.051	0.070	0.060	12.558***	8.235***
Number of obs	**3331**		**5940**			

Table 2 continues

Panel B	CEO appointed by PE		CEO not appointed by PE			
	Mean	Median	Mean	Median	T test	Rank-test
$Size_{t-1}$	7.505	7.432	6.079	6.088	-4.555***	-5.049***
ROA_{t-1}	0.011	0.000	0.022	0.000	1.394	1.062
LEV_{t-1}	0.668	0.922	0.728	0.306	0.942	0.137
MTB_{t-1}	2.495	1.851	2.005	1.003	-3.076**	-3.325**
DTURN	0.036	0.051	0.106	0.058	1.441	1.396
$NCSKEW_{t-1}$	0.106	0.036	0.064	-0.062	-0.712	-0.742
$MEANRET_{t-1}$	-0.005	-0.003	0.001	0.001	-2.192**	-3.084**
$SIGMA_{t-1}$	0.066	0.055	0.054	0.047	-2.894**	-2.528**
PE_exited	0.397	0.000	0.1807	0.000	-12.462***	-12.032***
Change in percentage PE ownership	-0.089	-0.06	-0.143	-0.059	-2.419**	-2.614**
CEO tenure	7.51	6.011	5.211	4.000	-3.397***	-3.189***
PE investment in IPO	71.765	49.011	55.923	41.100	-2.120**	-2.329**
PE capital under management ($m)	52000	41500	45600	29900	-2.010**	-2.163**
PE reputation (ranking)	44.287	37.266	42.079	34.088	-1.555	-1.049
Number of observations	**1135**		**506**			

Panel A of this table provides descriptive statistics for the subsamples of PE-backed and non-PE-backed IPOs listed between 2000 and 2020. Panel B splits the sample based on whether the CEO was appointed by PE. The variables are reported as the mean and median values. The last two columns report the t test and rank test values based on the differences in means and median values between the two subsamples of IPO firms. ***, **, and * indicate 1%, 5%, and 10%, respectively. The definitions of the variables are provided in Appendix Table A1.

Table 3. Impact of the presence of private equity on stock price crash risk

Variables	Model 1: Crash	Model 2: NCSKEW	Model 3: DUVOL
PE-backed (ownership)	0.042	-0.064**	-0.025**
	(0.489)	(0.033)	(0.030)
$Size_{t-1}$	0.055***	0.085***	0.034***
	(0.007)	(0.000)	(0.000)
ROA_{t-1}	-0.172*	0.194***	0.095***
	(0.094)	(0.004)	(0.000)
LEV_{t-1}	0.000	0.000	0.000
	(0.873)	(0.926)	(0.897)
MTB_{t-1}	0.021	-0.002	-0.002
	(0.780)	(0.873)	(0.689)
DTURN	0.021**	-0.002	0.000
	(0.020)	(0.599)	(0.879)
$NCSKEW_{t-1}$	0.048*	0.006	0.006
	(0.052)	(0.589)	(0.162)
$MEANRET_{t-1}$	1.273	3.096***	1.929***
	(0.525)	(0.000)	(0.000)
$SIGMA_{t-1}$	0.297	-0.846**	-0.435***
	(0.720)	(0.024)	(0.003)
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	9271	9271	9271
Log likelihood	-4945.5	0.049	0.056
Chi-squared	215.8		

This table presents the results of the regression on the impact of private equity on stock price crash risk. The P values reported in parentheses are based on standard errors clustered by firm. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 reports the results of the logistic regression in which the dependent variable is CRASH, which takes a value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year. A 3.2 standard deviation is chosen to generate a frequency of 0.1% in the normal distribution during the fiscal-year period and zero otherwise. In Model 2, the dependent variable is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. In Model 3, the dependent variable is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. The definitions of the variables are provided in Appendix Table A1.

