Fire-Sale Acquisitions and Intra-Industry Contagion

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Abstract

This paper investigates how the combined effects of target firm- and industry-level distress affect acquisition outcomes through the fire-sale channel. I show that distressed targets are sold at discounts when the target industry is in distress. Consistent with the Shleifer and Vishny model, the fire-sale effects cause distressed targets to be sold to industry outsiders and acquirers to gain higher return by exploiting target's weakened bargaining power. I further demonstrate the fire-sale effects in acquisitions by showing that these findings are stronger for targets with acquirers that are in different industries or where targets have high industry asset-specificity: high capital-specificity, strong labor union, or high R&D intensity. The results are robust to controlling for the effect of stock market undervaluation and economic recession. I then examine the contagion effects of fire-sale acquisitions on target rivals in the same industry. I find that rivals earn -0.9% abnormal returns at the announcement due to negative information from fire-sale acquisitions. Overall, the results show that the fire-sale discount in distressed target acquisitions is an important determinant of financial distress costs of a firm and contributes to industry-specific contagion of economic shocks.

Keywords: Mergers and acquisition, Fire-sale, Contagion, Financial distress, Asset-specificity

JEL Classification: G30, G34, C70

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1 Introduction

A fire-sale amplifies economic shocks and causes their effects to become systemic (Shleifer and Vishny (2011)). Many papers document the existence of fire-sale discounts in real asset transactions (i.e., Pulvino (1998), and Campbell et al. (2011)), but less academic attention has been paid to fire-sale acquisitions. Yet acquisitions, which differ in a number of important ways from asset markets, account for two-thirds of asset reallocation.[1] Despite the importance of fire-sale effects in distressed target acquisitions, evidence of these effects in the literature is limited. The goal of this paper is therefore to examine fire-sale effects in distressed target acquisitions by identifying the detailed channel of the discount and the intra-industry contagion effects to which it gives rise.

A fire-sale is an urgent sale of assets in an illiquid market at a discount. The essential condition for a forced sale is a seller's financial constraint. Firms that face a severe liquidity constraint may be forced to sell some or all of their assets to avoid bankruptcy. Thus, distressed acquisitions play an important role as a restructuring mechanism. In an imperfect world, however, negative economic shocks can cause asset prices to fall below their fair market values. Shleifer and Vishny (1992) posit a situation in which industry insiders with higher valuation on a distressed firm's assets are financially constrained and sidelined due to financial frictions, while an industry outsider with high liquidity and a lower valuation can acquire assets at a lower bid. This model implies that demand-side frictions in an illiquid market create additional costs in urgent asset sales.

Empirically, calculating the fair market value of distressed targets in an illiquid market and examining fire-sale discounts in acquisitions are challenging for two reasons. First, a target's offer price reflects both fire-sale effects and the decline of the economic worth of its assets. Second, it is important to consider the creation and division of synergies. To circumvent the first identification problem, I estimate the combined effects of target firm- and industry-level distress on acquirer abnormal returns and offer price after controlling for the determinants of the economic worth of assets. More importantly, I examine the interaction effects of fire-sale and industry-level asset-specificity with which fire-sale effects are expected to be stronger, while a pure decline in economic worth of assets is less associated. Then, I address the second problem by decomposing offer price into synergy and target's bargaining power and analyzing these elements separately to identify the source of discount.

Focusing on acquisitions between public firms that occurred between 1980 and 2010, I identify fire-sale acquisitions where both target industries and the targets themselves

[1] See Figure 1.

were distressed at the time. I find that acquirers in fire-sale acquisitions earn positive cumulative announcement returns of 0.91% over the -1 to +1 day window and outperform other acquirers by 1.93 percentage points. I further confirm this result using buy-and-hold abnormal returns (BHARs) during the two years following the acquisitions and a multivariate analysis after controlling for other factors. This directly supports fire-sale discounts in acquisitions because acquirers' return should be unaffected by target firm- and industry-level distress if acquirers pay the fair market value of a target.

I then analyze the source of this discount by examining the interaction effect of a target firm- and industry-level distress, separately, on offer price, synergy, and target's bargaining power. I find that a distressed target in a distressed industry, or fire-sale target, is acquired at a 14% discount compared to distressed targets in non-distressed industries. More specifically, the channel of fire-sale proposed by Shleifer and Vishny model implies that fire-sales are inefficient and exhibit lower synergy. In testing this, I also consider whether target firm- and industry-level distress negatively affects a target's bargaining power, thereby inducing a fire-sale discount that results in greater gains to buyers. I find that while the target's bargaining power, measured as the difference in announcement returns between target and acquirer, is substantially weakened, synergy is insignificantly affected, by the interaction effect of firm- and industry-level distress. These results suggest that observable fire-sale discounts are caused largely by wealth transfer to acquirers.

Next, I investigate whether target firm- and industry-level distress affect a buyer's identity and whether they drive stronger fire-sale effects if acquirers are outside the industry. The results show that industry-wide distress increases the likelihood of targets being sold to industry outsiders by 20 percentage points and the fire-sale effects on acquirer abnormal returns, offer price, and target's bargaining power are even stronger if targets are sold to acquirers outside an industry. Particularly, I also find a significant decrease in total synergy gain conditional on industry outside acquirers, which implies a deadweight loss from inefficient fire-sales.

To further demonstrate that the findings are driven by the fire-sale channel, I examine the interaction effects of combined distress of target firm and industry and high asset-specificity in three dimensions —capital-specificity, labor union, and R&D intensity— in which the fire-sale effects are expected to be stronger. The Shleifer and Vishny model suggests that fire-sale effects are stronger if targets' assets are specialized to their industry and, thus, not easily redeployable to industry outsiders. I show that the fire-sale effects are particularly significant for targets with high industry-specific assets. Specific capital, strong labor unions, and high R&D intensity in target industries strengthen the fire-sale effects by driving up frictions in asset allocation across industries. These findings provide evidence that a significant fire-sale discount exists, in a manner that is consistent with the industry-equilibrium theory of Shleifer and Vishny. Multiple robustness checks also show that the results are not driven by stock market undervaluation or macroeconomic recession effects. Overall, using these multiple complementary approaches, this paper disentangles the fire-sale effects from decline in fundamental value and demonstrates the channel of the fire-sale effects in acquisitions.

Finally, I relate fire-sale acquisitions to target industry rivals' stock returns. The relevant literature highlights contagious effects that economic shocks can transmit through the fire-sale. Fire-sale acquisitions could have a negative information externality by providing lower reference prices to subsequent acquisitions coming to market, or have a negative "out-of-play effect[2]" by reducing potential for an acquisition partner among industry. I find that industry rivals of fire-sale targets experience economically and statistically significant negative abnormal stock returns. The stock price of industry rivals drops upon announcement of fire-sale acquisitions, on average, by 0.9% over the -1 to +1 day window. The effect of fire-sale acquisitions on rivals' returns is stronger in high R&D industries where are likely to have high information asymmetry. This evidence supports that fire-sale acquisitions contribute to an intra-industry contagion of economic shocks by conveying negative information.

This paper contributes to the literature in several important ways. By providing new evidence on fire-sales in the corporate control market, this paper expands on previous research on fire-sale literature by building on Shleifer and Vishny (1992).[3] Pulvino (1998) provides the first empirical evidence of fire-sale on real assets by studying prices of used airplanes, and Campbell et al. (2011) examine foreclosure discounts from forced home sales. Considerable research also documents fire-sale of financial assets (e.g., Shleifer and Vishny (1997), and Coval and Stafford (2007)). However, acquisitions differ from asset sales in real asset markets or financial markets in that buyers in acquisitions should consider such factors as labor continuation, technology transfer, successor liabilities, and control premium. I first show that fire-sales exist in acquisition markets by showing that target firm- and industry-level distress affects acquirer returns and identity to a significant economic magnitude and that the effects are stronger for targets in industries having high asset-specificity.[4] Thus, this paper

[2] Banerjee and Eckard (1998), Fridolfsson and Stennek (2005), and Campbell et al. (2011)

[3] Pulvino (1998), Aguiar and Gopinath (2005), Coval and Stafford (2007), Officer (2007), Bharath and Shumway (2008), Eckbo and Thorburn (2008), Campbell et al. (2011), Ang and Mauck (2011), and Shleifer and Vishny (2011). See Shleifer and Vishny (2011) for a survey of the research on fire-sale.

[4] My paper is closely related to previous studies that analyze how a target's financial constraints affect acquisition outcome. Officer (2007) shows that financially constrained unlisted private targets are acquired at lower multiples than public targets are. Eckbo and Thorburn (2008), on the other hand, examining the acquisition outcomes of automatic bankruptcy auctions in Sweden, find insignificant discounts for going-

potentially also contributes to literature analyzing how asset redeployability affects capital structure and corporate liquidity management.[5]

This paper also suggests implications of widespread concerns about industry contagion effects resulting from fire-sales. The existence of negative spillover effects in asset fire-sales has been acknowledged in many papers.[6] Kiyotaki and Moore (1997) propose a macroeconomic model in which shock can turn into systemic risk through the lowering of collateral value. Campbell et al. (2011) show that foreclosures due to default or death result in the lowering of other local house prices. Benmelech and Bergman (2011) also examine the spillover effects of the sale of a bankrupt aircraft company on its rivals' collateral value and increased external financing cost. Although fire sales have been shown to be a central channel that amplifies economic shocks, little empirical evidence exists on the relation between fire-sale acquisitions and industry rivals' returns. If such a relation exists, it could be argued that fire-sale acquisition is a contagion channel for economic shocks. This paper shows that fire-sale acquisition has a negative contagious effect in industry, even in corporate-level transactions.

The remainder of this paper is organized as follows. In Section 2, I develop hypotheses and discuss the related literature. In Section 3, I describe sample selection, variable constructions, and summary statistics. Effects of fire-sale on acquisition outcomes are examined in Section 4, which also reports the results of robustness checks. In Section 5, I investigate the impact of fire-sale acquisition on industry rivals. Section 6 concludes.

2 Hypothesis Development

The primary goal of this study is to address two questions: (1) whether firm- and industry-level distress cause firms to be sold at discounts due to a fire-sale effect, and (2) how fire-sale acquisitions affect a target's industry rivals. In this section, I discuss the prior literature related to these questions, and develop hypotheses that guide empirical analysis.[7]

concern sales. Ang and Mauck (2011) explore the offer premium of distressed firms in crises. In contrast with the existing literature, my examination of fire-sales in acquisitions focuses on market illiquidity, the combined effects of target and target industry-specific distress, and cross-sectional differences in asset-specificity.

[5]Morellec (2001), Acharya et al. (2007), Benmelech and Bergman (2009), James and Kizilaslan (2010), Holmström and Tirole (2011), and Campello and Giambona (2012)

[6]See, for example, Kiyotaki and Moore (1997), Allen and Gale (2000), Benmelech and Bergman (2011), Oh (2012), and Hertzel and Officer (2012).

[7]A theoretical framework for fire-sale in acquisitions is presented in Appendix A.

2.1 Fire-Sale in Acquisitions

Distressed firms may face a severe liquidity constraint because they hold insufficient cash to meet debt obligations and have difficulties in raising capital. They can sell either some or all of their assets to generate cash needed to make debt payments, or attempt to renegotiate with creditors in order to restructure debt contracts. In a perfect world, the resolution of firm distress is costless. An absence of friction in renegotiating debt contracts would prevent the premature liquidation of assets. Even in times of industry distress, targets can sell assets at fair market value, which is based on their updated economic worth (P_1), as shown in Figure 2 (a).

In the real world, however, high financial distress costs may be incurred. Debt renegotiation often fails due to such frictions as information asymmetry between a debtor and its creditors, or holdout problems among creditors (Brown (1989), Gertner and Scharfstein (1991), and Asquith et al. (1994)). Distressed firms may be forced to sell their assets or control rights, or to go through a formal legal proceeding such as Chapter 11 bankruptcy. However, asset restructuring involves a liquidation cost that depends on market liquidity which, in turn, is determined by credit constraints of peer firms and asset redeployability. Shleifer and Vishny (1992) propose precise theoretical implications of how financial constraints in an industry give rise to a price that drops below an asset's revised economic value, a condition known as a fire-sale.

Because the subjects of asset sales are fairly specialized within industries, the first-best buyers are usually industry insiders that have invested in knowledge of, and managed, similar assets. However, industry insiders are likely to be financially constrained at the same time, if a negative shock is industry-wide. Therefore, the first-best buyer with the highest valuation of a distressed firm's asset is often sidelined due to financial frictions and industry-wide debt overhang (Myers (1977), and Clayton and Ravid (2002)). As a result, demand in the secondary asset market drops further, so prices frequently drop from P_1 to fire-sale price P_{FS} in Figure 2, which does not reflect longer-term asset potential.

Hypothesis 1 (Fire-Sale Discount): *Distressed targets in a distressed industry, or fire-sale targets, are likely to be acquired at discounts.*

The Shleifer and Vishny model focuses on a demand-side channel that predicts inefficient sales to industry outsiders with high liquidity but lower synergy. I also consider whether fire-sale is attributed to greater distribution of total gains to buyers. Given that intense negotiations are required to set an acquisition's price, target firm- and industry-level distress may affect the sharing rule. Bargaining theory literature provides a rationale for this hypothesis (Nash (1950), Rubinstein (1982), Binmore et al. (1986), and Gul (1989)). A large body of literature suggests that two sources of impatience determine relative bargaining outcomes. The first is the relative cost of delay from discounting futures (Rubinstein (1982)) and the second, which views acquisition as a multiplayer bargaining game, is the desire to be the first to realize gains from a transaction (Gul (1989), and Rhodes-Kropf and Robinson (2008)[8]). Target firm- and industry-level distress are expected to negatively affect the first source of a target's bargaining power by increasing its discount rate or cost of capital relative to the acquirer's. In addition, the fact that more sellers with similar assets are competing in the secondary market during an industry downturn increases a target's impatience at the negotiation table.

Hypothesis 2-1 (Inefficient sale): *Distressed targets in a distressed industry are acquired at discounts because of the lower synergy gain from a fire-sale acquisition.*

Hypothesis 2-2 (Wealth transfer): *Distressed targets in a distressed industry are acquired at discounts because of a target's weaker bargaining power.*

The *inefficient sale hypothesis* and *wealth transfer hypothesis* are not mutually exclusive but distinguishable, that wealth transfer is not necessarily inefficient.

Applying the industry-equilibrium theory of Shleifer and Vishny to distressed target acquisition, I also expect distressed targets in a distressed industry to be more likely to sell to industry outsiders relative to comparable distressed targets in a non-distressed industry, and fire-sale targets acquired by industry outsiders experience further discount.

Hypothesis 3 (Acquirer's Identity): *Distressed targets in a distressed industry are more likely to be acquired 1) by industry outsiders, and 2) at further discount conditional on industry outside acquirers.*

The next hypothesis relates the fire-sale effect to cross-sectional differences in asset-specificity. The key underlying condition of asset illiquidity during an industry downturn is that assets are specialized, and can thus be fully utilized only by industry insiders with sufficient accumulated knowledge and investment to generate the highest value from them. Therefore, when assets are highly industry specific, the inefficient sale or wealth transfer incurred by demand-side constraints in a fire-sale becomes more

[8] They propose a model that relative bargaining power between target and acquirer depends on the relative scarcity of each firm's assets, the quality of the match, and the costs of finding another partner. Consistent with their model, when an industry experiences liquidity constraints, liquidity and financing ability become scarce assets that may give more bargaining power to an acquirer.

severe because industry outsiders, who are unable to make the best use of them, have lower reservation value on the assets. I consider a simple Cobb-Douglas production function: a firm uses three factors —capital, labor, and technology— to produce output. The hypotheses that follow are that the fire-sale effects in acquisition should be stronger in industries with high capital-specificity, strong labor unions, and high R&D intensity. These characteristics increase the friction in asset allocation across industries, and thus make the distressed targets less redeployable.

Hypothesis 4 (Asset-specificity): *If assets are more specialized to industry insiders due to high capital-specificity, strong labor unions, or high R&D intensity, then the fire-sale discounts should be larger.*

2.2 Intra-Industry Contagion Effect

Having established the existence of the fire-sale effects in acquisitions, I extend current research a step further by examining an industry-specific contagion effect from fire-sale acquisitions. The fire-sale effects can be contagious to a target's industry rivals.

Prior literature documents that acquisitions can affect a target's industry rivals by revealing new information about the value of industry assets.[9] Fire-sale prices can pull down the prices of subsequent acquisitions coming to market by providing a lower reference price, as Campbell et al. (2011) proposed in housing markets. This negative information externality can be socially inefficient because it may cause firms selling assets in distressed industries to play a non-cooperative game. The possibility that updated information from other targets might further discount the option value to waiting may lead them to be inefficiently urgent to sell their assets ahead of others.[10]

The fire-sale acquisitions are also likely to have negative "out-of-play effects" for a target's industry rivals (Banerjee and Eckard (1998), and Fridolfsson and Stennek (2005)). Given that the number of capable buyers is limited during an industry downturn, announcements of acquisitions reduce the potential partners and the market's expectation that a rival will be acquired (Akdogu (2011), and Molnar (2007)).

