Economic Uncertainty and Going Private Transactions: The Corporate Governance Channel*

Joyce Xuejing Guan†

December 4, 2021
[Link to Latest Version]

Abstract

I study the impact of economic uncertainty on firms' decisions to go private. I show that firms are more likely to go private following economic uncertainty shocks, and this effect is stronger for firms prone to severe agency conflicts: firms with dual-class structure, less institutional ownership, lower asset redeployability, lower loan-to-bond ratio, and for firms in financial distress. After going private, the cost of debt decreases. I establish causality by instrumenting uncertainty using differential firms' exposure to macro uncertainty shocks in energy, exchange rate, treasury securities, and policy. These results are consistent with uncertainty exacerbating agency frictions faced by public companies. To alleviate the negative impacts of uncertainty shocks, firms go private to alter their capital structures to ones that are less prone to agency frictions: ones with a small number of dominant stakeholders with aligned interests. The agency frictions are mitigated through going private, resulting in a decrease in the cost of debt.

Keywords: going private, uncertainty shocks, corporate governance, agency frictions

*I am indebted to Jan Bena and Murray Carlson for their guidance and support. I would like to thank Isha Agarwal, Jack Favilukis, Will Gornall, Kai Li, as well as seminar participants at the University of British Columbia, and the UBC Summer Conference for their helpful comments. All errors are my own.

†Sauder School of Business, University of British Columbia, Vancouver, BC V6T1Z2, joyce.guan@sauder.ubc.ca

1 Introduction

Economic uncertainty plays a vital role in economic outcomes, especially during downturns. Uncertainty shocks reduce economic growth, hamper stock market performance, and make firms reduce investment and employment leading to lower sales growth and profitability.[1] The negative impact of economic uncertainty is amplified by the real and financial frictions faced by firms: Alfaro et al. (2019) show that, in the presence of these frictions, uncertainty shocks lead to larger recessions with slower recovery. While prior work documents the negative impact of uncertainty shocks on firms, our understanding of how firms respond to such shocks in order to lessen their impacts is minimal.[2]

In this paper, I investigate how firms change their capital structures to ones that are less prone to agency frictions to alleviate the negative impacts of uncertainty shocks. Specifically, I study whether going private transactions—events in which firms' capital structures are altered from dispersed to ones with a very small number of dominant stakeholders with aligned interests—is a possible mechanism by which firms respond to uncertainty shocks. The level of economic uncertainty has risen significantly in the wake of the COVID-19 pandemic.[3] In this period, we saw a resurgence of the going private transactions. These transactions receive record-high premiums in the years of 2020-21. The media describe the relationship between uncertainty and going private as follows: "Going-private transactions are cyclical in nature and tend to increase in number during economic downturns, where a variety of factors can cause the share price of a listed company to trade at a discount to its net asset value per share. 2020 is a case in point, as global stock markets saw increased volatility due to the Covid-19 pandemic and macroeconomic uncertainty."[4]

Agency frictions constitute a theoretically important cost for public companies. The separation of ownership and control creates conflicts between managers and shareholders, and

[1] Bloom (2009); Mian and Sufi (2010); Pastor and Veronesi (2012); Kahle and Stulz (2013); Alfaro et al. (2019).

[2] Im et al. (2017) and Alfaro et al. (2019) find that firms adopt more conservative corporate policies such as more cash holdings and less dividend payouts.

[3] https://voxeu.org/article/economic-uncertainty-wake-covid-19-pandemic

[4] Finanical Times, Oct 2021.

between creditors and shareholders (Jensen and Meckling 1976). Conflicts of interest also exist between controlling and minority shareholders. These agency problems can generate financial frictions and increase the cost of external capital. Existing literature documents that investors and lenders require higher rate of returns to compensate for the agency costs (La Porta et al. 2002; Aslan and Kumar 2012).

Uncertainty can exacerbate firms' agency problems through a variety of channels. First, it can aggravate information asymmetry, increasing the costs of signaling and monitoring. Previous studies show that firms increase voluntary disclosure to reduce information asymmetry in response to uncertainty shocks (Balakrishnan et al. 2014; Guay et al. 2016).

Second, moral hazard problems between shareholders and creditors and between managers and shareholders are more severe with high uncertainty. Cash flows become more volatile, creating risk-shifting incentives for shareholders to exploit creditors. Managers may also expropriate more from shareholders when outcomes are uncertain. In addition, firms tend to have more cash holdings following uncertainty (Im et al. 2017), which can be easily turned into private benefits by management. The equity-based incentive mechanism may also become less effective since firm performance is highly volatile despite management efforts.

Third, uncertainty magnifies the coordination frictions among managers, shareholders, and creditors. Garlappi et al. (2017, 2021) find that heterogeneous priors can lead to inefficiencies when decisions are made collectively by a group of agents. The coordination frictions are more severe following uncertainty shocks because agents' beliefs about future outcomes may become more dispersed. Moreover, these coordination frictions make firms less responsive to uncertainty shocks. While uncertainty triggers the need for companies to restructure their assets, disagreements among agencies make the negotiation process difficult. The frictions need to be resolved before firms can implement the changes. Garlappi et al. (2017) show that the inefficiencies due to coordination frictions may be resolved when agents can trade among themselves or collectively trade with outside investors.

Due to these agency frictions, firms experience higher costs of capital during periods of high

uncertainty (Pástor and Veronesi 2013; Gilchrist et al. 2014; Ashraf and Shen 2019; Kaviani et al. 2020). Alfaro et al. (2019) show that the financial frictions amplify, prolong, and propagate the negative impact of uncertainty shocks. They argue that even small financial adjustment costs could generate significant impacts. The elevated agency costs following uncertainty shocks create an incentive for firms to address the agency problems. In this paper, I postulate that one possible way to mitigate the agency frictions is to restructure the capital via going private. In going private transactions, firms alter their capital structure from dispersed to ones with a very small number of dominant stakeholders with aligned interests. Based on these arguments, I hypothesize that firms are more likely to go private following uncertainty shocks. The effects are expected to be stronger for firms that are prone to severe agency problems.

To study the impacts of economic uncertainty on going private, I collect a sample of firms that went private from 1994 to 2017 and compare them with those that remain public. Following DeAngelo et al. (1984), Leuz et al. (2008) and Bharath and Dittmar (2010), I identify the going private sample as those that filed Schedule 13E-3 and delisted from the stock exchange within two years. A publicly-traded company must file Schedule 13E-3 if the company or an affiliate voluntarily engages in a transaction resulting in the delisting of the company's shares.

By reading through the Schedule 13E-3 filings of the going private firms, I find significant changes in firms' capital structures through the going private process. Figure 1 illustrates the changes. Panel A and B compare the capital structures of a representative company, American Greetings Corp., before and after it went private. Before going private, the company had dual class shares with a large number of institutional and dispersed shareholders. After going private, the company was owned entirely by management and a private equity investor. The debt structure also became less complex after going private. Existing loans were paid off with new loan facilities arranged by one syndicate with previous lending relationships with the PE investor. Panel C of Figure 1 illustrates the capital structure of the average company after going private, demonstrating a similar pattern as in Panel B. Firms alter their capital structures through the going private process. The capital structure before going private is prone to severe

agency frictions. After going private, agency problems are mitigated since the management, the PE investor, and the creditors share aligned interests.

I measure firm uncertainty using changes in realized stock return volatility. Using a Cox proportional hazards model, I find that firms are more likely to go private with high uncertainty. An one standard deviation increase in the change of annualized stock return volatility leads to a 14% increase in the hazard rate of going private. One concern with using changes in stock return volatility as a proxy for uncertainty is that firm characteristics can simultaneously affect stock return volatility and the going private decisions. For example, stock liquidity affects stock return volatility, and firms may choose to delist due to the lack of liquidity. In addition, the decision to go private may affect stock return volatility reversely. To address the endogeneity concern, I employ an instrumental strategy following Alfaro et al. (2019). I construct the instruments exploiting firms' differential exposure to aggregate uncertainty shocks in energy, currency, policy, and U.S. Treasury notes. The instruments, by construction, capture the changes in firm-level stock return volatility which are induced by exogenous uncertainty shocks to macro variables. Using a control function approach with the instrumental variables, I find that firms experiencing high uncertainty which is induced by aggregate economic uncertainty shocks are more likely to go private. The results are robust when I control for macroeconomic conditions such as GDP growth, investor sentiment, indicators for NBER recessions, VIX, or the term premium. The results also hold when I conduct a propensity score matching based on the initial conditions at IPO and firm characteristics three years before going private.

I exploit heterogeneity in firm characteristics to investigate the economic mechanism driving the results. Consistent with the corporate governance hypothesis, I find the positive effects of uncertainty on going private to be stronger for firms subject to severe manager-shareholder conflicts. Masulis et al. (2009) show that the dual-class structure aggravates the agency problems between managers and shareholders. For such firms, incentives to resolve agency conflicts following uncertainty shocks are expected to be higher. I find that the impacts are more prominent for firms with dual class shares. The going private filings indicate that the dual-class

structure is eliminated after going private in most cases. For firms which still have dual class shares after delisting, management and PE investors own the same proportions for both share classes. The impacts of economic uncertainty shocks on going private are also stronger for firms with less ownership by institutional blockholders. Literature on corporate governance (Agrawal and Mandelker 1990; Mehran 1995; Core et al. 1999) shows that blockholders provide effective monitoring for public firms. Therefore, the agency problems should be less of a concern for firms with more institutional blockholders.

The positive effects of uncertainty on going private are also more pronounced in companies with more creditor-shareholder conflicts. Agency problems between creditors and shareholders may be more severe for firms in financial distress. Using Altman Z-Score as a measure for financial distress, I find the effects to be stronger for firms in financial distress. The effects also concentrate in firms with lower asset redeployability, that is, when the collateral value is lower for firms whose assets are more difficult to sell in the secondary market. For such firms, the conflicts are more severe because creditors experience lower recovery rates in bankruptcy. The effects of uncertainty on going private are also stronger for firms with a higher ratio of corporate bonds to bank loans. One advantage of bank loans to corporate bonds is the flexibility of renegotiation (Chemmanur and Fulghieri 1994). Firms' incentives to resolve the agency conflicts of debt are higher if they experience difficulties renegotiating with current debtholders.

If the conflicts between shareholders and creditors are mitigated through going private, the cost of debt is expected to decrease. I conduct a difference-in-differences analysis to examine the impact of going private on the cost of debt. Specifically, I compare the difference in bank loan spreads of the going private firm in the pre- and post-delisting period with that of a group of matched firms that remain public. I find that the costs of debt are significantly lower for going private firms after they delist. Figure 2 shows that going private firms pay significantly higher loan spreads relative to the control group before going private, but the loan spreads become comparable after delisting. By realigning the control rights and cash flow rights through going private, the agency problems are mitigated. As a result, the cost of debt decreases.

Collectively, the evidence suggests that firms go private to resolve the heightened agency frictions following uncertainty shocks. Companies are more likely to go private in the presence of high uncertainty, and the positive effects are more prominent for firms prone to severe agency problems, both between managers and shareholders and between creditors and shareholders. Uncertainty can exacerbate financial frictions and increase the cost of external capital. Going private helps alleviate the problems by aligning incentives of the management, new shareholders, and new creditors. As a result, firm receives lower cost of capital after going private.

I investigate several alternative explanations for the results. One possible explanation is the market timing hypothesis, where managers and private equity investors take firms private when they are undervalued. Undervaluation may be more likely following uncertainty shocks, since it becomes more difficult for investors to evaluate firm fundamentals. Using firm Tobin's Q relative to the industry average as a proxy for undervaluation, I show that impacts of uncertainty on going private are indifferent between undervalued and fairly valued firms.

Another alternative explanation is the market distraction hypothesis. Changes in stock prices in the public market distract controlling shareholders and employees. Managers may decide to take the firm private to enjoy a quiet life. Following Easton and Zmijewski (1989), I construct the earnings response coefficient (ERC) to measure sensitivity of stock returns to earning announcements. Based on the market distraction hypothesis, managers of the companies whose stock returns are more sensitive to earning news should be more likely to take the firm private in uncertain times. However, I find the effects do not vary with ERC.

The positive impacts of economic uncertainty on going private may also be driven by the heightened cost of information production in uncertain times. Subrahmanyam and Titman (1999) discuss the costs of duplication of information production for public companies. It is more costly for investors to produce information during periods of high uncertainty. Using analyst coverage as a proxy for the cost of information production, I show that the results do not vary across firms with different information production costs. In summary, the results suggest

that the positive impacts of economic uncertainty on going private are not driven by undervaluation, market distraction, or higher information production costs following uncertainty.

The paper is related to two veins of literature. First, it relates to the growing literature on economic uncertainty. A large number of studies document the negative impacts of uncertainty on corporations. They show that uncertainty negatively impacts firm performance and growth (Gulen and Ion 2015; Alfaro et al. 2019). Firms reduce investment and employment (Bernanke 1983; Leahy and Whited 1996; Guiso and Parigi 1999; Bloom 2009; Fernández-Villaverde et al. 2011; Bachmann and Bayer 2013; Stein and Stone 2013; Fernández-Villaverde et al. 2015; Alfaro et al. 2019), and adopt conservative corporate policies (Chen et al. 2014; Chen 2016; Im et al. 2017; Alfaro et al. 2019) following uncertainty shocks. As for financial consequences, studies show that higher uncertainty leads to higher cost of bank loans (Ashraf and Shen 2019), corporate bond spreads (Kaviani et al. 2020) and the cost of equity (Pástor and Veronesi 2013). Alfaro et al. (2019) show that financial frictions amplify the impacts of uncertainty in the real economy. This paper contributes to this literature by reporting novel evidence of how economic uncertainty can directly exacerbate financial frictions. To the best of my knowledge, this is the first paper providing empirical evidence on the impacts of economic uncertainty on corporate governance. In addition, this paper documents new findings that firms alter their capital structures via going private to moderate the high agency frictions following uncertainty.