Table 4. Robustness test of the effect of PE presence on stock price crash risk (PSM)

Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-backed	0.071	-0.057	-0.019
	(0.299)	(0.235)	(0.260)
$Size_{t-1}$	0.028	0.125***	0.044***
	(0.300)	(0.000)	(0.000)
ROA_{t-1}	0.105	0.093	0.065*
	(0.549)	(0.362)	(0.091)
LEV_{t-1}	0.000	0.000	0.000
	(0.865)	(0.994)	(0.912)
MTB_{t-1}	0.062	0.019	-0.008
	(0.430)	(0.919)	(0.913)
DTURN	0.061***	0.002	0.000
	(0.000)	(0.722)	(0.987)
$NCSKEW_{t-1}$	0.105***	-0.053***	-0.012**
	(0.001)	(0.000)	(0.049)
$MEANRET_{t-1}$	-1.850	1.273	1.611***
	(0.530)	(0.336)	(0.003)
$SIGMA_{t-1}$	-0.705	-1.173*	-0.494**
	(0.581)	(0.051)	(0.037)
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	6662	6662	6662
Adjusted R-squared		0.021	0.032
Log likelihood	-3306.6		

This table reports the results of PSM addressing possible observable endogeneity concerns. The P values reported in parentheses are based on standard errors clustered by firm. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 is a logistic regression, and the dependent variable is CRASH, which is an indicator variable that takes the value one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. The definitions of the variables are provided in Appendix Table A1.

Table 5. Impact of private equity exit on stock price crash risk

Variables	Model 1: Crash	Model 2: NCSKEW	Model 3: DUVOL
PE-exited	0.297**	0.233***	0.090***
	(0.023)	(0.000)	(0.000)
$Size_{t-1}$	0.075**	0.073***	0.034***
	(0.048)	(0.000)	(0.000)
ROA_{t-1}	-0.077	0.107	0.065
	(0.776)	(0.352)	(0.180)
LEV_{t-1}	0.000	0.000	0.000
	(0.931)	(0.657)	(0.410)
MTB_{t-1}	0.457	-0.112	-0.088
	(0.692)	(0.662)	(0.408)
DTURN	0.065**	0.010	0.005
	(0.012)	(0.302)	(0.215)
$NCSKEW_{t-1}$	0.089**	0.046**	0.013*
	(0.041)	(0.012)	(0.085)
$MEANRET_{t-1}$	-9.688**	3.063	1.565**
	(0.037)	(0.108)	(0.047)
$SIGMA_{t-1}$	1.050	0.217	0.076
	(0.564)	(0.766)	(0.803)
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	3331	3331	3331
Log likelihood	-1877.6	0.039	0.048
Chi-squared	101.8		

This table presents the results of the regression on the impact of private equity exit on stock price crash risk for the subsample of PE-backed IPOs. The P values reported in parentheses are based on standard errors clustered by firm. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. The P values reported in parentheses are based on standard errors clustered by firm. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 is a logistic regression, and the dependent variable is CRASH, which takes a value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year. A 3.2 standard deviation is chosen to generate a frequency of 0.1% in the normal distribution during the fiscal-year period and zero otherwise. In Model 2, the dependent variable is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. In Model 3, the dependent variable is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. The definitions of the variables are provided in Appendix Table A1.

Table 6. Robustness test of the effect of PE exit on stock price crash risk (PSM)

Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-exited	0.478**	0.235***	0.098***
	(0.015)	(0.006)	(0.009)
$Size_{t-1}$	0.014	0.122***	0.059***
	(0.864)	(0.000)	(0.000)
ROA_{t-1}	-0.026	0.427	0.212*
	(0.966)	(0.103)	(0.070)
LEV_{t-1}	-0.007	0.001	0.001
	(0.675)	(0.850)	(0.592)
MTB_{t-1}	-3.557	-2.747	-1.765
	(0.753)	(0.542)	(0.347)
DTURN	0.201**	0.025	0.007
	(0.013)	(0.352)	(0.541)
$NCSKEW_{t-1}$	0.134	0.025	-0.008
	(0.150)	(0.542)	(0.632)
$MEANRET_{t-1}$	-6.312	2.269	1.679
	(0.522)	(0.564)	(0.306)
$SIGMA_{t-1}$	0.702	2.513	1.088
	(0.862)	(0.109)	(0.102)
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	818	818	818
Adjusted R-squared		0.087	0.091
Log likelihood	-422.3		

This table reports the results of PSM addressing possible observable endogeneity concerns on the impact of private equity exit on stock price crash risk. The P values reported in parentheses are based on standard errors clustered by firm. The P values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 is a logistic regression, and the dependent variable in this model is CRASH, which is an indicator variable that takes the value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. The definitions of the variables are provided in Appendix Table A1.