Hypothesis 5-1 (Negative information): *Announcements of distressed target acquisitions in a distressed industry at fire-sale prices signal low reference prices and decreased demand that result in negative stock returns for a target's industry rivals.*

[9]Eckbo (1983), Eckbo and Wier (1985), Song and Walkling (2000), Fee and Thomas (2004), and Shahrur (2005)

[10]Contestants compete by escaping first in this game, in contrast to the famous game theory model, *war of attrition*, in which contestants compete by persisting with accumulating costs over time.

Previous studies suggest that acquisitions, contrary to the *negative information hypothesis*, have implications for industry rivals in terms of changing product market dynamics. Eckbo (1983) proposes that acquirers gain competitive advantage from productivity improvements in operating, marketing, distribution, or purchasing activities, and the resulting intense product market competition harms industry rivals. Recent studies by Fee and Thomas (2004) and Shahrur (2005) support this hypothesis based on evidence from horizontal mergers. This hypothesis predicts a negative stock return for industry rivals from diminished post-acquisition operating performance.[11]

Hypothesis 5-2 (Intense competition): *Announcements of distressed target acquisitions in a distressed industry intensify industry competition that results in negative operating performance, and negative stock returns, for a target's industry rivals.*

Alternatively, acquisitions can benefit industry rivals by increasing the likelihood of anticompetitive collusion (Stigler (1964), Eckbo (1983), Kim and Singal (1993) and Fee and Thomas (2004)). Stigler (1964) proposes that acquiring firms can use their increased market power to collude with rivals in order to reduce output to monopoly levels and raise prices at the expense of consumers. If anticompetitive acquisition is loosely governed by antitrust laws during industry downturns, monopolistic collusion is likely to motivate acquisitions. Under this hypothesis, I expect rival firms to have positive stock returns at the announcement of a fire-sale acquisition, and improved operating performance to follow.

Hypothesis 5-3 (Market power): *Announcements of distressed target acquisitions in a distressed industry result in positive stock returns and improved operating performance for industry rivals through anticompetitive collusion.*

Other externalities from fire-sale acquisitions may exist in the agency and labor market channels.[12] These, however, are beyond the scope of this paper and remain for future research.

[11] This hypothesis can be drawn by a simple theoretical setting that acquisition causes Cournot competition to become Stackelberg competition in which a leader, or combined firm, moves first and other rivals move later.

[12] Substantial discounts in fire-sale acquisitions perhaps convey a warning to shareholders and managers of industry rivals that results in intensified monitoring and reduces agency costs in general. Moreover, distressed acquisitions that entail intense restructuring and worker layoffs will affect labor-related decisions of targets' rivals.

3 Data and Methodology

3.1 Sample Construction

The sample of mergers is from the Securities Data Company's (SDC) U.S. Mergers and Acquisitions Database. This paper employs all completed mergers between U.S. non-bankrupt public targets and U.S. public bidders during the period 1980-2010. I require acquiring firms to control less than 50% of the shares of target firms before the announcement, and the transaction value of deals to be greater than one million dollars. Both acquirers and targets must be public firms listed on the Center for Research in Security Prices (CRSP) and Compustat databases during the event window. I further eliminate firms in a financial industry (SIC: 6000 - 6999) and utilities (SIC: 4900 - 4999), using their primary SIC code.

3.2 Identifying Fire-Sale Acquisitions

The Shleifer and Vishny model theoretically identifies firm distress combining with industry-wide distress as a set of necessary conditions for a fire-sale to occur. Following this model, acquisitions are defined as fire-sale acquisitions when both target industries and targets themselves are distressed at the announcement. The interaction variable of target firm- and industry-level distress is termed *Fire-Sale*. The variable constructions for each distress are as follows.

3.2.1 Measures of Target Distress

To identify the distressed target mergers within the sample, I use two measures of firm distress widely employed in the literature. The first measure is based on the KMV-Merton model that provides a distance measure between expected asset value and the default threshold based on an option-pricing model (Merton (1974)). This model calculates default risk by considering equity as a call option on firm value and debt as a strike price. This measure is widely used in the literature (e.g., BasleCommittee (1999), Vassalou and Xing (2004), and Chava and Purnanandam (2010)), and its predictive power has assessed by many studies (e.g., Bharath and Shumway (2008), and Duffie et al. (2007)). Following Bharath and Shumway (2008), I construct expected default frequency (EDF) for each target from the distance to default. I call this continuous variable $Distress1_T$. The estimation process is detailed in Appendix B.

The second, following Pulvino (1998), defines a target as distressed if its leverage ratio is greater, and its current ratio (current assets/current liabilities) less, than the industry median. This measure implies that distressed targets face both short- and long-term financial constraints. I define a firm's industry as the set of firms with the same 3-digit SIC code.

3.2.2 Proxy for Industry Distress

The measure used in this paper for target industry distress should capture the degree of distress of a target's peer firms as a whole. I define an industry as distressed if its median firm's sales growth is negative in the year of acquisition. A firm's industry is defined as the set of firms with the same 3-digit SIC code. The target firms are excluded from the calculation of industry variables. This dummy variable is termed $Ind.Distress_T$.

Additionally, I construct, as a robusteness check, alternative measures of industry distress 1) if median sales growth is lower than -1% ($Ind.Distress3_T$), 2) if median sales growth is lower than +1% ($Ind.Distress3_T$), and 3) if median sales growth is negative for two consecutive years ($Ind.Distress4_T$). I report the main results of this paper based on the primary measure $Ind.Distress_T$. The results with alternative industry distress measures are reported in Appendix Table A.6. The results are qualitatively robust.[13]

3.3 Control Variables

In order to compare acquisition outcomes over different degrees of target firm- and industry-level distress, I control other characteristics that may potentially drive the results. Control variables used in this study include target, acquirer, and deal and industry characteristics as well as year and industry fixed-effects. Firm- and industry-level proxies for future profitability and growth option are included to account for drops in the economic worth of assets. For the industry level, I add *median industry Q*, defined as the ratio of market value of asset (estimated as book value of total asset - book value of equity + market value of equity) to book value of asset. For the firm level, I include target *profitability* (profit margin: the ratio of operating income before depreciation (*OIBDP*) divided by total sales) and target market-to-book ratio.

Other firm characteristics considered in the specification include *size*, defined as the natural log of market value of equity 4 weeks before the announcement, *leverage*, defined as the ratio of debt (current debt plus long-term debt) to book value of assets, and *tangibility*, defined as the PP&E scaled by total book value of assets. *Median industry leverage* is defined as the 3-digit SIC-level median leverage ratio. Major deal characteristics suggested in the previous literature are also considered. Deal specific controls include *same industry*, *tender offer*, *toehold*, *competing*, *poison pill*,

[13] Following previous literature (e.g., Gilson et al. (1990); Opler and Titman (1994); Acharya et al. (2007); and Ang and Mauck (2011)), I also attempt to use as a measure of industry distress the negative industry median net income of all firms in an industry. Median net income appears to be a poor measure of industry distress, however, because of cross-industry variation in average net income levels. Negative net income for a substantial portion of high-tech industry firms in the public stock market does not necessarily mean that the high-tech industry is distressed.

and *termination fee*. All variables are defined further in Appendix D.

3.4 Summary Statistics

Table 1 presents summary statistics of key variables used in this study. Panel A of Table 1 identifies targets' pre-merger characteristics. The mean and median of firm default risk *EDF* is 0.11 and 0.001 with average standard deviation of 0.227. This variable shows high positive skewness. Of 1572 acquisition sample, 955 targets have lower than 1% EDF at the announcement of acquisition. Panel B presents the acquirers' characteristics. It shows that the acquirers, on average, have lower default risk than targets while have larger size, higher q, and higher profit margin.

Table 2 reports the major deal characteristics of the acquisition sample. The mean (median) premium based on targets' 4 weeks before the announcement is 50% (38%). The relative size between target and acquirer is, on average, 0.84. Tender offers account for 25% of total acquisitions, and acquirers hold, on average, 3% of a target's shares before acquisition. Acquirers are less likely to use cash for payment, in the distressed target acquisition sample. Lastly, 54% of acquisitions occur in the same industry.

4 Fire-Sale Effects on Acquisition Outcomes

I employ multiple empirical approaches to examine fire-sale effects from a target's firm- and industry-level distress and identify a channel for the effects. First, I estimate the combined effect of target firm- and industry-level distress on acquirers' abnormal returns. Under the null hypothesis, acquirers' return should be unaffected by target firm- and industry-level distress. I assess whether distressed targets in a distressed industry are sold at discounts by comparing acquirers' abnormal returns between fire-sale acquisitions and other acquisitions. Second, I estimate the fire-sale effects on offer price after controlling for industry-median Q, firm Q and the firm profitability measure. These firm- and industry-level growth option and profitability measures control for the decline in economic worth of target assets by capturing future growth prospects of the assets. Then, I examine whether fire-sale affects synergy or target's bargaining power by decomposing offer price and analyzing each separately. Fourth, I test whether target firm- and industry-level distress affect buyer's identity and whether they drive stronger fire-sale effects if acquirers are outside the industry. Finally, to demonstrate that the findings are driven by the fire-sale channel, I estimate cross-sectional regressions using industry asset-specificity in three dimensions: capital-specificity, labor union, and R&D intensity. This empirical design enables me to disentangle the fire-sale effects from the decline in economic worth and identify the channel of the fire-sale effects.

4.1 Acquirer Return in Fire-Sale Acquisitions

The first test relates the fire-sale effect to acquirers' return. To provide support for the proposed fire-sale channel in which firm- and industry-wide distress combine to force the sale of a target at a discount, I compare acquirers' abnormal return between fire-sale targets and distressed targets in a non-distressed industry. Following Shleifer and Vishny (1992), I define fire-sale acquisitions as when both target industry and target are distressed at the time of the deal announcement. The interaction term of target distress ($Distress_T$) and target industry distress ($Ind.Distress_T$) is termed *Fire-Sale*.

As shown in Figure 3, I begin by plotting the evolution of the cumulative abnormal returns of acquirers from 20 days before to 200 days after announcement of the acquisition. Abnormal returns are calculated as the acquirer's return minus a value-weighted market index. The figure shows that cumulative abnormal returns of acquirers in fire-sale acquisitions lie well above other acquisitions throughout the 200 days following the acquisition announcements. The graph implies that acquirers of distressed targets in distressed industries earn higher abnormal returns compared to other acquirers, which suggests that targets in distressed industries are sold at a discount.

I next compare the short-term announcement return and long-term performance of acquirers over the target's firm- and industry-level distress. The short-term return is estimated as the acquirer's three-day cumulative abnormal return (CAR) at announcement of the acquisition, using the standard method of Bradley et al. (1988).[14] Table 3 shows that acquirers of distressed targets in a distressed industry earn positive CARs of 0.91% over the -1 to +1-day window and outperform other acquirers by 1.93 percentage points. The differences between acquirer returns are statistically significant at the 5-10% level.

I also estimate acquirers' buy-and-hold abnormal returns (BHAR), which is a commonly used measure of long-term abnormal performance[15], of fire-sale acquisitions and those of other acquisitions. I use a two-year window for the long-term performance analysis to reduce potential noise from overlapping events that can influence performance.[16] I define BHAR as follows.

$$\text{BHAR}_{i,t} = \prod_{j=1}^{T_i}(1 + r_{i,t+j}) - \prod_{j=1}^{T_i}(1 + r_{\text{Matched firm}_{t+j}}) \quad (1)$$

[14] I use the Fama-French three-factor model with 240 daily returns covering (-300, -60) to estimate parameters for each acquirer.

[15] Barber and Lyon (1997), Kothari and Warner (1997), and Lyon et al. (1999)

[16] I estimate these results based on the 3- and 5-year window following the announcement date and find robust results.

where $r_{i,t}$ denotes the return to stock i over month t and T_i is the holding period for stock i (2 years or the time until delisting or the occurrence of a new acquisition, whichever comes first).[17]

Matched firms are selected based on the following procedures. 1) Select all CRSP-listed companies at the end of the year prior to the year of the acquisition and companies not in the sample of acquisitions for a period of three years prior to the announcement date. 2) Select the subset of firms with total book asset values within ±30% of the total book asset values of the acquiring firm. 3) Rank the subset based on market-to-book ratio. 4) Choose the firm with the closest market-to-book ratio. 5) Matched firms are included for the full two-year holding period or until they are delisted, whichever occurs first. Table 3 shows that acquirers of distressed targets in a distressed industry earn positive BHARs. The abnormal returns of acquirers in fire-sale acquisitions are substantially higher than the returns of acquirers of distressed targets in non-distressed industries in the same two-year window. The difference between acquirer returns are statistically significant at the 1% level.

Because the previous analysis does not control for other variables that might be driving the differences in acquirer returns, I also examine the fire-sale effects on acquirers' short-term and long-term returns using a multivariate analysis. *Hypothesis 1* predicts a strong positive coefficient on the interaction term of target's firm- and industry-level distress for the following specification:

$$CAR^A_{ijdt} = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (2)$$

$$BHAR^A_{ijdt} = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (3)$$

where CAR^A_{ijdt} is the acquirer's three-day cumulative abnormal return (CAR) at announcement of acquisitions, estimated using a market model. $BHAR^A_{ijdt}$ is an acquirer buy-and-hold return during two years following acquisition less a buy-and-hold return of the matched firm, $Distress_{it}$ and $Ind.D_{it}$ are the target firm and industry distress measures, respectively, of target i, and X_{ijd} represents control variables for target i, acquirer j, and deal characteristics d. Year fixed effect (α_t) and industry fixed effect (α_i) are also included. Control variables are as follows.

$$X_{ijd} = \begin{cases} \text{Target \& Acquirer Char.: Size, M/B, Leverage, Profitability, Tangibility} \\ \text{Deal Char.: Same industry, Tender offer, Toehold, Competing, Term. Fee} \\ \text{Industry Char.: Med. industry Q, Med. industry Leverage} \end{cases}$$

[17] The potential bias of the BHAR measure, albeit well recognized, may not qualitatively affect the results because I concentrate on differences in performance in fire-sale and other acquisitions.

The variable of interest is *Fire-Sale*, the interaction between target firm- and industry-level distress. *Fire-Sale*$_1$ is the interaction between the continuous measure of target distress based on the distance-to-default model, $Distress1_T$ and $Ind.Distress_T$. *Fire-Sale*$_2$ is the interaction between the dummy measure, $Distress2_T$ and $Ind.Distress_T$. *Hypothesis 1* predicts all of these interaction effects to be positive.

Columns (1) and (2) in Table 4 present the results of examining the fire-sale effects on acquirers' cumulative abnormal returns at announcement (-1, +1). It shows that acquirers earn economically and statistically higher returns in fire-sale acquisitions. The economic magnitude of this effect is 2.5 percentage points based on the coefficient of *Fire-Sale*$_1$ and a one standard deviation increase in $Distress1_T$[18], and 5 percentage points based on the coefficient of *Fire-Sale*$_2$. The coefficients are statistically significant at the 1% level. I also find positive coefficients on the fire-sale effect in columns (3) and (4). In column (3), the coefficient implies that acquirer buy-and-hold abnormal returns are 23.2 percentage points higher in distressed industries with a one standard deviation increase in $Distress1_T$. This directly supports fire-sale discount in acquisitions because acquirers' return should be unaffected by target firm- and industry-level distress if they pay the fair market value of a target.[19]

4.2 Fire-Sale Discount: *Inefficient Sales or Wealth Transfer?*

The previous results show that acquirers earn higher returns from fire-sale acquisitions. To provide evidence of a specific source for these higher returns, I estimate the combined effect of firm- and industry-level distress on offer price after controlling for firm- and industry-level investment opportunity measures. Then, I decompose offer price into synergy and target's bargaining power, and quantify the fire-sale effects on the components of division of gains separately.

$$P_i = V_i + \underbrace{S_{ij} * \omega_i^T}_{\text{Division of Gains}}$$

where

$P_i =$ total proceeds(offer price) for target i

$V_i =$ stand-alone value of target i

$S_{ij} =$ synergy from acquisition between target i by acquirer j

$\omega_i^T =$ target i's bargaining power

[18] The standard deviation of $Distress1_T$ is 0.23 in Table 1. The economic magnitude can be calculated by 0.11*0.23 = 2.5%

[19] I report, as a robustness check, coefficient estimates from quantile regressions (25th, median, and 75th) on acquirer abnormal returns in Appendix Table A.1. While the coefficients vary across quantiles, the results show that the relationship between acquirer returns and fire-sale is robust at different points in the conditional distribution of acquirer returns.