Second, the paper relates to the large body of literature investigating the choice between public and private ownership structure.(Shah and Thakor, 1988; Zingales, 1995, Chemmanur and Fulghieri, 1999; Boot et al., 2006). Within this literature, the paper is closely related to the studies on going private decisions. Jensen (1986) argue that delisting can be used to reduce agency problems between managers and shareholders. Maupin et al. (1984), Lehn and Poulsen (1989) and Opler and Titman (1993) supports this argument by showing that firms with more free cash flows are more likely to go private. Bolton and Von Thadden (1998) and Bharath and Dittmar (2010) show that firms use private equity to opt out public markets for information and liquidity considerations. Mehran and Peristiani (2009) finds that firms go private when they

lack financial visibility and fail to attract investor attention. Engel et al. (2007) argue that firms go private to avoid compliance costs. Firm characteristics that affect the going private decision include size, market to book ratio, growth prospects, performance, and leverage. (Kim and Lyn, 1991; Kieschnick, 1998; Caprio et al., 2011; Martinez and Serve, 2011; Thomsen and Vinten, 2014;). The paper contributes to the literature by identifying economic uncertainty as a missing factor that can help explain going private transactions. In addition, the paper finds that going private can not only resolve agency problems between managers and shareholders, but also the conflicts between shareholders and creditors.

The paper is organized as follows. Section 2 presents the sample and data. Section 3 describes the empirical methodology. Section 4 summarizes the main results. Section 5 discusses the alternative explanations and the robustness tests. Section 6 concludes.

2 Data

This section describes the data used to study the impacts of economic uncertainty on going private transactions. I first describe the sample construction process. I then discuss summary statistics of the going private sample and the deal structure of the going private transactions.

2.1 Going Private Sample

I follow SEC's legal definition of going private to construct the going private sample. According to Rule 13E-3 of the Securities Exchange Act of 1934, a public company must file Schedule 13E-3 if the company or an affiliate is engaged in the transactions which will cause a class of equity securities to become eligible for deregistration or delisting. I follow the SEC rule because there is no ambiguity with this definition. In practice, going private transactions can be quite heterogeneous. A broad range of transactions can fall into this definition, including management buyouts (MBO), non-leveraged or leveraged buyouts (LBO) by private equity firms, or strategic buyouts by private operating companies. Schedule 13E-3 filings have also been used to identify

going private transactions by other studies (DeAngelo et al., 1984; Engel et al., 2007; Leuz et al., 2008; Mehran and Peristiani, 2009; Bharath and Dittmar, 2010)

To construct the going private sample, I retrieve all Schedule 13E-3 filings from 1994 to 2017. To ensure the transactions are completed, I cross-check with SEC Form 15 and Form 25 filings, which are filed when the securities are officially delisted. In addition, I check CRSP to ensure companies are no longer publicly traded within two years after they filed Schedule 13E-3. I also screen the sample firms to ensure they are not traded on the pink sheets or over-the-counter. By doing so, I exclude the firms that "go dark", which refers to the action to deregister from SEC, but continue to trade on the pink sheets or over-the-counter. According to Leuz et al. (2008), going dark and going private are very different corporate events with different economic consequences. Firms usually go dark due to poor prospects and high compliance costs. Controlling insiders may also deregister the firm to extract private benefits and escape from public scrutiny. Therefore, going dark is usually associated with negative cumulative abnormal returns. Going private, on the other hand, is mostly associated with positive cumulative abnormal returns. In this paper, I exclude the going dark firms and focus purely on the going private transactions.

1,453 firms filed Schedule 13E-3 from 1994 to 2017. Among these deals, 188 deals were withdrawn (voluntarily or rejected by shareholders). 1,265 firms delisted within two years after the initial filing. Companies from financial and utilities industries are excluded from the sample, decreasing the sample size to 935 companies. To calculate firm-level uncertainty shock, firms need to have two consecutive years of stock return data available before delisting. The sample size drops to 525 firms due to data availability. The control sample in the main analysis is the firms that remain public until the end of 2017. I also conduct a matching analysis to account for the selection bias of the going private sample. Details of the matching process are discussed in Section 3.4. The final sample consists of 525 going private firms and 2,659 control firms, with 48,060 firm-year observations.

Table OA1 Panel A illustrates the industries in which the going private firms operate, based

on Fama-French twelve industry classifications.[5] Industries that experience most going private transactions are business equipment, which includes computers, software and electronic equipment, and shops including wholesale, retail, and some services. Table OA1 Panel B describes the sample composition by year. The year of going private is identified by the year firms file for going private, rather than the year they delist. Most firms delist at the same year or within one year after they file Schedule 13E-3. The period 1998-2006 saw a boom in going private transactions due to the development of the private equity market. An increase in the cost of public listing after the passage of the Sarbanes–Oxley Act of 2002 also contributes to this boom. The number of going private transactions decreased after the financial crisis of 2007-08.

Deal-specific information on the going private transactions is retrieved from Schedule 13E-3 filings. Accounting variables are from Compustat and variables in the stock market are from CRSP. IPO dates are from SDC New Issues Databases. Data on currency exchange rates, crude oil prices and Treasury returns are from Bloomberg. Measurement of economic political uncertainty is from Baker et al. (2016). Asset redepoyability measures are from Kim and Kung (2017). Information on institutional ownership is from SEC 13F holdings. Information on the firm's debt structure is from Capital IQ. All variables are winsorized at the 1% and 99% levels. Detailed definitions of the variables are discussed in Appendix A.

2.2 Descriptive Statistics

Table 1 Panel A compares firm characteristics of the going private sample and a control sample of surviving firms over their entire public life cycle. The control sample constitutes firms that remain public until the end of 2017. There are 525 going private firms and 2,659 surviving firms. The going private sample experiences lower but more volatile stock returns. Firms that go private are significantly smaller in size and have lower Tobin's Q. However, performance measured by return on assets is similar between the two groups. The going private sample has higher leverage, possesses fewer intangible assets, and demonstrates a higher tax to assets ratio

[5] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html

on average.

To better understand the going private transactions, I read the Schedule 13E-3 filings of the going private transactions in detail. The going private company is required to discuss the purposes of the transaction, any alternatives that the company considered, and whether the transaction is fair to unaffiliated shareholders in the Schedule 13E-3 filings. Most companies also disclose the source of deal financing, the ownership structure before and after the transaction in the Schedule 13E-3 filings.

Since the study focuses on the capital restructuring process, I focus on the Schedule 13E-3 filings of a subset of going private firms with outstanding bank loans before the going private transaction. Within the 252 firms with non-missing control variables in the main analysis, 120 firms had bank loans outstanding before they went private. I go through their Schedule 13E-3 (13E-3, DEF13E-3, PRE13E-3) filings and obtain detailed descriptions of 84 transactions. I also go through the Schedule TO filings, which are filed if the going private transactions are completed through tender offers. Panel B of Table 1 reports summary statistics of these transactions. The deal value is $544.6 million on average. Bidders pay an average takeover premium of 34.5% to the pre-deal share price. Deals are usually financed by a combination of bank loans, cash on the company's balance sheet, and equity contributions by a PE firm and the management. On average, 61% of the deal is financed by debt. 84% of that debt comes from bank loans, usually a term loan facility and a revolving credit facility. The bank loans are usually arranged by a syndicate of banks with lending relationships with the PE investors. Sometimes, the going private company also issues corporate bonds to finance the deal, accounting for the remaining 16% of the debt. The remaining 39% of the deal is financed by cash on the company's balance sheet (16%), and equity contributed by a PE firm (63%) and the management (21%). After delisting, the PE firm owns 64% of the company on average. Management owns 35% of the company, with the remaining 1% owned by other existing shareholders before going private.

3 Empirical Methodology

In this section, I describe the empirical methodology used to study the impacts of economic uncertainty on going private. First, I describe the Cox proportional hazards model. Second, I discuss how I measure economic uncertainty and the identification strategy. Then I describe the control function approach to instrument economic uncertainty in the Cox proportional hazards model. I also discuss the matching analysis to address the sample selection bias, and the difference-in-differences analysis to study the impact of going private on the loan rate in this section.

3.1 Cox Proportional Hazards Model

Following Mehran and Peristiani (2009) and Bharath and Dittmar (2010), I use a hazards model to study firms' decisions to go private. Hazards models are widely applied in survival analysis. Shumway (2001) shows that they are more appropriate to analyze survival data compared to static models. A hazards model is suitable to analyze going private decisions in the following two ways.

First, hazard models trace down firms' decisions over their entire life cycles. In hazard models, each firm is treated as one observation during its entire life span. The time-varying firm characteristics allow me to study both cross-sectional and time-series effects of uncertainty on going private. Second, hazards models can handle censored data, which is a crucial feature of the going private sample. The sample period ends in 2017. Firms are still at risk of going private after the sample period ends. Instead of treating these firms as surviving as done by static models, hazards models treat all firms as being dropped out of the sample at the end of the sample period.

I use a Cox proportional hazards model because it does not impose any restriction on the baseline hazard rate. The model to estimate is

$$h(t, X_{t-1}) = h(t, 0) exp(\beta' X_{t-1} + \xi) \tag{1}$$

where $h(t)$ is the hazard rate for a firm with covariates X_{t-1} to go private at time t. $h(t,0)$ is the baseline hazard rate. The coefficient vector to be estimated is β. Cox proportional hazards model allows me to estimate β without estimating the baseline hazard rate $h(t,0)$. A positive β means that the hazard rate of going private is higher when x is higher. The hazard ratio $exp(\beta)$ indicates the increase in the hazard rate when there is one unit change in the independent variable.

3.2 Measuring Uncertainty

Following the uncertainty literature, I measure firm-level uncertainty using realized stock return volatility $\sigma_{i,t}$, which is the standard deviation of daily dividend cumulative stock returns within a fiscal year. Uncertainty shock is defined as the change in annualized stock return volatility $\Delta\sigma_{i,t} = (\sigma_{i,t} - \sigma_{i,t-1})/(\frac{1}{2}\sigma_{i,t} + \frac{1}{2}\sigma_{i,t-1})$ for firm i at a given year t.

Stock return volatility is an endogenous variable that can be related to various aspects of a firm. First of all, it may correlate with other omitted variables which drive firms' going private decisions. For example, stocks of firms with less analysts coverage can be very volatile. Meanwhile, firms with less analysts coverage may decide to go private due to their lack of financial visibility in the public market. Second, if investors anticipate the firm to go private soon, its stock prices can move dramatically within a short period. This generates an issue of reverse causality. Indeed, previous literature finds contradictory effects of stock return volatility on going private, indicating that stock return volatility contains various aspects of information, which affects the going private decisions in different directions. Therefore, to study the impacts of economic uncertainty on going private, it is crucial to identify the component in changes of stock return volatility due to exogenous uncertainty shocks.

Identification I follow the identification strategy in Alfaro et al. (2019) to construct instruments for uncertainty shocks. To be more specific, I employ firms' differential exposure to aggregate macroeconomics uncertainty shocks to capture shocks to firm-level uncertainty. The identification strategy is similar to Bartik (1991), which utilizes local industry share and overall

industry growth of the country to measure local development. In this paper, I use uncertainty shocks to oil prices, economic political uncertainty, US 10-year treasury notes and seven major currency exchange rates defined by the Federal Board[6]. In the following of the paper, I refer to these ten macroeconomic factors as commodities. The intuition is as follows. Suppose there are two firms, one operates in an industry which is highly government-dependent, such as health care or defense, while the other is a local retailer. When political uncertainty rises, the first company will be affected significantly while the latter will be barely affected. Similarly, firms operating in energy industries will experience high uncertainty following an uncertainty shock to oil prices.

Construction of the instruments follows two steps. First, I estimate firms' exposure to aggregate macroeconomic conditions. Second, I calculate firm-level uncertainty shocks as the product of firm exposure and aggregate uncertainty shocks.

Exposure to aggregate uncertainty shocks Firm exposure to currencies, energy, treasury and policy is obtained by regressing risk adjusted stock returns on the changes in prices of the 10 commodities:

$$r_{i,t} = \alpha_{j,t} + \sum_{c} \beta_j^c \cdot r_t^c + \epsilon_{i,t} \tag{2}$$

$r_{i,t}$ is the daily risk-adjusted stock return of firm i, which is the residual, $\varepsilon_{i,t}$, of equation (3). r_t^c is the daily change in prices of commodity c. Firm exposure to commodity c is the coefficient β_j^c, which measures the sensitivity of stock price to commodity c. β_j^c are estimated at SIC 3-digit level, on a rolling basis with daily stock returns in the past ten years.

The daily risk-adjusted return of firm i is the Carhart (1997) four factor risk adjusted return, which is the residual of the following equation:

$$r_{i,t}^{excess} = \alpha_i + \beta_{i,MKT} \cdot MKT_t + \beta_{i,HML} \cdot HML_t + \beta_{i,SMB} \cdot SMB_t + \beta_{i,UMD} \cdot UMD_t + \varepsilon_{i,t}, \tag{3}$$

where $r_{i,t}^{excess}$ is firm i's daily stock return in excess of risk free rates. MKT is the value weighted

[6]The seven "major" currencies defined by the Federal Board includes the euro, Canadian dollar, Japanese yen, British pound, Swiss franc, Swedish krona and the Australian dollar

market index in excess of risk free rate. HML is the book to market factor. SMB is the size factor, and UMD is the momentum factor. Risk adjusted returns are used to estimate sensitivities so that β_j^c captures firm exposure to commodities rather than systematic risks. I also estimate the sensitivities using raw returns and returns adjusted by other risk models. The results are similar and discussed in section 5.2.