Table 7. Robustness test of the effect of PE backing and PE exit on stock price crash risk

Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-backed	-0.194	-0.236***	-0.0888***
	(0.128)	(0.000)	(0.000)
PE-exited	0.268**	0.195***	0.0721***
	(0.034)	(0.002)	(0.003)
$Size_{t-1}$	0.0581***	0.0857***	0.0347***
	(0.005)	(0.000)	(0.000)
ROA_{t-1}	0.168	0.191***	0.0939***
	(0.215)	(0.005)	(0.000)
LEV_{t-1}	-0.00214	-0.00249	-0.00134
	(0.869)	(0.917)	(0.886)
MTB_{t-1}	0.0208	-0.00168	-0.00159
	(0.775)	(0.866)	(0.683)
DTURN	0.0208**	0.00182	0.000284
	(0.019)	(0.631)	(0.848)
$NCSKEW_{t-1}$	0.0476*	0.00925	0.00766*
	(0.057)	(0.428)	(0.093)
$MEANRET_{t-1}$	-1.356	3.140***	1.949***
	(0.499)	(0.000)	(0.000)
$SIGMA_{t-1}$	0.354	-0.807**	-0.422***
	(0.669)	(0.031)	(0.004)
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	9271	9271	9271
Adjusted R-squared		0.053	0.046
Log likelihood	-4943.1		

This table presents the regression results on the impact of private equity backing and exit on stock price crash risk. The P values reported in parentheses are based on standard errors clustered by firm. The P values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 is a logistic regression, and the dependent variable in this model is CRASH, which is an indicator variable that takes the value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. The definitions of the variables are provided in Appendix Table A1.

Table 8: CEOs appointed by or connected to PE or not.

	CEO APPONTED BY PE			CEO NOT APPOINTED BY PE		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
PANEL A	Depvar: CRASH	Dep var:	Dep var:	Dep var: CRASH	Dep var:	Dep var:
PE-exited	0.686**	0.192**	0.0696**	0.079	0.028	0.001
	[0.025]	[0.038]	[0.041]	[0.277]	[0.429]	[0.468]
Other controls	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Interacted industry-year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1135	1135	1135	506	506	506
Adjusted R-squared		0.052	0.056		0.026	0.024
Log likelihood	-637			-365		

	CEO previously connected with PE or Appointed by PE			CEO NOT previously connected with PE or Appointed by PE		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
PANEL B	Depvar: CRASH	Dep var:	Dep var:	Depvar: CRASH	Dep var:	Dep var:
PE-exited	0.651**	0.235***	0.0914***	0.0791	0.0290	0.0094
	[0.042]	[0.000]	[0.000]	[0.277]	[0.420]	[0.455]
Other controls	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Interacted industry-year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1123	1123	1123	518	518	518
Adjusted R-squared		0.056	0.054		0.056	0.057
Log likelihood	-1750			-168		

Panel A of this table presents the regression results on the impact of PE exit on crash risk for IPOs where the CEOs are appointed by the PE firms versus CEOs that are not appointed by the PE firms. Panel B of this table presents the regression results on the impact of PE exit on crash risk for IPOs where the CEOs had previous connection with PE firms versus CEOs that had not any previous connection with PE firms. The P values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, and * indicate 1%, 5%, and 10%, respectively. Model 1 is a logistic regression, and the dependent variable in this model is CRASH, which is an indicator variable that takes the value of one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Models 2 and 3 are based on OLS estimations. CEOs are considered to be appointed by PE if CEO appointment happens after the first PE investment date. CEOs are considered to have previous connection with PE if CEO had previously had a role in a PE backed firm. The definitions of the variables are provided in Appendix Table A1.

Table 9: Splitting the sample based on high and low CEO tenure

	Higher CEO tenure			Low CEO tenure		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Variables	CRASH	NCSKEW	DUVOL	CRASH	NCSKEW	DUVOL
PE-exited	-0.611	-0.167	-0.088	0.836**	0.341***	0.108***
	[0.122]	[0.169]	[0.117]	[0.031]	[0.002]	[0.029]
Other controls	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***
Interacted industry-year dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	655	655	655	655	655	655
Adjusted R-squared		0.091	0.0735		0.085	0.089
Log likelihood	-344			-365		

Panel A of this table presents the regression results on the impact of private equity exit and its interaction with change in percentage of PE ownership on stock price crash risk. Panel B of this table presents the regression results on the impact of private equity exit on stock price crash risk for the subsamples of high CEO tenure versus low CEO tenure. The higher CEO tenure subsample refers to the firms in which CEO tenure is above the median tenure in the sample. The lower CEO tenure subsample refers to the firms in which CEO tenure is below the median tenure in the sample. CEO Tenure is the number of years CEO has been in the company calculated as the difference between the dates become CEO and the fiscal year in our panel data. The P-values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, * indicate 1%, 5%, and 10% significance levels. Model 1 is a logistic regression and the dependent variable in this model is CRASH, which is an indicator variable that takes the value one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Both Model 2 and 3 are based on OLS estimations. Definition of the variables are in Appendix Table A1.