4.2.1 Fire-Sale Discount on Offer Price

To examine the effect of a fire-sale on the offer price a target receives, I employ three different measures of offer price for target shareholders from the SDC database. The first measure $Ln(Price1)$ is the log of total equity value (EQVAL). I use the log transformation for these variables to adjust skewed size distribution. The second measure $Ln(Price2)$ is the log of total transaction value ($TRANSACT$). Transaction value represents the equity value of the target company (i.e., offer price per share * shares outstanding plus cost to acquire convertibles) plus any assumed liabilities that are publicly disclosed.[20] The third measure, $Premium$, is offer price per share divided by target stock price four weeks prior to announcement.[21]

Hypothesis 1 predicts a strong negative coefficient on the interaction term of target's firm- and industry-level distress for the following specification:

$$Price_{ijdt} = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (4)$$

where $Distress_i$ and $Ind.D_i$ are the target firm and industry distress measures, respectively, of target i, and X_{ijd} represents control variables for target i, acquirer j, and deal characteristics d. Year fixed effect(α_t) and target industry fixed effect (α_i) are also included.

In columns (1), (3) and (5) of Table 5, the coefficients on $Fire\text{-}Sale_1$ are negative and statistically significant to all measures of offer price. These results indicate that distressed targets in a distressed industry are acquired at a discount relative to distressed targets in a non-distressed industry. The economic magnitude can be interpreted as 14 percentage points discount relative to distressed targets in non-distressed industries for an increase of one standard-deviation of the default risk, $Distress1_T$.[22] As shown in columns (2), (4), and (6) of Table 5, the results are robust to use of the dummy variable of firm distress, $Distress2_T$ and its interaction term $Fire\text{-}Sale_2$.

In the presence of firm- and industry-level profitability, this significant interaction term in Table 5 provides support for the fire-sale effect in *Hypothesis 1*.

4.2.2 Synergy and Bargaining Power in Fire-Sale Acquisitions

Measuring the division of total gains on the basis of the abnormal stock return at the announcement date enables me to identify the source of fire-sale discount in the previous

[20] The correlation between $Ln(Price1)$ and $Ln(Price2)$ is 0.98.

[21] Although $Premium$ is widely used in literature to compare the offer price, this measure is affected by the reference stock price in the denominator, which is particularly confounded by target firm- and industry-distress. Therefore, I focus on the equity value in this paper.

[22] The standard deviation of $Distress1_T$ is 0.23 in Table 1. The economic significant can be calculated by Exp((-0.89+0.23)*0.23)-1 = -14%)

results. Synergy is measured in two ways based on Bradley et al. (1988). I use (1) combined CAR: market equity value weighted average of target's CAR and acquirer's CAR, and (2) Ln(Synergy): the log of the sum of acquirer's and target's abnormal dollar return ($CAR * MarketCap$). I employ a bargaining outcome measure that uses the difference in abnormal dollar returns between target and acquirer following Ahern (2011).[23] Basically, the bargaining outcome is the percentage of a firm's abnormal gain over total abnormal synergistic gain. One problem with using abnormal return to measure bargaining outcome is that it can be negative for the acquirer. A player with a negative expected bargaining outcome will not participate in the game.[24] I avoid this problem by using the difference in dollar gains between target and acquirer as a proxy for the target's bargaining outcome. Following Ahern (2011), I normalize this measure by dividing by the sum of the acquirer's and target's market values four weeks prior to the announcement. The measure of the acquirer's relative bargaining power is,

$$NDCAR_T = \frac{DCAR_{Target} - DCAR_{Acq}}{MV_{Target} + MV_{Acq}}$$

where DCAR: Dollar Cumulative Abnormal Return at the announcement (-1, +1).

I construct, as a robustness check, an alternative measure that calculates the ratio of the target's abnormal dollar return to the combined abnormal dollar return of acquirer and target, and winsorize this ratio by 0 and 1. This measure is more intuitive, but potentially downward biased if negative abnormal returns are frequent for acquirers.

$$Bargain_T = \begin{cases} \dfrac{DCAR_{Target}}{DCAR_{Target} + DCAR_{Acq}} & \text{if} \quad DCAR_{Target} > 0, DCAR_{Acq} > 0 \\ 0 & \text{if} \quad DCAR_{Target} < 0, DCAR_{Acq} > 0 \\ 1 & \text{if} \quad DCAR_{Target} > 0, DCAR_{Acq} < 0 \end{cases}$$

where DCAR: Dollar Cumulative Abnormal Return at the announcement (-1, +1).

I then estimate the effect of firm- and industry-level distress on each component using the following specifications.

$$S_{ijdt} = \beta_1 (\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (5)$$

$$\omega^T_{ijdt} = \beta_1 (\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (6)$$

[23] Offer premium, which is used by most bargaining-related papers (e.g., Officer (2003), and Subramanian (2003)) does not necessarily capture a target's relative bargaining outcome because it does not properly consider the acquirer's share of gains.

[24] Many studies explain the negative acquirer return based on such drivers of mergers as the hubris hypothesis, the market-driven misvaluation hypothesis, swarm behavior, and the market mania hypothesis (Roll (1986), Malmendier and Tate (2005) , Malmendier and Tate (2008), Shleifer and Vishny (2003)).

Hypothesis 2-1 predicts lower synergy in fire-sale acquisitions and lower corresponding gain for targets. Columns (1)-(4) in Table 6, however, show that both measures of synergy have an insignificant relation with the interaction effects of target firm- and industry-level distress. One interpretation of this result is that fire-sale acquisitions with severe inefficiency are avoided by a conservative ex-ante debt structure or by alternative resolution of distress (Morellec (2001), and Campello and Giambona (2012)). Alternatively, this result is consistent with current research by Almeida et al. (2011) and Erel et al. (2013), that highlights the importance of financial synergy.

The results in columns (5)-(8) in Table 6, on the other hand, show that target firm- and industry-level distress has a negative and significant impact on a target's bargaining outcome. Columns (5) and (6) present coefficient estimates on $NDCAR(\omega_T)$. The coefficient of the interaction effect is economically large and statistically significant, and the effect is robust to both measures of target distress. This result implies that distressed targets in a distressed industry receive a substantially lower portion of total gains relative to other targets in the sample. The economic magnitudes are \$40 million further transfer to acquirer for a one standard deviation increase in a target's default probability in a distressed industry or 5% * \$1.8 billion = \$90 million further transfer to acquirer based on $\textit{Fire-Sale}_2$. Consistent with this result, the regression estimates in columns (7) and (8) indicate that targets have 10-20 percentage points lower bargaining share of total synergy gain in fire-sale acquisitions.

In sum, these results provide support for the bargaining channel of the fire-sale effects proposed in *Hypothesis 2-2*, which states that distressed targets in a distressed industry are acquired at discounts due to targets' weakened bargaining power.

4.3 Acquirer Identity in Fire-Sale Acquisitions

4.3.1 Effect of Industry-wide Distress on Acquirer Identity

Thus far, the results suggest that financial constraints of targets and their peer firms drives a price discount. To provide further evidence of fire-sale effects, I explore the effects of target firm- and industry-level distress on acquirers' identity, whether they are inside or outside the target's industry. The null hypothesis is that acquirer identity is unaffected by target firm- and industry-level distress. Alternatively, the main hypothesis of this paper is that targets are likely to sell to industry outsiders when their peer firms are financially constrained, as in *Hypothesis 3*. To test this hypothesis, I compare the probability of being acquired by industry outsiders over target firm- and industry-level distress using the following probit model to estimate probability.

$$Prob.(Outsider_{ijdt}) = \beta_1 (\underbrace{Ind.D_{it} \times Distress_{it}}_{\textit{Fire-Sale}}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad (7)$$

where $Outsider_{ijdt}$ is the dummy equals 1 if acquirer j, has a different 3-digit SIC code from target i., $Distress_i$ and $Ind.D_i$ are the firm and industry distress measures, respectively, of target i, and X_{ijd} represents control variables for target i, acquirer j, and deal characteristics d. Year fixed effect and industry fixed effect are also included.

Table 7 presents estimates of the probability that targets are sold to industry outsiders. Acquirer and deal characteristics are excluded in columns (1) and (3) to control for potential endogeneity.[25] I find large and significant coefficients for the industry distress measure in all columns (1)-(4). The coefficient on industry distress captures the difference in probability of being acquired by industry outsiders. The result, evaluated at the means of independent variables, indicates that targets in a distressed industry are more likely to sell to outside buyers by 20 percentage points compared with targets in a non-distressed industry. The stand-alone variable of target distress and the interaction term of target firm- and industry-level distress have insignificant coefficients. The results imply that when the target industry is distressed, peer firms in the same industry are not capable of buying the target.

4.3.2 Fire-Sale Acquisitions with Outsider

I next examine the triple-interaction effect of target firm distress, industry distress, and outside acquirer dummy. *Hypothesis 3* suggests that the effects on fire-sale targets should be stronger if the targets are sold to acquirers outside a target's industry.

Table 8 presents the estimates from regressions that explain the main acquisition outcomes using the interaction variable of fire-sale and acquirer's industry identity.[26] I find that the interaction effects of target firm- and industry-level distress on acquirer returns, offer price, and target's bargaining power are stronger when acquirers are from different industries. The triple-interaction effects are economically large and statistically significant. The results in Table 8 indicate that, if the acquirer is an industry outsider, a one standard deviation increase in the target's default probability during industry distress increases the acquirers' return by 4.6 percentage points, and decreases the offer price by 47.5% and the target's bargaining power by 5.8%. Crucially, I also find that the coefficient of triple interaction term on synergy becomes negative and statistically significant, which indicates that a deadweight cost incurred from inefficient fire-sales conditional on industry outside acquirers.

It is also important to note that the interaction term of target firm- and industry-level distress, $Fire\ Sale_1$ becomes insignificant in columns (1)-(3) when the triple interaction effect with industry outsider is included. This suggests that the results in the previous section is largely driven by fire-sale acquisitions with industry outsiders.

[25] Acquirer and deal characteristics are determined simultaneously with acquirer identity.

[26] In this analysis, I report the results with $Fire\text{-}Sale_1$ due to the small sample size with $Fire\text{-}Sale_2$.

This result supports *Hypothesis 3*, or the fire-sale channel suggested by the Shleifer and Vishny model.

4.4 Fire-Sale Effects with Specialized Assets

When assets are highly industry specific, inefficiency from demand-side constraints becomes more severe as industry outsiders are not able to utilize the assets to their best-use. The resulting prediction is that distressed targets in an industry with high asset specificity may be sold at a deeper discount in an illiquid market. I test this prediction with three main input factors —capital, labor, and technology— of production function.

4.4.1 Fire-Sale Effects and Capital-Specificity

I construct the proxy for industry (physical) capital-specificity using the Census-based industry-level measure provided by Balasubramanian and Sivadasan (2009). They calculate the ratio of firms' used capital expenditures to the aggregate industry capital expenditure, which captures capital re-salability or capital liquidity within an industry.[27] Their index is based on the U.S. Census Bureau dataset for manufacturing sectors for the years 1987 and 1992. Following the approach of Almeida et al. (2011), I create a time-invariant measure of industry-level capital-specificity by one minus the median value of this index for an industry within the 3-digit SIC code over the Census survey of 1987 and 1992.

Alternatively, I measure industry capital-specificity based on industry's property, plant, and equipment (PP&E) scaled by the book value of total assets. This measure, however, proxies for overall tangibility of the industry instead of industry capital-specificity because property, including real estate, is highly redeployable. I also attempt to use a further alternative measure that uses an industry's machinery and equipment (PPENME) scaled by the book value of total assets obtained from COMPUSTAT. However, this analysis lacks statistical power because this value has been absent from COMPUSTAT since 1997. In untabulated results, I find statistically insignificant coefficients in related regression tests using these capital-specificity measures.

Table 9 presents estimates of target firm- and industry-level distress on the main dependent variables over industry capital-specificity. I examine the triple-interaction effect of target firm distress, industry distress, and industry capital-specificity measure on acquisition outcomes.[28] The dependent variables are acquirer's abnormal return (CAR_A), offer price ($Ln(Price1)$), target's bargaining power ($NDCAR(\omega^T)$) and synergy ($CAR_{combined}$).

[27] This proxy is also used as a measure of capital salability within an industry by Almeida and Campello (2007) and Almeida et al. (2011).

[28] The stand-alone variable for *Capital-Specificity* is omitted in the regression specification because *Capital-Specificity* is a time-invariant industry-level measure which is captured by the industry fixed effect.

I find that the fire-sale effects on acquirer's abnormal return, offer price, target's bargaining power, and synergy are economically large and statistically significant when industry-level capital-specificity is high. The magnitude of fire-sale effects, moreover, becomes greater than the regression results in the previous results.

With a one standard deviation increase in target industry-level capital specificity(0.03), the acquirer abnormal returns further increase by 1.3 percentage point, offer price decreases by 23.6%, and $NDCAR_T$ decreases by 1.9%. Particularly, in column (4), the synergy, measured by combined abnormal returns at the announcement, decreases by around 2.0 percentage point.

These results indicate that the main results in the previous section are driven by asset illiquidity consistent with the proposed *Hypothesis 4* and thus provide strong evidence for the fire-sale channel.

4.4.2 Fire-Sale Effects and Target Labor Union

I further investigate the impact of target labor unions on the fire-sale effects. Labor unions play a significant role in protecting workers' rights through collective bargaining. Strong labor unions could increase restructuring costs by influencing layoff costs or severance payments and blocking restructurings and plant closings (McLaughlin and Fraser (1984)). Especially high costs may be incurred during industry downturns, when acquirers may need to restructure firms intensively. Therefore, industries with strong labor unions may thus experience less demand in acquisition markets during industry downturns. A strong labor union could also influence a distressed firm to sell all of its assets with a guarantee of labor continuation, thereby reducing the acquisition price and transferring wealth from the distressed target's shareholders to its workers. This hypothesis predicts that if a target industry has a strong labor union, then the fire-sale effects should be stronger because strong labor union increases restructuring costs and thus makes the distressed target less redeloyable.

Alternatively, a strong labor union can resist acquisitions, in particular, hostile takeovers, by refusing to tender workers' shares or voting against acquisitions (Pagano and Volpin (2005), and Kim and Ouimet (2013)). This will lower the probability of receiving a takeover bid, but increase the offer price. It is also possible for strong labor unions to make concessions to and create more synergy gain for acquirers by giving up their rents. This competing hypothesis predicts that the fire-sale effects are likely to be mitigated in industries with strong labor unions.

Therefore, it is empirical question to examine whether strong labor unions in target industries promote the fire-sale effects or not. I perform a subsample analysis using regressions with the same specifications as in main regressions, but dividing the total sample into strong labor union industries and weak labor union industries.

I employ a labor unionization measure that records the percentage of unionized workers in each 3-digit SIC industry from 1980-2010. The Union Membership and Coverage Database constructed by Barry Hirsch and David Macpherson compiles industry-level unionization data from the Current Population Survey (CPS) of the Bureau of Labor Statistics.[29] The database provides two unionization measures, (1) the percentage of labor union membership, and (2) the percentage of workers covered by a collective bargaining agreement.[30] CPS classifies industries based on firms' primary Census Industry Classification (CIC) codes. In the present study, I match each CIC industry to a 3-digit SIC industry by comparing the industry specification. Table 1 reports the descriptive statistics for the first labor union variable. I create a dummy variable for strong labor union industry that equals one if the labor union measure is above the median value of total sample.

The results in Table 10 show that the fire-sale effects combined with strong labor unions result in further increases in returns for acquirers, a deeper discount in offer prices, and weaker bargaining outcomes for targets. Comparing each column between Panels A and B, I find that the coefficients on fire-sale variable are economically larger and statistically more significant when the target industry has a strong labor union. These results suggest that strong labor unions promote the fire-sale effects by generating further demand-side frictions.

4.4.3 Fire-Sale Effects and R&D Intensity

I next explore how asset-specificity in technology (intangible assets) affects fire-sale effects in distressed target acquisitions in a distressed industry. Technology-intensive industries play particularly important roles in acquisition markets. Previous literature documents that productive opportunity is a main motivation of acquisitions (e.g., Higgins and Rodriguez (2006), and Levine (2011)). However, there is little evidence on how variation in an industry's technology intensity affects acquisition outcomes across different industry-specific financial conditions.

Aboody and Lev (2000) suggests that R&D may increase firm- and industry-level information asymmetry for the following three reasons. First, contrary to capital or labor, R&D is more likely to be specific to a firm and its industry, so, across industries, firms have difficulty in sharing knowledge on their technologies and undergoing R&Ds. Second, relatively less organized markets for technology assets lead outsiders not to infer the precise value of the assets from market prices. Third, the current accounting rule does not require to report value and productivity changes of R&D after being expensed. Building on this argument, I develop a hypothesis that technology- or

[29] At www.unionstat.com, Hirsch and Macpherson (2002)

[30] I mainly employ the first measure. The correlation between two unionization measures is 0.99. The results are robust with the second measure.

knowledge-based assets are likely to be less redeployable to industry outsiders, particularly during an illiquid market, therefore, strengthening fire-sale effects in acquisitions. Higher information asymmetry embedded in technology-intensive industry drives more frictions in asset allocation across industries because industry outsiders have more difficulty in valuing and operating the assets.