Construction of instrument variables Firm-level uncertainty shocks are constructed using the sensitivities of stock returns to factor prices and aggregate uncertainty shocks:

$$IV_{j,t}^c = |\beta_{j,t-2}^{c,weighted}| \cdot \Delta\sigma_t^c, \tag{4}$$

where $\beta_{j,t-2}^{c,weighted}$ is a weighted value of sensitivity estimated in the first step (discussed below). σ_t^c is the standard deviation of daily changes in the price of commodity c within a year. $\Delta\sigma_t^c$ is the change of σ_t^c, which is calculated in a similar way as $\Delta\sigma_{i,t}$. I adjust each β_j^c by its significance level to obtain the significance weighted sensitivities. To be more specific, $\beta_j^{c,weighted} = \omega_j^c \cdot \beta_j^c$, where $\omega_j^c = \frac{|t_j^c|}{\sum^c |t_j^c|}$ and $|t_j^c|$ is the absolute value of t-statistics estimated in (2) for commodity c. ω_j^c is calculated as the ratio of $|t_j^c|$ to the sum of absolute t-statistics for all commodities. The significance weighted sensitivities capture both economic and statistical significance of firms' exposure to the commodities.

To ensure the instruments capture the effects of uncertainty shocks other than economic conditions, I also include the first moment variables as control variables in the regressions. The first moment variables are calculated as $\beta_j^{c,weighted} \cdot r_t^c$, where r_t^c is the annual growth of the 10 commodity prices.

The instruments satisfy the exogeneity condition for the following two reasons. First, aggregate uncertainty shocks are very unlikely to be driven by firm characteristics. Second, sensitivities are estimated two years ahead of time to capture the pre-shock exposure and avoid any looking forward bias. Table OA2 illustrates the first stage results of IV regressions. The dependent variable is the changes in stock return volatility and the independent variables are the ten

instruments. Column (1) shows the results without any control variable. Column (2) reports the results with firm characteristics and the ten first moment variables as controls. Columns (3) and (4) report the results with industry fixed effects, and with industry and year fixed effects respectively. All the coefficients are positive and statistically significant except for instruments of the British pound. Results of the test statistics indicate that the instruments pass both the underidentification tests and the overidentification tests.

3.3 Control Function Approach

The standard two-stage least squares (2SLS) estimations cannot be applied in non-linear models like the Cox proportional hazards model. To instrument for uncertainty shocks in the Cox proportional hazards model, I use a control function approach. The control function approach follows a two-step estimation procedure. First, I regress firm-level uncertainty shocks on the 10 instruments and obtain the residuals.

$$\Delta\sigma_{i,t} = \alpha_0 + \alpha_1 X_{i,t} + \alpha_2 Z_{1,j,t} + \alpha_3 Z_{2,j,t} + \zeta_{i,t} \tag{5}$$

$X_{i,t}$ are the control variables of firm characteristics. $Z_{1,j,t}$ are the first moment effects at SIC 3 digit level discussed in the identification section. $Z_{2,j,t}$ are the 10 instruments constructed at SIC 3-digit level.

The residual has two components:

$$\zeta_{i,t} = \delta\xi_{i,t} + \eta'_{i,t} \tag{6}$$

The first component $\delta\xi_{i,t}$ contains the endogenous part in $\Delta\sigma_{i,t}$, while the second component $\eta'_{i,t}$ is orthogonal to it. Rewrite equation (7), we get:

$$\xi_{i,t} = \lambda\zeta_i + \xi'_i \tag{7}$$

where $\lambda = 1/\delta$ and $\xi'_i = -\eta'_{i,t}/\delta$. By running the Cox hazard proportional model with the residual $\zeta_{i,t}$ obtained from equation (5) as an explanatory variable:

$$h(t, \Delta\sigma_i, X_i, Z_{1,j}) = h(t,0)exp(\beta_1 \Delta\sigma_i + \beta_2 X_i + \beta_3 Z_{1,j} + \lambda\zeta_i + \xi'_i) \tag{8}$$

The new error term ξ'_i is orthogonal to the change in stock return volatility. Therefore, β_1 is an unbiased estimator of the effects of uncertainty shocks on going private.

3.4 Matching Analysis

Comparison between the going private companies and the surviving companies in Table 1 Panel A indicates that firm characteristics are significantly different between the two groups. To address the concern that the going private companies are fundamentally different from the surviving firms, I investigate the effects of uncertainty on going private through a matching analysis. The matched control samples are constructed based on firm characteristics one year after IPO and three years before going private. Bharath and Dittmar (2010) finds that firm characteristics at the time of IPO are important determinants for the decision to go private. Therefore, I construct alternative control samples based only on IPO characteristics as a robustness test. The variables to match include industry, firm size, Tobin's Q, and annual stock returns. Among all the companies that remain public until the end of 2017, I first restrict the matched group to those that went public in the same year as the going private firm. For each going private firm, I then construct different control samples by selecting the firms operate in the same 2 digit SIC industry, whose log sales, Tobin'Q or annual stock return is within +/- 10% of the delisted firm. I also conduct a propensity score matching based on these characteristics. For each going private company, I select up to five companies that remain public at the end of 2017, and operate in the same Fama-French 12 industry and went public in the same year as the going private company. 105 going private companies are matched with 410 control companies. Panel A and B of Table 3 present the at-IPO and pre-delisting comparisons of the delisted firms and

the control sample based on the propensity score matching. The summary statistics in Panel A and Panel B of Table 3 indicate that the differences in firm characteristics between the going private sample and the matched control group are insignificant, both at the time of IPO and in the year before going private.

3.5 Difference-in-differences Analysis of the Impacts of Going Private on Loan Rate

If agency problems between creditors and shareholders are mitigated through going private, the agency cost of debt should decrease after going private. To further investigate the economic mechanism driving the results, I conduct a difference-in-differences analysis to investigate the impact of going private on loan rates. The sample construction process of the difference-in-differences analysis is as follows.

I select the subsample of going private companies which have loan facilities both before and after the going private transaction. To minimize changes in firm fundamentals between the two loans, I restrict the loan facilities to those within two years of the going private date. If more than one loan facility satisfies the criteria, I select the one closest to the delisting date. Loans used to finance the going-private transaction are excluded from the sample. The loan pair allows me to compare the cost of two bank loans with little change in the firm's fundamentals except for the public status.

For each pre-delisting and post-delisting loan pair issued by the going private firm, loan pairs issued by public firms operating in the same 2-digit SIC industry are matched. The loan pairs must start within one year of the loan pair of the going private firm so that the loan rates are not affected by market conditions. Among all the matched firms with available loan pairs, I conduct a propensity score matching based on firm size, stock return, and stock return volatility. Due to the restrictive criteria, the number of matched control companies is much smaller compared to the matching analysis in Section 3.4. To have a balanced sample, I select up to two control companies for each going private firm in this difference-in-differences analysis. Panel

A of Table 6 reports summary statistics of the going private firms and the control firms with matched loan pairs. The going private sample demonstrates lower stock returns and higher stock return volatility before going private. However, the differences are statistically insignificant.

I estimate the effect of going private on the loan rate using the following difference-in-differences regression:

$$LoanRate_{i,t} = \beta_1 + \beta_2 GoingPrivate_i \times Post_t + \beta_3 GoingPrivate_i + \beta_4 Post_t + \beta_5 Loan_{i,t} + \theta_p + \psi_t + \epsilon_{i,p,t} \tag{9}$$

where $GoingPrivate_i$ is an indicator variable that equals one for going private firms, and zero otherwise. $Post_t$ is a dummy variable that equals one if the loan facility starts after delisting, or is matched to a post-delisting loan. I include year fixed effects, ψ_t, to control for any macroeconomic factors affecting the loan spread. I also include fixed effects for each matched pair, θ_p, to control for unobserved matched pair characteristics that might affect the loan spread. Loan characteristics are also included in the regression to control for heterogeneity in loan facilities.

4 Results

I discuss the results in this section. First, I discuss the main results of impacts of uncertainty shocks on going private transactions. After that, I provide evidence of the corporate governance mechanism exploiting heterogeneity in the level of agency problems firms face. Lastly, I discuss how going private affects firms' cost of bank loans.

4.1 Main Results

Table 2 reports the results of Cox proportional hazards model for time to go private. The major independent variable is economic uncertainty shock, which is measured as the year-on-year change in stock return volatility. The dependent variable is the hazard rate of going private.

Columns (1) and (2) show results of the baseline Cox proportional hazards estimations. Column (1) shows the univariate results, and column (2) reports the results with control variables. Both coefficients of the change in stock return volatility and volatility are positive and statistically significant, indicating that firms are more likely to go private following uncertainty shocks. Regarding economic magnitudes, results in column (2) indicate that a one standard deviation increase in uncertainty shocks increases the hazard rate of going private by 14%.

Columns (3) to (6) report the IV results of the Cox proportional hazards models for time to go private, using a control function approach. Column (3) reports the univariate results. Column (4) includes additional firm characteristics and first moment macroeconomic variables as control variables. Column (5) includes Fama-French 12 industry fixed effects, and column (6) includes industry and year fixed effects. The impacts of uncertainty shocks on going private are positive and statistically significant at 1% level for all specifications. Results in column (6) indicate that a one standard deviation increase in the ΔVolatility induced by macro uncertainty shocks increases the hazard rate of going private by 22.8%.

Firms with lower stock returns are more likely to go private. The coefficient on log sales is negative, meaning that smaller firms are more likely to go private. It is easier for larger firms to amortize fixed costs, and smaller firms go private to avoid compliance costs. The coefficient on Tobin's Q is negative, showing that firms with fewer growth opportunities are more likely to go private. It also suggests that undervalued companies are more likely to become going private targets. Asset intangibility positively affects the likelihood of going private. Firms with more intangible assets may be more likely to be misvalued. Alternatively, there may be more disagreement between public investors and firm insiders in these companies, creating incentives to go private. Consistent with Mehran and Peristiani (2009), firms that went private demonstrate higher return on assets before delisting.

4.2 Estimation Results Based on Matched Control Samples

Table 3 Panel C reports the matching results of the Cox proportional hazards models with the control function. The control sample constitutes public firms that went public in the same year as the going private firms, and matched on various firm characteristics at the time of IPO and three years before delisting. The control firms in column (1) operate in the same SIC 2-digit industries as the going private firms. Control firms in columns (2) and (3) are matched on log sales and Tobin's Q respectively. Firms with characteristics +/- 10% of the going private firms are included in the matched sample. The control sample in column (4) is constructed based on a one-to-five propensity score matching on SIC 2-digit industry, log sales, Tobin's Q, and annual stock returns. Control variables and first moment macro variables are included in all specifications. Year and Fama-French 12 industry fixed effects are included to account for the time varying effects and heterogeneity across industries. The effects of uncertainty shocks on the hazard rates of going private are positive and significant, consistent with Table 2. Results of the propensity score matching in column (4) indicate that one standard deviation increase in uncertainty induced by macro uncertainty shocks increases the likelihood of going private by 13%.

4.3 Agency Problems and Going Private Transactions

Based on the agency hypothesis, incentives for firms to go private should be higher when there are more agency problems associated with the firms' capital structures. Therefore, the likelihood of going private should be higher for firms with more agency problems, both among shareholders, and between shareholders and creditors. To investigate this hypothesis, I exploit heterogeneity in firms' agency problems associated with their capital structures, and test whether firms with more agency problems are more likely to go private under uncertainty shocks. Specifically, I re-estimate equation (1) by including the interaction terms of economic uncertainty shocks and various proxies for agency frictions.

4.3.1 Shareholder Conflicts and Going Private Transactions

I first study firms' ownership structures and investigate whether firms are more likely to go private with uncertainty shocks when there are more agency conflicts between managers/controlling shareholders and minority shareholders.

Masulis et al. (2009) show that the dual-class structure aggravates the agency problems between managers/controlling shareholders and minority shareholders. The divergence between control rights and cash flow rights allows managers and controlling shareholders to extract private benefits without bearing the financial consequences. Because of these agency frictions, firms with dual-class structure bear higher cost of capital (Masulis et al. 2009), and experience lower firm value and stock returns (Claessens et al. 2002; Lemmon and Lins 2003). Therefore, the incentives to go private under uncertainty shocks to resolve the agency conflicts are expected to be higher for the firms with dual-class structure. I also investigate whether the impacts of uncertainty on going private vary for firms with different levels of institutional ownership. Literature on corporate governance (Shleifer and Vishny 1986; Agrawal and Mandelker 1990; Shleifer and Vishny 1997) suggests that institutional blockholders provide effective monitoring for public firms. Therefore, the agency problems should be bigger for firms with fewer institutional blockholders, increasing the incentives for firms to go private following uncertainty shocks.

Table 4 reports the results on shareholder conflicts and going private transactions. Panel A shows results on dual-class structure and going private transactions. Dual class is an indicator variable that equals to one if the company has dual class shares that year. Consistent with the results in Table 2, I find that the coefficients of uncertainty shocks on going private are positive and statistically significant across all specifications. The effects are stronger for firms with dual class shares. The Schedule 13E-3 filings indicate that the dual-class structure is usually eliminated after delisting. For the firms with dual class shares after delisting, management and the PE firm usually own the same proportions for both classes. Panel B presents results on institutional ownership and going private transactions. Institutional investor is the percentage

ownership by institutional blockholders. Consistent with Table 2, firms are more likely to go private under uncertainty shocks. The impacts are stronger for firms with less ownership by institutional blockholders. Results in Table 4 suggest that firms with potential agency problems between managers/controlling shareholders and minority shareholders are more likely to go private under uncertainty shocks, consistent with the agency hypothesis.