Table 10. Effect of PE reputation as a channel on stock price crash risk

Panel A	**Capital under management**		
PE-exited	0.297**	0.228***	0.0876***
	[0.040]	[0.000]	[0.001]
Above Median capital under management (Dummy)	0.00517	0.0938	0.0383
	[0.978]	[0.221]	[0.196]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	3331	3331	3331
Log likelihood	-1877.6		
adjusted R-Square		0.048	0.039
PE-exited	0.636**	0.193**	0.0701**
	[0.026]	[0.030]	[0.048]
Above Median capital under management (Dummy)	-0.278	0.0141	0.000205
	[0.282]	[0.915]	[0.997]
CEO appointed by PE	0.134**	0.0293**	0.010*
	[0.039]	[0.043]	[0.071]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	1641	1641	1641
Log likelihood	-761.1		
adjusted R-Square		0.038	0.029

Panel B	Investment in IPOs		
PE-exited	0.258*	0.226***	0.0861***
	[0.091]	[0.001]	[0.002]
Above Median investment in IPO (Dummy)	-0.129	-0.0252	-0.0117
	[0.624]	[0.822]	[0.802]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	3331	3331	3331
Log likelihood	-1877.5		
adjusted R-Square		0.048	0.039
PE-exited	0.477*	0.132	0.0407
	[0.083]	[0.235]	[0.383]
Above Median investment in IPO (Dummy)	-0.554	-0.209	-0.0992
	[0.318]	[0.276]	[0.218]
CEO appointed by PE	0.134*	0.0219	0.01
	[0.071]	[0.144]	[0.177]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	1641	1641	1641
Log likelihood	-761		
adjusted R-Square		0.038	0.029

Panel C	Private Equity Ranking		
PE-exited	0.191	0.205***	0.0856***
	[0.215]	[0.002]	[0.002]
PE reputation (ranking)	-0.00356	-0.000904	-0.000146
	[0.226]	[0.416]	[0.754]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	3331	3331	3331
Log likelihood	-1876.8		
adjusted R-Square		0.049	0.039
PE-exited	0.679**	0.275**	0.110**
	[0.017]	[0.011]	[0.016]
PE reputation (ranking)	0.00169	0.00236	0.00116*
	[0.639]	[0.123]	[0.070]
CEO appointed by PE	0.138**	0.0245**	0.0114*
	[0.045]	[0.048]	[0.072]
Other controls	YES	YES	YES
Interacted industry-year dummies included	YES	YES	YES
Number of observations	1641	1641	1641
Log likelihood	-761.5		
adjusted R-Square		0.039	0.029

The table presents regression results on the effect of PE reputation as a channel on stock price crash risk. Panel A of this table measures PE reputation by the number of previous investments in IPOs. In this panel, PE reputation measure captured with a dummy variable that takes value 1 for those PE firms with above median investment in IPOs and 0 otherwise. Panel B measures PE reputation by capital under management by PE firms. In this panel, PE reputation measure captured with a dummy variable that takes value 1 for those PE firms with above median capital under management and 0 otherwise. Panel C measures PE reputation using the PEI 300 ranking. In this panel, PE reputation measure captured by the PEI 300 ranking which measures the fundraising totals of the biggest private equity firms over the past five years. The P-values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, * indicate 1%, 5%, and 10% significance levels. Model 1 is a logistic regression and the dependent variable in this model is CRASH, which is an indicator variable that takes the value one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Both Model 2 and 3 are based on OLS estimations. Definition of the variables are in Appendix Table A1.

