Monetary Policy and Mergers and Acquisitions[*]

Johannes J. Fischer
European University Institute

Carl-Wolfram Horn
European University Institute

CLICK HERE FOR THE MOST RECENT VERSION

This version: October 6, 2021

Abstract

We analyse the effect of monetary policy on mergers and acquisitions (M&A) activity in the United States. We find that aggregate M&A activity decreases significantly following a monetary policy shock. This result is confirmed on the firm level with the likelihood of becoming an acquirer decreasing significantly following a contractionary monetary policy shock. The acquisition likelihood falls significantly more for relatively more financially constrained firms, suggesting a strong role for a credit channel of monetary policy transmission to firms' M&A decisions. M&A transactions are associated with positive abnormal returns on average, suggesting that expansionary monetary policy can facilitate beneficial capital reallocation by enabling more M&A activity. At the margin, however, expansionary monetary policy leads to lower average abnormal returns as more constrained firms engage in M&A. We rationalise these findings in a stylised partial-equilibrium model.

JEL Classification: E44, E52, G34
Keywords: Monetary Policy, Corporate Finance, Mergers and Acquisitions

1 Introduction

Monetary policy affects the real economy through a number of channels. One such channel that has been widely documented is firms' capital expenditure. Besides regular capital expenditure, however, mergers and acquisitions (M&A) constitute a key instrument through which firms adjust their productive capacities. In fact, with 1.73 trillion US dollar (USD) worth of transactions, U.S.-targeted M&A activity amounted to around 160 percent of U.S. gross fixed capital formation and around a tenth of overall U.S. gross domestic product in 2018.[1] This activity constitutes not just a redistribution of ownership rights, but shapes the capital allocation across firms and influences aggregate economic outcomes. Despite the magnitude of this activity, its connection to monetary policy is not yet well understood.

In this paper, our key research question therefore is: How does monetary policy affect M&A activity and the quality of the resulting capital reallocation? To address these questions, we study the effects of monetary policy on M&A activity in the U.S., both on the aggregate and on the firm level. We document a significant heterogeneity in responses at the firm level akin to the results of, e.g., Cloyne et al. (2018) for capital expenditure. Using cumulative abnormal stock returns to assess deal quality as in Adra et al. (2020), we furthermore document how monetary policy affects the quality of M&A transactions (as perceived by capital markets) through the composition of firms engaging in M&A activity. We rationalise our findings in a stylised partial equilibrium model of a firm's M&A decision.

We find that contractionary monetary policy significantly dampens M&A activity, both on the aggregate and the firm level. Using an instrumental-variable Bayesian vector autoregression (BVAR), we find that contractionary monetary policy shocks persistently lower both the aggregate number of deals as well as the overall deal value with a trough approximately one year after the shock. The aggregate finding is mirrored by the individual responses of publicly listed U.S. firms in the Compustat database. We focus on the decision of a given firm whether or not to initiate a transaction, in other words, whether or not to become an acquiring firm. Using an instrumental-variable linear probability model, we find that a 1 percentage point increase in the 1y-Treasury rate decreases the likelihood of engaging in an M&A transaction by 8% relative to the unconditional transaction likelihood. On both the aggregate and the firm level, we instrument the 1y-Treasury rate with the high-frequency surprises of Gurkaynak et al. (2005). Interacting the interest rate with different measures of financial constraints, we show that constrained firms react significantly stronger than unconstrained firms. In a last step, we investigate the cumulative abnormal returns of the acquiring firms around the announcement of a successful M&A transaction as a market-based measure of the transaction quality. We find that M&A announcements are generally associated with substantial positive abnormal returns for the acquiring firm. Somewhat counter-intuitively, a contractionary monetary policy stance is associated with *higher* cumulative

---

[1] See, Dealogic M&A Research (2019).

1

abnormal returns. This effect, however, disappears when controlling for individual acquirer characteristics, implying that monetary policy affects the average deal quality by changing the composition of acquiring firms. Overall, this suggests that on average monetary policy facilitates the reallocation of capital to more productive firms. The marginal transaction, however, reallocates capital to somewhat less productive firms. We propose a stylised partial equilibrium model of a firm's M&A decision to rationalise these empirical findings. Upon meeting a target firm, the potential acquirer chooses whether or not to engage in a M&A transaction subject to a borrowing constraint. The model illustrates how tighter monetary conditions leave only more productive firms in a position to engage in M&A transactions, which in turn are of higher quality.

The paper contributes to the literature in several ways. Most importantly, this is the first paper to provide a comprehensive investigation of the effect of monetary policy on M&A transaction activity as well as transaction quality. In particular, this is the first paper to study the effect of monetary policy on the likelihood of engaging in an M&A transaction. We thereby extend the literature on the firm-level investment response to monetary policy (e.g. Bernanke et al., 1999; Ottonello and Winberry, 2020; Cloyne et al., 2018) by investigating a second major channel through which firms expand their productive capacities that has previously not received much attention.

Second, we improve the identification of the monetary policy stance relative to Adra et al. (2020). By using high-frequency surprises in interest rate futures contracts within a narrow window around monetary policy announcements we can identify unexpected movements in the interest rate. This identification probably explains why we find a significant negative response of aggregate deal value to contractionary monetary policy shocks and a positive/zero effect of monetary policy on deal quality while the results of Adra et al. (2020) suggest a negative relationship in both cases.

Finally, we confirm the importance of financial constraints in shaping the firm-level investment response to monetary policy shocks (e.g. Cloyne et al., 2018; Jeenas, 2018; Drechsel, 2020) for firms' M&A decisions. In response to a change in interest rates, financially constrained firms adjust their M&A activity significantly more than unconstrained firms. However, our results suggest that firm age is not a relevant proxy for financial constraints when it comes to M&A decisions. This implies that the findings of Cloyne et al. (2018) do not necessarily extend beyond the capital expenditure decision of a given firm.

More generally, our paper is also related to the literature studying the M&A decision of the firm. Firms engage in M&A activity for a variety of reasons, e.g., value creation (e.g., by achieving higher market power, business diversification, lower cost/higher efficiency, or economies of scope), managerial self-interest (in particular, "empire building"), or idiosyncratic firm factors like acquisition experience or strategic orientation.[2] Since monetary pol-

---

[2]See Haleblian et al. (2009) for an extensive survey of M&A motives.

icy itself is unlikely to be a fundamental motive to engage in a M&A transaction, our paper is particularly related to the literature investigating the facilitators of M&A activity. So far, this literature has provided evidence that M&A activity is related to the business cycle (e.g., Maksimovic and Phillips, 2001), bidder and target valuations (e.g., Shleifer and Vishny, 2003), corporate liquidity (e.g., Almeida et al., 2011), economic (policy) uncertainty (e.g., Bonaime et al., 2018), business risk (e.g., Garfinkel and Hankins, 2011), and the general macroeconomic environment (e.g., Choi and Jeon, 2011). We control for these different M&A motives and aggregate facilitators in our analysis.

The remainder of the paper continues as follows: Section 2 describes the data used in our analyses. Section 3 presents the empirical approach and the results of our aggregate analysis. Section 4 proposes a stylised model of the firm's M&A problem. Section 5 & 6 discuss the approach and results of our firm-level and deal-level analysis, respectively. Section 7 concludes.

2 Data

2.1 Mergers and Acquisitions Data

Our data on M&A transactions are from Refinitiv's Financial's Securities Data Company (SDC) and cover M&A transaction of both private and public firms over the period from 1982M1 to 2019M11. Following previous literature, e.g. Bonaime et al. (2018), we only consider completed M&A transactions with a value of at least $1 million USD, in which the acquirer owned less than 50% of the target's shares six months prior to the transaction and owns 90% or more of the shares after the deal is completed.

Throughout, we focus on the acquirer's perspective because we can construct the acquisition decision of the universe of public U.S. firms by combining the M&A transaction data with firm balance-sheet information from the Compustat North America database. We do not account for target characteristics since this would either require balance-sheet data on every company worldwide, as this is the universe of potential targets, or introduce severe sample selection by limiting the analysis to transactions among Compustat firms. The latter would then not accurately reflect a firm's M&A decision.