I examine this hypothesis by estimating the combined effect of target firm- and industry-level distress on acquisition outcomes with different R&D intensities. I measure R&D intensity based on research and development expenses divided by total sales. This variable is set to zero if total assets are reported for a firm in the same year but no record is reported for R&D expenses. I separate the total sample into high and low R&D industry subsamples. An observation is considered to be high (low) R&D industry if it belongs to an industry with below (above) the sample median industry R&D intensity. Subsample analysis with separate estimation enables coefficients of the control variables and fixed effects to vary across high and low R&D regimes.

In Table 11, results for the subsamples are reported in Panels A and B. Each panel presents the fire-sale effects on acquirer's abnormal returns (CAR_A), offer price ($Ln(Price1)$), target's bargaining power ($NDCAR(\omega^T)$) and synergy ($CAR_{combined}$). Comparing each column between the two Panels A and B of Table 11, I find that the fire-sale effects on acquirer's abnormal return, offer price, and target's bargaining power are economically large and statistically significant only in high R&D industries. In Panel A, these coefficients are sharper than those for the full sample. Control variables also show coefficients generally consistent with the regression results with full sample. In contrast, in Panel B, they reveal no relation when R&D intensity is low. This is robust in both target firm distress measures. These results further support *Hypothesis 4* that price discounts in distressed target acquisitions in a distressed industry are driven by the fire-sale channel rather than the decline in economic worth of target assets.

4.5 Alternative Explanations

4.5.1 Stock Market Undervaluation in Fire-Sale Acquisitions

A potential concern with the previous results is that the fire-sale discount and related acquisition outcomes could be driven by stock market undervaluation. Many studies in the M&A literature show that stock market misvaluation drives acquisition activity and outcomes (Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004), and Rhodes-Kropf et al. (2005)). If either firm- or industry-level distress causes systematic undervaluation of targets, it would be possible for informed acquirers to purchase undervalued targets at prices below their fundamental values.

As a robustness check, I re-estimate the fire-sale effects in the main regressions using the same explanatory variables and including measures for target firm- and industry-level undervaluation. Following Rhodes-Kropf et al. (2005), I measure target undervaluation by decomposing the market-to-book ratio of firms with the same 3-digit SIC code into three components: firm-specific error; industry-wide, short-run error; and long-run growth option. Details of this estimation are provided in Appendix A.2. Table A.2 in Appendix presents the descriptive statistics for the robustness checks. Panel A shows that the book-to-value ratio is lower for distressed than for non-distressed targets. Moreover, distressed targets are undervalued, on average, by 2% at the firm level.[31] Sector errors are -6% in all samples.

The regression results in Table A.3 show that target misvaluation has significant effects on all dependent variables except target's bargaining power. Columns (1) and (2) indicate that a negatively misvalued target receives a significantly lower offer price, and columns (3) and (4) show that the target undervaluation results in higher returns for acquirers. In columns (7) and (8), I also find that the negative misvaluation of a target can increase combined abnormal returns in acquisitions, which implies that target undervaluation is a source of additional synergy gain. The target industry misvaluation measures are insignificant in all specifications. The results support that fire-sale targets are priced below their fundamental values and it influences acquisition outcomes significantly. However, the fire-sale variable, the interaction of target firm- and industry-level distress, remains significant and consistent with the main results, even in the presence of the target misvaluation measure. The results thus show that the fire-sale channel is essential to explaining the outcomes of distressed target acquisition.

4.5.2 Fire-Sale Acquisitions in Recession

While the present study measures industry-specific distress and estimates the fire-sale effects on acquisition outcomes, Ang and Mauck (2011) investigated the effect of economy-wide recession on acquisitions and argued that recession drives a higher offer premium for distressed targets because acquirers assume the targets to be largely depressed during recession. In this section, I control for the recession dummy variable and examine the effect of target firm- and industry-level distress on key variables. Recessions are defined in terms of recessionary months identified by NBER, as in Ang and Mauck (2011).

Table A.4 in Appendix presents coefficient estimates from an OLS regression that uses the same explanatory variables as in the paper's main regressions, but includes the recession dummy variable. The results in Table A.4 show that the recession dummy has a negative effect on acquirer's return. Target bargaining power is also positively related with the recession dummy. In all specifications, however, coefficients on the

[31] A negative number of misvaluation implies that targets are undervalued.

main explanatory variable, the interaction effect of target distress and target industry distress, are robust and consistent with the main regressions in the previous sections. This result provides evidence that industry-specific rather than economy-wide distress accounts for the fire-sale effects in distressed target acquisitions.

5 Intra-Industry Contagion of Fire-Sales

The competing hypotheses for industry-specific contagion effect have different predictions on rivals' operating performance and abnormal stock returns following the announcement of a target's fire-sale acquisition. The *negative information hypothesis* predicts negative stock returns, but makes no particular prediction with respect to post-acquisition operating performance. However, the *intense competition hypothesis* predicts negative stock returns following negative operating performance whereas *anticompetitive collusion hypothesis* implies positive stock returns following positive operating performance in the post-acquisition period. This mutually exclusive set of hypotheses enables me to identify a valid hypothesis by investigating post-acquisition stock returns and comparing operating performance, of rivals in the pre- and post-acquisition period.

5.1 Abnormal Stock Returns of Industry Rivals

I first estimate the impact of fire-sale on industry rivals' stock returns at the announcement of a fire-sale acquisition. To minimize other confounded effects in the broad industry classification, I focus on target industry rivals in the same 4-digit SIC code. I compare abnormal stock returns for industry rivals that share similar characteristics with the target. Matched industry rivals are selected based on size and market-to-book ratio. Among the subset of same industry rivals that have total book asset values within ±30% of the total book asset values of the target firm, I choose a rival with the closest market-to-book ratio to that of the target. Rival's cumulative abnormal return (CAR) at the announcement (-1, +1) of the acquisition of an industry target is estimated using the Fama-French three-factor model. I use 240 daily returns covering (-300, -60) to estimate parameters for each rival firm.[32]

Panel A in Table A.5 presents abnormal stock returns for industry rivals at the announcement of acquisitions. The results show distressed target acquisitions in a distressed industry to have a significant impact on rivals' stock prices. Although their CARs in the total sample are positive, rivals, in response to fire-sale acquisitions, earn -0.9% abnormal returns, on average, at the 5% significance level (t-stat = -2.12).

[32]The results are robust after excluding the cases of multiple acquisitions occurring during the estimation period.

Figure 4 plots the equal-weighted average of short-term cumulative abnormal returns of matched target rivals from 50 days before to 50 days after the announcement of acquisitions. It also shows that matched target rivals of fire-sale acquisitions experience negative short-term returns relative to other rivals.

Previous results do not control for variables that could be driving the differences. I, therefore, turn to regression analysis and control for such factors including product market variables. I estimate the fire-sale effects on target industry rivals using the following specifications.

$$R^T_{ijdkt} = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma^{'} X_{ijdk} + \alpha_t + \alpha_i + \varepsilon_{ijdkt} \quad (8)$$

where R^T_{iidkt} is the CAR for a matched industry rival of targets with same 4-digit SIC over the three-day period (-1, +1) surrounding the announcement of acquisition, X_{ijdk} represents control variables for target i, acquirer j, rival k, and deal characteristics d.

The coefficient estimates from the OLS regression in Table 12 show that the interaction effect of a target's firm- and industry-level distress negatively affects the stock returns of industry rivals. The coefficient is large and significant. The economic magnitude of the coefficient can be interpreted as 1-4 percentage points. These results support both the *negative information hypothesis* and *intense competition hypothesis.* Negative stock returns, however, do not allow me to determine whether the negative contagion effects are related to the negative information or acquiring firms' competitive advantage.

In the second matched sample test, I conduct subsample analysis with high and low industry-level R&D intensity. The previous section shows that high R&D intensity drives stronger fire-sale effects by creating greater information asymmetry between industry insiders and outsiders. If negative stock returns of target industry rivals are not driven by fire-sale effects, then there should be no difference between the stock market reactions of high and low R&D industries in this sub-sample. On the other hand, if high information asymmetry in high R&D industries reinforces negative information effects, then I should find greater impact for target industry rivals in high R&D industries. I show that the effects of a fire-sale acquisition on target industry rivals are stronger in high R&D industries. This evidence, therefore, supports the *negative information hypothesis.* Columns (3)-(6) in Table 12 reports the subsample results. They reveal a significant relation when industry-level R&D intensity is high, but an insignificant relation when industry-level R&D intensity is low. The estimates in columns (3)-(4) show -1.4% rivals' abnormal return for a one standard deviation increase in $Distress1_T$, or -5.97% decrease by $Distress2_T$ when the target industry is distressed. These negative coefficients are economically larger and statistically more significant than those of the full matched rival sample.

5.2 Operating Performance of Industry Rivals

I next examine matched industry rivals' operating performance by comparing ROA and profitability margin (operating cash flow/total sales) pre and post acquisition, as presented in Panels B and C in Table A.5. I find that matched industry rivals' ROA decrease by 0.007 in the total sample of acquisition, but increase in the sample of fire-sale acquisitions by 0.026. Profitability margin exhibits a slight negative change post acquisition. Figure 5 presents the operating performance (ROA and profit margin) of matched target rivals from t-3 years to t+3 years. The figure shows that matched rivals of fire-sale targets experience an insignificant decrease in operating performance during the post-acquisition period.

I next estimate the impact of acquisitions on industry rivals' operating performance using the following specifications.

$$\text{ROA-Diff}^T = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijdk} + \alpha_t + \alpha_i + \varepsilon_{ijdkt} \quad (9)$$

$$\text{Profit-Diff}^T = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijdk} + \alpha_t + \alpha_i + \varepsilon_{ijdkt} \quad (10)$$

where ROA-Diff$^T_{ijkdt}$ is the difference of return on asset for industry rivals between the average post-acquisition period (+3, +1) year and the average pre-acquisition period (-3, -1) year, and X_{ijkd} represents control variables for target i, acquirer j, rival k, and deal characteristics d. The error terms are clustered by target, industry and year. Profit-Diff$^T_{ijkdt}$ is the difference in profitability margin (operating cash flow/total sales) for industry rivals between the average post-acquisition period (+3, +1) year and the average pre-acquisition period (-3, -1) year. The coefficient estimates from the OLS regression in Table 13 indicate that the interaction of a target's firm- and industry-level distress has an insignificant effect on the post-acquisition operating performance of industry rivals.

Taken together, industry rivals' negative abnormal stock returns unaccompanied by diminished operating performance at announcements of acquisitions support *Hypothesis 5-1*, which states that negative information from fire-sale acquisitions causes a negative contagion effect for industry rivals of fire-sale targets.

6 Conclusion

Do fire-sales exist in acquisitions? If they do, how do fire-sale acquisitions affect target industry competitors? This paper addresses these two important questions by inferring the effect of the frictions involved in fire-sale acquisitions from an examination of the combined impact of firm- and industry-level distress on acquisition outcomes.

The main finding in this paper is that a target's firm- and industry-level distress is a robust and economically important determinant of acquisition outcomes. In particular, the evidence suggests that distressed targets with financially constrained industry peers are sold at substantial discounts, as proposed by Shleifer and Vishny (1992). Acquirers gain positive and higher announcement returns in fire-sale acquisitions and fire-sale targets are more likely to sell to outside acquirers. I demonstrate the fire-sale effects in acquisitions by showing that these findings are stronger when fire-sale targets are sold to industry outsiders or when targets' assets are highly industry-specific. The results are robust to stock market undervaluation and economic recession. I also find that fire-sale acquisitions negatively affect target industry rivals' stock returns by sending negative information without fundamental changes in product market competition.

Overall, this study shows that financial distress costs in an illiquid market are substantial, particularly, when the assets are less redeployable. It highlights implications for debt capacity and capital structure as well as the contagion channel through which economic shocks can transmit.

APPENDICES

A The Model

This section provides a simple two-stage model to derive testable implications for fire-sale effects on acquisition outcomes. This work is closely related to the work of Shleifer and Vishny (1992) and Aguiar and Gopinath (2005). There are two firms in the industry. In state j at time t, each firm has an initial capital stock K_t and produce output y_t according to the production technology

$$y_{j,t} = z_{j,t} K_{j,t}^{\alpha} \tag{A-1}$$

where $\alpha \in (0,1)$ and $z_{j,t}$ is productivity. The output price is exogenously determined and normalized to one. The cost of capital is normalized to one. Firms choose the optimal investment $I_{j,t}$ on the capital at every t subject to the anticipated productivity at t=2. I assume perfect foresight. Capital depreciates at a rate δ. The firm's capital is accumulated according to

$$K_{j,t+1} = I_{j,t} + (1-\delta)K_{j,t} \tag{A-2}$$

There are two states of nature, prosperity and depression, $j \in H, L$. If the economy is in the L state, both firms in the industry are hit by industry-wide aggregate shock, and thus, productivity z is assumed to be such that $z_H > z_L$. Furthermore, I assume that one firm is hit harder than the other, and sold to other firms. There are two types of competing buyer: the other firm inside the industry (the insider), and an industry outsider (the outsider). In the L state, the seller under the insider's ownership has a borrowing constraint $\overline{D}$ due to debt overhang, whereas I assume that the outsider is not subject to a borrowing constraint. However, the cross-industry acquisition requires an additional cost γ due to frictions in capital allocation across industries. This cost captures an additional agency cost of hiring a manager with knowledge to operate the seller. Therefore, γ is higher when the seller's assets are more specialized to the industry insiders.

Let $W_{j,t}$ denote the seller's stand-alone value in state j at time t. Specifically, the values are $W_{H,t}$ and $W_{L,t}$ in prosperity and depression, respectively, and $W_{H,t} > W_{L,t}$. Let U_j denote the value of the seller under the insider's ownership.

$$U_{j,t} = \max_{I_{j,t}} \{ y_{j,t} + \beta(y_{j,t+1} + (1-\delta)K_{j,t+1}) \} \tag{A-3}$$

$s.t.$

$$K_{j,t+1} = I_{j,t} + (1-\delta)K_{j,t} \tag{A-4}$$

$$I_{L,t} \leq \overline{D} + y_{L,t} \tag{A-5}$$

where $\beta \in (0,1)$ is the discount rate. The value of the seller under the outsider's ownership, $V_{j,t}$, can be written as

$$V_{j,t} = \max_{I_{j,t}} \{y_{j,t} + \beta(y_{j,t+1} + (1-\delta)K_{j,t+1})\} \tag{A-6}$$

$s.t.$

$$K_{j,t+1} = I_{j,t} + (1-\delta)K_{j,t} \tag{A-7}$$

Let $U^+_{j,t}$ and $V^+_{j,t}$ denote the amount of surplus from the transfer of ownership to the insider and the outsider, respectively.

$$U^+_{j,t} = max(U_{j,t} - W_{j,t}, 0) \tag{A-8}$$

$$V^+_{j,t} = max(V_{j,t} - W_{j,t}, 0) \tag{A-9}$$

The buyer's identity (A) is determined by the given function with each surplus.

$$A(U^+_{j,t}, V^+_{j,t} - \gamma) = A(max(U_{j,t} - W_{j,t}, 0), max(V_{j,t} - W_{j,t}, 0) - \gamma) \tag{A-10}$$

$$= 1_{\{max(U_{j,t} - W_{j,t}, 0) - max(V_{j,t} - W_{j,t}, 0) + \gamma \geq 0\}} \tag{A-11}$$

The insider gets the seller, if $A(U^+_{j,t}, V^+_{j,t} - \gamma) = 1$, and vice versa.

When matched, the buyer and the seller bargain over price. The offer price ($P_{j,t}$) can be written as

$$P_{j,t} = \underbrace{W_{j,t} + min(U^+_{j,t}, V^+_{j,t} - \gamma)}_{\text{seller's outside option}} + \mu \mid U^+_{j,t} - (V^+_{j,t} - \gamma) \mid \tag{A-12}$$

$$= \underbrace{W_{j,t} + max(U^+_{j,t}, V^+_{j,t} - \gamma)}_{\text{buyer's reservation price}} \tag{A-13}$$

where $\mu \in (0,1)$ captures the seller's bargaining power and the seller has the outside option from the stand-alone value (W) plus the second highest bid, $min(U^+, V^+ - \gamma)$. The buyer's reservation price, or the maximum price, is the stand-alone value (W) plus $max(U^+_{j,t}, V^+_{j,t} - \gamma)$.