4.3.2 Shareholder-creditor Conflicts and Going Private Transactions

I also investigate whether the effects of uncertainty on going private concentrate on firms with more agency costs of debt. The agency problems between shareholders and creditors are particularly costly when firms are in financial distress. Therefore, incentives to resolve the agency conflicts of debt are higher for the firms in financial distress. I also exploit heterogeneity in firms' asset redeployability to investigate the economic mechanism. Theories suggest that collateral alleviates financial frictions of debt. Creditors bear significantly fewer risks if the assets are easy to resell in the secondary markets. Benmelech and Bergman (2009) shows that the ability to pledge redeployable collateral lowers the cost of external financing and increases debt capacity. Based on this argument, firms with less redeployable assets should demonstrate higher agency costs of debt and therefore have larger incentives to go private under uncertainty shocks. I also investigate how a firm's debt structure affects the impact of uncertainty on going private. Specifically, I investigate whether the positive impacts of uncertainty on going private vary with the ratio of bank loans to corporate bonds. Chemmanur and Fulghieri (1994) show that bank loans are more flexible for renegotiation in the event of financial distress. Firms' incentives to resolve the agency conflicts of debt are higher if they experience difficulties in the renegotiation process.

Table 5 reports the results on shareholder-creditor conflicts and going private transactions. Consistent with the main results, the positive impacts of uncertainty on going private are positive and statistically significant in all the results. Panel A reports results on asset redeployability and going private transactions. Asset redeployability is the standardized value-weighted

asset redeployability index from Kim and Kung (2017) times minus one. The results suggest that firms with less redeployable assets are more likely to go private under uncertainty shocks. Panel B reports the results of financial distress and going private transactions. Financial distress is an indicator variable if the Altman Z-Score is lower than 1.8. Results in Panel B indicate that the positive impacts of uncertainty on going private are stronger for firms in financial distress. Panel C of Table 5 reports the debt structure and going private transactions. Loan to bond ratio is the ratio of outstanding bank loans to corporate bonds of the firms. Results in Table 5 Panel C indicate that firms are more likely to go private under uncertainty when they have more corporate bonds than bank loans. Overall, the results in Table 5 suggest that firms are more likely to go private when they face more shareholder-creditor conflicts.

4.4 Impacts of Going Private on Loan Rate

Figure 2 illustrates the comparisons of loan rates between going private firms and control firms before and after delisting. Before delisting, going private firms pay significantly higher costs for bank credit compared to the control group. After delisting, the difference becomes insignificant. Panel B of Table 6 summarizes the differences in loan rates. The difference is close to zero when we compare the loan rate residuals, which are residuals from the regression of loan rates on year and matched pair fixed effects, in the post-delisting period.

Panel C of Table 6 reports regression results of the difference-in-differences analysis from Equation (9). Year fixed effects are included in all specifications. Columns (2) to (4) include matched pair fixed effects. On average, going private firms pay more for bank credit compared to matched control firms. However, their relative cost of bank credit decreases after delisting, because they had worse ex-ante credit quality, which was improved through going private. The difference-in-differences coefficient in column (4) suggests that, compared to the matched sample, going private firms pay 230 bps less for bank credit after they delist—a significant decrease in economic terms. This result provides further support to the agency hypothesis that going private resolves the agency conflicts of debt. As a result, the cost of bank loans decreases.

5 Alternative Explanations and Robustness Tests

This section investigates three alternative explanations, which may drive the positive impacts of uncertainty shocks on going private: undervaluation, market distraction, and the cost of information production. It also presents several robustness tests.

5.1 Alternative Explanations

5.1.1 Undervaluation

When firms experience uncertainty shocks, it may become more difficult for investors to evaluate the fundamentals of the firms. Firms are more likely to be misvalued. Previous studies show that managers and private equity investors are more likely to take firms private when they believe the firms are undervalued. If undervaluation is the primary channel that drives the results, the impacts should be stronger for firms that are undervalued. I use relative Tobin's Q, which is firm Tobin's Q divided by industry Tobin's Q at SIC 3-digit level, as a proxy for undervaluation.

Column (1) in Table 7 reports the results with relative Tobin's Q as an additional control variable in the regression. The coefficient on uncertainty shock is similar compared to the main results in Table 2. The negative coefficient on relative Tobin's Q indicates that firms are more likely to go private when they are undervalued. Column (2) adds an interaction term of relative Tobin'Q and uncertainty shock into the regression. The coefficient on the interaction term is insignificant, indicating that the effects are indifferent between undervalued and fairly priced firms. The results suggest that undervaluation is a major reason for firms to go private. However, undervaluation does not drive the impacts of uncertainty on going private.

5.1.2 Market Distraction

Another possible explanation of the results is market distraction. Uncertainty increases the volatility of stock prices, which can be a distraction to controlling shareholders and employees. Following Easton and Zmijewski (1989) in the accounting literature, I construct the earnings re-

sponse coefficient (ERC) to measure the sensitivity of stock returns to earning announcements. ERC is estimated as the coefficient of regressing size-adjusted abnormal returns around the announcement date on unexpected earnings at SIC 3-digit level. ERC measures market responsiveness to earning news. The underlying reasoning is as follows. Managers of the companies whose stock returns are more sensitive to earning news are more likely to take the firm private to enjoy a quiet life. When stock return volatility increases due to uncertainty, the need to take the firm private becomes higher.

Column (3) in Table 7 shows the results with log ERC as an additional control variable. The coefficient of log ERC on the hazard rate of going private is insignificantly different from zero. Column (4) adds the interaction term to the regressions. The results indicate that the effects of uncertainty on going private are indifferent for firms with high and low ERC.

5.1.3 Cost of Information Production

Another possible explanation is the elevated cost of information production under uncertainty. Subrahmanyam and Titman (1999) highlights the cost of duplication of information production by dispersed investors of public firms. Their paper suggests that more firms would go private if the cost of information production increases. With economic uncertainty shocks, investors' costs of information production are higher. Therefore, the positive effect of economic uncertainty on going private may be attributed to the increased cost of information production under uncertainty. When a large number of analysts follow the company, the cost of duplication of information production is mitigated because the analysts produce more publicly available information. If the effects of uncertainty on going private are driven by the cost of information production, the effects should concentrate in the firms followed by fewer analysts.

Column (5) and (6) in Table 7 shows the results investigating the cost of information production hypothesis. Column (5) includes analyst coverage of the firm as an additional control variable, and column (6) includes the interaction term in the regression. Results indicate that analyst coverage negatively affects the hazard rate of going private. Analyst coverage represents

financial visibility of the company. Mehran and Peristiani (2009) finds that firms with a lack of financial visibility choose to go private since they have fewer benefits of being public. The interaction term of analyst coverage with uncertainty shock is insignificantly different from zero, suggesting that the cost of information production is not driving the results. In conclusion, results in Table 7 indicate that the alternative explanations do not drive the positive effects of uncertainty shocks on going private.

5.2 Robustness Tests

This section investigates robustness of the findings. The effects of macroeconomic conditions are studied in Section 5.2.1. In Section 5.2.2, I re-examine equation (1) using alternative factor models for risk-adjusted returns.

5.2.1 Effects of Macroeconomic Conditions

Studies show that uncertainty is counter-cyclical. Therefore, the results may be driven by business cycles rather than uncertainty shocks. To ensure the results are not driven by business cycles, I include the 10 first moment variables on changes in commodity prices as controls. To further address the concern, I add macroeconomic variables in the regressions. Table OA3 reports the impacts of macroeconomic factors on the hazard rate of going private. The hazard rate of going private is higher when investor sentiment is high. The hazard rate of going private is lower when yield curve is steeper. Supply of debt in the credit is an important determinant for going private since many going private transactions are completed through leveraged buyouts. Consistent with the main results, VIX positively affect the hazard rate of going private. Results in column 5 show that recessions do not play a role in the probability of going private. The positive effect of GDP growth on going private is somehow surprising. The result may be an artifact since changes in prices of the 10 commodities, which are highly correlated with GDP growth, are already included as controls in the regressions. Results in OA3 suggest that the positive effects of uncertainty shocks on going private are not driven by business cycles.

5.2.2 Different Factor Models for Risk Adjusted Return

The risk factors may be correlated with macroeconomic uncertainty. To ensure the effects are not driven by different risk factors, I re-construct the instruments using risk-adjusted returns estimated based on different factor models. Table OA4 demonstrates the results using different risk-adjusted returns to estimate firm exposure to aggregate uncertainty shocks. Panel A shows the first stage results. Similar to Table OA2, the 10 instruments positively predict firm-level uncertainty shocks. All of the specifications pass the Kleibergen-Paap underidentification test and Hansen-Sargan J overidentification test. Panel B shows the main results of Cox proportional hazards models with risk adjusted returns by different factor models. Column (1) shows the results with raw returns. Column (2)-(4) report results with CAPM, Fama-French 3-factor model and Fama-French 5-factor model respectively. The coefficients of uncertainty on going private are significantly positive across all specifications. The economic magnitudes are similar to the main results.

6 Conclusion

In this paper, I investigate the effect of economic uncertainty on going private. I find that firms are more likely to go private following uncertainty shocks. The positive correlation between uncertainty and going private is robust to controlling for firm and macroeconomics characteristics such as GDP growth, investor sentiment, indicators for NBER recession, VIX or the term premium. Moreover, the results are not sensitive to sample composition, or to controls for endogeneity problems using a control function analysis with instrumental variables.

In additional analyses, I find the positive effects of uncertainty on going private concentrate on firms with more agency conflicts. Specifically, the effects are more substantial for firms with dual-class structure and with less institutional ownership. Also, the effects are more prominent for firms with more credit-shareholder conflicts: firms with lower asset redeployability, firms in financial distress, and firms with low loan-to-bond ratio. A difference-in-differences analysis

indicates that the cost of debt decreases after going private. The results are consistent with the corporate governance hypothesis. Uncertainty exacerbates the agency frictions faced by public companies. It generates more information asymmetry, and amplifies moral hazard problems and coordination frictions among managers, shareholders and creditors. As a response, firms alter their capital structures via going private to address the financial frictions and lessen the negative impacts of uncertainty. After agency frictions are mitigated through going private, firms obtain lower costs of debt.

The paper documents uncertainty as a missing factor which can explain going private transactions. More importantly, the paper provides novel evidence on the impacts of uncertainty on corporate governance. The paper proposes one possible response by firms to address the impacts of uncertainty shocks. The impacts of uncertainty on firms are well documented in the literature, while firms' responses to uncertainty shocks are less studied. Im et al. (2017) and Alfaro et al. (2019) find that firms adopt more conservative corporate policies such as more cash holdings and fewer dividend payouts. This paper, on the other hand, documents a different kind of response: capital restructuring through going private. Studying firms' responses to the uncertainty shocks helps us better understand economic uncertainty and how to recover from the negative impacts of uncertainty.

References

Agrawal, Anup, and Gershon N Mandelker, 1990, Large shareholders and the monitoring of managers: The case of antitakeover charter amendments, *Journal of Financial and Quantitative Analysis* 25, 143–161.

Alfaro, Ivan, Nicholas Bloom, and Xiaoji Lin, 2019, The finance uncertainty multiplier, *National Bureau of Economic Research* .

Ashraf, Badar Nadeem, and Yinjie Shen, 2019, Economic policy uncertainty and banks' loan pricing, *Journal of Financial Stability* 44, 100695.

Aslan, Hadiye, and Praveen Kumar, 2012, Strategic ownership structure and the cost of debt, *Review of Financial Studies* 25, 2257–2299.

Bachmann, Rüdiger, and Christian Bayer, 2013, 'Wait-and-see' business cycles?, *Journal of Monetary Economics* 60, 704–719.

Baker, Malcolm, and Jeffrey Wurgler, 2006, Investor sentiment and the cross-section of stock returns, *Journal of Finance* 61, 1645–1680.

Baker, Scott R, Nicholas Bloom, and Steven J Davis, 2016, Measuring economic policy uncertainty, *Quarterly Journal of Economics* 131, 1593–1636.

Balakrishnan, Karthik, Mary Brooke Billings, Bryan Kelly, and Alexander Ljungqvist, 2014, Shaping liquidity: On the causal effects of voluntary disclosure, *Journal of Finance* 69, 2237–2278.

Bartik, Timothy J, 1991, Who benefits from state and local economic development policies? .

Benmelech, Efraim, and Nittai K Bergman, 2009, Collateral pricing, *Journal of Financial Economics* 91, 339–360.

Bernanke, Ben S, 1983, Irreversibility, uncertainty, and cyclical investment, *Quarterly Journal of Economics* 98, 85–106.

Bharath, Sreedhar T, and Amy K Dittmar, 2010, Why do firms use private equity to opt out of public markets?, *Review of Financial Studies* 23, 1771–1818.

Bloom, Nicholas, 2009, The impact of uncertainty shocks, *Econometrica* 77, 623–685.

Bolton, Patrick, and Ernst-Ludwig Von Thadden, 1998, Blocks, liquidity, and corporate control, *Journal of Finance* 53, 1–25.

Boot, Arnoud WA, Radhakrishnan Gopalan, and Anjan V Thakor, 2006, The entrepreneur's choice between private and public ownership, *Journal of Finance* 61, 803–836.

Caprio, Lorenzo, Ettore Croci, and Alfonso Del Giudice, 2011, Ownership structure, family control, and acquisition decisions, *Journal of Corporate Finance* 17, 1636–1657.

Carhart, Mark M, 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Chemmanur, Thomas J, and Paolo Fulghieri, 1994, Reputation, renegotiation, and the choice between bank loans and publicly traded debt, *Review of Financial Studies* 7, 475–506.

Chemmanur, Thomas J, and Paolo Fulghieri, 1999, A theory of the going-public decision, *Review of Financial Studies* 12, 249–279.

Chen, Guojun, 2016, Corporate savings, financing, and investment with aggregate uncertainty shocks, *Financing, and Investment with Aggregate Uncertainty Shocks* .

Chen, Hui, Hao Wang, and Hao Zhou, 2014, Stock return volatility and capital structure decisions, *PBCSF-NIFR Research Paper* .