Table 1 presents summary statistics for the full sample of deals obtained from SDC and the sample of deals available after merging the SDC M&A data with firm-level information obtained from Compustat. Public and private U.S.-based acquirers account for approximately 40% of all deals reported in SDC and approximately 50% of aggregate deal value. We are able to match approximately half of all deals involving an U.S. based acquirer with firm-level information from Compustat both in terms of the number of deals and their total value. In all samples, the distribution of transaction values is skewed with the mean transaction value significantly above the median transaction volume. The great deal of right-skewness

Table 1: Summary Statistics: M&A Activity

	Number of deals	Tot deal value(tn $)	Avg deal size(mil $)	Med deal size(mil $)
Panel A: SDC Sample				
All Deals	199,199	46.90	235.46	23.72
US Acquirer	78,021	23.01	295.89	32.3
Panel B: SDC sample merged with Compustat				
US Public Acquirer	35,883	11.92	332.15	33.50

Note: Statistics calculated on the sample of M&A transactions obtained from SDC following the selection criteria outlined above. The sample spans 1982M1:2019M11. We exclude share buybacks and recapitalizations. U.S. Acquirer refer to companies whose ultimate parent is located in the U.S.
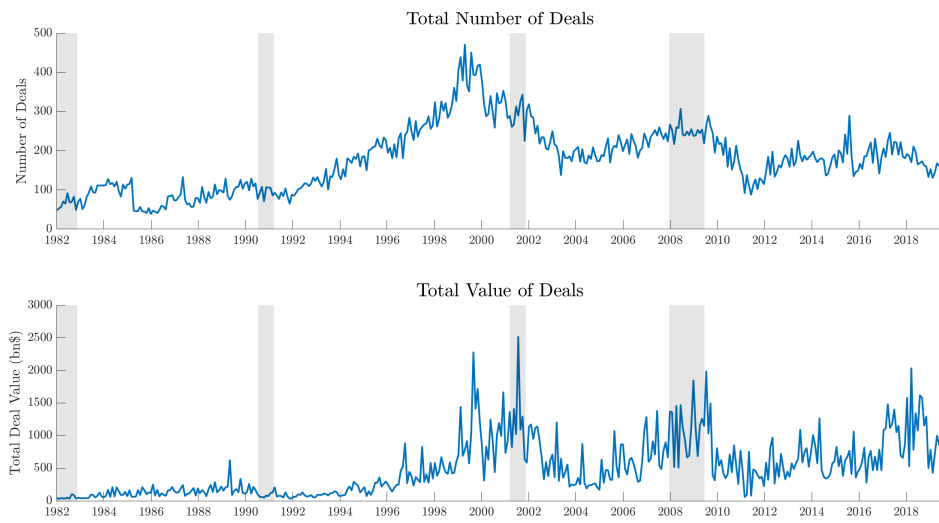
Note: This figure depicts the aggregate deal volume (top panel) and value (bottom panel) of acquisitions conducted by US-based companies. Shaded areas indicate U.S. recessions.

Figure 1: M&A activity by U.S. Acquirers

in the distribution of transaction values shows that the majority of deals are small with some very large outliers.

Figure 1 depicts the evolution of both the total number of transactions as well as their total deal value over the sample period.

2.2 Firm Level Data

For the firm-level analysis, we use balance-sheet information on the universe of U.S. public firms from the Compustat database. Compustat offers distinct advantages over other firm-level data sources that are important for our study. First, it is available quarterly, a frequency high enough to study monetary policy. Second, it is a long panel, allowing us to use within-firm variation. And third, it contains a rich set of balance-sheet and income-statement information which allows us to construct our key variables of interest. The main disadvantage

of Compustat is that it offers balance sheet information on publicly listed companies only. Hence, it excludes private companies which could to be subject to more severe financial frictions. The results of our paper, therefore, likely represent a lower bound with respect to the overall set of U.S. firms.

We use the (historic) Committee on Uniform Security Identification Procedures (CUSIP) code of the ultimate parent of each acquirer in our SDC sample to match it with the Compustat database. We use WorldScope information (accessed via Datastream) about the firm's foundation date (and, if that is missing, firm incorporation date) to compute firm age and merge it with our remaining data using the CUSIP identifier.

We impose the following set of sample restrictions: 1) we drop all firms with fewer than 20 consecutive quarters of reported data; 2) we drop erroneous firm-quarter observations such as negative assets; 3) we drop observations for which the leverage ratio is negative; 4) we drop observations for which the net-liquidity ratio is smaller than -10 or bigger than 10; 5) for all control variables we trim the 1% on the top if their respective distribution (by year); 6) all variables in levels such as assets are deflated using the CPI; 7) we follow others in the literature and linearly interpolate single missing values. Section A in the appendix presents the definitions of all variables used in the firm-level regressions and their respective summary statistics.

2.3 Deal Data

We obtain the acquirer cumulative abnormal returns (CAR) around our sample of transactions by submitting the historic CUSIP of each transaction's acquiring firm along with the announcement date to WRDS' event study tool. CARs are computed between one day prior and one day after the announcement date. As a robustness check we also consider a window of 2 days before and after the announcement day. The underlying abnormal returns are calculated relative to the return predicted by the Fama-French three-factor model, whose parameters are estimated on a 100 day window that ends 50 days before the event window to rule out any bias from insider activity. See section A in the appendix for an illustration of the average CAR around our set of M&A transaction announcement dates.

2.4 Monetary Policy Shocks

Estimating the dynamic causal effects of monetary policy on any economic outcome variable is subject to the potential reverse causality problem that monetary policy affects the economy but the economy also determines the monetary policy stance. To estimate the causal effect of monetary policy on M&A activity we, therefore, need to consider a change in the interest rate that is exogenous to both aggregate and firm-level M&A activity as well as any other macroeconomic factors that could cause interest rates to move. To identify

such an exogenous impulse, we rely on the external instruments approach of Mertens and Ravn (2013) and Stock and Watson (2018). As an external instrument we use the monetary policy surprises of Gurkaynak et al. (2005), consisting of changes in the three-month-ahead Fed funds futures contracts recorded in a 30 minute window around the Federal Open Market Committee's (FOMC) monetary policy announcements.[3] The identifying assumption is, hence, that within this narrow time window, no events other than the respective FOMC announcement occur that could affect private sector interest rate expectations. Variations of such high-frequency surprises have been used widely – either directly or as external instruments – to study the effects of monetary policy both in the aggregate, e.g., Gertler and Karadi (2015), Nakamura and Steinsson (2018), or Jarociński and Karadi (2020), and on the firm level, e.g. Ottonello and Winberry (2020), Cloyne et al. (2018), Jeenas (2018), or Gorodnichenko and Weber (2016), amongst many others. Following the convention in the literature, we sum up all shocks within a month (quarter) to obtain a monthly (quarterly) series. Figure A.1a in appendix A plots the resulting quarterly shock series.

Recent studies suggest the presence of an information effect in the monetary surprises identified using high frequency movements (e.g. Nakamura and Steinsson, 2018; Miranda-Agrippino and Ricco, 2021). That is, high frequency movements of interest rates around monetary policy announcements might not only be driven by the interest rate decision alone but also partially by a change in markets' perceptions of economic conditions following the monetary policy announcement. Therefore, as a robustness check, we also consider the shock series of Miranda-Agrippino and Ricco (2021) that separates any potential information effect from the actual monetary policy shocks in the series of monetary policy surprises.

3 Macro Evidence

In this section, we present our macroeconomic analysis of the relationship between monetary policy and aggregate M&A activity, with a focus on the response of both the aggregate *number* and *value* of M&A transactions. We initially consider both private and public firms that are either based in the U.S. themselves or whose ultimate parent is based in the U.S. The aggregate number of transactions refers to the total number of transactions recorded in SDC in a given months. The aggregate value is the sum of those transactions' individual values.

---

[3]We thank Peter Karadi for sharing an updated version of the surprises up to including June 2019.