Table 11. Determinants of the time to delist and time to M&A after PE shareholder exiting the IPO firm

Variables	Time to delist	Time to M&A
PE-exited	-0.467***	-0.212***
	[0.000]	[0.000]
MKTVALUE	0.150***	0.023
	[0.000]	[0.248]
LEV	-0.040***	-0.010
	[0.007]	[0.317]
CAPX	-0.006	-0.054***
	[0.790]	[0.004]
MKTLIQ	-0.012	0.004
	[0.410]	[0.713]
VOLAT	0.002	0.002
	[0.154]	[0.187]
MTB	-0.083***	0.028
	[0.002]	[0.140]
Interacted industry-year dummies included	Yes	Yes
Number of observations	818	593
Log likelihood	-848	-86.18

This table shows the estimation results of the AFT models. The dependent variable is the logarithm of Time to delist in Model 1 and Time to M&A in Model 2. Interacted industry-year fixed effects are included in all the specifications below. All ***, **, * indicate 1%, 5%, and 10% significance levels. Definition of the variables are in Appendix Table A1.

Appendix

Table A1: Definition of variables

Variable	Definition	Source
Size	Log of the market value of equity	Compustat
ROA	Income before extraordinary items divided by lagged total assets	Compustat
LEV	Total long-term debts divided by total assets. *MTB* is the market value of equity divided by the book value of equity	Compustat
MTB	Market value of equity divided by the book value of equity.	Compustat
DTURN	Average monthly share turnover over the current fiscal-year period minus the average monthly share turnover over the previous fiscal-year period, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.	CRSP
NCSKEW	Negative skewness of firm-specific weekly returns over the fiscal-year period.	CRSP
MEAN*RET*	Mean of firm-specific weekly returns over the fiscal-year period, times 100.	CRSP
SIGMA	Standard deviation of firm-specific weekly returns over the fiscal-year period	CRSP
CAPX	Natural log of capital expenditure which represents the funds used to acquire fixed assets.	Compustat
MKTLIQ	Volume divided by outstanding shares	CRSP
VOLAT	Average yearly volatility calculated using Garch Model	CRSP
PE-exited	A dummy variable taking the value one when PE exits the IPO firm and 0 when PE shareholders are still present in the firm.	Thomson Reuters Eikon
High tech_d	Dummy variable taking value 1 if IPO company is high-tech company and 0 otherwise	CRSP
Change in percentage of PE ownership	The difference between percentage of shares hold by all PE investors of the firm from one year to the next year.	Thomson Reuters Eikon
CEO tenure	Difference between the date CEO become CEO and the observation year	Execucomp
Above Median investment in IPO	PE reputation measure captured with a dummy variable that takes value 1 for those PE firms with above median investment in IPOs and 0 otherwise	Thomson Reuters Eikon
Above Median capital under management	PE reputation measure captured with a dummy variable that takes value 1 for those PE firms with above median capital under management and 0 otherwise	Thomson Reuters Eikon
PE reputation (ranking)	PE reputation measure captured by the PEI 300 ranking which measures the fundraising totals of the biggest private equity firms over the past five years	https://www.privateequityinternational.com/pei-300/#pei-300-full-ranking
CEO appointed by PE	CEOs are considered to be appointed by PE if CEO appointment happens after the first PE investment date.	Execucomp/ Thomson Reuters Eikon
CEO previously connected with PE	CEOs are considered to have previous connection with PE if CEO had previously had a role in a PE backed firm.	LinkedIn/ Thomson Reuters Eikon

This table provides definition of the variables of the study.

Table A2: Descriptive statistics of the matched sample using Propensity Score Matching

Variables	*PE_backed=1*		*PE_backed=0*	
	Mean	Median	Mean	Median
$Size_{t-1}$	6.526	6.520	6.555	6.588
ROA_{t-1}	0.018	0.000	0.023	0.000
LEV_{t-1}	0.324	0.662	0.497	0.112
MTB_{t-1}	0.000	0.002	0.005	0.003
DTURN	0.046	-0.015	0.081	0.017
$NCSKEW_{t-1}$	0.071	-0.022	0.078	-0.004
$MEANRET_{t-1}$	-0.002	-0.001	-0.002	-0.001
$SIGMA_{t-1}$	0.064	0.056	0.064	0.058
Number of observations	3331		3331	

This table provides descriptive statistics for all variables used during the matching process, by means and medians for the treatment (private equity backed) and control (non-PE-backed) groups post-PSM. All the variables are defined as in the Appendix Table A1.