Claessens, Stijn, Simeon Djankov, Joseph PH Fan, and Larry HP Lang, 2002, Disentangling the incentive and entrenchment effects of large shareholdings, *Journal of Finance* 57, 2741–2771.

Core, John E, Robert W Holthausen, and David F Larcker, 1999, Corporate governance, chief executive officer compensation, and firm performance, *Journal of Financial Economics* 51, 371–406.

DeAngelo, Harry, Linda DeAngelo, and Edward M Rice, 1984, Going private: Minority freezeouts and stockholder wealth, *Journal of Law and Economics* 27, 367–401.

Easton, Peter D, and Mark E Zmijewski, 1989, Cross-sectional variation in the stock market response to accounting earnings announcements, *Journal of Accounting and Economics* 11, 117–141.

Engel, Ellen, Rachel M Hayes, and Xue Wang, 2007, The Sarbanes–Oxley Act and firms' going-private decisions, *Journal of Accounting and Economics* 44, 116–145.

Fernández-Villaverde, Jesús, Pablo Guerrón-Quintana, Keith Kuester, and Juan Rubio-Ramírez, 2015, Fiscal volatility shocks and economic activity, *American Economic Review* 105, 3352–84.

Fernández-Villaverde, Jesús, Pablo Guerrón-Quintana, Juan F Rubio-Ramírez, and Martin Uribe, 2011, Risk matters: The real effects of volatility shocks, *American Economic Review* 101, 2530–61.

Garlappi, Lorenzo, Ron Giammarino, and Ali Lazrak, 2017, Ambiguity and the corporation: Group disagreement and underinvestment, *Journal of Financial Economics* 125, 417–433.

Garlappi, Lorenzo, Ron Giammarino, and Ali Lazrak, 2021, Group-Managed Real Options, *Review of Financial Studies* hhab100.

Gilchrist, Simon, Jae W Sim, and Egon Zakrajšek, 2014, Uncertainty, financial frictions, and investment dynamics, *National Bureau of Economic Research* .

Guay, Wayne, Delphine Samuels, and Daniel Taylor, 2016, Guiding through the fog: Finan-

cial statement complexity and voluntary disclosure, *Journal of Accounting and Economics* 62, 234–269.

Guiso, Luigi, and Giuseppe Parigi, 1999, Investment and demand uncertainty, *Quarterly Journal of Economics* 114, 185–227.

Gulen, Huseyin, and Mihai Ion, 2015, Policy uncertainty and corporate investment, *Review of Financial Studies* 29, 523–564.

Im, Hyun Joong, Heungju Park, and Gege Zhao, 2017, Uncertainty and the value of cash holdings, *Economics Letters* 155, 43–48.

Jensen, Michael C, 1986, Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review* 76, 323–329.

Jensen, Michael C, and William H Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305–360.

Kahle, Kathleen M, and René M Stulz, 2013, Access to capital, investment, and the financial crisis, *Journal of Financial Economics* 110, 280–299.

Kaviani, Mahsa S, Lawrence Kryzanowski, Hosein Maleki, and Pavel Savor, 2020, Policy uncertainty and corporate credit spreads, *Journal of Financial Economics* 138, 838–865.

Kieschnick, Robert L, Jr, 1998, Free cash flow and stockholder gains in going private transactions revisited, *Journal of Business Finance & Accounting* 25, 187–202.

Kim, Hyunseob, and Howard Kung, 2017, The asset redeployability channel: How uncertainty affects corporate investment, *Review of Financial Studies* 30, 245–280.

Kim, Wi Saeng, and Esmeralda O Lyn, 1991, Going private: Corporate restructuring under information asymmetry and agency problems, *Journal of Business Finance & Accounting* 18, 637–648.

La Porta, Rafael, Florencio Lopez-de Silanes, Andrei Shleifer, and Robert Vishny, 2002, Investor protection and corporate valuation, *Journal of Finance* 57, 1147–1170.

Leahy, John, and Toni M Whited, 1996, The effects of uncertainty on investment: Some stylized facts, *Journal of Money, Credit, and Banking* 28, 64–83.

Lehn, Kenneth, and Annette Poulsen, 1989, Free cash flow and stockholder gains in going private transactions, *Journal of Finance* 44, 771–787.

Lemmon, Michael L, and Karl V Lins, 2003, Ownership structure, corporate governance, and firm value: Evidence from the East Asian financial crisis, *Journal of Finance* 58, 1445–1468.

Leuz, Christian, Alexander Triantis, and Tracy Yue Wang, 2008, Why do firms go dark? Causes and economic consequences of voluntary SEC deregistrations, *Journal of Accounting and Economics* 45, 181–208.

Martinez, Isabelle, and Stéphanie Serve, 2011, The delisting decision: The case of buyout offer with squeeze-out (BOSO), *International Review of Law and Economics* 31, 228–239.

Masulis, Ronald W, Cong Wang, and Fei Xie, 2009, Agency problems at dual-class companies, *Journal of Finance* 64, 1697–1727.

Maupin, Rebekah J, Clinton M Bidwell, and Alan K Ortegren, 1984, An empirical investigation of the characteristics of publicly-quoted corporations which change to closely-held ownership through management buyouts, *Journal of Business Finance & Accounting* 11, 435–450.

Mehran, Hamid, 1995, Executive compensation structure, ownership, and firm performance, *Journal of Financial Economics* 38, 163–184.

Mehran, Hamid, and Stavros Peristiani, 2009, Financial visibility and the decision to go private, *Review of Financial Studies* 23, 519–547.

Mian, Atif, and Amir Sufi, 2010, The great recession: Lessons from microeconomic data, *American Economic Review* 100, 51–56.

Opler, Tim, and Sheridan Titman, 1993, The determinants of leveraged buyout activity: Free cash flow vs. financial distress costs, *Journal of Finance* 48, 1985–1999.

Pastor, Lubos, and Pietro Veronesi, 2012, Uncertainty about government policy and stock prices, *Journal of Finance* 67, 1219–1264.

Pástor, L'uboš, and Pietro Veronesi, 2013, Political uncertainty and risk premia, *Journal of Financial Economics* 110, 520–545.

Shah, Salman, and Anjan V Thakor, 1988, Private versus public ownership: Investment, ownership distribution, and optimality, *Journal of Finance* 43, 41–59.

Shleifer, Andrei, and Robert W Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 461–488.

Shleifer, Andrei, and Robert W Vishny, 1997, A survey of corporate governance, *Journal of Finance* 52, 737–783.

Shumway, Tyler, 2001, Forecasting bankruptcy more accurately: A simple hazard model, *Journal of Business* 74, 101–124.

Stein, Luke CD, and Elizabeth Stone, 2013, The effect of uncertainty on investment, hiring, and R&D: Causal evidence from equity options .

Subrahmanyam, Avanidhar, and Sheridan Titman, 1999, The going-public decision and the development of financial markets, *Journal of Finance* 54, 1045–1082.

Thomsen, Steen, and Frederik Vinten, 2014, Delistings and the costs of governance: a study of european stock exchanges 1996–2004, *Journal of Management & Governance* 18, 793–833.

Zingales, Luigi, 1995, Insider ownership and the decision to go public, *Review of Economic Studies* 62, 425–448.

Appendix A. Variable Definition

Δ ***Volatility*** is the change in annualized stock return volatility $(\sigma_{i,t} - \sigma_{i,t-1})/(\frac{1}{2}\sigma_{i,t} + \frac{1}{2}\sigma_{i,t-1})$ for firm i at a given year t.

Analyst Coverage is the number of analysts following the company.

Asset Redeployability is the value weighted asset redeployability index from Kim and Kung (2017).

Dual Class is an indicator variable which equals to one if the firm has dual class structure.

Financial Distress is an indicator variable which equals to one if the Altman Z-score if lower than 1.8. Altman Z-Score = 1.2*(working capital / total assets) + 1.4*(retained earnings / total assets) + 3.3*(earnings before interest and tax / total assets) + 0.6*(market value of equity / total liabilities) + 1.0*(sales / total assets)

GDP Growth is the percent change of gross domestic product from FRED.

Institutional Ownership is the percentage ownership by institutional blockholders from SEC 13F holdings.

Intangible Assets is total intangible assets divided by total assets from Compustat.

Leverage is total long term debt divided by total assets from Compustat.

Loan to Bond Ratio is the ratio of bank loans to corporate bonds from Capital IQ.

Log ERC is the log of earnings response coefficient. Earnings response coefficient is estimated as the coefficient of regressing size-adjusted CAR around the three day window of the earning announcement on unexpected earnings. Unexpected earning is the actual earning per share minus the median earning forecast from I/B/E/S database. ERC is estimated at SIC 3-digit industry level.

Log Relative Tobin's Q is the log of firm Tobin's Q divided by industry Tobin's Q, which is the size-weighted average of Tobin's Q for each 3-digit SIC industry.

Log Sales is the log of sales from Compustat.

VIX is the CBOE volatility index from Bloomberg.

Recession is the recession indicators defined by NBER.

Return on Assets is net income divided by total assets from Compustat.

Sentiment is the investor sentiment sf1 measure from Baker and Wurgler (2006).

Stock Return is the compounded return within a fiscal year, using CRSP daily dividend cumulative stock returns.

Tax Ratio is (federal income taxes + foreign income taxes - total interest and related expense + state income tax)/ market capitalization from Crsp/Compustat Merged Database.

Term Premium is the yield spread between 10 years and 1 year Treasury bond.

Tobin's Q is (stock price * common shares used to calculate earnings per share + preferred

stock/liquidating value + total long term debt + total debt in current liabilities - deferred taxes and investment tax credit) divided by total assets at the beginning of the fiscal year from Compustat.

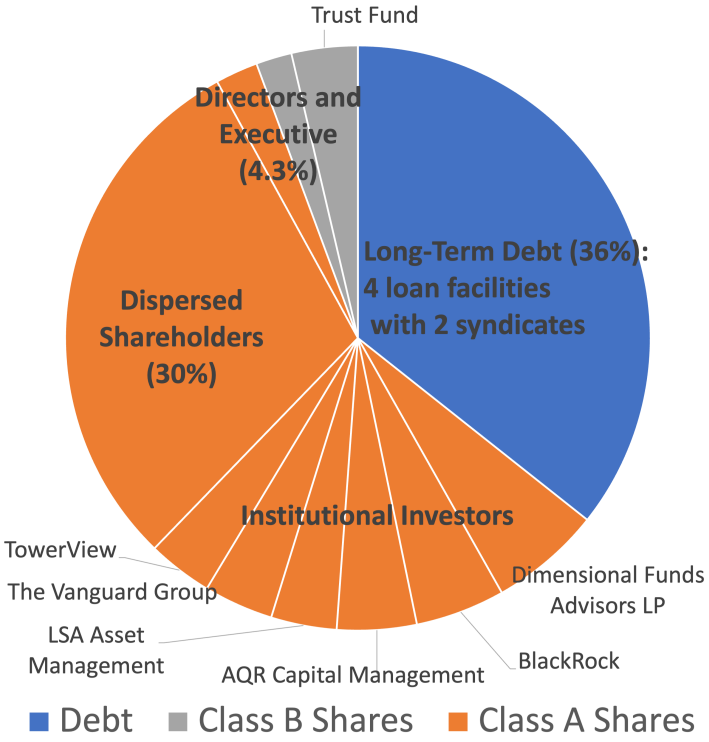
VIX is the CBOE volatility index from Bloomberg.

Volatility is the standard deviation of daily dividend cumulative stock returns (from CRSP) within a fiscal year, multiplied by $\sqrt{252}$.

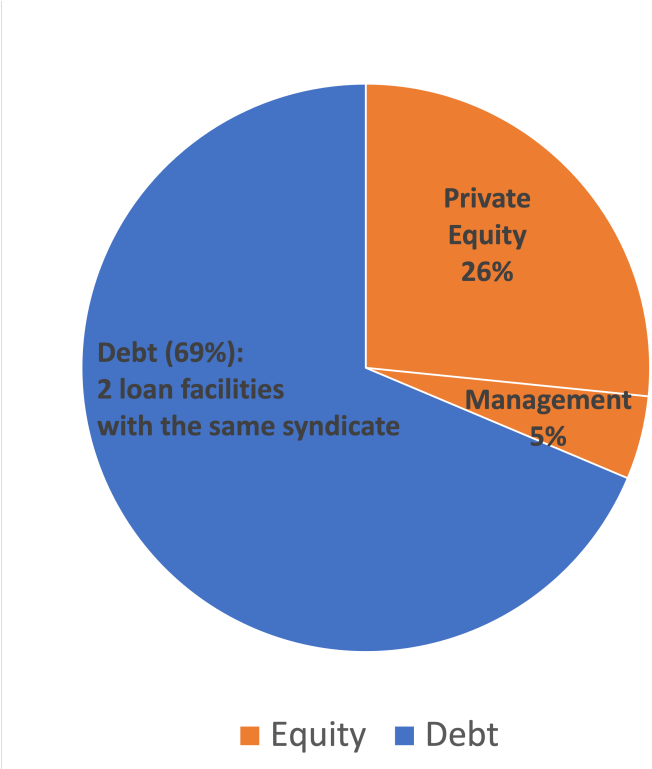
Figure 1. Capital structure before v.s. after going private

The figure compares capital structures of the company before and after going private. Panel A and Panel B illustrate the capital structures of American Greetings Corp. before and after it went private in 2013. Panel C illustrates the average post-delisting capital structure of the going private firms.