3.1 Empirical Specification

To analyse the effect of monetary policy on M&A activity we estimate a Bayesian proxy-SVAR (BP-SVAR) with monthly data. In reduced form, we can write the model as

$$y_t = C + \sum_{l=1}^{p} A_l y_{t-l} + u_t$$

where u_t are the reduced-form error terms with zero mean and covariance matrix Σ. Stacking the regressors into a single matrix this can be written as $Y = XB + u$. We employ a standard Minnesota prior with optimal hyperparameter selection as in Giannone et al. (2015). The prior and posterior distributions are discussed in more detail in section B of the appendix.

The vector y_t includes either the log of the monthly aggregate (inflation-adjusted) deal value or the total number of deals. To adequately characterise monetary policy decisions we include the 1y-Treasury rate as monetary policy rate, the log level of industrial production (IP), and the log consumer price index (CPI), both obtained from the St. Louis Federal Reserve Bank's FRED database. We use the 1y-Treasury rate instead of the Federal Funds rate to circumvent the problems created by the zero lower bound and better capture the effects of unconventional monetary. To capture the likely transmission channels as identified in the literature, we furthermore include the excess bond premium (EBP) of Favara et al. (2016) as measure of credit market sentiment and Robert Shiller's adjusted price-earnings ratio (CAPE) of the S&P500 as a measure of market valuation. The vector of endogenous variables is, therefore, given by

$$y_t = [\text{1y-Treasury rate}_t, IP_t, CPI_t, EBP_t, CAPE_t, MA_t]'$$

where MA_t represents either aggregate number or the aggregate value of M&A deals. Our main specification includes $p = 2$ lags, as suggested by the BIC. In appendix B.2.3, we consider $p = 4$ lags, as suggested by the AIC. We estimate the BP-SVAR residuals on the full sample from 1982M1 to 2019M11 but execute the proxy identification on the residuals from 1990M2 to 2019M11, matching the availability of the instrument. In using partial instrumentation, we follow the standard in the literature as, e.g., in Gertler and Karadi (2015).

3.2 Main Results

Figures 2 and 3 present the estimated impulse response functions of our BP-SVAR for the aggregate deal volume and total deal value respectively.[4] Both the aggregate deal volume and aggregate deal value decrease significantly in response to the contractionary shock with a trough approximately 18 months after the shock. With a trough of -19%, the total number of

---

[4]The first-stage regression statistics for the VAR with aggregate deal volume (value) are: $F = 22.52\,(19.86)$; Robust $F = 11.71\,(10.38)$; $R^2 = 6.63\%\,(5.89\%)$; adj. $R^2 = 6.34\%\,(5.60\%)$
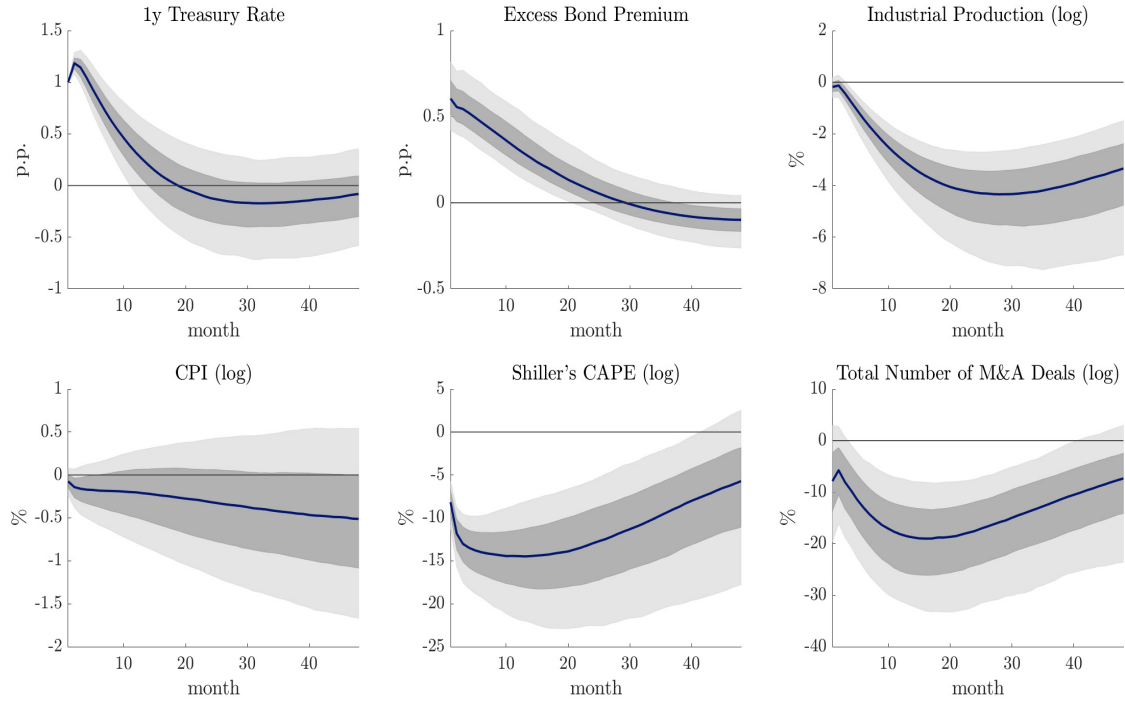
Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure 2: Response of Aggregate Deal Volume to a Monetary Policy Shock

M&A transaction decreases less then the total value of M&A transactions, which decreases by up to 28%. In both cases the effect is very persistent and levels off only towards the end of the forecast horizon. The remaining variables respond as expected: A contractionary monetary policy shock increases the 1y-Treasury rate, worsens funding conditions, and depresses industrial output, the price level, and firm valuations.[5]

---

[5]Shiller's CAPE is based on dividing the current month's real stock price by the average inflation-adjusted earnings from the previous 10 years up until the previous month. Therefore, in particular, the initial response in particular is driven exclusively by valuations and not by earnings.
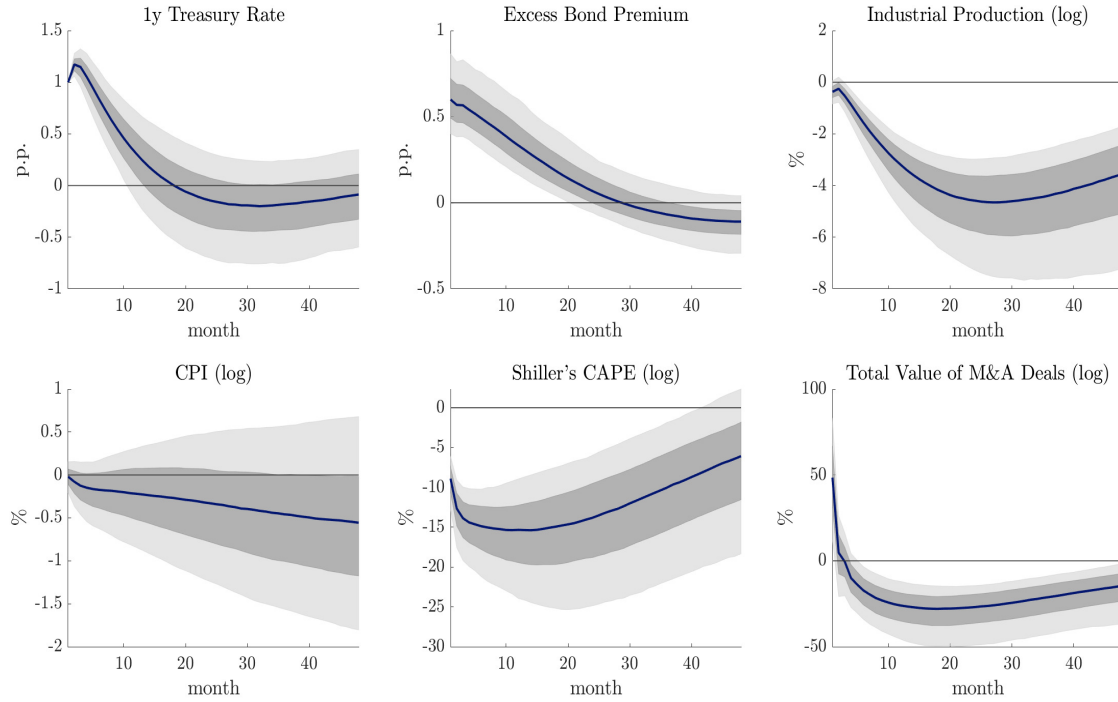
Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure 3: Response of Aggregate Deal Value to a Monetary Policy Shock

3.3 Robustness

As robustness check we furthermore consider whether our results are sensitive to 1) only including considering transactions completed by *public* U.S. acquirors (to match our firm level evidence), 2) not imposing any prior on the estimation (i.e. estimating a standard frequentist VAR), and to 3) selecting a lag length of 3 as suggested by the AIC (instead of 2 as suggested by the BIC). The resulting IRFs are plotted in Section -. These robustness checks do not significantly alter our main results. In fact, the response of the total amount of M&A deals is slightly stronger when we consider only transactions conducted by public U.S. firms are or do not impose any Bayesian prior. Extending the lag length on the other hand mutes the response somewhat, but it overall remains highly significant. The response of the total value of M&A deals is somewhat less persistent in the frequentist VAR but remains large and significant. In the other two specifications the response of the total value of M&A deals is largely unaltered.