Table A3: Descriptive statistics of the matched sample using Propensity Score Matching (post PE exit)

Variables	*PE-exited=1*		*PE-exited=0*	
	Mean	Median	Mean	Median
$Size_{t-1}$	6.931	6.897	6.902	6.866
ROA_{t-1}	0.003	-0.004	0.005	0.000
LEV_{t-1}	1.507	0.673	0.844	1.025
MTB_{t-1}	0.004	0.002	0.003	0.002
DTURN	0.148	0.018	0.134	0.160
$NCSKEW_{t-1}$	0.026	-0.059	0.063	-0.023
$MEANRET_{t-1}$	-0.003	-0.002	-0.002	-0.001
$SIGMA_{t-1}$	0.061	0.052	0.059	0.050
Number of observations	409		409	

This table provides descriptive statistics for all variables used during the matching process, by means and medians for the treatment (PE-exited=1) and control (PE-exited=0) groups post-PSM. All the variables are defined in the Appendix Table A1.

Table A4. Effect of change in percentage of PE ownership and CEO tenure as a channel on stock price crash risk

	Model 1: Crash	Model 2: NCSKEW	Model 3: DUVOL
PE-exited	0.632*	0.260***	0.094**
	[0.057]	[0.006]	[0.019]
PE-exited x Change in percentage of PE ownership	0.306	0.137	0.460
	[0.280]	[0.140]	[0.221]
Change in percentage of PE ownership	0.084	-0.625	-0.230
	[0.950]	[0.112]	[0.264]
CEO appointed by PE	0.139*	0.031**	0.015*
	[0.067]	[0.038]	[0.073]
Other controls	Yes	Yes	Yes
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	1641	1641	1641
Log likelihood	-760.7		
Adjusted R-Square		0.048	0.058
Chi-squared	90.74		

Table A5. Effect of leverage as a channel on stock price crash risk (bottom quartile leverage)

Panel A: Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-exited	0.418	0.251*	0.109*
	[0.144]	[0.053]	[0.051]
PE-exited* Bottom quartile LEV	**0.012**	**0.002**	**0.002**
	[0.532]	**[0.723]**	**[0.433]**
Bottom quartile LEV	0.009	-0.001	-0.001
	[0.595]	[0.866]	[0.633]
ROA_{t-1}	-1.031*	-0.144	-0.006
	[0.071]	[0.591]	[0.959]
$Size_{t-1}$	0.097	0.0893**	0.0452**
	[0.330]	[0.037]	[0.011]
MTB_{t-1}	-4.643	-0.313	-0.227*
	[0.231]	[0.291]	[0.076]
DTURN	0.195***	0.042	0.0208*
	[0.003]	[0.130]	[0.056]
$NCSKEW_{t-1}$	0.034	-0.025	-0.013
	[0.751]	[0.513]	[0.462]
$MEANRET_{t-1}$	-16.870	2.355	0.169
	[0.123]	[0.587]	[0.920]
$SIGMA_{t-1}$	-0.557	-0.269	-0.045
	[0.888]	[0.882]	[0.952]
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	698	698	698
Adjusted R-squared		0.067	0.076
Log likelihood	-394.9		

Table A5 continues

Panel B: Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-exited	0.499	0.336*	0.132
	[0.256]	[0.066]	[0.117]
PE-exited* Top quartile ROA	**0.859**	**-0.388**	**-0.147**
	[0.642]	**[0.681]**	**[0.715]**
Top quartile ROA	-0.867	0.453	0.212
	[0.627]	[0.639]	[0.607]
LEV_{t-1}	-0.002	0.000	0.000
	[0.489]	[0.674]	[0.348]
$Size_{t-1}$	0.142**	0.131***	0.0585***
	[0.022]	[0.000]	[0.000]
MTB_{t-1}	2.793	-0.027	-0.073
	[0.357]	[0.879]	[0.268]
DTURN	0.0711*	-0.011	0.000
	[0.054]	[0.648]	[0.974]
$NCSKEW_{t-1}$	0.158**	0.041	0.019
	[0.041]	[0.222]	[0.193]
$MEANRET_{t-1}$	-1.099	3.301	1.663
	[0.883]	[0.252]	[0.176]
$SIGMA_{t-1}$	-0.534	-0.083	0.004
	[0.864]	[0.946]	[0.993]
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	1193	1193	1193
Adjusted R-squared		0.063	0.0566
Log likelihood	-670.5		