Panel A. Capital structure of American Greetings Corp. on Dec 31, 2012



Panel B. Capital structure of American Greetings Corp. after going private



Panel C. Capital structure of the average company after going private

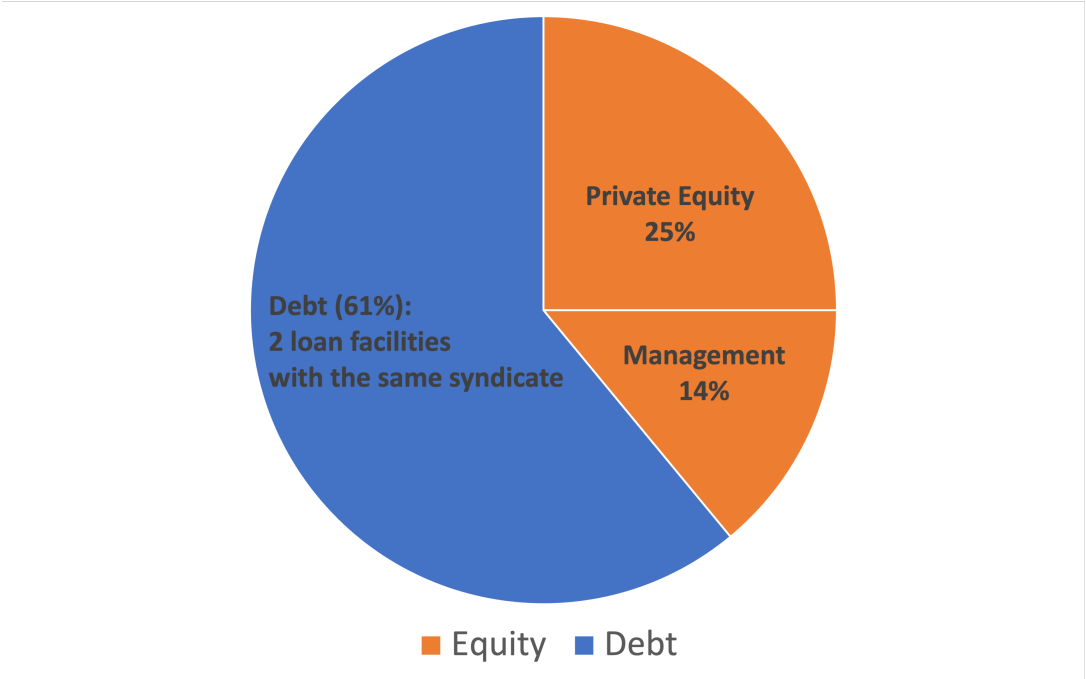


Figure 2. Differences in loan rates between going private firms and control firms

The figure illustrates the differences in loan rates between going private firms and matched control firms that remain public, in the pre-delisting period and the post-delisting period. The control firms are selected based on a propensity score matching on firm size, stock return, and stock return volatility of the year before a firm goes private.

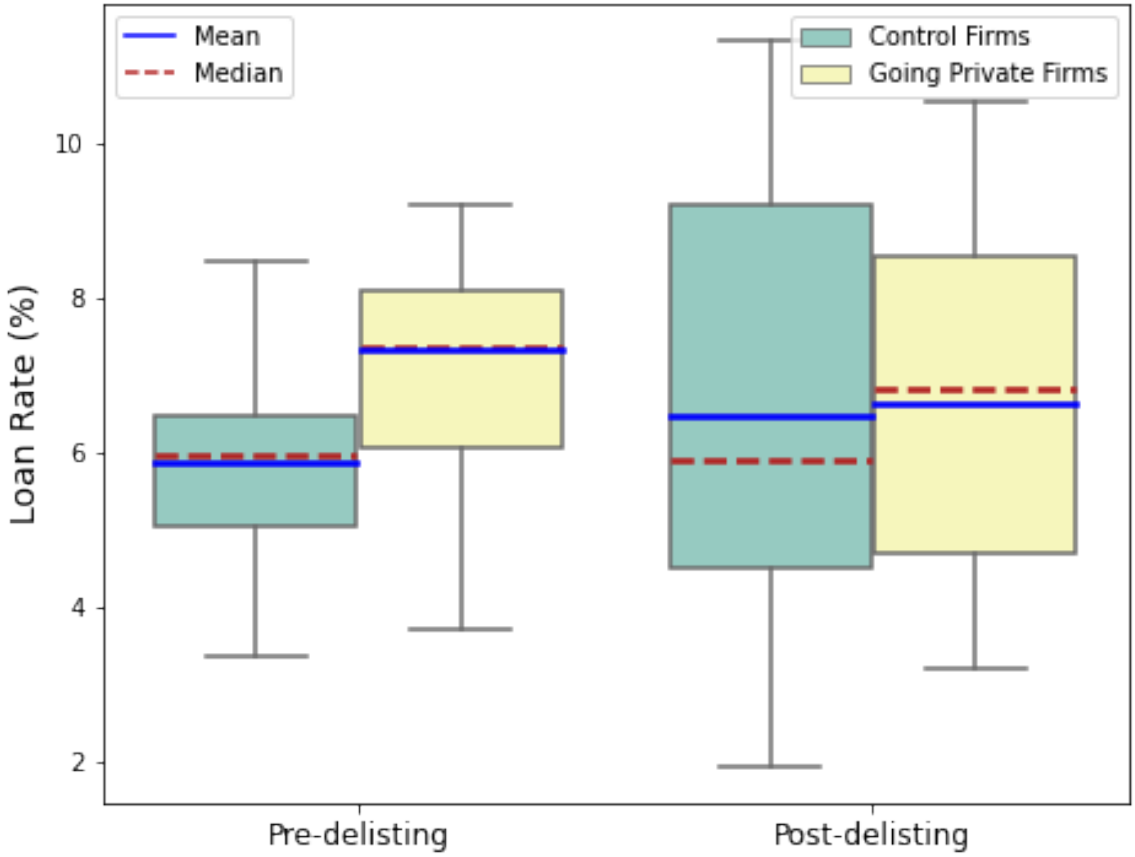


Table 1. Descriptive Statistics

Panel A. Comparison of firm characteristics between going private firms and the firms that remain public

This table compares going private firms with a control sample of surviving firms over the period of 1994-2017. The going private sample is the firms that filed for a Schedule 13E-3 (the going private statement) and delisted within two years after the filing. The control sample constitutes the firms that remain public at the end of 2017. Companies from financial and utility industries are excluded from the sample. The summary statistics summarize firm characteristics over the entire public life cycle. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Going Private Firms		Control Firms		
	Mean	SD	Mean	SD	Difference
Stock return variables					
ΔVolatility	0.001	0.284	-0.005	0.267	0.006
Volatility	0.616	0.435	0.476	0.353	0.140***
Stock Return	0.120	0.634	0.178	0.614	-0.058***
Control variables					
Log Sales	4.777	1.792	5.946	2.341	-1.168***
Tobin's Q	1.537	1.848	2.101	2.494	-0.563***
Leverage	0.201	0.199	0.174	0.181	0.028***
Intangible Assets	0.114	0.158	0.140	0.177	-0.026***
Return on Assets	-0.014	0.197	-0.013	0.238	-0.001
Tax Ratio	0.024	0.042	0.021	0.031	0.003***
Other firm characteristics					
Dual Class	0.026	0.160	0.033	0.179	-0.007**
Institutional Ownership	0.113	0.140	0.173	0.144	-0.059***
Asset Redeployability	0.421	0.102	0.402	0.101	0.018***
Financial Distress	0.408	0.492	0.263	0.440	0.145***
Loan to Bond Ratio	0.581	0.415	0.461	0.425	0.121***
Log Relative Tobin's Q	-0.109	0.871	0.088	0.795	-0.197***
Log ERC	-0.328	1.688	-0.264	1.865	-0.065*
Analyst Coverage	5.109	5.166	8.711	7.450	-3.602***
No. of Firms	525		2,659		3,184
Firm-year Observations	4,915		43,145		48,060

Panel B. Summary statistics of going private transactions

The table reports summary statistics of the going private transactions. The sample includes a subsample of going private transactions for firms with debt outstanding before delisting, and with available information in the going private filings (13E-3, DEF13E-3, PRE13E-3 and Schedule TO). Variables are defined in Appendix A.

	Mean	SD	P10	P50	P90	Obs.
Deal characteristics						
Deal Value ($MM)	544.6	767.8	77.7	188	1500	84
Premium (%)	34.5	14.9	19.2	32.1	68	84
Post-delisting equity structure						
Management Ownership	0.35	0.33	0.08	0.20	1	84
Private Equity Ownership	0.64	0.33	0	0.78	0.90	84
Other Existing Shareholder Ownership	0.01	0.04	0	0	0.06	84
Source of deal financing						
Leverage	0.61	0.20	0.31	0.66	0.81	84
Bank Loan/Total Debt	0.84	0.25	0.43	1	1	84
Corporate Bond/Total Debt	0.16	0.25	0	0	0.57	84
Private Equity/Total Equity	0.63	0.37	0	0.75	1	84
Equity by Management/Total Equity	0.21	0.31	0	0.06	0.95	84

Table 2. Uncertainty shocks and going private transactions

This table reports results of the Cox proportional hazards models for time to go private, estimated using Equation (1). The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of 2017. Columns (1) and (2) report estimates from the Cox proportional hazards models, assuming that ΔVolatility is exogenous. Columns (3)-(6) present control function estimates of the Cox proportional hazard models treating ΔVolatility as endogenous. Standard errors (in parentheses) are clustered at SIC 3-digit level. Columns (3)-(6) report bootstrapped standard errors with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model		Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)	(5)	(6)
ΔVolatility$_{i,t\text{-}1}$	0.41***	0.40**	1.79***	1.80***	1.55***	1.34***
	(0.15)	(0.20)	(0.17)	(0.24)	(0.23)	(0.28)
Volatility$_{i,t\text{-}2}$	0.93***	0.75***	1.33***	1.28***	1.11***	0.82***
	(0.09)	(0.14)	(0.11)	(0.19)	(0.20)	(0.23)
Stock Return$_{i,t\text{-}1}$	-0.54***	-0.33***	-0.44***	-0.37***	-0.41***	-0.44***
	(0.07)	(0.09)	(0.08)	(0.09)	(0.10)	(0.11)
Log Sales$_{i,t\text{-}1}$		-0.15***		-0.10**	-0.15***	-0.17***
		(0.04)		(0.04)	(0.04)	(0.04)
Tobin's Q$_{i,t\text{-}1}$		-0.23***		-0.17*	-0.12*	-0.15**
		(0.08)		(0.09)	(0.07)	(0.07)
Leverage$_{i,t\text{-}1}$		0.61**		0.34	0.16	0.26
		(0.30)		(0.68)	(0.42)	(0.40)
Intangible Assets$_{i,t\text{-}1}$		0.87***		0.44	0.31	0.44
		(0.30)		(0.62)	(0.56)	(0.58)
Return on Assets$_{i,t\text{-}1}$		0.71**		0.91**	0.54**	0.51**
		(0.32)		(0.39)	(0.26)	(0.24)
Tax$_{i,t\text{-}1}$		0.11		3.35	3.07	2.91
		(1.77)		(2.36)	(2.27)	(2.42)
1st Moment 10 IV$_{i,t-1}$	No	No	No	Yes	Yes	Yes
Industry FE	No	No	No	No	Yes	Yes
Year FE	No	No	No	No	No	Yes
Firm-year Observations	48,060	36,452	33,711	26,034	26,034	26,034
No. of Firms	3,184	2,893	2,996	2,620	2,620	2,620
No. of Going Private Firms	525	378	356	252	252	252
Wald χ^2	171.0***	132.7***	133.4***	166.6***	364.6***	2207.8***

Table 3. Uncertainty shocks and going private transactions: Matching analysis on IPO and pre-delisting characteristics

Panel A. At IPO comparison

This table compares firm characteristics between the going private firms and the control firms two years after IPO. The going private sample is the firms that filed for a Schedule 13E-3 (the going private statement) and delisted within two years after the filing. The control sample is constructed with propensity score matching on firm characteristics (Fama-French 12 industry, log sales, Tobin's Q, and stock return) one year after IPO and three years before going private. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Going Private Firms		Matched Control Firms		
	Mean	SD	Mean	SD	Difference
Stock return variables					
ΔVolatility	0.023	0.299	0.006	0.268	0.017
Volatility	0.699	0.487	0.605	0.403	0.094
Stock Return	0.121	0.723	0.185	0.747	-0.064
Control variables					
Log Sales	4.305	1.908	4.417	1.779	-0.112
Tobin's Q	2.557	2.981	2.715	3.420	-0.159
Leverage	0.182	0.201	0.176	0.189	0.006
Intangible Assets	0.095	0.138	0.096	0.161	-0.001
Return on Assets	-0.058	0.288	0.000	0.190	-0.058
Tax Ratio	0.015	0.028	0.022	0.033	-0.006
Other firm characteristics					
Dual Class	0.067	0.251	0.078	0.269	-0.011
Institutional Ownership	0.097	0.126	0.100	0.124	-0.003
Asset Redeployability	0.422	0.107	0.424	0.112	-0.002
Financial Distress	0.455	0.501	0.363	0.482	0.092
Loan to Bond Ratio	0.614	0.358	0.644	0.401	-0.030
Log Relative Tobin's Q	0.225	0.959	0.279	0.923	-0.054
Log ERC	-0.958	1.769	-0.277	1.765	-0.681**
Analyst Coverage	4.087	3.221	4.208	3.203	-0.121
No. of Firms	105		410		515