4 A stylized model of the firm's M&A decision

In this section, we lay out a stylised two-period model to illustrate the firms' M&A decision. The goal of the model is to highlight the main mechanism at work and to derive empirically testable predictions.

9

Environment. We consider an economy that lasts for two periods, $t = 0, 1$. The economy is populated by a mass of risk-neutral potential acquiring firms indexed by A. The acquiring firms are exogenously presented with the possibility to acquire a potential target firm T. We assume that the potential target firms T do not have the possibility to acquire. Both types of firms, $i = A, T$, produce an output $y_{i,t}$ using a linear production technology that combines capital $k_{i,t}$ and productivity $z_{i,t}$

$$y_{i,t} = z_{i,t} k_{i,t} \qquad \forall i = A, T \tag{1}$$

and discount future profits at rate β. Acquirers make an M&A decision, $\mathbb{I}^{M\&A} \in \{0, 1\}$, and borrow external funds $b_{i,t}$ at an exogenous fixed real interest rate r to maximise discounted shareholder dividends. We assume that $\beta < \frac{1}{1+r}$, so that firms are more impatient than the financial market.[6]

Mergers and Acquisitions. We are interested the acquiring firm's decision whether or not to make a takeover bid to the target in $t = 0$, i.e. the acquiring firm's M&A decision conditional on having matched a target firm. We assume that in the event of a merger, the capital stocks of the two firms are combined additively and productivity synergies accrue according to a synergy function $f(z_A, z_T)$. For simplicity, we assume that there are no direct productivity synergies from the merger, i.e. $f(z_A, z_T) = z_A$. We, hence, ignore mergers motivated by scale-efficiencies or pure-synergy mergers. Instead, we focus on the case in which mergers are a vehicle to reallocate capital from less to more productive firms. This is akin to the q-theory of mergers outlined, for instance, by Rousseau and Jovanovic (2002).[7] The assumption that the productivity of the acquirer is fully extendable to the combined capital stock is standard in the literature.[8]

$$k_{A,1} = k_{A,0} + k_{T,0} \qquad z_{A,1} = z_{A,0} \tag{2}$$

We assume that the benefits of a merger accrue only with a one-period delay.[9] To acquire the target, the acquiring firm makes a "take-it-or-leave-it" offer, i.e., there is no bargaining over the merger gains. Instead all gains from the merger accrue to the acquiring firm. We assume that owners of the target firm accept any offer that is as least as good as the stand-alone value of the target. Since the time-0 profits of the target firm still accrue to its original

---

[6] Assuming $\beta = \frac{1}{1+r}$ does not alter the results but complicates the analysis since it does not pin down a unique debt policy.

[7] The model is easily extendable to a case including productivity synergies without changing the main predictions of the model.

[8] In addition to Rousseau and Jovanovic (2002), see, for instance, David (2021), Eisfeldt and Rampini (2006), Eisfeldt and Rampini (2008), Faria (2008).

[9] We think of this assumption as reflecting the post-merger integration process until the merged firm operates fully at its new scale.

owners, the stand-alone value of the target is equal to its discounted time-1 profits. Therefore, the target price is given by[10]

$$p_{T,0} = \beta z_{T,1} k_{T,1} \qquad (3)$$

Lastly, we assume that the capital stock does not depreciate over time and that M&A transactions are the firm's only means to grow its capital stock. That is, in case the firm chooses not to make a takeover bid, its capital stock and productivity remain constant, i.e. $k_{A,1} = k_{A,0}$ and $z_{A,1} = z_{A,0}$.

Firm problem. Acquiring firms make their M&A and borrowing decisions in order to maximise discounted shareholder dividends. We assume that the acquirer enters the initial period with a stock of legacy debt $b_{A,0}$. The acquirer's dividends in period $t = 0$ are, hence, determined by a balance sheet constraint and can be written as

$$d_{A,0} = z_{A,0} k_{A,0} - (1+r) b_{A,0} + b_{A,1} - \mathbb{I}^{M\&A} p_{T,0} \qquad (4)$$

where $b_{A,0}$ is the stock of legacy debt when entering period $t = 0$ and $b_{A,1}$ is the stock of debt chosen for next period. The indicator function $\mathbb{I}^{M\&A}$ takes a value of one if the firm decides to engage in an M&A transaction and zero otherwise. The acquirer's dividends in period $t = 1$ depend on its M&A decision in period $t = 0$ and can be summarized as follows:

$$
\begin{aligned}
d_{A,1} &= z_{A,1} k_{A,1} - (1+r) b_{A,1} && \text{if } \mathbb{I}^{M\&A} = 0 \\
d_{A,1} &= z_{A,1} (k_{A,0} + k_{T,0}) - (1+r) b_{A,1} && \text{if } \mathbb{I}^{M\&A} = 1
\end{aligned}
\qquad (5)
$$

We assume that the acquirer's borrowing choice is constrained as follows

$$b_{A,1} \in [0, \frac{\theta}{1+r} z_{A,1} k_{A,1}] \qquad (6)$$

where $\theta \leq 1$ denotes the tightness of the borrowing constraint. Hence, a firm can only commit to repay a fraction θ of its future output which includes the proceeds of any eventual merger. That is, the acquiring firm can also pledge the profits generated by its M&A decision to raise debt.

Denoting the time 0 value of the acquiror if $\mathbb{I}^{M\&A} = 1$ as $V_{A,0}^M$ and its stand-alone value as $V_{A,0}$, we can, therefore, formulate the acquirer's discrete choice problem as follows

$$\max\{V_{A,0}^M, V_{A,0}\} \qquad (7)$$

---

[10]Recall that the target firm does not have the possibility to acquire and, hence, grow its capital stock. Therefore, the target's capital stock and productivity are constant over time, $z_{T,0} = z_{T,1}$ and $k_{T,0} = k_{T,1}$

subject to

$$V_{A,0}^M = z_{A,0}k_{A,0} - (1+r)b_{A,0} + b_{A,1} + \beta(z_{A,1}k_{A,1} - (1+r)b_{A,1}) \tag{8}$$

$$V_{A,0} = z_{A,0}k_{A,0} - (1+r)b_{A,0} + b_{A,1} - p_{T,0} + \beta(z_{A,1}(k_{A,0} + k_{T,0}) - (1+r)b_{A,1}) \tag{9}$$

$$b_{A,1} \in [0, \frac{\theta}{1+r}z_{A,1}k_{A,1}] \tag{10}$$

and a non-negativity constraint on dividends[11]

$$d_{A,0} \geq 0 \tag{11}$$

Solution. Under the assumption that $\beta < \frac{1}{1+r}$, the firm always chooses to borrow up to its borrowing limit, i.e.