Proposition 1. *Depression decreases the price premium ($P_j - W_j$) by reducing synergy and seller's bargaining power.*

Proof: U_H equals to V_H, but $U^+_H \geq U^+_L$ due to the borrowing constraint in state L. $V^+_H \geq V^+_L$ because the benefit of liquidity is high in state H. Therefore, $(P_H - W_H) - (P_L - W_L) = max(U^+_H, V^+_H - \gamma) - max(U^+_L, V^+_L - \gamma) = U^+_H - max(U^+_L, V^+_L - \gamma) \geq 0$.

Similarly, $min(U_H^+, V_H^+ - \gamma) - min(U_L^+, V_L^+ - \gamma) = V_H^+ - \gamma - min(U_L^+, V_L^+ - \gamma) \geq 0$, because $V_H^+ - \gamma \geq V_L^+ - \gamma$. If $min(U_L^+, V_L^+ - \gamma) = U_L^+$, then, $V_H^+ - \gamma \geq V_L^+ - \gamma \geq U_L^+$. Therefore, in depression, both reservation price (synergy) and target's outside option decrease and thus reduces the price premium.

Proposition 2. *Depression increases the probability that the seller is sold to the outsider.*
Proof: $U_H^+ = V_H^+$. Thus, $A(U_H^+, V_H^+ - \gamma) = 1$. In depression, if (A-5) is binding, V_L is greater than U_L. Therefore, $1_{\{max(U_H - W_H, 0) - max(V_H - W_H, 0) + \gamma \geq 0\}} = 1 \geq 1_{\{max(U_L - W_L, 0) - max(V_L - W_L, 0) + \gamma \geq 0\}}$

Proposition 3. *Increasing the cost of outsider(γ) decreases the price premium and increases probability of the outside buyer.*
Proof: Assume $\gamma_0 < \gamma_1$. Then, $\{max(U_H - W_H, 0) - max(V_H - W_H, 0) + \gamma_0\} \geq \{max(U_L - W_L, 0) - max(V_L - W_L, 0) + \gamma_0\} \geq \{max(U_L - W_L, 0) - max(V_L - W_L, 0) + \gamma_1\}$. Similarly, $max(U_H^+, V_H^+ - \gamma_0) \geq max(U_L^+, V_L^+ - \gamma_0) \geq max(U_L^+, V_L^+ - \gamma_1)$.

B Distance-to-Default Model

The KMV-Merton model estimates a default probability based on the bond pricing model by Merton (1974). It calculates the probability that the value of the firm will be less than the face value of debt at given point in time. The model requires market equity value (E) and face value of debt (F) from COMPUSTAT and risk-free rate of return(r). Following Vassalou and Xing (2004), the face value of debt (F) is calculated by (Current liability + 0.5 * Long-term debt).[33] I follow Bharath and Shumway (2008) to construct this measure as given below.

Step 1: Estimate the equity volatility (σ_E) from historical stock returns over the past one year (set T=1).

Step 2: Simultaneously solve the below two equations numerically for values of V and σ_V.

$$E = VN(d_1) - e^{-rT} FN(d_2)$$
$$\sigma_E = (\frac{V}{E})N(d_1)\sigma_V$$

[33] Vassalou and Xing (2004) highlights that long-term liabilities should be taken into account for corporate default risk because long-term debt influences the solvency of firm through interest payments and the roll-over decision of short-term debt.

Step 3: Calculate the distance to default using

$$DD = \frac{ln(V/F) + (r + 0.5\sigma_V^2)T}{\sigma_V \sqrt{T}}$$

The corresponding probability of default (EDF) is $N(-DD)$.

C Computation of target undervaluation

Follow Rhodes-Kropf et al. (2005), I construct the measure for target undervaluation by decomposing the market-to-book ratio into three components: the firm-specific error; industry-wide short-run error and long-run growth option based on the below equation.

$$m_{it} - b_{it} = \underbrace{m_{it} - v(\theta_{it}; \alpha_{jt})}_{\text{firm}} + \underbrace{v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_j)}_{\text{sector}} + \underbrace{v(\theta_{it}; \alpha_j) - b_{it}}_{\text{long-run}}$$

Where $m_{it} - b_{it}$ is the natural log of the market to book ratio. $v(\theta_{it}; \alpha_{jt})$ is the estimated fundamental value of the firm at year t by applying firm-specific model parameter α_{jt} and $v(\theta_{it}; \alpha_j)$ is the long-run average fundamental value of the firm estimated based on industry average parameter α_j. The first step is to estimate the market value of firm i at time t, m_{it} based on the below regression (Model 3 in Rhodes-Kropf et al. (2005)).

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} ni_{it}^{+} + \alpha_{3jt} I_{(<0)} (ni^{+})_{it} + \alpha_{4jt} Lev_{it} + \varepsilon_i$$

Where b_{it} is the logs of book asset value, ni_{it}^{+} is natural log of the absolute value of net income and $I_{(<0)}$ is an indicator function for negative net income. This estimation provides the set of firm-specific loading α_{jt} for each accounting variable. Then, I calculate α_j by aggregating α_{jt} over the sample period. Lastly, using the fitted parameters, I calculate $v(\theta_{it}; \alpha_{jt})$ and $v(\theta_{it}; \alpha_j)$.

$$v(\theta_{it}; \alpha_{jt}) = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} ni_{it}^{+} + \alpha_{3jt} I_{(<0)} (ni^{+})_{it} + \alpha_{4jt} Lev_{it}$$
$$v(\theta_{it}; \alpha_j) = \alpha_{0j} + \alpha_{1j} b_{it} + \alpha_{2j} ni_{it}^{+} + \alpha_{3j} I_{(<0)} (ni^{+})_{it} + \alpha_{4j} Lev_{it}$$

D Variable Definitions

Variable	Description	Source
$Distress1_T$	EDF index from Distance-to-Default model (Merton (1974))	COMPUSTAT, CRSP
$Distress2_T$	Dummy equal to one if leverage > industry median and current ratio < industry median	COMPUSTAT
$Ind.Distress_T$	Dummy equal to one if median sales growth is negative	COMPUSTAT
CAR(-1, +1)	Cumulative abnormal returns over three days surrounding the announcement (-1, +1) using Fama-French three-factor model	CRSP
$BHAR_A$	The acquirer's buy-and-hold returns during 2 years following acquisition less the buy-and-hold return of a matched firm	COMPUSTAT, CRSP
Ln(Price1)	The log of total equity value (EQVAL)	SDC
Ln(Price2)	The log of total transaction value (TRANSACT)	SDC
Premium	Offer price (PR) divided by target stock price 4 weeks before the announcement (SPRC_4WK)	SDC
$CAR_{Combined}$	The marget equity value weighted average of the target's CAR and acquirer's CAR	COMPUSTAT, CRSP
Log(Synergy)	The log of the sum of the acquirer's and target's abnormal dollar return (CAR*market cap.)	COMPUSTAT, CRSP
$DCAR$	CAR(-1, +1) times market equity value 4 weeks prior to the announcement	SDC
NDCAR (ω^T)	($DCAR_T$ - $DCAR_A$)/(target mkt cap. + acquirer mkt cap.)	Ahern (2011)
$Bargain_T$	$DCAR_T$ /($DCAR_T$ +$DCAR_A$)	CRSP
Outsider	Dummy equal to one if the acquirer's 3-digit SIC code is different from the target's	COMPUSTAT
Capital-Specificity	1 - (used capital expenditure within an industry/aggregate industry capital expenditure), Balasubramanian and Sivadasan (2009)	
Labor Union	Percentage of labor union membership in 3-digit SIC code, Hirsch and Macpherson (2002)	
R&D Intensity	Research and development expense divided by total sales	COMPUSTAT
Size	Log of market capitalization 4 weeks before announcement	CRSP
Market-to-book	Market value of total assets divided by book value assets	COMPUSTAT, CRSP
Leverage	Total debt (Debt in current liabilities + long-term debt) divided by total book assets	COMPUSTAT
Tangibility	(Total assets - Intangible assets)/Total assets	COMPUSTAT
Profitability	Operating income after depreciation divided by total sales (Profit margin)	COMPUSTAT
Same Industry	Dummy equal to one if target and acquirer in the same 3-digit SIC code	COMPUSTAT
Tender Offer	Dummy equal to one if acquirers issue tender offer	SDC
Toehold	The percentage of shares held by the acquirer at the acquisition announcement	SDC
Competing	Dummy equal to one if the acquirer had to make a counter-offer	SDC
Poison Pill	Dummy equal to one if the target has poison pill provision	
Termination Fee	Dummy equal to one if the merger agreement includes a target termination fee	SDC
Recession	NBER defined recession	NBER

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Figure 1: Components of Corporate Sector Asset Reallocation

This graph shows the components of corporate sector asset reallocation in billions of dollars between 1980 and 2010. The solid line denotes total annual amount of asset reallocation: sum of acquisitions (Compustat: AQC) and sales of property, plant and equipment (Compustat: SPPE). The dotted line denotes total acquisitions of all firms in Compustat. The dashed line denotes sales of property, plant and equipment of all firms in Compustat. This graph shows that acquisitions account for around two-thirds of asset reallocation.

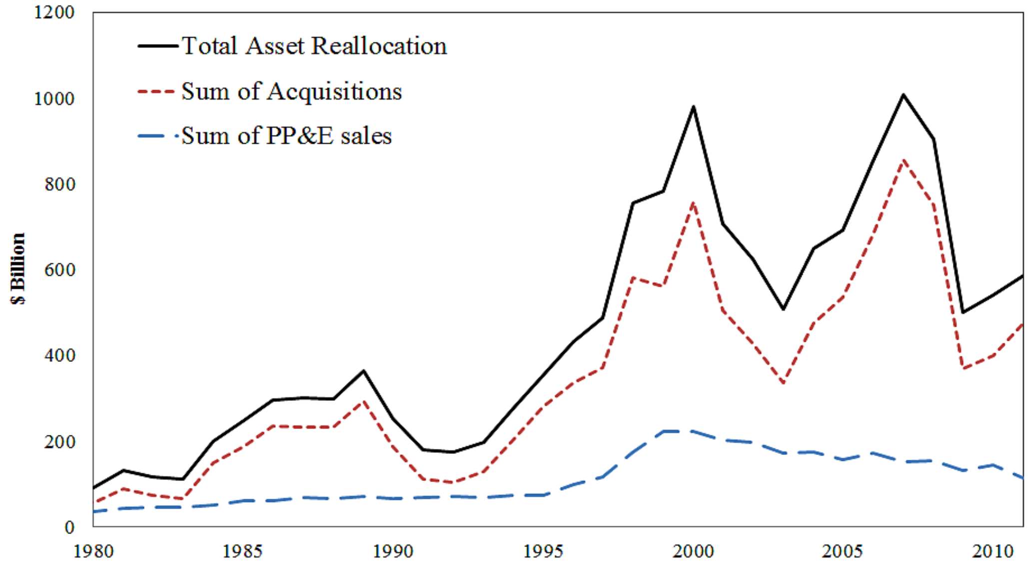


Figure 2: Financial Frictions and Fire-Sale

This graph shows the impact of a negative industry-wide shock on the secondary market for corporate assets. In a world without financial frictions, corporate assets are traded based on the future cash flows from the assets. A negative industry-wide shock drives price to fall from P_0 to P_1, which reflects the updated value of the assets, by shifting supply (S) and demand (D) curves. With financial frictions, however, more firms within the industry are likely to be financially constrained due to industry-wide debt overhang problem. Moreover, given that the assets are fairly specialized to the industry, industry outsiders with high liquidity have lower valuation on the assets due to frictions in capital allocation across industries. Thus, demand decreases further from D_1 to D_{FS} and supply increases further from S_1 to S_{FS}, which reduces market price to P_{FS}, or fire-sale price.

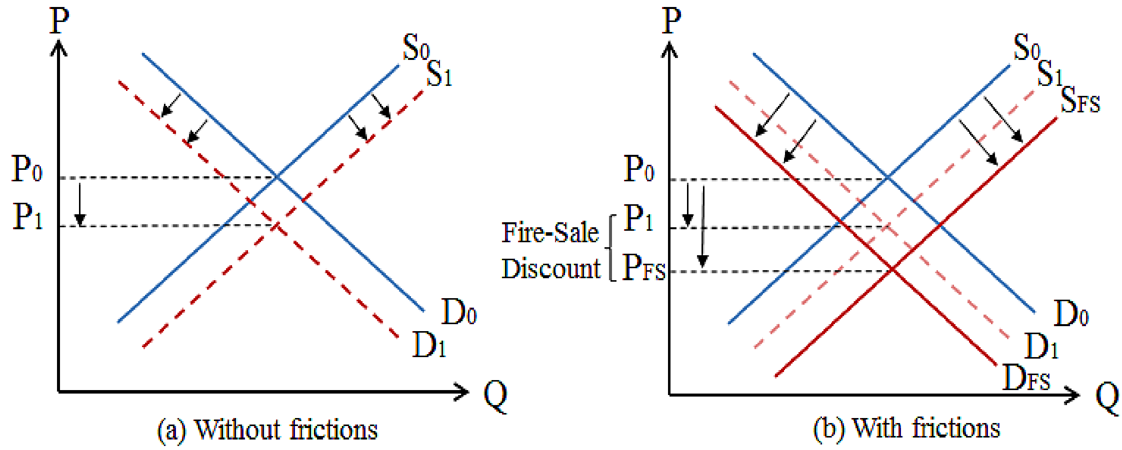


Figure 3: Long-term Abnormal Returns for Acquirers

This figure shows the cumulative abnormal returns (CARs) of acquirers from 20 days before to 200 days after the announcement of acquisitions. The solid line shows CARs for acquirers of a distressed target in a distressed industry, or fire-sale acquisition. The dotted line shows CARs for acquirers of a distressed target in a non-distressed industry. The dashed line shows CARs for acquirers of a non-distressed target in a non-distressed industry. Abnormal returns are calculated as the acquirer's return minus a value-weighted market index.

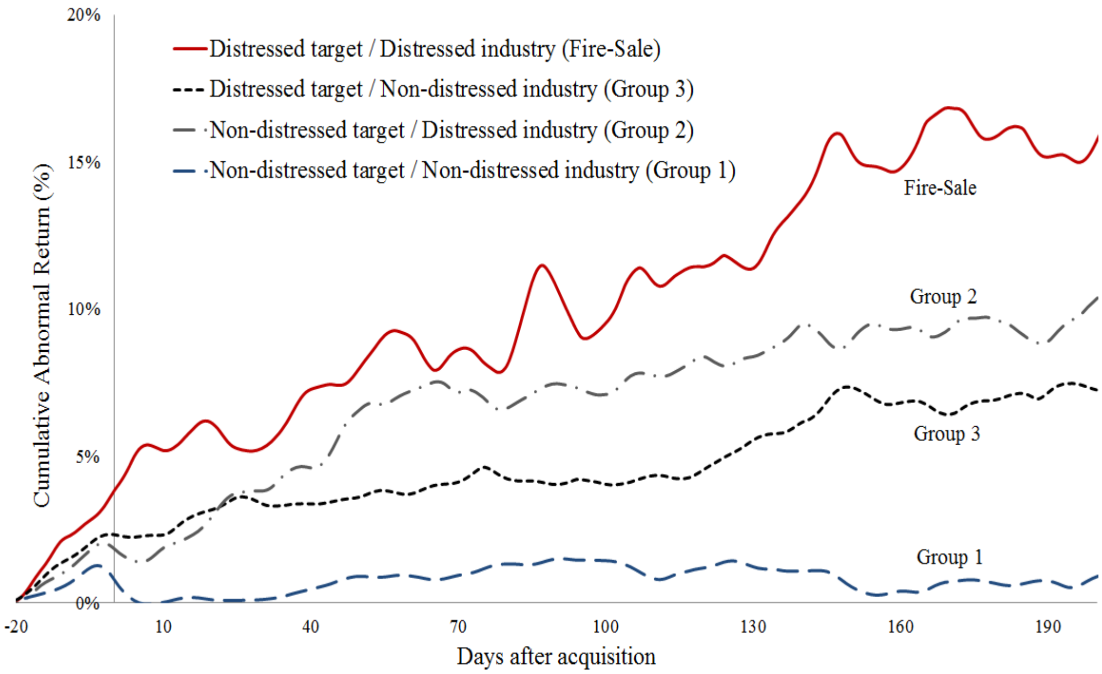


Figure 4: Abnormal Returns for Target Industry Rivals

This figure shows the short-term cumulative abnormal returns (CARs) of target industry rivals from 50 days before to 50 days after the announcement of acquisitions. The solid line shows CARs for acquirers of a distressed target in a distressed industry, or fire-sale acquisition. The dotted line shows CARs for acquirers of a distressed target in a non-distressed industry. The dashed line shows CARs for acquirers of a non-distressed target in a non-distressed industry. Abnormal returns are calculated as the acquirer's return minus a value-weighted market index.