Table A5 continues

Panel C: Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-exited	-2.418	0.476	0.081
	[0.209]	[0.473]	[0.767]
PE-exited* Top quartile Size	**0.375**	**-0.038**	**-0.003**
	[0.120]	**[0.636]**	**[0.917]**
Top quartile Size	-0.271	0.083	0.023
	[0.220]	[0.250]	[0.465]
ROA_{t-1}	-0.337	0.009	0.009
	[0.440]	[0.963]	[0.916]
LEV_{t-1}	0.000	0.000	0.000264*
	[0.967]	[0.153]	[0.051]
MTB_{t-1}	0.360	-0.552	-0.309*
	[0.926]	[0.155]	[0.051]
DTURN	0.0919**	0.0567**	0.0240***
	[0.043]	[0.012]	[0.004]
$NCSKEW_{t-1}$	0.008	0.037	0.013
	[0.896]	[0.200]	[0.260]
$MEANRET_{t-1}$	-8.635	4.581	3.347**
	[0.355]	[0.210]	[0.030]
$SIGMA_{t-1}$	4.552	2.622**	0.830
	[0.206]	[0.040]	[0.124]
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	1430	1430	1430
Adjusted R-squared		0.0411	0.0504
Log likelihood	-814.2		

Panel A of this table presents the regression results on the impact of private equity exit and its interaction with leverage in bottom quartile leverage sub sample on stock price crash risk. Panel B of this table presents the regression results on the impact of private equity exit and its interaction with top quartile ROA sub sample on stock price crash risk. Panel C of this table presents the regression results on the impact of private equity exit and its interaction with top quartile size subsample on stock price crash risk. The P-values reported in parentheses are based on standard errors clustered by firm. The P-values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, * indicate 1%, 5%, and 10% significance levels. Model 1 is a logistic regression and the dependent variable in this model is CRASH, which is an indicator variable that takes the value one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Both Model 2 and 3 are based on OLS estimations. Definition of the variables are in Appendix Table A1.

Table A6. Effect of high technology sector as a channel on stock price crash risk

Variables	Model 1 Dep var: CRASH	Model 2 Dep var: NCSKEW	Model 3 Dep var: DUVOL
PE-exited	0.196	0.239***	0.0938***
	[0.167]	[0.000]	[0.000]
PE-exited* high tech_d	**0.116**	**-0.186**	**-0.066**
	[0.737]	**[0.212]**	**[0.287]**
$Size_{t-1}$	0.192	0.214	0.066
	[0.555]	[0.125]	[0.255]
ROA_{t-1}	0.050	0.0666***	0.0310***
	[0.180]	[0.000]	[0.000]
LEV_{t-1}	0.016	0.101	0.060
	[0.953]	[0.359]	[0.189]
MTB_{t-1}	0.000	0.000	0.000
	[0.634]	[0.593]	[0.378]
DTURN	0.485	-0.147	-0.098
	[0.661]	[0.563]	[0.351]
$NCSKEW_{t-1}$	0.0630**	0.011	0.005
	[0.014]	[0.286]	[0.200]
$MEANRET_{t-1}$	0.100**	0.0510***	0.0167**
	[0.024]	[0.006]	[0.030]
$SIGMA_{t-1}$	-8.327*	3.416*	1.737**
	[0.073]	[0.071]	[0.027]
Interacted industry-year dummies included	Yes	Yes	Yes
Number of observations	3345	3345	3345
Adjusted R-squared		0.0425	0.046
Log likelihood	-1894.1		

This table presents the regression results on the impact of private equity exit and its interaction with high tech industry dummy on stock price crash risk. The P-values reported in parentheses are based on standard errors clustered by firm. The P-values reported in parentheses are based on standard errors clustered by both firm and time. Year and industry fixed effects are included. ***, **, * indicate 1%, 5%, and 10% significance levels. Model 1 is a logistic regression and the dependent variable in this model is CRASH, which is an indicator variable that takes the value one for a firm-year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. The dependent variable in Model 2 is NCSKEW, which is the negative skewness of firm-specific weekly returns over the fiscal-year period. The dependent variable in Model 3 is DUVOL, which is the log of the ratio of the standard deviations of down-week to up-week firm-specific returns. Both Model 2 and 3 are based on OLS estimations. Definition of the variables are in Appendix Table A1.