$$b_{A,1}^* = \frac{\theta}{1+r}z_{A,1}k_{A,1} \tag{12}$$

This implies the following firm values in case of no M&A and M&A, respectively,

$$V_{A,0} = z_{A,0}k_{A,0} - (1+r)b_{A,0} + \frac{\theta}{1+r}z_{A,1}k_{A,1} + \beta(z_{A,1}k_{A,1} - \theta z_{A,1}k_{A,1})$$
$$= \left(1 + \frac{\theta}{1+r} + \beta - \beta\theta\right)z_{A,0}k_{A,0} - (1+r)b_{A,0} \tag{13}$$

$$V_{A,0}^M = z_{A,0}k_{A,0} + (1+r)b_{A,0} + \frac{\theta}{1+r}z_{A,1}(k_{A,0} + k_{T,0}) - p_T + \beta(z_{A,1}k_{A,1} - \theta z_{A,1}k_{A,1})$$
$$= \left(1 + \frac{\theta}{1+r} + \beta - \beta\theta\right)z_{A,0}k_{A,0} - (1+r)b_{A,0} + \left(\frac{\theta}{1+r} + \beta - \beta\theta\right)z_{A,0}k_{T,0} - \beta z_{T,0}k_{T,0} \tag{14}$$

From here we can derive two conditions under which a merger occurs: First, the merger must be *optimal*, i.e. the ex-ante discounted present value of the merged firm must exceed the acquirer's stand-alone value, $V_{A,0}^M \geq V_{A,0}$, or,

$$(\beta + \frac{\theta}{1+r} - \beta\theta)z_{A,0} - \beta z_{T,0} \geq 0 \tag{15}$$

Second, the merger must be *feasible* feasible, i.e. the acquirer needs to have sufficient internal funds and borrowing capacity to finance the merger. The transaction is feasible if

$$(1 + \frac{\theta}{1+r})z_{A,0}k_{A,0} + \frac{\theta}{1+r}z_{A,0}k_{T,0} - (1+r)b_{A,0} - \beta z_{T,0}k_{T,0} \geq 0 \tag{16}$$

We, therefore, observe the firm's M&A decision, conditional upon meeting a potential

---

[11]Note that the non-negativity constraint on dividends in period $t = 1$ is always slack.

target, as

$$\mathbb{I}^{M\&A} = \begin{cases} 1 & \text{if (15) and (16)} \\ 0 & \text{otherwise} \end{cases} \tag{17}$$

This stylised model generates two key predictions we test in the data. First, from equation (15) and (16), the probability of initiating in an M&A transaction is decreasing in the interest rate. And second, from equation (16), this effect is stronger for firms that are relatively more financially constrained, i.e. for firms with higher legacy debt $b_{0,A}$.

The literature has often analysed the gains from merger using percentage gains, specifically, percentage cumulative abnormal stock returns. We can connect the acquiror's problem to its cumulative abnormal return as

$$CAR_{A,0} = \frac{V_{A,0}^M - V_{A,0}}{V_{A,0}} = \frac{\left(\frac{\theta}{1+r} + \beta - \beta\theta\right)z_{A,0}k_{T,0} - \beta z_{T,0}k_{T,0}}{\left(1 + \frac{\theta}{1+r} + \beta - \beta\theta\right)z_{A,0}k_{A,0} - (1+r)b_{A,0}} \tag{18}$$

Equation (18) shows that the interest rate can affect the CAR in two different ways: First, the interest rate affects the stand alone value $V_{A,0}$ of the acquiring firm and, thereby, changes the CAR of any given transaction directly. Furthermore, when assuming a set of firms with a distribution over productivity, the interest rate affects the set of firms that can afford to initiate M&A transactions. A higher interest rate implies that only more productive firms still have sufficient funds to engage in M&A. A higher r therefore increases the average CAR observed in a given period.

In the following section, we test these predictions and identify and quantify factors that affect the probability of engaging in a M&A transaction using granular firm-level data for the U.S.

5   Firm-Level Evidence

In this section we extend the aggregate analysis to the firm level using a quarterly panel of publicly listed U.S. firms from Compustat. Since the panel setting does not allow for partial instrumentation of the interest rate, the availability of the monetary policy shocks limits our sample to start in 1990Q1. We confirm the aggregate findings of section 3 and provide evidence for the existence of a credit channel of monetary policy transmission to M&A transactions.

5.1   The Average Effect

Methodology.   In line with the literature on M&A activity (e.g., Bonaime et al., 2018; Owen and Yawson, 2010) we model the decision to become an acquirer in a given period. As men-

tioned above, the focus is on the acquirer's decision to initiate a M&A transaction since the Compustat database conveniently lets us model the acquisition decision of the universe of public U.S. firms whereas accounting for any target characteristic would either require data on every company worldwide as the universe of potential targets or severely restrict the sample of transactions we can analyse within the Compustat universe.

Our baseline econometric specification is a linear probability model that estimates the likelihood of a firm to initiate a M&A transaction in a given period as a function of the monetary policy stance. In particular, we estimate the likelihood of firm i to engage in a M&A transaction between t and $t + 3$, i.e. within 1 year following the change in the interest rate.

$$Pr(\text{Transaction}_{i,\{t,t+3\}} = 1) = \alpha_i + \gamma r_t + \Phi \mathbf{X}_{i,t-1} + \Theta \mathbf{W}_{t-1} + \varepsilon_{i,t} \tag{19}$$

In equation (19), α_i is a firm-level fixed effect and the vectors $\mathbf{X}_t$ and $\mathbf{W}_t$ contain firm and macro controls, respectively. $\mathbf{X}_t$ includes 1) the leverage ratio, 2) firm age, 3) (the log of) real assets, 4) the ratio of net liquidity to total assets, 5) Tobin's Q, 6) the EBITDA to asset ratio as measure of profitability, 7) a dummy indicating whether the firm has paid dividends over the past year, and 8) a dummy variable indicating whether a firm has already acquired another firm in the previous five years. As in Jeenas (2018), all constructed financial ratios in $\mathbf{X}_t$ (e.g. the leverage ratio) are measured as averages between t and $t - 3$. We also control for the number of M&A transactions in a firm's respective Fama-French 48 industry over the past four quarters to capture potential industry-level merger trends. $\mathbf{W}_t$ contains the same macro controls as the aggregate VAR, i.e. CPI inflation, industrial production growth, the EBP, and Robert Shiller's CAPE. We estimate equation (19) by 2SLS, using the cumulative series of monetary policy surprises to instrument the 1y-Treasury rate, r_t. The sample period runs from 1990Q1 to 2019Q2 to match the availability of the monetary policy shocks.[12] Following the argument of Abadie et al. (2017), the standard errors in our baseline specification are clustered on the firm level only, since we have neither clustering in treatment nor clustering in sampling. However, as reported in section C, the results are robust to clustering on both the firm and the quarterly level.

We choose a linear probability model instead of a non-linear model for several reasons: First, we want to avoid the uncertainty regarding the distribution of regression residuals and the potential problems this causes for the estimation of the standard errors in our panel IV approach. Second, we are interested in establishing an average causal link between monetary policy and acquisition likelihood for which both linear and non-linear type of models give very similar estimates around the mean of the covariates. Finally, a non-linear model would significantly complicate testing for heterogeneous responses between groups. In the spirit of Angrist and Pischke (2008) we therefore choose the linear model over the non-linear alternatives.

---

[12]Our full sample ends in 2019q2. However, given that our dependent variable includes a lead of 3 quarters, we effectively make use of firm-level data until 2018Q3.

Results. Table 2 displays the average response of the likelihood of engaging in an M&A transaction to a monetary policy shock. Consistent with the aggregate results presented in section 3, we find that a one percentage point increase in the 1y-Treasury rate reduces the likelihood of engaging in a M&A transaction within the following four quarters by 0.9 percentage points. Considering the unconditional likelihood of engaging in a M&A transaction in any given year of 16.3%, this represents an 5.5% decrease in the likelihood of becoming an acquirer.