Pane B. Pre-delisting comparison

This table compares firm characteristics between the going private firms and the control firms one year before delisting. The going private sample is the firms that filed for a Schedule 13E-3 (the going private statement) and delisted within two years after the filing. The control sample is constructed with propensity score matching on firm characteristics (Fama-French 12 industry, log sales, Tobin's Q, and stock return) one year after IPO and three years before going private. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Going Private Firms		Matched Control Firms		
	Mean	SD	Mean	SD	Difference
Stock return variables					
ΔVolatility	0.002	0.308	0.001	0.268	0.002
Volatility	0.588	0.428	0.554	0.393	0.033
Stock Return	-0.062	0.447	0.196	0.680	-0.258***
Control variables					
Log Sales	5.315	1.735	5.526	1.757	-0.210
Tobin's Q	1.380	1.603	1.778	2.024	-0.398*
Leverage	0.197	0.218	0.195	0.193	0.002
Intangible Assets	0.142	0.178	0.134	0.184	0.008
Return on Assets	-0.041	0.273	0.010	0.172	-0.050
Tax Ratio	0.020	0.042	0.022	0.033	-0.002
Other firm characteristics					
Dual Class	0.069	0.255	0.082	0.275	-0.013
Institutional Ownership	0.139	0.142	0.174	0.141	-0.035*
Asset Redeployability	0.415	0.105	0.415	0.112	-0.000
Financial Distress	0.347	0.478	0.246	0.431	0.100
Loan to Bond Ratio	0.598	0.396	0.596	0.409	0.003
Log Relative Tobin's Q	-0.227	0.795	-0.073	0.865	-0.154
Log ERC	-0.098	1.701	-0.232	1.686	0.134
Analyst Coverage	4.875	5.395	6.174	5.601	-1.298
No. of Firms	105		410		515

Panel C. Cox proportional hazards models for time to go private

This table reports results of the Cox proportional hazards models for time to go private, estimated using Equation (1). The sample includes going-private firms over the period of 1994-2017 and control firms that matched on firm characteristics both one year after IPO and three years before delisting. The dependent variable is the hazard rate of going private. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. The control samples in columns (1)-(3) are matched on SIC 2-digit industry, log sales, and Tobin's Q respectively. The control sample in column (4) is constructed with propensity score matching on Fama-French 12 industry, log sales, Tobin's Q, and stock return. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function			
	SIC2	Log Sales	Tobin's Q	P-score
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	2.28***	1.90***	2.92***	2.35***
	(0.43)	(0.54)	(0.93)	(0.39)
Volatility$_{i,t\text{-}2}$	1.39***	1.07**	1.42*	1.06***
	(0.38)	(0.46)	(0.73)	(0.41)
Stock Return$_{i,t\text{-}1}$	-0.42***	-0.62***	-0.24	-0.66***
	(0.16)	(0.21)	(0.40)	(0.21)
Log Sales$_{i,t\text{-}1}$	-0.12**	-0.11	-0.02	-0.12
	(0.06)	(0.09)	(0.15)	(0.08)
Tobin's Q$_{i,t\text{-}1}$	-0.16	-0.27	-0.06	-0.14
	(0.11)	(0.17)	(0.23)	(0.15)
Tax$_{i,t\text{-}1}$	2.96	1.19	6.50	3.39
	(3.50)	(3.45)	(6.68)	(3.73)
Leverage$_{i,t\text{-}1}$	0.33	0.66	0.90	0.07
	(0.52)	(0.73)	(1.22)	(0.59)
Return on Assets$_{i,t\text{-}1}$	0.51	0.30	-0.37	0.15
	(0.40)	(0.62)	(0.98)	(0.57)
Intangible Assets$_{i,t\text{-}1}$	-0.21	-0.13	-0.72	0.43
	(0.72)	(0.76)	(1.60)	(0.67)
Control Variables	Yes	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	Yes	Yes	Yes	Yes
Indystry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm-year Observations	13,774	8,353	2,163	6,055
No. of Firms	1,132	716	202	515
No. of Going Private Firms	140	105	50	105
Wald χ^2	2542.7***	1488.6***	96743.8***	99444.8***

Table 4. Shareholder conflicts and going private transactions

The table presents evidence of the economic mechanism, focusing on shareholder conflicts of the firms. Results are estimated using Cox proportional hazards models with control functions. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. Dual class is an indicator variable which equals to one if a firm has dual class shares in the year before going private. Inst. Ownership is the percentage ownership by institutional blockholders. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

Panel A. Dual class shares status and going private transactions

	Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	1.74***	1.60***	1.31***	1.04***
	(0.18)	(0.25)	(0.24)	(0.29)
ΔVolatility$_{i,t\text{-}1}$ × Dual Class$_{i,t\text{-}1}$	2.46***	5.50***	6.26***	6.90***
	(0.56)	(0.96)	(0.97)	(0.96)
Dual Class$_{i,t\text{-}1}$	0.58**	0.34	0.14	0.09
	(0.28)	(0.41)	(0.40)	(0.40)
Volatility$_{i,t\text{-}2}$	1.35***	1.26***	1.08***	0.77***
	(0.09)	(0.19)	(0.20)	(0.23)
Stock Return$_{i,t\text{-}1}$	-0.43***	-0.36***	-0.41***	-0.45***
	(0.07)	(0.09)	(0.10)	(0.16)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	33,711	26,034	26,034	26,034
No. of Firms	2,996	2,620	2,620	2,620
No. of Going Private Firms	356	252	252	252
Wald χ^2	143.9***	176.7***	377.9***	2325.5***

Panel B. Institutional blockholders and going private transactions

	Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	2.57***	1.97***	1.82***	1.40***
	(0.26)	(0.35)	(0.33)	(0.36)
ΔVolatility$_{i,t\text{-}1}$ × Inst. Ownership$_{i,t\text{-}1}$	-2.75**	-4.64**	-4.79***	-5.03***
	(1.27)	(1.86)	(1.83)	(1.78)
Inst. Ownership$_{i,t\text{-}1}$	-1.88***	-2.61***	-2.37***	-1.97***
	(0.44)	(0.65)	(0.66)	(0.64)
Volatility$_{i,t\text{-}2}$	1.57***	1.09***	1.00***	0.60***
	(0.12)	(0.21)	(0.20)	(0.22)
Stock Return$_{i,t\text{-}1}$	-0.52***	-0.54***	-0.56***	-0.57***
	(0.09)	(0.12)	(0.12)	(0.13)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	22,982	16,581	16,581	16,581
No. of Firms	2,382	2,000	2,000	2,000
No. of Going Private Firms	301	197	197	197
Wald χ^2	169.6***	215.2***	385.7***	4905.5***

Table 5. Shareholder-creditor conflicts and going private transactions

The table presents evidence of the economic mechanism, focusing on shareholder-creditor conflicts of the firms. Results are estimated using Cox proportional hazards models with the control function approach. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. Asset redeployability is minus one times the asset redeployability index from Kim and Kung (2017). Financial distress is an indicator variable if the Altman Z-score is lower than 1.8. Loan to bond ratio is the ratio of outstanding bank loans to corporate bonds. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

Panel A. Asset redeployability and going private transactions

	Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	1.43***	1.37***	1.12**	0.77
	(0.43)	(0.49)	(0.50)	(0.83)
ΔVolatility$_{i,t\text{-}1}$ × Asset Redeployability$_{i,t\text{-}1}$	0.97	1.69**	1.50**	1.45**
	(0.66)	(0.76)	(0.66)	(0.74)
Asset Redeployability$_{i,t\text{-}1}$	-0.16*	-0.17	-0.06	-0.05
	(0.09)	(0.10)	(0.10)	(0.10)
Volatility$_{i,t\text{-}2}$	1.20***	1.23***	1.07***	0.76*
	(0.23)	(0.29)	(0.29)	(0.42)
Stock Return$_{i,t\text{-}1}$	-0.49***	-0.45***	-0.48***	-0.51***
	(0.09)	(0.13)	(0.13)	(0.14)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	30,892	21,705	21,705	21,705
No. of Firms	2,640	2,264	2,264	2,264
No. of Going Private Firms	333	214	214	214
Wald χ^2	127.9***	146.8***	315.6***	3507.7***

Panel B. Financial distress and going private transactions

	Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	1.41***	1.34***	1.06***	0.78**
	(0.27)	(0.33)	(0.33)	(0.36)
ΔVolatility$_{i,t\text{-}1}$ × Financial Distress$_{i,t\text{-}1}$	0.58*	0.89**	0.89**	0.79
	(0.34)	(0.44)	(0.44)	(0.49)
Financial Distress$_{i,t\text{-}1}$	0.07	0.10	0.12	0.31
	(0.15)	(0.20)	(0.20)	(0.20)
Volatility$_{i,t\text{-}2}$	1.28***	1.25***	1.07***	0.72***
	(0.10)	(0.19)	(0.21)	(0.23)
Stock Return$_{i,t\text{-}1}$	-0.42***	-0.35***	-0.40***	-0.43***
	(0.07)	(0.09)	(0.10)	(0.11)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	32,867	25,522	25,522	25,522
No. of Firms	2,990	2,615	2,615	2,615
No. of Going Private Firms	355	252	252	252
Wald χ^2	133.2***	174.5***	411.8***	2870.3***

Panel C. Bank loans, corporate bonds and going private transactions

	Cox Proportional Hazards Model with Control Function			
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	3.49**	3.02**	3.05**	4.19**
	(1.47)	(1.49)	(1.51)	(1.83)
ΔVolatility$_{i,t\text{-}1}$ × Loan to Bond Ratio$_{i,t\text{-}1}$	-4.19*	-4.28*	-4.28*	-5.12**
	(2.48)	(2.45)	(2.44)	(2.57)
Loan to Bond Ratio$_{i,t\text{-}1}$	0.23	0.20	0.10	0.27
	(0.21)	(0.28)	(0.26)	(0.25)
Volatility$_{i,t\text{-}2}$	1.00***	0.36	0.35	0.59
	(0.33)	(0.49)	(0.52)	(0.71)
Stock Return$_{i,t\text{-}1}$	-0.37***	-0.36*	-0.41*	-0.44*
	(0.14)	(0.22)	(0.23)	(0.23)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	14,404	11,750	11,750	11,750
No. of Firms	1,984	1,746	1,746	1,746
No. of Going Private Firms	134	96	96	96
Wald χ^2	48.6***	103.4***	664.1***	2687.6***

Table 6. Bank loan rates of the going-private firms

The table compares loan rates of the going-private firms in the pre- and post-delisting periods. Panel A reports summary statistics of the going private firms and a matched sample of firms that remain public. Panel B compares the loan rates between the going private firms and control firms in the pre-delisting and post-delisting periods. Panel C reports results of the difference-in-differences analyses studying the impacts of going private on loan rate. The dependent variable is the loan rate. GP is a dummy variable which equals 1 if the firm goes private. Post is a dummy variable that equals one if the loan starts after the firm delists (or a matched loan for the control firm). All columns include year fixed effects. Columns (2)-(4) include matched pair fixed effects. The standard errors are in parentheses. The standard errors in Panel C are clustered at firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

Panel A. Summary statistics

	Going Private Firms (GP)	Control Firms	Difference
Stock Return Volatility	0.64	0.58	0.06
	(0.13)	(0.08)	(0.14)
Stock Return	-0.26	-0.14	-0.12
	(0.13)	(0.10)	(0.17)
Total Assets ($B)	3.30	2.36	0.94
	(1.96)	(0.55)	(1.60)

Panel B. Loan rate comparisons

	Pre-delisting			Post-delisting		
	GP	Control	Difference	GP	Control	Difference
Loan Rate	7.34	5.89	1.46*	6.66	6.50	0.16
	(0.98)	(0.35)	(0.85)	(0.66)	(0.54)	(0.89)
Loan Rate Residual	1.44	-0.31	1.75**	-0.01	-0.16	0.15
with Year FE	(0.79)	(0.38)	(0.76)	(0.37)	(0.31)	(0.51)
Loan Rate Residual	1.40	-0.12	1.52**	-0.23	-0.23	0.00
with Year & Matched Pair FE	(0.64)	(0.32)	(0.64)	(0.19)	(0.31)	(0.46)

Panel C. Impact of going private on the loan rate

	(1)	(2)	(3)	(4)
GP = 1 × Post = 1	-2.13*	-2.46**	-2.72**	-2.30*
	(1.10)	(1.01)	(1.13)	(1.19)
GP = 1	2.19***	1.72**	1.52**	1.28*
	(0.71)	(0.66)	(0.65)	(0.68)
Post = 1	0.39	-0.98	-1.10	-0.65
	(0.71)	(0.95)	(1.05)	(1.13)
Term Loan			0.88	0.93
			(0.68)	(0.68)
Secured Loan			1.09*	1.00
			(0.59)	(0.59)
Loan Maturity			0.04	0.03
			(0.19)	(0.19)
Log Loan Amount				-0.33
				(0.30)
Year FE	Yes	Yes	Yes	Yes
Matched Pair FE	No	Yes	Yes	Yes
Adjusted R^2	0.39	0.53	0.56	0.56
Observations	70	70	68	68

Table 7. Alternative explanations

The table reports results investigating the alternative hypotheses. Columns (1) and (2) examine the undervaluation hypothesis. Columns (3) and (4) examine the market distraction hypothesis. Columns (5) and (6) examine the information production hypothesis. Results are estimated using Cox proportional hazards models with control functions. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. Relative Tobin's Q is the log of firm Tobin's Q relative to the industry average. Log ERC is the log of earnings response coefficient. Analyst coverage is the number of analysts following the company. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function					
	Undervaluation		Market Distraction		Cost of Info. Production	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔVolatility$_{i,t\text{-}1}$	1.22***	1.29***	1.41***	1.35***	1.27***	1.15**
	(0.28)	(0.30)	(0.28)	(0.28)	(0.36)	(0.52)
Relative Tobin's Q$_{i,t\text{-}1}$	-0.36**	-0.36**				
	(0.15)	(0.15)				
ΔVolatility$_{i,t\text{-}1}$ × Relative Tobin's Q$_{i,t\text{-}1}$		0.15				
		(0.25)				
Log ERC$_{i,t\text{-}1}$			0.05	0.06		
			(0.07)	(0.07)		
ΔVolatility$_{i,t\text{-}1}$ × Log ERC$_{i,t\text{-}1}$				-0.12		
				(0.16)		
Analyst Coverage$_{i,t\text{-}1}$					-0.09***	-0.09***
					(0.03)	(0.03)
ΔVolatility$_{i,t\text{-}1}$ × Analyst Coverage$_{i,t\text{-}1}$						0.03
						(0.11)
Volatility$_{i,t\text{-}2}$	0.74***	0.74***	0.86***	0.86***	0.65**	0.65**
	(0.24)	(0.24)	(0.25)	(0.28)	(0.32)	(0.33)
Stock Return$_{i,t\text{-}1}$	-0.43***	-0.43***	-0.44***	-0.44***	-0.63***	-0.63***
	(0.10)	(0.10)	(0.12)	(0.12)	(0.14)	(0.15)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Year, Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year Observations	26,034	26,034	22,200	22,200	16,635	16,635
No. of Firms	2,620	2,620	2,580	2,580	1,950	1,950
No. of Going Private Firms	252	252	223	223	144	144
Wald χ^2	2128.9***	2200.8***	2203.2***	2209.4***	2439.2***	2504.8***

Table OA1. Sample description

Panel A. Sample composition by industry

The table reports the industry distribution of the firms that filed for Schedule 13E-3 and delisted within two years after the filing from 1994 to 2017. Firms in financial and utilities industries are excluded from the sample. Industries are based on Fama-French twelve industry classifications from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html.