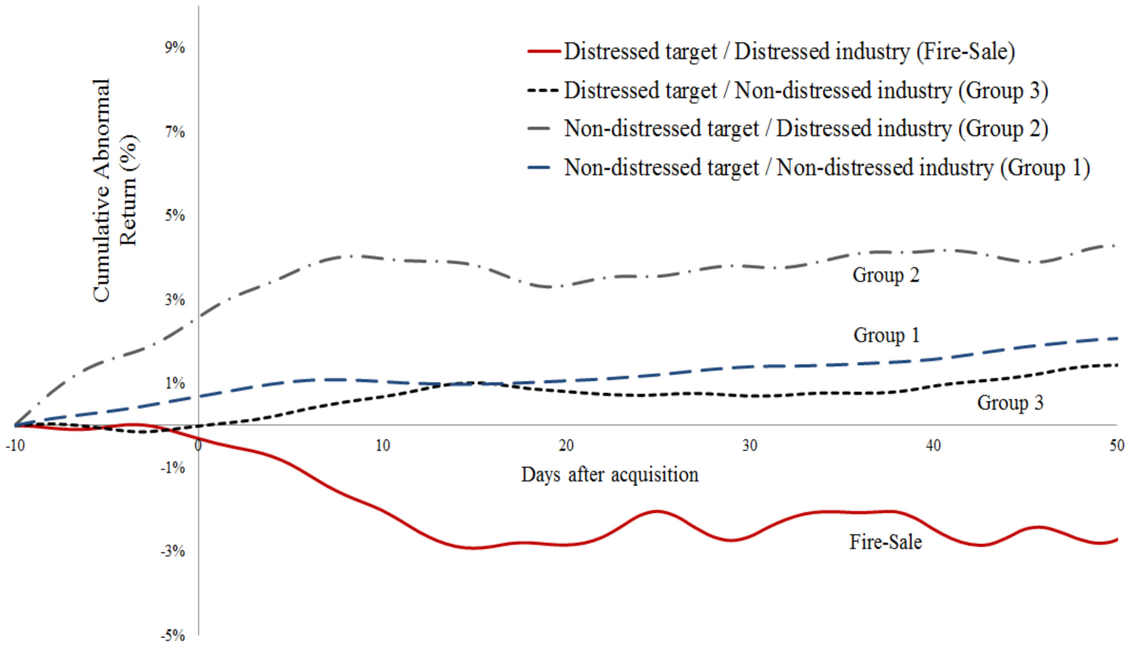
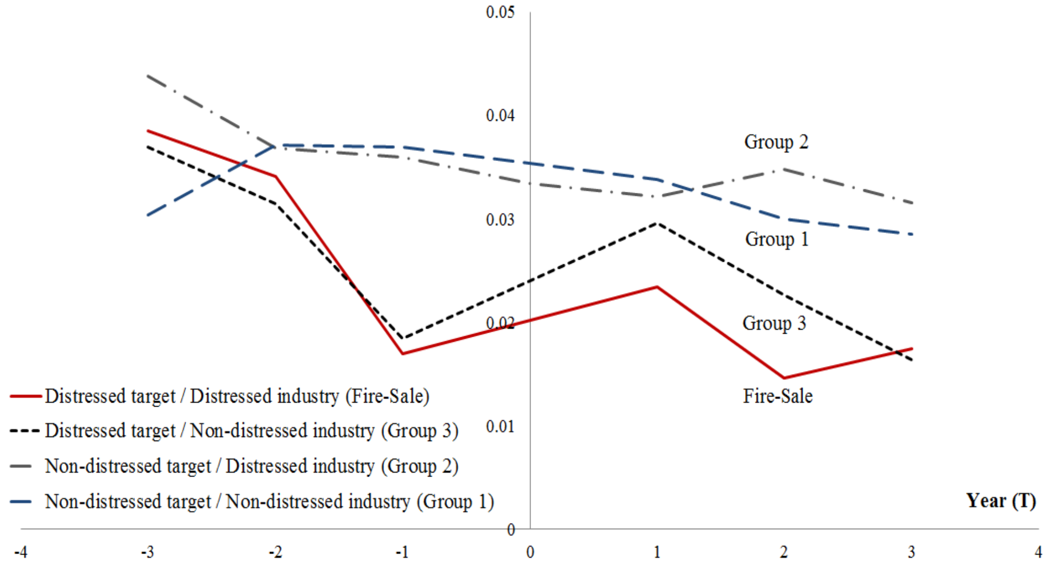
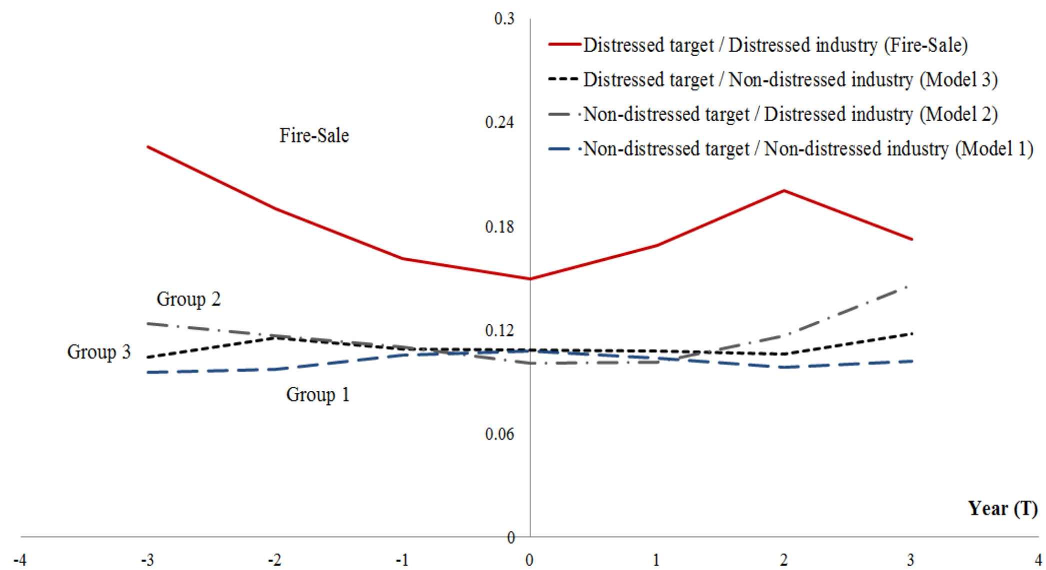


Figure 5: Operating Performance of Target Rivals

These figures show the operating performance of target industry rivals from t-3 year to t+3 year around the announcement of acquisition. Figure (a) shows median ROA (net income/total assets) and figure (b) shows median profit margin (operating cash flow/total sales).



(a) ROA



(b) Profit margin

Table 1: Summary Statistics: Target and Acquirer

This table presents the summary statistics for the U.S. acquisitions completed between 1980 and 2010 in which the publicly traded acquiring firm gains control of a public target as listed by SDC. Panels A and B provide pre-acquisition characteristics of target and acquirer, respectively. All variables are defined in Appendix A.3.

	Mean	Median	Std. dev.	Min	Max	Obs.
Panel A. Target Characteristics						
EDF	0.111	0.001	0.227	0.000	0.998	1572
Industry Distress	0.074	0.000	0.262	0.000	1.000	1572
Log (Assets)	11.78	11.66	1.644	7.183	17.60	1572
Log (Equity)	5.282	5.201	1.721	0.096	11.27	1572
Market/Book	2.087	1.479	2.018	0.297	28.40	1572
Cash	0.228	0.135	0.236	0.000	0.970	1572
Leverage	0.181	0.127	0.184	0.000	0.929	1572
Profitability	-0.198	0.095	1.671	-20.78	0.618	1556
Tangibility	0.892	0.972	0.159	0.171	1.000	1334
Industry Q	1.765	1.619	0.652	0.756	7.184	1572
Industry Leverage	0.147	0.120	0.119	0.000	0.663	1572
Capital-Specificity	0.937	0.940	0.033	0.786	1.000	866
Union Membership	9.560	5.700	10.909	0.000	78.40	1495
R&D Intensity	0.107	0.074	0.161	0.000	1.093	1513
Panel B. Acquirer Characteristics						
EDF	0.052	0.000	0.160	0.000	1.000	1427
Industry Distress	0.082	0.000	0.275	0.000	1.000	1569
Log (Assets)	14.17	14.11	2.092	7.632	19.82	1572
Log (Equity)	7.829	7.756	2.210	1.148	13.37	1572
Market/Book	2.505	1.807	2.675	0.354	58.04	1572
Cash	0.177	0.109	0.186	0.000	0.981	1572
Leverage	0.198	0.179	0.161	0.000	0.869	1572
Profitability	0.100	0.159	1.467	-55.09	0.812	1571
Tangibility	0.852	0.921	0.174	0.080	1.000	1313

Table 2: Summary statistics: Deal Characteristics

This table presents the summary statistics for key deal characteristics for the U.S. acquisitions completed between 1980 and 2010 in which the publicly traded acquiring firm gains control of a public target as listed by SDC. A firm's industry is defined as the set of firms with the same 3-digit SIC code. All variables are defined in Appendix A.3.

	Mean	Median	Std. dev.	Min	Max	Obs.
Ln (Price1)	5.388	5.286	1.779	-1.808	11.39	1566
Ln (Price2)	5.404	5.325	1.752	-0.511	11.40	1572
Premium	0.504	0.377	0.934	-0.628	19.94	933
Relative Size	0.841	0.848	0.120	0.500	1.511	1572
Tender Offer	0.254	0.000	0.435	0.000	1.000	1572
Toehold	0.032	0.000	0.130	0.000	0.982	1572
Competing Bidder	0.050	0.000	0.217	0.000	1.000	1572
Cash Payment	0.373	0.000	0.484	0.000	1.000	1572
Stock Payment	0.280	0.000	0.449	0.000	1.000	1572
Termination Fee	0.601	1.000	0.490	0.000	1.000	1497
Same Industry	0.539	1.000	0.499	0.000	1.000	1572

Table 3: The Effect of a Fire-Sale on Acquirer Return: Univariate Analysis

This table compares acquirer returns over target firm- and industry-distress. Panel A compares the cumulative abnormal returns (CAR_A (%)) of acquirers over target firm- and industry-distress. Panel B compares the buy-and-hold returns ($BHAR_A$ (%)) during the two years following the acquisition, less the buy-and-hold return of a matched firm. CARs are presented for the (-1, +1) window surrounding the announcement of acquisitions. Target is classified as distressed, based on a dummy variable $Distress2_T$, if the firm's leverage ratio is greater than the median leverage ratio of all firms in the same industry, and the firm's current ratio (current assets/current liabilities) is less than the median current ratio of the industry. Industry is defined as distressed, based on a dummy variable $Ind.Distress_T$. The industry of a firm is defined as the set of firms with the same 3-digit SIC code.

	All	Distressed Target		Non-distressed Target	
	-	Dist. Ind.	Non-dist. Ind.	Dist. Ind.	Non-dist. Ind.
Panel A. CAR (%)					
Mean	-1.02	0.91	-0.60	-1.10	-1.21
Std. Dev.	7.20	8.72	6.72	6.01	7.41
Median	-0.70	0.20	-0.42	-0.94	-0.83
Panel B. BHAR(%)					
Mean	-10.01	46.45	-15.04	-24.87	-7.98
Std. Dev.	80.28	111.88	75.76	120.96	76.87
Median	-7.14	19.50	-10.71	-11.69	-6.29
Number of Obs.	1627	24	397	94	1112

Table 4: Effects of Fire-Sale on Acquirer Returns: Multivariate Analysis

This table presents the impact of fire-sale on short-run and long-run abnormal returns for acquirers. We specify a regression model:

$$Y_{ijdt} = \beta_1(\underbrace{Ind.D_{it} \times Distress_{it}}_{Fire\text{-}Sale}) + \beta_2 Ind.D_{it} + \beta_3 Distress_{it} + \gamma' X_{ijd} + \alpha_t + \alpha_i + \varepsilon_{ijdt} \quad \text{(A-14)}$$

where $Distress_{it}$ and $Ind.D_{it}$ are the target firm and industry distress measures, respectively, of target i, and X_{ijd} represents control variables for target i, acquirer j, and deal characteristics d. Year fixed effect (α_t) and industry fixed effect (α_i) are also included. In columns (1)-(2), the dependent variable is acquirer's three-day cumulative abnormal return (CAR_A) at announcement of acquisition, estimated using a market model. In columns (3)-(4), the dependent variable is acquirer's buy-and-hold returns ($BHAR_A$) during 2 years following acquisition less buy-and-hold return of a matched firm. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). $Ind.Distress_T$ is a dummy that equals 1 if the sales growth of the median firm in an industry is negative in the year of the transaction. Control variables for acquirer characteristics are *size*, *leverage*, *m/b*, *tangibility*, and *profitability*. Deal-specific controls include *same industry*, *tender offer*, *toehold*, *competing*, *poison pill*, and *termination fee*. Industry fixed effects are at the 3-digit SIC code level. Other variables are defined in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	CAR_A		$BHAR_A$	
	(1)	(2)	(3)	(4)
Fire-Sale$_1$	0.11***		1.01*	
	(0.03)		(0.53)	
Fire-Sale$_2$		0.05***		0.82***
		(0.01)		(0.19)
$Ind.Distress_T$	0.00	0.01	0.07	0.09
	(0.01)	(0.01)	(0.09)	(0.08)
$Distress1_T$	-0.01		-0.10	
	(0.01)		(0.17)	
$Distress2_T$		0.01		-0.07
		(0.01)		(0.06)
Med. Ind. Q	0.01**	0.01**	0.04	0.04
	(0.01)	(0.01)	(0.10)	(0.09)
Med. Ind. Leverage	0.01	0.01	1.45	1.52
	(0.05)	(0.05)	(1.16)	(1.17)
Target Size	-0.01***	-0.01***	-0.05***	-0.05**
	(0.00)	(0.00)	(0.02)	(0.02)
Target Leverage	-0.00	-0.02	-0.32*	-0.30*
	(0.01)	(0.02)	(0.17)	(0.17)
Target M/B	-0.00***	-0.00***	-0.00	-0.00
	(0.00)	(0.00)	(0.02)	(0.02)
Target Tangibility	0.03	0.03	0.02	0.01
	(0.02)	(0.02)	(0.19)	(0.18)
Target Profitability	0.00	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	1098	1098	776	776
Adj-R^2	0.08	0.07	0.16	0.16

Table 5: Effects of Fire-Sale on Target Offer Price

This table tests for the impact of fire-sale on target offer price. The dependent variables are three different measures of offer price for target shareholders from the SDC database, defined as follows: $Ln(Price1)$: the log of total equity value, $Ln(Price2)$: the log of total transaction value, and $Premium$: per share offer price divided by target stock price four weeks before the announcement. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable: Offer Price	Ln(Price1)		Ln(Price2)		Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Fire-Sale$_1$	-0.89*		-0.50***		-0.76***	
	(0.49)		(0.13)		(0.24)	
Fire-Sale$_2$		-0.24		-0.24*		-0.28**
		(0.22)		(0.12)		(0.13)
$Ind.Distress_T$	0.23**	0.14	0.07	0.05	0.09	-0.00
	(0.10)	(0.09)	(0.06)	(0.08)	(0.08)	(0.11)
$Distress1_T$	0.31***		0.29***		0.69**	
	(0.10)		(0.09)		(0.28)	
$Distress2_T$		-0.01		-0.05		0.02
		(0.05)		(0.04)		(0.06)
Med. Ind. Q	0.02	-0.02	-0.00	-0.05	-0.01	0.01
	(0.04)	(0.07)	(0.04)	(0.06)	(0.06)	(0.09)
Med. Ind. Leverage	0.91***	0.45	0.57*	0.17	-0.54	-0.19
	(0.32)	(0.38)	(0.31)	(0.41)	(1.28)	(1.56)
Target Size	0.89***	0.83***	0.90***	0.84***	-0.11***	-0.15***
	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.04)
Target Leverage	0.80***	1.11***	0.27**	0.65***	-0.16	0.14
	(0.11)	(0.12)	(0.10)	(0.11)	(0.20)	(0.21)
Target M/B	0.01	0.02	-0.00	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Target Tangibility	-0.68***	-0.82***	-0.37***	-0.52***	-0.69**	-0.88*
	(0.15)	(0.19)	(0.11)	(0.17)	(0.32)	(0.45)
Target Profitability	0.00	0.00	0.00	0.00	0.00**	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1187	1300	1193	1306	1078	1167
Adj-R^2	0.92	0.87	0.94	0.89	0.29	0.21