In line with the literature on M&A determinants we furthermore find that size, liquidity, valuation (i.e. Tobin's Q), and profitability all increase the likelihood of becoming an acquirer. Higher leverage and prior acquisition history on the other hand decrease acquisition likelihood. Presumably, this is because prior acquisitions lead to higher leverage and the integration of past transactions occupies (operational) resources, both limiting resources available for new transactions. Firm age has a significantly negative impact on acquisition likelihood. This is somewhat surprising as Cloyne et al. (2018) highlight the role of age as proxy for financial constraints, implying that we would expect the opposite sign. Furthermore, this goes against the findings of Owen and Yawson (2010), who provide evidence of a hump shaped relationship between the corporate life cycle and M&A activity. This difference is probably due to the different measure of the firm life cycle used by Owen and Yawson (2010) (i.e. the proportion of retained earnings to equity) and due to a smaller sample size.

Among the macroeconomic variables, we find that inflation and the excess bond premium negatively affect the acquisition likelihood whereas aggregate valuations positively affect the transaction likelihood, mirroring the effect of firm level valuations.[13]

---

[13]We report the results of the first stage regression for the specification in column (4) in appendix D, table D.1 to demonstrate the relevance of the instrument.

Table 2: Effect of Monetary Policy on the Likelihood of Engaging in an M&A Transaction

	(1) P(Acq, 1y)	(2) P(Acq, 1y)	(3) P(Acq, 1y)	(4) P(Acq, 1y)
1y Treasury Rate	-0.004***	0.002**	-0.007***	-0.009***
	(0.000)	(0.001)	(0.001)	(0.001)
L.Leverage			-0.015***	-0.015***
			(0.002)	(0.002)
L.Age			-0.002***	-0.003***
			(0.000)	(0.000)
L.Log Total Assets (real)			0.004**	0.004**
			(0.002)	(0.002)
L.Net Liquidity Ratio			0.007***	0.006***
			(0.002)	(0.002)
L.Tobin's Q			0.001***	0.001***
			(0.000)	(0.000)
L.EBITDA-to-Assets Ratio			0.029***	0.028***
			(0.006)	(0.006)
L.Dividend Payer			-0.004	-0.005
			(0.005)	(0.005)
L.# Industry Mergers			0.000***	0.000***
			(0.000)	(0.000)
L.Prior Acquisition History			-0.043***	-0.043***
			(0.004)	(0.004)
L.IP Growth				0.003**
				(0.001)
L.CPI Inflation				-0.015***
				(0.003)
L.Excess Bond Premium				-0.024***
				(0.002)
L.Shillers's CAPE				0.001***
				(0.000)
Constant	0.163***			
	(0.001)			
N	452,714	452,714	452,714	452,714
FE	No	Firm	Firm	Firm
Cluster	No	Firm	Firm	Firm
Controls	No	No	Firm	Firm, Macro

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls for leverage, net liquidity ratio, Tobin's Q, and EBITDA-to-assets ratio are constructed as 4 quarter averages.

5.2 The Credit Channel of Monetary Transmission

It is well known that financial frictions play a key role in shaping heterogeneous responses to monetary policy shocks at the firm level. A channel that has been studied extensively in the literature, is, hence, the so called credit channel or financial accelerator channel of monetary policy transmission (e.g., Kiyotaki and Moore, 1997; Bernanke and Gertler, 1995; Bernanke et al., 1999) which amplifies the effects of monetary policy on certain types of borrowers through imperfections in credit markets. More precisely, the credit channel argues that monetary policy can affect a wide range of firm decisions by changing the value of a firm's assets and net worth which subsequently affects the firm's borrowing constraint. A large literature, therefore, argues that financially more constrained firms have a stronger reaction to monetary policy (see, e.g., Gertler and Gilchrist, 1994; Kashyap and Stein, 1995). We investigate whether this channel plays a role for a firm's M&A decision. To that end, we interact the interest rate with a measure of financial constraints on the firm level, $Z_{i,t}$. Following the literature on firms' capital investment response to monetary policy, e.g. Ottonello and Winberry (2020), we use the firm's leverage ratio to proxy financial constraints. As robustness check, in section 5.3.2 we provide additional results using other proxies for financial constraints, both asset- and earnings-based, that are used in the literature such as age (Cloyne et al., 2018), liquidity (Jeenas, 2018), or profitability (Drechsel, 2020; Lian and Ma, 2020).

The regression equation is given by equation (20). We lag the interaction term to ensure that the measure of financial constraintnes is predetermined at the time of the monetary shock. As before, all constructed financial ratios, including $Z_{i,t}$, are measured as four-quarter averages and we estimate (20) via 2SLS, instrumenting the 1y-Treasury rate with the identified monetary policy shocks.

$$Pr(\text{Transaction}_{i,\{t,t+3\}} = 1) = \alpha_i + \gamma r_t + \delta(r_t \times Z_{i,t-1}) + \Phi X_{i,t-1} + \Theta W_{t-1} + \varepsilon_{i,t} \tag{20}$$

Results. Table 3 reports the heterogeneous responses of firms' likelihood of engaging in an M&A transaction to monetary policy along the different financing constraints. Firms with lower leverage, higher liquidity, and higher profitability react much less to changes in the interest rate compared to their financially more constraint peers. Only age does not seem to proxy any relevant financial constraint, as the associated interaction term is zero and insignificant. These results combined suggest that the credit channel of monetary policy not only shapes the response of capital investment, but also of M&A activity. That is, monetary policy affects firms' capital and M&A expenditure not just through its effect on financing costs, but also through its effect on borrowing constraints.

17

Table 3: Credit Channel of Monetary Policy

	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se
1y Treasury Rate	0.001***	0.005***	-0.006***	-0.008***
	(0.000)	(0.001)	(0.001)	(0.001)
1y Treasury Rate × L.Leverage ratio	-0.024***	-0.015***	-0.006***	-0.005***
	(0.001)	(0.001)	(0.002)	(0.002)
L.Leverage			-0.006*	-0.006**
			(0.003)	(0.003)
L.Age			-0.002***	-0.003***
			(0.000)	(0.000)
L.Log Total Assets (real)			0.004**	0.004**
			(0.002)	(0.002)
L.Net Liquidity Ratio			0.006***	0.006***
			(0.002)	(0.002)
L.Tobin's Q			0.001***	0.001***
			(0.000)	(0.000)
L.EBITDA-to-Assets Ratio			0.030***	0.029***
			(0.006)	(0.006)
L.Dividend Payer			-0.003	-0.004
			(0.005)	(0.005)
L.# Industry Mergers			0.000***	0.000***
			(0.000)	(0.000)
L.Prior Acquisition History			-0.042***	-0.043***
			(0.004)	(0.004)
L.IP Growth				0.003**
				(0.001)
L.CPI Inflation				-0.015***
				(0.003)
L.Excess Bond Premium				-0.024***
				(0.002)
L.Shillers's CAPE				0.001***
				(0.000)
Constant	0.165***			
	(0.001)			
N	452,712	452,712	452,712	452,712
FE	No	Firm	Firm	Firm
Cluster	No	Firm	Firm	Firm
Controls	No	No	Firm	Firm, Macro
IV	Yes	Yes	Yes	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm-level controls and the interaction term are constructed as 4 quarter averages.

5.3   Additional Results and Sensitivity Checks

In this section we present some additional results and a range of sensitivity checks for our main results. First, we analyse two additional factors relevant to a firm's M&A decision, namely the role of market power and capital investment. We then present a set of sensitivity checks that focus on the identification of the monetary policy shocks and the stability of our main results across sub-samples and industries. Here we study, in particular, (i) whether our results are sensitive to using an alternative monetary policy shock series for instrumenting the short-term interest rate, (ii) whether our results are robust to excluding the period after the global financial crisis, (iii) whether our results are robust to clustering on both the firm and the quarter level, and (iv) whether our results are robust to excluding firms in the financial, insurance, and real estate (FIRE) sectors. In the following we discuss the results of these sensitivity checks in detail.