No.	Description	No. of Going Private Firms	Percentage
1	Consumer Nondurables	77	0.08
2	Consumer Durables	27	0.03
3	Manufacturing	94	0.10
4	Energy	46	0.05
5	Chemicals	15	0.02
6	Business Equipment	190	0.20
7	Telecom	52	0.06
9	Shops	148	0.16
10	Healthcare	53	0.06
12	Other	233	0.25
	Total	935	100.00

Panel B. Sample composition by year

The table reports the time-series distribution of the firms that filed for schedule 13E-3 and delisted within two years after filing from 1994 to 2017. Firms in financial and utilities industries are excluded from the sample. Percentage indicates the number of going private firms in that year out of the total number of going private firms.

Year	No. of Going Private Firms	Percentage
1994	4	0.43
1995	12	1.28
1996	27	2.89
1997	42	4.49
1998	51	5.45
1999	77	8.24
2000	54	5.78
2001	69	7.38
2002	53	5.67
2003	66	7.06
2004	51	5.45
2005	53	5.67
2006	43	4.60
2007	36	3.85
2008	24	2.57
2009	38	4.06
2010	39	4.17
2011	28	2.99
2012	24	2.57
2013	39	4.17
2014	20	2.14
2015	24	2.57
2016	44	4.71
2017	17	1.82
Total	935	100.00

Table OA2. Cox proportional hazards models for time to go private: First stage results

This table reports first stage results of the Cox proportional hazards models for time to go private with control functions. Columns (1)-(4) correspond to the first stage results in Table 2 columns (3)-(6) respectively. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is $\Delta\text{Volatility}_{i,t-1}$. Standard errors (in parentheses) are clustered at SIC 3-digit level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function: First Stage			
	(1)	(2)	(3)	(4)
Δ Vol Exposure $\text{CAD}_{i,t-1}$	1.11***	1.32***	1.30***	1.14***
	(0.38)	(0.37)	(0.38)	(0.35)
Δ Vol Exposure $\text{EUR}_{i,t-1}$	1.84***	1.69***	1.72***	1.56***
	(0.61)	(0.59)	(0.60)	(0.39)
Δ Vol Exposure $\text{JPY}_{i,t-1}$	1.62***	0.99*	1.02*	1.97***
	(0.61)	(0.52)	(0.52)	(0.42)
Δ Vol Exposure $\text{AUD}_{i,t-1}$	4.41***	3.39***	3.22***	2.08***
	(0.89)	(0.90)	(0.90)	(0.47)
Δ Vol Exposure $\text{SEK}_{i,t-1}$	3.53***	4.22***	4.16***	2.94***
	(0.46)	(0.53)	(0.53)	(0.43)
Δ Vol Exposure $\text{CHF}_{i,t-1}$	3.85***	3.51***	3.54***	1.98***
	(0.68)	(0.59)	(0.61)	(0.37)
Δ Vol Exposure $\text{GBP}_{i,t-1}$	-0.05	0.43	0.57	0.86
	(0.89)	(0.95)	(0.96)	(0.62)
Δ Vol Exposure $\text{Oil}_{i,t-1}$	4.28***	3.92***	3.96***	2.70***
	(0.28)	(0.24)	(0.24)	(0.25)
Δ Vol Exposure $\text{Policy}_{i,t-1}$	415.78**	507.70**	532.83**	418.46***
	(176.01)	(207.15)	(208.78)	(152.18)
Δ Vol Exposure $\text{Treasury}_{i,t-1}$	57.65***	61.83***	62.69***	36.88***
	(4.95)	(5.46)	(5.41)	(4.69)
Control Variables	No	Yes	Yes	Yes
1st Moment 10 $\text{IV}_{i,t-1}$	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Firm-year Observations	33,711	26,034	26,034	26,034
F statistic Cragg-Donald	287.4	209.7	210.8	75.5
F statistic Kleibergen-Paap	130.4	102.6	104.3	33.3
p-val Kleib.-P Underidentification Test	0.000	0.000	0.000	0.000
p-val Sargan-H J Overidentification Test	0.412	0.342	0.307	0.495

Table OA3. Uncertainty shocks and going private transactions: Impacts of macroeconomic factors

This table reports results of the Cox proportional hazards models with control functions, controlling for macroeconomic factors. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function				
	(1)	(2)	(3)	(4)	(5)
ΔVolatility$_{i,t\text{-}1}$	1.63***	1.40***	1.82***	1.29***	1.40***
	(0.25)	(0.25)	(0.23)	(0.26)	(0.26)
Volatility$_{i,t\text{-}2}$	1.17***	0.73***	1.04***	0.78***	0.77***
	(0.19)	(0.18)	(0.20)	(0.21)	(0.19)
Stock Return$_{i,t\text{-}1}$	-0.42***	-0.48***	-0.43***	-0.43***	-0.44***
	(0.10)	(0.11)	(0.10)	(0.10)	(0.10)
GDP growth$_{t\text{-}1}$	0.16***				
	(0.05)				
Sentiment$_{t\text{-}1}$		0.36***			
		(0.10)			
Term Premium$_{t\text{-}1}$			-0.23**		
			(0.09)		
VIX$_{t\text{-}1}$				0.02**	
				(0.01)	
Recession$_{t\text{-}1}$					-0.13
					(0.23)
Control Variables	Yes	Yes	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	Yes	Yes	Yes	Yes	Yes
Indystry FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Firm-year Observations	26,034	21,875	25,896	25,300	21,917
No. of Firms	2,620	2,216	2,482	2,466	2,216
No. of Going Private Firms	252	206	222	222	206
Wald χ^2	394.9***	325.0***	332.8***	363.4***	307.1***

Table OA4. Cox proportional hazards models for time to go private: Instruments with alternative risk models

Panel A. First stage results

This table reports first stage results of the Cox proportional hazards models for time to go private with control functions, with the instruments constructed using alternative risk models. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is $\Delta\text{Volatility}_{i,t-1}$. Standard errors (in parentheses) are clustered at SIC 3-digit level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function: First Stage			
	Raw Return	CAPM	FF3F	FF5F
	(1)	(2)	(3)	(4)
Δ Vol Exposure $\text{CAD}_{i,t-1}$	0.78***	0.68***	1.36***	1.37***
	(0.10)	(0.20)	(0.39)	(0.37)
Δ Vol Exposure $\text{EUR}_{i,t-1}$	1.77**	1.16***	1.59***	1.69***
	(0.69)	(0.33)	(0.31)	(0.39)
Δ Vol Exposure $\text{JPY}_{i,t-1}$	1.19***	1.37***	1.60***	1.86***
	(0.42)	(0.27)	(0.47)	(0.42)
Δ Vol Exposure $\text{AUD}_{i,t-1}$	-0.07	1.76***	1.83***	1.96***
	(0.17)	(0.42)	(0.38)	(0.39)
Δ Vol Exposure $\text{SEK}_{i,t-1}$	-0.44**	1.99***	2.53***	2.84***
	(0.17)	(0.35)	(0.43)	(0.41)
Δ Vol Exposure $\text{CHF}_{i,t-1}$	0.88***	1.94***	1.45***	1.70***
	(0.15)	(0.30)	(0.35)	(0.32)
Δ Vol Exposure $\text{GBP}_{i,t-1}$	1.32	0.79	1.54***	1.25*
	(1.48)	(0.75)	(0.56)	(0.69)
Δ Vol Exposure $\text{Oil}_{i,t-1}$	3.23***	2.29***	2.39***	2.58***
	(0.58)	(0.20)	(0.24)	(0.26)
Δ Vol Exposure $\text{Policy}_{i,t-1}$	1142.33***	473.89*	421.46**	617.05***
	(359.57)	(269.49)	(183.15)	(165.06)
Δ Vol Exposure $\text{Treasury}_{i,t-1}$	12.24***	29.62***	37.15***	33.86***
	(1.65)	(2.12)	(3.95)	(4.81)
Control variables	Yes	Yes	Yes	Yes
1st Moment 10 $\text{IV}_{i,t-1}$	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm-year Observations	25,814	25,214	25,173	25,300
F statistic Cragg-Donald	72.9	85.8	72.6	73.5
F statistic Kleibergen-Paap	35.9	57.2	44.1	37.5
p-val Kleib.-P Underidentification Test	0.000	0.000	0.000	0.000
p-val Sargan-H J Overidentification Test	0.791	0.386	0.328	0.307

Panel B. Cox proportional hazards models with control functions

This table reports results of the Cox proportional hazards models for time to go private, with the instruments constructed using alternative risk models. The sample includes going-private firms over the period of 1994-2017 and a group of control firms that remain public. The dependent variable is the hazard rate of going private. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function			
	Raw Return	CAPM	FF3F	FF5F
	(1)	(2)	(3)	(4)
ΔVolatility$_{i,t\text{-}1}$	1.07***	1.06***	0.93***	1.13***
	(0.27)	(0.25)	(0.26)	(0.24)
Volatility$_{i,t\text{-}2}$	0.68***	0.73***	0.68***	0.71***
	(0.22)	(0.20)	(0.19)	(0.21)
Stock Return$_{i,t\text{-}1}$	-0.45***	-0.48***	-0.48***	-0.45***
	(0.11)	(0.11)	(0.11)	(0.10)
Control Variables	Yes	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	Yes	Yes	Yes	Yes
Indystry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm-year Observations	25,814	25,214	25,173	25,300
No. of Firms	2,650	2,635	2,609	2,600
No. of Going Private Firms	258	248	245	246
Wald χ^2	2165.9***	3354.3***	3228.7***	2750.9***

Table OA5. Cox proportional hazards models for time to go private: Matching analysis on IPO characteristics

This table reports results of the Cox proportional hazards models for time to go private, estimated using Equation (1). The sample includes going-private firms over the period of 1994-2017 and control firms that matched on firm characteristics one year after IPO. The dependent variable is the hazard rate of going private. In the Cox proportional hazards models, the firm-year observations are treated as recurring censored events until the firm goes private or the end of the sample period. The control samples in columns (1)-(4) are matched on SIC 2-digit industry, log sales, Tobin's Q, and stock return respectively. The control sample in column (5) is constructed with propensity score matching on Fama-French 12 industry, log sales, Tobin's Q and stock return. Standard errors (in parentheses) are clustered at SIC 3-digit level and bootstrapped with 300 replications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Variables are defined in Appendix A.

	Cox Proportional Hazards Model with Control Function				
	SIC2	Log Sales	Tobin's Q	Stock Return	P-score
	(1)	(2)	(3)	(4)	(5)
ΔVolatility$_{i,t\text{-}1}$	0.98***	1.14***	1.59***	1.46**	0.75**
	(0.38)	(0.38)	(0.40)	(0.67)	(0.32)
Volatility$_{i,t\text{-}2}$	0.72**	0.71***	0.96***	1.11*	0.46***
	(0.30)	(0.24)	(0.31)	(0.65)	(0.29)
Stock Return$_{i,t\text{-}1}$	-0.41***	-0.49***	-0.48***	-0.55***	-0.58***
	(0.14)	(0.13)	(0.14)	(0.21)	(0.14)
Log Sales$_{i,t\text{-}1}$	-0.10*	-0.19***	-0.13***	-0.13*	-0.04
	(0.06)	(0.06)	(0.05)	(0.08)	(0.05)
Tobin's Q$_{i,t\text{-}1}$	-0.19**	-0.10	-0.22***	0.00	-0.08
	(0.10)	(0.07)	(0.08)	(0.10)	(0.06)
Tax$_{i,t\text{-}1}$	4.45	4.38	3.68	3.80	4.20
	(3.29)	(2.68)	(2.73)	(4.52)	(3.10)
Leverage$_{i,t\text{-}1}$	0.08	0.26	0.10	1.80**	-0.03
	(0.44)	(0.43)	(0.44)	(0.70)	(0.47)
Return on Assets$_{i,t\text{-}1}$	0.60*	0.31	0.84**	0.47	0.25
	(0.35)	(0.28)	(0.36)	(1.11)	(0.32)
Intangible Assets$_{i,t\text{-}1}$	0.19	0.49	0.35	1.07	0.64
	(0.70)	(0.65)	(0.63)	(1.08)	(0.65)
Control Variables	Yes	Yes	Yes	Yes	Yes
1st Moment 10 IV$_{i,t-1}$	Yes	Yes	Yes	Yes	Yes
Indystry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm-year Observations	13,151	17,127	17,993	6,149	10,132
No. of Firms	1,271	1,715	1,651	536	958
No. of Going Private Firms	171	198	174	71	171
Wald χ^2	6436.2***	1325.3***	4030.8***	88220.3***	136504.5***