Table 6: Effects of Fire-Sale on Synergy and Target Bargaining Power

This table presents the effect of fire-sale on synergy and target's bargaining power. In columns (1) and (2), the dependent variable is combined CAR, measured as the market equity value weighted average of the target's CAR and acquirer's CAR. In columns (3) and (4), $Ln(Synergy)$ is the log of sum of the target's and acquirer's abnormal dollar returns ($CAR * MarketCap$). In columns (5) and (6), the dependent variable is target's bargaining power, $NDCAR(\omega_T)$, estimated as the difference of abnormal dollar returns for the (-1, +1) window between target and acquirer divided by the sum of market equity value of target and acquirer four weeks prior to acquisition announcement. In columns (7) and (8), the dependent variable is $Bargain_T$, calculated as target's abnormal dollar return divided by the combined abnormal dollar returns of acquirer and target. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	$CAR_{Combined}$		Ln(Synergy)		NDCAR (ω^T)		$Bargain_T$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	0.03		-0.14		-0.10**		-0.43***	
	(0.02)		(0.63)		(0.04)		(0.08)	
Fire-Sale$_2$		-0.01		0.18		-0.05***		-0.20**
		(0.02)		(0.45)		(0.02)		(0.08)
$Ind.Distress_T$	0.00	0.01	0.22	0.25	0.00	-0.00	0.00	-0.02
	(0.01)	(0.01)	(0.29)	(0.27)	(0.01)	(0.01)	(0.07)	(0.06)
$Distress1_T$	-0.01		0.98***		0.01		0.00	
	(0.01)		(0.30)		(0.01)		(0.07)	
$Distress2_T$		0.01		0.34*		-0.01		-0.05
		(0.01)		(0.17)		(0.01)		(0.04)
Med. Ind. Q	0.01	0.01	0.29	0.29	-0.01	-0.01	0.02	0.03
	(0.01)	(0.01)	(0.18)	(0.18)	(0.01)	(0.01)	(0.05)	(0.05)
Med. Ind. Leverage	0.08	0.08	-0.01	0.56	0.05	0.04	0.14	0.07
	(0.07)	(0.07)	(1.44)	(1.42)	(0.06)	(0.07)	(0.38)	(0.38)
Target Size	0.00**	0.01**	0.39***	0.36***	0.02***	0.02***	0.06***	0.06***
	(0.00)	(0.00)	(0.07)	(0.07)	(0.00)	(0.00)	(0.01)	(0.01)
Target Leverage	-0.01	-0.02	0.55	0.37	-0.01	-0.00	-0.12	-0.05
	(0.01)	(0.02)	(0.54)	(0.56)	(0.01)	(0.01)	(0.12)	(0.11)
Target M/B	-0.01***	-0.01***	-0.06	-0.08	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.06)	(0.06)	(0.00)	(0.00)	(0.01)	(0.01)
Target Tangibility	0.02	0.02	0.54	0.70*	-0.01	-0.01	-0.08	-0.11
	(0.02)	(0.02)	(0.36)	(0.36)	(0.01)	(0.02)	(0.09)	(0.09)
Target Profitability	0.00	0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1098	1098	668	668	1098	1098	1011	1011
Adj-R^2	0.10	0.10	0.63	0.62	0.18	0.18	0.06	0.06

Table 7: Effects of Fire-Sale on Acquirer Identity

This table presents estimates from probit regressions that explain acquirer identity using target firm- and industry-level distress and the interaction of these two variables. The dependent variable is *Outsider*, a dummy that equals 1 if the acquirer's 3-digit SIC code is different from the target's. Columns (1) and (3) exclude control variables for acquirer and deal characteristics; columns (2) and (4) include control variables, as described in Table 4. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. A detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable: *Outsider*	(1)	(2)	(3)	(4)
$Fire\text{-}Sale_1$	-0.62	-0.23		
	(0.59)	(0.69)		
$Fire\text{-}Sale_2$			-0.35	-0.25
			(0.35)	(0.40)
$Ind.Distress_T$	0.55**	0.51**	0.51**	0.51**
	(0.22)	(0.23)	(0.20)	(0.22)
$Distress1_T$	-0.17	-0.18		
	(0.23)	(0.28)		
$Distress2_T$			-0.17	-0.11
			(0.13)	(0.15)
Med. Ind. Q	-0.30**	-0.33**	-0.29**	-0.32**
	(0.13)	(0.15)	(0.13)	(0.15)
Med. Ind. Leverage	-1.07	-2.09	-1.08	-2.12
	(1.15)	(1.38)	(1.16)	(1.39)
Target Size	0.02	-0.04	0.03	-0.03
	(0.03)	(0.04)	(0.03)	(0.04)
Target Leverage	-0.66**	-0.68**	-0.48	-0.58
	(0.29)	(0.32)	(0.32)	(0.36)
Target M/B	0.05***	0.06**	0.05***	0.06**
	(0.02)	(0.03)	(0.02)	(0.03)
Target Tangibility	-0.50	-0.54	-0.55*	-0.59*
	(0.33)	(0.35)	(0.33)	(0.36)
Target Profitability	0.01*	0.01	0.01*	0.01
	(0.00)	(0.01)	(0.00)	(0.01)
Control: Acq. & Deal	No	Yes	No	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	1111	916	1111	916
Pseudo-R^2	0.19	0.22	0.19	0.22

Table 8: Effects of Fire-Sale with Outside Acquirers

This table tests whether fire-sale effects are stronger when acquirers are industry outsiders. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. The variable of interest is the interaction between *Fire-Sale* and *Outsider*. *Fire-Sale* is the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). *Outsider* is a dummy variables that equals 1 if the acquirer's 3-digit SIC code is different from the target's. Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	CAR_A	Ln(Price1)	NDCAR (ω^T)	$CAR_{Combined}$
	(1)	(2)	(3)	(4)
Fire-Sale$_1$***Outsider*	0.20**	-2.80**	-0.25***	-0.14*
	(0.08)	(1.31)	(0.09)	(0.08)
Fire-Sale$_1$	0.06	-0.36	-0.04	0.06***
	(0.04)	(0.34)	(0.04)	(0.02)
$Ind.Dist._T$***Outsider*	-0.02	0.11	0.03**	0.01
	(0.02)	(0.15)	(0.01)	(0.02)
$Dist.1_T$***Outsider*	-0.01	0.14	0.02	-0.00
	(0.03)	(0.23)	(0.02)	(0.02)
$Ind.Distress_T$	0.01	0.18*	-0.01	-0.00
	(0.01)	(0.10)	(0.01)	(0.01)
$Distress1_T$	-0.01	0.31**	0.00	-0.01
	(0.01)	(0.14)	(0.01)	(0.01)
Outsider	0.00	-0.11**	-0.01	-0.01
	(0.01)	(0.05)	(0.01)	(0.01)
Med. Ind. Q	0.01*	0.00	-0.01	0.01
	(0.01)	(0.05)	(0.01)	(0.01)
Med. Ind. Leverage	0.01	0.37	0.05	0.07
	(0.05)	(0.39)	(0.06)	(0.06)
Target Size	-0.01***	0.88***	0.02***	0.00**
	(0.00)	(0.03)	(0.00)	(0.00)
Target Leverage	-0.01	0.80***	-0.01	-0.01
	(0.02)	(0.10)	(0.01)	(0.01)
Target M/B	-0.00***	0.01	0.00	-0.01***
	(0.00)	(0.01)	(0.00)	(0.00)
Target Tangibility	0.02	-0.67***	-0.01	0.02
	(0.02)	(0.13)	(0.02)	(0.02)
Target Profitability	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	1098	1093	1098	1098
Adj-R^2	0.08	0.92	0.18	0.11

Table 9: Effects of Fire-Sale and Industry Capital-Specificity

This table tests whether fire-sale effects are stronger when targets have high industry-level capital-specificity. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. Industry capital-specificity is one minus the ratio of used capital expenditure within an industry to the aggregate industry capital expenditure as calculated by Balasubramanian and Sivadasan (2009). I define an industry as a high capital-specificity industry if industry-level capital-specificity is above the median value of the aggregate industry. The variable of interest is the interaction between *Fire-Sale* and *Capital-Specificity*. Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	CAR_A	Ln(Price1)	NDCAR (ω^T)	$CAR_{Combined}$
	(1)	(2)	(3)	(4)
$Fire\text{-}Sale_1$*$Capital\text{-}Specificity$	3.84*	-81.49***	-5.74***	-6.03***
	(2.27)	(20.41)	(2.00)	(1.39)
$Fire\text{-}Sale_1$	0.30***	-3.87***	-0.34***	-0.14***
	(0.10)	(0.75)	(0.08)	(0.04)
$Ind.Dist._T$*$Capital\text{-}Specificity$	-0.15	1.99	0.30	0.19
	(0.30)	(2.24)	(0.25)	(0.31)
$Dist.1_T$*$Capital\text{-}Specificity$	1.64**	-9.93*	-1.40*	1.20*
	(0.70)	(5.85)	(0.72)	(0.65)
$Ind.Distress_T$	0.01	0.28*	-0.01	0.01
	(0.02)	(0.15)	(0.02)	(0.02)
$Distress1_T$	-0.04**	0.27	0.05**	-0.02
	(0.02)	(0.19)	(0.02)	(0.02)
Med. Ind. Q	0.01	-0.00	0.01	0.02
	(0.01)	(0.12)	(0.02)	(0.01)
Med. Ind. Leverage	-0.02	0.30	0.13	0.11
	(0.09)	(0.70)	(0.12)	(0.13)
Target Size	-0.01**	0.88***	0.02***	0.01**
	(0.00)	(0.05)	(0.00)	(0.00)
Target Leverage	0.01	0.54***	-0.04*	-0.02
	(0.02)	(0.18)	(0.02)	(0.03)
Target M/B	-0.00	-0.00	-0.00	-0.01**
	(0.00)	(0.02)	(0.00)	(0.00)
Target Tangibility	0.00	-0.74***	0.01	0.00
	(0.03)	(0.20)	(0.02)	(0.03)
Target Profitability	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	570	567	570	570
Adj-R^2	0.08	0.91	0.24	0.12

Table 10: Effects of Fire-Sale and Labor Union

This table examines whether fire-sale effects are stronger when target industries have strong labor unions. Industry labor unionization is measured by the percentage of unionized workers in each industry. I define an industry to be a strong labor union industry if the union membership at 3-digit SIC industry-level is above the overall median. Panel A includes only acquisitions in strong labor union industries and Panel B includes only acquisitions in weak labor union industries. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Strong Labor Union Industries

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	0.20***		-4.26**		-0.19***		0.01	
	(0.05)		(1.67)		(0.04)		(0.05)	
Fire-Sale$_2$		0.12*		-0.85		-0.10*		0.01
		(0.06)		(0.76)		(0.05)		(0.02)
$Ind.Distress_T$	-0.00	-0.00	0.36*	0.15	-0.03	-0.03	-0.03	-0.03
	(0.01)	(0.02)	(0.19)	(0.18)	(0.02)	(0.02)	(0.03)	(0.03)
$Distress1_T$	-0.05*		0.66***		0.06**		-0.03	
	(0.03)		(0.19)		(0.03)		(0.03)	
$Distress2_T$		-0.02		0.00		-0.00		-0.01
		(0.01)		(0.09)		(0.01)		(0.01)
Target & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	491	491	490	490	491	491	491	491
Adj-R^2	0.03	0.03	0.91	0.90	0.21	0.19	0.17	0.17

Panel B. Weak Labor Union Industries

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	0.08*		-0.29		-0.07		0.08**	
	(0.04)		(0.32)		(0.05)		(0.03)	
Fire-Sale$_2$		0.02		0.00		-0.03**		0.00
		(0.02)		(0.15)		(0.01)		(0.03)
$Ind.Distress_T$	0.00	0.01	0.08	0.06	0.01	0.00	0.01	0.02
	(0.01)	(0.01)	(0.12)	(0.11)	(0.01)	(0.01)	(0.01)	(0.01)
$Distress1_T$	0.00		0.38***		-0.01		-0.00	
	(0.02)		(0.14)		(0.02)		(0.01)	
$Distress2_T$		0.02*		0.09		-0.00		0.02*
		(0.01)		(0.06)		(0.01)		(0.01)
Target & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	572	572	568	568	572	572	572	572
Adj-R^2	0.14	0.14	0.92	0.92	0.19	0.18	0.07	0.07

Table 11: The Effect of Fire-Sale and R&D Intensity

This table examines whether fire-sale effects are stronger when target industries have high R&D intensity. R&D intensity is measured by research and development expenses scaled by sales. I define an industry to be a high (low) R&D industry if the R&D intensity at 3-digit SIC industry-level is above (below) the overall median. Panel A includes only acquisitions in intense R&D industries and Panel B includes only acquisitions in low R&D industries. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. High R&D Industries

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	0.16***		-1.08**		-0.13***		0.08	
	(0.05)		(0.43)		(0.05)		(0.05)	
Fire-Sale$_2$		0.05*		-0.53**		-0.06**		-0.01
		(0.03)		(0.25)		(0.03)		(0.03)
$Ind.Distress_T$	-0.01	0.01	0.07	-0.03	0.02	-0.00	0.02	0.03
	(0.04)	(0.04)	(0.29)	(0.28)	(0.03)	(0.01)	(0.04)	(0.04)
$Distress1_T$	0.01		0.26*		-0.01		-0.01	
	(0.02)		(0.15)		(0.02)		(0.02)	
$Distress2_T$		0.02		0.15*		-0.00		0.02
		(0.01)		(0.08)		(0.01)		(0.01)
Target & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	538	538	533	533	538	538	538	538
Adj-R^2	0.09	0.08	0.91	0.91	0.21	0.16	-0.05	-0.05

Panel B. Low R&D Industries

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	-0.04		1.53		0.13		0.11	
	(0.17)		(1.05)		(0.21)		(0.20)	
Fire-Sale$_2$		0.02		0.72		0.01		0.05
		(0.07)		(0.50)		(0.09)		(0.09)
$Ind.Distress_T$	-0.10	-0.08	0.08	-0.06	0.12	0.09	-0.05	-0.05
	(0.07)	(0.07)	(0.45)	(0.49)	(0.09)	(0.09)	(0.09)	(0.09)
$Distress1_T$	-0.02		0.97***		0.01		-0.01	
	(0.04)		(0.27)		(0.05)		(0.05)	
$Distress2_T$		0.02		0.15		-0.03		0.00
		(0.02)		(0.11)		(0.02)		(0.02)
Target & Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	522	522	522	522	522	522	522	522
Adj-R^2	0.25	0.27	0.96	0.95	0.09	0.11	0.26	0.26

Table 12: Effects of Fire-Sale on Target Industry Rival CARs(%)

This table presents the impact of fire-sale on abnormal returns for target industry rivals. The dependent variables are matched rivals' abnormal stock returns (%) at the announcement of acquisition. Columns (1) and (2) are for all matched rivals, columns (3)-(4) for the matched sample in high R&D industries, and columns (5)-(6) for the matched sample in low R&D industries. I define an industry to be a high (low) R&D industry if the R&D intensity at 3-digit SIC industry-level is above (below) the overall median. R&D intensity is measured by research and development expenses scaled by total sales. The target rivals are matched based on same industry, size, and M/B. CARs (%) are cumulative abnormal returns for the (-1, +1) window surrounding the announcement of acquisitions. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Additional control variables for rival characteristics are *industry concentration(HHI)*, *size*, *leverage*, *m/b*, *tangibility*, and *profitability*. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable: Rival CAR(%)	All Matched Rivals		High R&D Industries		Low R&D Industries	
	(1)	(2)	(3)	(4)	(5)	(6)
$Fire\text{-}Sale_1$	-4.59*		-6.15**		-3.88	
	(2.45)		(2.75)		(3.56)	
$Fire\text{-}Sale_2$		-3.96**		-5.97***		-4.19
		(1.97)		(2.18)		(2.67)
$Ind.Distress_T$	0.44	0.35	0.22	-0.17	2.60	3.14
	(1.19)	(1.30)	(1.66)	(1.61)	(1.81)	(2.57)
$Distress1_T$	-0.06		-1.15		1.12	
	(1.83)		(2.52)		(2.58)	
$Distress2_T$		0.30		-1.26		1.88
		(0.68)		(1.02)		(1.14)
Med. Ind. Q	0.93	0.89	1.65	1.45	-0.41	0.39
	(0.87)	(0.83)	(1.09)	(1.04)	(1.78)	(1.60)
Med. Ind. Leverage	5.06	5.74	9.19	6.76	-5.70	0.53
	(7.19)	(7.16)	(12.24)	(12.17)	(10.34)	(10.73)
HHI	-4.19	-3.43	-8.82	-8.26	-5.56	-3.07
	(4.28)	(4.25)	(5.69)	(5.93)	(8.80)	(8.05)
Rival Size	0.26	0.18	0.94	0.74	-0.54	-0.52
	(0.59)	(0.50)	(0.79)	(0.70)	(1.06)	(0.79)
Rival Leverage	0.49*	0.45*	0.48	0.28	0.74	1.07*
	(0.27)	(0.26)	(0.34)	(0.35)	(0.65)	(0.61)
Rival M/B	2.76	2.45	1.88	1.06	2.69	2.81
	(1.80)	(1.70)	(2.86)	(2.94)	(2.39)	(2.07)
Rival Tangibility	-1.91	-2.25	0.32	0.53	-8.28**	-8.77**
	(2.00)	(2.14)	(2.43)	(2.77)	(3.70)	(3.61)
Rival Profitability	0.00***	0.00***	0.00***	0.00***	-0.01	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)
Control: Target & Deal	Yes	Yes	Yes	Yes	Yes	Yes
Control: Acq.	No	No	No	No	No	No
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	714	753	367	382	347	371
R^2	0.24	0.24	0.21	0.20	0.40	0.40