5.3.1   Additional results

Dynamic Effects.   In this section we investigate the dynamic response of M&A likelihood. For this purpose, we estimate a linear probability local projection model in the style of Jorda (2005). That is, instead of estimating the probability of engaging in a M&A transaction in the 4 quarters following a monetary policy shock, we estimate the quarter by quarter likelihood of engaging in a M&A transaction over a horizon of 20 quarters. Figures C.1a-C.1f in appendix C plot the estimated impulse response function (IRF) of the 1y-Treasury rate as well as the IRF of the 1y Treasury Rate interacted with the lagged indicators of financial constraints (i.e. the leverage ratio, liquidity ratio, and EBITDA-to-Assets ratio). The model is estimated using the same set of controls, fixed effects, and clusters as the baseline model. In all three cases the average response to a 1 pp. increase in the 1y-Treasury rate is significantly negative over the whole horizon, bottoming out approximately two years after the initial shock. This suggests that our baseline model with a window of just one year actually understates the impact of monetary policy on M&A activity. The interaction terms suggest that highly leveraged firms react more upon impact but this heterogeneity in responses disappears rather quickly. Note that after four years the coefficient turns significantly positive. However, due to the rather long horizon, this result should be taken with a grain of salt. Furthermore, firms with a large amount of liquidity assets (high profitability) initially react less, but this heterogeneity in responses disappears after one (three) years.

Role of market power.   As a first additional result, we investigate the role of market power in a firm's M&A decision. Firms with high degrees of market power might be more likely to be financially unconstrained and might also be more likely to engage in M&A transactions in order to insulate their dominant position. We investigate whether market power plays a role for M&A decisions. To that end, we calculate several different measures of market

Table 4: Monetary Policy, M&A, and Market Power

	(1) P(Acq, 1y)	(2) P(Acq, 1y)	(3) P(Acq, 1y)	(4) P(Acq, 1y)
1y Treasury Rate	-0.010***	-0.011***	-0.010***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
1y Treasury Rate × L.Markup	-0.000			
	(0.001)			
1y Treasury Rate × Lerner Index		0.001		
		(0.003)		
1y Treasury Rate × Market Share			0.000*	
			(0.000)	
1y Treasury Rate × Industry Leader				-0.004
				(0.004)
L.Markup	0.010**			
	(0.004)			
L.Lerner Index		0.090***		
		(0.014)		
L.Market Share			-0.002	
			(0.002)	
L.Industry Leader				0.076***
				(0.018)
N	432,107	393,976	452,702	452,714
FE	Firm	Firm	Firm	Firm
Cluster	Firm	Firm	Firm	Firm
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Note: The firm level controls and interaction terms are constructed as 4 quarter averages.

power. First, we compute the firms' markup relative to their respective Fama-French industry average.[14] Second, we calculate the Lerner index.[15] Third, we calculate the firm's market share in its respective Fama-French industry (computed using Compustat sales data only). And fourth, we construct a dummy indicating whether the firm is in the 95% percentile of its respective Fama-French industry in terms of its market capitalisation (see Liu et al., 2019).

We find that higher market power indeed predicts a higher likelihood of engaging in M&A transactions. The reaction to monetary policy, however, does not seem to be driven by heterogeneity in market power since basically all relevant interaction terms are insignificant. Only the market share is significant but the magnitude of the effect is economically negligible.

M&A and capital investment. Furthermore, we investigate whether there any synergies

---

[14]To compute this measure of relative mark-ups we use the expression for the markup $\mu_{i,t}$ from De Loecker et al. (2020) $\mu_{it} = \theta_{it}^v \frac{P_{it}Q_{it}}{P_{it}^V V_{it}}$ where θ_{it}^v is the industry specific output elasticity, and $\frac{P_{it}Q_{it}}{P_{it}^V V_{it}}$ the revenue share of the variable input. Taking logs and demeaning this expression on the industry level eliminates the industry specific constant and thus returns the markup of the firm relative to its respective industry. We compute $\frac{P_{it}Q_{it}}{P_{it}^V V_{it}}$ as the ratio of revenue (Compustat item SALES) to cost of goods sold (Compustat item COGS).

[15]Computed as the ratio of Operating Income Before Depreciation (Compustat item OIBDPQ) minus depreciation (Compustat item DPQ) to overall revenue (Compustat item SALES), see (Gutiérrez and Philippon, 2017).

Table 5: Monetary Policy, M&A, and Investment

	(1) P(Acq, 1y)	(2) P(Acq, 1y)
1y Treasury Rate	-0.010***	-0.010***
	(0.001)	(0.001)
1y Treasury Rate × L.CAPEX Intensity	0.000	
	(0.000)	
1y Treasury Rate × L.(Perpetual Capital) Investment		0.011***
		(0.003)
L.CAPEX Intensity	0.000	
	(0.000)	
L.(Perpetual Capital) Investment		0.008
		(0.013)
N	442,300	316,365
FE	Firm	Firm
Cluster	Firm	Firm
Controls	Firm, Macro	Firm, Macro

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Note: The firm level controls and interaction terms are constructed as 4 quarter averages.

or complementarities between the decision to engage in M&A and capital investment. It could be the case that M&A acts as a complement to capital investment so that the frictions affecting capital investment spill over into the M&A decision. We investigate whether this channel plays a role by interacting the interest rate with a firm's capital expenditure intensity, calculated as the ratio of the firm's real capital expenditure to the firm's capital stock in the previous period[16] and the growth rate perpetual capital. As before, both are included in the regression as lagged four-quarter averages. We find no evidence for a relation between a firm's capital investment intensity and its M&A policy, neither overall nor in terms of its response to monetary policy changes. However, growing firm, i.e. those increased their (perpetual) capital stock over the past four quarters are more likely to engage in M&A in the first place and also react less to monetary policy changes. The fact that we find a significant effect for the growth of the capital stock but not for investment intensity suggests that the heterogeneous response along capital growth rates reflects some underlying financial constraint, as high growth firms are less likely to be financially constrained.

5.3.2 Sensitivity Checks

Measures of financial constraints. The literature on financial constraints at the firm level has produced a plethora of balance sheet variables and other firm characteristics that can be used to gauge the extent of a firm's financing constraints. Traditionally, the literature has re-

---

[16]Since capital expenditure in Compustat is recorded as year-to-date, CAPXY, we follow the literature and difference this variable within the fiscal year to reconstruct the quarterly series, CAPXQ.

Table 6: Different Measures of Financial Constraints

	(1) P(Acq, 1y)	(2) P(Acq, 1y)	(3) P(Acq, 1y)	(4) P(Acq, 1y)
1y Treasury Rate	-0.008***	-0.008***	-0.010***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)
1y Treasury Rate × L.Age	-0.000			
	(0.000)			
1y Treasury Rate × L.Leverage ratio		-0.005***		
		(0.002)		
1y Treasury Rate × L.Liquidity ratio			0.004***	
			(0.001)	
1y Treasury Rate × L.EBITDA-to-assets ratio				0.026***
				(0.004)
L.Age	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
L.Leverage	-0.015***	-0.059	-0.016***	-0.016***
	(0.002)	(0.068)	(0.002)	(0.002)
L.Net Liquidity Ratio	0.006***	0.006***	0.024	0.006***
	(0.002)	(0.002)	(0.030)	(0.002)
L.EBITDA-to-Assets Ratio	0.028***	0.029***	0.030***	0.374**
	(0.006)	(0.006)	(0.006)	(0.158)
N	452,714	452,603	452,701	452,547
FE	Firm	Firm	Firm	Firm
Cluster	Firm	Firm	Firm	Firm
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls and interaction terms are constructed as 4 quarter averages. For convenience, we restate the result based on the leverage ratio in table 3, column (4).

lied on so-called "asset-based" financing constraints with a firm's leverage ratio as the most natural and widely used proxy. In addition to the leverage ratio, others have also used a firm's liquidity ratio (Jeenas, 2018). More recently, the corporate finance literature, e.g. Drechsel (2020) or Lian and Ma (2020), has emphasized the role of so-called "earnings-based" constraints which determine the firms ability to borrow based on its future cash flow stream. At last, Cloyne et al. (2018) has emphasized age as informative about a firm's financial position. To test the robustness of our results when considering different proxies for financial constraints popular in the literature, we replace the leverage ratio in equation 20 with the net liquidity ratio, the EBITDA-to-assets ratio, and firm age. Table 6 shows that the results of section 5.2 are robust to considering different ways to measure a firm's borrowing capacity.