Table 13: Effects of Fire-Sale on Target Industry Rivals' Operating Performance

This table presents the impact of fire-sale on matched target rivals' operating performance. In columns (1) and (2), the dependent variable is the difference of average ROA (net income/total book assets), before (t-3, t-1) and after (t+1, t+3) acquisition. In columns (3) and (4), the dependent variable is the difference of average profitability margin (operating cash flow/total sales), before (t-3, t-1) and after (t+1, t+3) acquisition. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Additional control variables for rival characteristics are *industry concentration(HHI)*, *size*, *leverage*, *m/b*, *tangibility*, and *profitability*. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	Profit_Diff		ROA_Diff	
	(1)	(2)	(3)	(4)
$Fire\text{-}Sale_1$	1.05		-0.44	
	(15.98)		(0.60)	
$Fire\text{-}Sale_2$		-3.42		-0.29
		(10.00)		(0.39)
$Ind.Distress_T$	-4.11	0.34	0.15	0.38
	(6.60)	(6.28)	(0.31)	(0.38)
$Distress1_T$	11.35		0.10	
	(16.70)		(0.27)	
$Distress2_T$		6.20		0.26
		(6.70)		(0.23)
Med. Ind. Q	10.45	5.71	0.03	0.12
	(8.98)	(7.66)	(0.24)	(0.29)
Med. Ind. Leverage	54.08	38.10	2.88	3.22
	(58.16)	(50.08)	(3.01)	(3.26)
HHI	-23.12	-31.65	-0.05	0.03
	(31.08)	(30.19)	(0.56)	(0.75)
Rival Size	-1.59	-1.90	-0.03	-0.03
	(2.96)	(3.13)	(0.06)	(0.11)
Rival Leverage	-17.51	-15.06	0.10	0.08
	(11.89)	(11.16)	(0.08)	(0.12)
Rival M/B	-24.71	-20.88	0.01	0.41
	(19.02)	(17.05)	(0.28)	(0.46)
Rival Tangibility	13.00	13.38	-0.14	0.02
	(16.55)	(15.69)	(0.26)	(0.40)
Rival Profitability	0.00***	0.00***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Control: Target	Yes	Yes	Yes	Yes
Control: Acq. & Deal	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	286	305	294	314
Adj-R^2	0.65	0.68	0.30	0.37

Table A.1: Robustness Check: Quantile Regression for Acquirer Returns

This table presents coefficient estimates from quantile regressions on abnormal returns for acquirers. CARs are acquirer's three-day cumulative abnormal returns (CAR_A) at announcement of acquisition, estimated using a market model. Column (1) is for mean, column (2) for 25th quantile, column (3) for 50th quantile, and column (4) for 75th quantile. The variable of interest is *Fire-Sale* — the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable: CAR_A	(1) Mean	(2) QR_25th	(3) QR_50th	(4) QR_75th
Fire-Sale$_1$	0.11***	0.08***	0.06***	0.10***
	(0.03)	(0.02)	(0.02)	(0.03)
$Ind.Distress_T$	0.00	-0.00	-0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
$Distress1_T$	-0.01	-0.02***	-0.02***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Med. Ind. Q	0.01**	0.00	0.00	0.00
	(0.01)	(0.00)	(0.00)	(0.00)
Med. Ind. Leverage	0.01	0.01	0.03	-0.00
	(0.05)	(0.02)	(0.02)	(0.02)
Target Size	-0.01***	-0.01***	-0.01***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Target Leverage	-0.00	-0.01	0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Target M/B	-0.00***	-0.00***	-0.00**	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Target Tangibility	0.03	0.00	-0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Target Profitability	0.00	-0.00	0.00**	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	1098	1199	1098	1098
Adj-R^2	0.08	0.09	0.04	0.03

Table A.2: Robustness Check: Descriptive Statistics

The table contains the descriptive statistics for key variables in robustness tests. Panel A provides the summary for target misvaluation by decomposing market-to-book ratio (M/B) into target firm-specific error, industry-wide short-run error, and long-run growth option based on Appendix A.2. Panel B provides the summary for macroeconomic variables including *Recession*, annual GDP growth rate(%) and spread between Aaa corporate bond and Bbb bond (%).A target is classified as distressed, based on a dummy variable $Distress2_T$, if the firm's leverage ratio is greater than the median leverage ratio of all firms in the same industry, and the firm's current ratio (current assets/current liabilities) is less than the median current ratio of the industry. Industry is defined as distressed, based on a dummy variable $Ind.Distress_T$. $Ind.Distress_T$ is a dummy that equals 1 if the sales growth of the median firm in an industry is negative in the year of the transaction. The industry of a firm is defined as the set of firms with the same 3-digit SIC code. All variables are further defined in Appendix A.3.

	All		Distressed Target		Non-distressed Target	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Panel A. Target Misvaluation						
Ln(M/B): $m_{it} - b_{it}$	0.52	0.60	0.42	0.51	0.55	0.63
Target error: $m_{it} - v(\theta_{it}; \alpha_{jt})$	0.05	0.55	-0.02	0.49	0.07	0.58
Sector error: $v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_j)$	-0.06	0.21	-0.08	0.23	-0.05	0.20
Growth Option: $v(\theta_{it}; \alpha_j) - b_{it}$	0.55	0.40	0.54	0.43	0.55	0.38
Panel B. Recession						
Recession	0.11	0.32	0.13	0.33	0.11	0.31
Annual GDP growth (%)	5.50	2.09	5.42	1.98	5.53	2.13
Spread (Aaa-Bbb) (%)	0.96	0.41	0.95	0.44	0.97	0.40
Number of Observations	1627		421		1206	

Table A.3: Robustness Check: Fire-Sale Effects and Stock Market Misvaluation

This table presents coefficient estimates from OLS regressions on outcome variables after controlling for the misvaluation of target. *Target Ind. Misvaluation* is target industry-wide short-run error and *Target Misvaluation* is target-specific error. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. The variable of interest is the interaction between *Fire-Sale* and *Outsider*. *Fire-Sale* is the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Fire\text{-}Sale_1$	0.10***		-1.03*		-0.10**		0.02	
	(0.03)		(0.60)		(0.04)		(0.02)	
$Fire\text{-}Sale_2$		0.05***		-0.24		-0.05***		-0.01
		(0.01)		(0.27)		(0.02)		(0.02)
$Ind.Distress_T$	0.01	0.01	0.20*	0.13	-0.00	-0.00	0.01	0.01
	(0.01)	(0.01)	(0.12)	(0.08)	(0.01)	(0.01)	(0.01)	(0.01)
$Distress1_T$	-0.02		0.42***		0.01		-0.02	
	(0.01)		(0.11)		(0.01)		(0.01)	
$Distress2_T$		0.01		0.06		-0.00		0.01
		(0.01)		(0.05)		(0.01)		(0.01)
Target Misvaluation	-0.02**	-0.02**	0.18***	0.17**	0.01	0.01	-0.02**	-0.02**
	(0.01)	(0.01)	(0.06)	(0.08)	(0.01)	(0.01)	(0.01)	(0.01)
Target Ind. Misvaluation	-0.01	-0.01	-0.03	-0.01	0.01	0.01	-0.00	-0.00
	(0.02)	(0.02)	(0.12)	(0.11)	(0.02)	(0.02)	(0.02)	(0.02)
Med. Ind. Q	0.01**	0.01**	-0.02	-0.01	-0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.06)	(0.06)	(0.01)	(0.01)	(0.01)	(0.01)
Med. Ind. Leverage	0.01	0.01	0.41	0.45	0.05	0.04	0.08	0.08
	(0.05)	(0.05)	(0.42)	(0.46)	(0.06)	(0.07)	(0.07)	(0.07)
Target Size	-0.01***	-0.01***	0.86***	0.85***	0.02***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Target Leverage	-0.00	-0.01	0.75***	0.78***	-0.01	-0.00	-0.01	-0.02
	(0.01)	(0.02)	(0.12)	(0.12)	(0.01)	(0.01)	(0.01)	(0.02)
Target M/B	-0.00	-0.00	-0.02*	-0.03	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Target Tangibility	0.03	0.03	-0.69***	-0.68***	-0.01	-0.01	0.02	0.02
	(0.02)	(0.02)	(0.15)	(0.16)	(0.01)	(0.02)	(0.02)	(0.02)
Target Profitability	0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1098	1098	1093	1093	1098	1098	1098	1098
Adj-R^2	0.08	0.08	0.92	0.91	0.18	0.17	0.11	0.11

Table A.4: Robustness Check: Fire-Sale Effects and Recession

This table presents coefficient estimates from OLS regressions on outcome variables after controlling for the recession. Recessions is defined as recessionary months identified by NBER. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. The variable of interest is the interaction between *Fire-Sale* and *Outsider*. *Fire-Sale* is the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Dep. variable:	CAR_A		Ln(Price1)		NDCAR (ω^T)		$CAR_{Combined}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fire-Sale$_1$	0.11***		-1.11*		-0.10**		0.03	
	(0.03)		(0.63)		(0.04)		(0.02)	
Fire-Sale$_2$		0.05***		-0.24		-0.05***		-0.01
		(0.01)		(0.28)		(0.02)		(0.02)
$Ind.Distress_T$	0.00	0.01	0.22*	0.14	0.00	-0.00	0.00	0.01
	(0.01)	(0.01)	(0.12)	(0.09)	(0.01)	(0.01)	(0.01)	(0.01)
$Distress1_T$	-0.01		0.37***		0.01		-0.01	
	(0.01)		(0.10)		(0.01)		(0.01)	
$Distress2_T$		0.01		0.05		-0.00		0.01
		(0.01)		(0.05)		(0.01)		(0.01)
Recession	-0.02*	-0.02**	-0.03	0.00	0.02***	0.03***	-0.01	-0.01
	(0.01)	(0.01)	(0.06)	(0.08)	(0.01)	(0.01)	(0.01)	(0.01)
Med. Ind. Q	0.01**	0.01**	-0.00	-0.00	-0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.06)	(0.05)	(0.01)	(0.01)	(0.01)	(0.01)
Med. Ind. Leverage	0.01	0.01	0.38	0.42	0.05	0.04	0.08	0.08
	(0.05)	(0.05)	(0.43)	(0.46)	(0.06)	(0.07)	(0.07)	(0.07)
Target Size	-0.01***	-0.01***	0.88***	0.87***	0.02***	0.02***	0.00**	0.01**
	(0.00)	(0.00)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Target Leverage	-0.01	-0.02	0.79***	0.81***	-0.01	-0.00	-0.01	-0.02
	(0.01)	(0.02)	(0.11)	(0.11)	(0.01)	(0.01)	(0.01)	(0.02)
Target M/B	-0.00***	-0.00***	0.01	0.00	0.00	0.00	-0.01***	-0.01***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Target Tangibility	0.03	0.03	-0.69***	-0.67***	-0.01	-0.01	0.02	0.02
	(0.02)	(0.02)	(0.16)	(0.16)	(0.01)	(0.02)	(0.02)	(0.02)
Target Profitability	0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Control: Acq. & Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1098	1098	1093	1093	1098	1098	1098	1098
Adj-R^2	0.08	0.07	0.91	0.91	0.18	0.18	0.10	0.10

Table A.5: Descriptive Statistics for Target Industry Rivals

The table contains descriptive statistics for matched target industry rivals. The target rivals are matched based on same industry, size and M/B. Target is classified as distressed, based on a dummy variable $Distress2_T$, if the firm's leverage ratio is greater than the median leverage ratio of all firms in the same industry, and the firm's current ratio (current assets/current liabilities) is less than the median current ratio of the industry. Industry is defined as distressed, based on a dummy variable $Ind.Distress_T$. $Ind.Distress_T$ is a dummy that equals 1 if the sales growth of the median firm in an industry is negative in the year of the transaction. The industry of a firm is defined as the set of firms with the same 3-digit SIC code. Panel A provides the summary for target industry rivals' abnormal returns at announcement. Rival CARs(%) are rivals' cumulative abnormal returns for the (-1, +1) window surrounding the announcement of acquisitions. Panel B provides the median ROA (net income/total assets), before (t-3, t-1) and after (t+1, t+3) acquisition. Panel C provides the median profitability margin (operating cash flow/total sales) for target industry rivals at announcement.

	All	Distressed Target		Non-distressed Target	
	-	Dist. Ind.	Non-dist. Ind.	Dist. Ind.	Non-dist. Ind.
Panel A. Rival CAR (%)					
Mean	0.280	-0.895	0.559	0.278	0.233
Std. Dev.	5.632	5.944	6.080	4.983	5.505
Number of Obs.	1154	19	287	72	750
Panel B. Rival ROA (Median)					
Before (-3,-1)	0.032	-0.002	0.039	0.018	0.030
After (+1,+3)	0.025	0.024	0.031	0.016	0.024
Change	-0.007	0.026	-0.008	-0.002	-0.006
Number of Obs.	1249	19	319	74	837
Panel C. Rival Profitability Margin (Median)					
Before (-3,-1)	0.101	0.190	0.104	0.108	0.094
After (+1,+3)	0.105	0.175	0.113	0.113	0.099
Change	0.004	-0.016	0.008	0.005	0.005
Number of Obs.	1160	19	281	65	795

Table A.6: Robustness Check: Fire-Sale Effects and Alternative Industry Distress Measures

This table presents coefficient estimates from OLS regressions on outcome variables with alternative industry distress measures. In Panel 1, target industry is classified as distressed, if the sales growth of the median firm in an industry is lower than -1% in the year of the transaction. In Panel 2, target industry is classified as distressed, if the sales growth of the median firm in an industry is lower than +1% in the year of the transaction. In Panel 3, target industry is classified as distressed, if the sales growth of the median firm in an industry is negative for the two previous consecutive years of the transaction. The dependent variables for acquisition outcomes are as follows. Acquirer return: CAR_A, target offer price: $Ln(Price1)$, target bargaining power: $NDCAR(\omega_T)$, and synergy: $CAR_{Combined}$. The variable of interest is the interaction between *Fire-Sale* and *Outsider*. *Fire-Sale* is the interaction between target firm distress ($Distress1_T$, $Distress2_T$) and industry-level distress ($Ind.Distress_T$). Industry fixed effects are at the 3-digit SIC code level. Control variables are described in Table 4 and a detailed description of each variable is included in Appendix A.3. Robust standard errors clustered at year-industry are reported in parentheses. Coefficients marked ***, ** and * are significant at the 1%, 5%, and 10% level, respectively.

Panel A. Industry Distress2 (if median sales growth < -1%)

Dep. variable:	CAR_A	Ln(Price1)	NDCAR (ω^T)	$CAR_{Combined}$
	(1)	(2)	(3)	(4)
$Distress1_T$*$Ind.Distress2_T$	0.10***	-1.98*	-0.10***	-0.02
	(0.02)	(0.99)	(0.03)	(0.05)
$Ind.Distress2_T$	-0.00	0.20	0.00	-0.00
	(0.01)	(0.12)	(0.01)	(0.01)
$Distress1_T$	-0.01	0.36***	0.01	-0.01
	(0.01)	(0.10)	(0.01)	(0.01)

Panel B. Industry Distress3 (if median sales growth < 1%)

Dep. variable:	CAR_A	Ln(Price1)	NDCAR (ω^T)	$CAR_{Combined}$
	(1)	(2)	(3)	(4)
$Distress1_T$*$Ind.Distress3_T$	0.10**	-1.04*	-0.09*	0.03
	(0.04)	(0.60)	(0.05)	(0.04)
$Ind.Distress3_T$	-0.00	0.25**	0.01	0.01
	(0.01)	(0.11)	(0.01)	(0.01)
$Distress1_T$	-0.01	0.37***	0.01	-0.01
	(0.01)	(0.10)	(0.01)	(0.01)

Panel C. Industry Distress4 (if median sales growth is negative for two years)

Dep. variable:	CAR_A	Ln(Price1)	NDCAR (ω^T)	$CAR_{Combined}$
	(1)	(2)	(3)	(4)
$Distress1_T$*$Ind.Distress4_T$	0.13***	-4.13***	-0.14***	-0.07*
	(0.02)	(0.74)	(0.02)	(0.04)
$Ind.Distress4_T$	-0.01	0.50***	0.00	-0.00
	(0.01)	(0.11)	(0.01)	(0.01)
$Distress1_T$	-0.00	0.36***	0.01	-0.00
	(0.01)	(0.10)	(0.01)	(0.01)