Identification of Monetary Policy Shocks. Some recent work, e.g. by Nakamura and Steinsson (2018) or Miranda-Agrippino and Ricco (2021), argues that the monetary policy surprises obtained as changes in short-rate futures contracts around monetary policy announcements might not capture the pure effect of these policy rate changes but in fact be contaminated by so-called "information effects", i.e. a change in the central bank's view of future economic performance as perceived by financial markets. In this section, we, therefore, analyse whether our findings are sensitive to using the information-robust shocks

of [Miranda-Agrippino and Ricco](2021). This approach disentangles the monetary policy shocks from any information effects in the high frequency monetary surprises and allows us to isolate the pure effect of monetary policy on M&A activity, without any potential contamination by releases of information about future economic growth. The results for the baseline specification as well as for the interaction with the leverage as well as the EBITDA-to-Assets ratio are reported in Table C.5. The average effect of monetary policy is smaller and only significant at the 10% threshold but still present. The estimated coefficients on the interaction terms are highly significant and even stronger (in absolute terms) than in the baseline model. These results suggest that while the information component of monetary policy shocks matters for the overall M&A decision, what matters for the transmission of monetary policy to firms' M&A decision via the credit channel is rather the pure policy rate change.

Sub-Sample Stability and Sectoral Effects. This section investigates whether our findings are affected by (i) dropping the years after the financial crisis i.e. limiting our sample to 1990Q1:2007Q4, (ii) controlling for effects across industrial sectors, i.e. including year-sector fixed effects or dropping FIRE industries, and (iii) clustering on the firm as well as on the quarterly level. The results for the average effect are presented in table C.1, the results for the credit channel are presented in tables C.2, including the leverage ratio as a proxy for financial constraints, C.3 using liquidity as the proxy variable, and C.4 using the EBITDA-to-assets ratio as a proxy. The results remain largely unaffected. Only the interaction of the interest rate and the leverage ratio in the subsample between 1990Q1:2007Q4 turns insignificant. However, the other two proxies for financial constraints remain significant even in the pre-crisis subsample.

6 Deal Quality

In this section, we shed light on the relationship between monetary policy and the quality of M&A transactions. Measuring the quality of M&A transactions is fraught with endogeneity issues, making the assessment of M&A transactions in terms of outcomes very difficult. Therefore, it is common in the literature to use an event study approach and rely on the market's assessment of a given transaction. To estimate the value generated by the transaction, one computes the cumulative abnormal return (CAR) of the involved firms around the announcement day of the transaction. We follow this approach and calculate 3-day acquirer CARs around the announcements of all transactions in our sample that could be merged with the respective firm's balance sheet information.

The abnormal return $AR_{i,t}$ of acquirer i at time t is calculated as

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{21}$$

That is, the abnormal return on day t of firm i is the difference between the realised stock return $R_{i,t}$ and the expected return $E(R_{i,t})$. The expected return is estimated using the three-factor model (3FF) of Fama and French (1996)

$$E(R_{i,t}) = \widehat{\beta}_i E(R_{m,t} - R_{f,t}) + \widehat{\beta}_i^{smb} E(SMB_t) + \widehat{\beta}_i^{hml} E(HML_t) \tag{22}$$

where $R_{f,t}$ and $R_{m,t}$ are the risk free rate and the overall market return in period t, respectively, SMP_t is the period t excess returns of small cap stocks over big cap stocks, and HML_t is the period t excess return of value stocks over growth stocks. The relevant parameters of equation (22) are estimated over days $t-150$ to $t-50$ where period t refers to the time of the event. The cumulative abnormal return is then computed as the sum of abnormal returns in a tight window around the announcement day of the transaction. For our analysis, we choose a window starting one day before the announcement day and ending one day after, thus capturing the abnormal returns over three consecutive days.

$$CAR_{i,t} = \sum_{t-1}^{t+1} AR_{i,t} \tag{23}$$

In principle, abnormal returns around M&A transactions can accrue to both the acquirer and the target.[17] The sum of the two abnormal returns constitutes the overall merger gain. Since we consider only the acquirer side in our estimation, we study the impact of monetary policy on deal quality focusing on the relationship between realised CARs of the acquiring firm and the monetary policy stance. We estimate the relationship between the monetary policy stance and the CAR using the following specification

$$CAR_{t,i} = \alpha + \gamma \bar{r}_{\{t-1,t-4\}} + \beta p_{t-1} + \Phi \mathbf{W}_{i,t-1} + \Theta \mathbf{X}_{t-1} + \varepsilon_{i,t} \tag{24}$$

where $\bar{r}_{\{t-1,t-4\}}$ refers to the average interest rate over the preceding four quarters instrumented by the equivalent four quarter average of the cumulative monetary policy surprise series. p_{t-1} is the end of period value of the Wilshire 5000 Total Market Index, i.e. the market value of all American stocks traded in the U.S. We use the Wilshire 5000 to control for the baseline firm valuations relative to which merger gains are evaluated. As before, the vectors $\mathbf{X}_t$ and $\mathbf{W}_t$ contain firm- and aggregate-level controls, respectively. The results are presented in table 7.

At this point, it is worthwhile to clarify some aspects of the relationship between monetary policy and acquirer CARs. It is unlikely that monetary policy affects the abnormal returns of a given acquirer in a short window around a M&A announcement directly. Instead, monetary policy can affect observed CARs in a given period through its effect on the overall M&A decision process. First, monetary policy affects the composition of firms that

---

[17] In fact, the literature overwhelmingly suggests that targets capture the bigger share of the merger gains (see e.g. Betton et al., 2007).

engage in M&A, i.e. it changes the average numerator of the model CAR in equation (18). Second, monetary policy affects the overall macroeconomic setting in which the deal takes place, thereby affecting deal outcomes, e.g. via financing conditions or expected growth rates. Third, monetary policy can affect overall firm valuations and thereby changes the baseline valuations relative to which merger gains are evaluated, i.e. the denominator of the model CAR in equation (18). Fourth, it affects which firms become acquisition targets. And fifth, monetary policy can affect the bargaining weights between targets and acquirers, thus changing the distribution of the overall CAR. Therefore, the estimated coefficients presented in Table 7 are a composite of several ways in which monetary policy can affect the average CAR around M&A announcements. However, combining these estimates with the results from the previous sections allows us to shed light on the effect of monetary policy on deal quality.

We first note that the average CAR associated with M&A transactions in our sample is significant and large. On average, transactions are associated with an excess return of 0.7%, which is largely in line with the existing literature (see e.g. Betton et al., 2007). Furthermore, without controlling for acquirer characteristics, the effect of a contractionary monetary policy stance on transaction CARs is positive and significant (even when controlling for baseline firm valuations), suggesting that markets assess the average M&A transaction under a contractionary monetary policy stance as of higher quality than otherwise. However, this effect disappears when controlling for acquirer characteristics. This strongly suggests that monetary policy affects the average deal quality mainly by changing the composition of acquiring firms. If monetary policy affected the transaction quality through any of the other three channels (different target composition, different bargaining weights, different macro outlook), we would expect a significant impact on transaction CARs even after controlling for acquirer characteristics.

We have shown in the previous section that especially financially constrained firms reduce their M&A activity under tighter monetary policy conditions. Combining this result with the result of the CAR regressions, suggests the following transmission channel of monetary policy: Contractionary monetary policy leads to a smaller number of transactions, but this smaller number of transaction is of higher (market-perceived) quality because the acquiring firms are in better financial shape, thus offering better post-merger perspectives (e.g. because they are able to afford investment in the target firms' productive capacities or are better suited to realise merger gains). Conversely, expansionary monetary policy leads to more transactions. However, the marginal transaction is of somewhat lower (perceived) quality since the marginal acquirer is less financially sound and is expected to realise smaller merger gains. Overall, this suggests that expansionary monetary policy leads to more frequent reallocation of capital to more productive firms (otherwise the average acquirer CAR would not be positive), although the marginal transaction reallocates capital to somewhat

Table 7: Effect of Monetary Policy on M&A transaction CARs

	(1) CAR	(2) CAR	(3) CAR	(4) CAR
L.1y Treasury Rate (4Q avg.)	0.002***	0.003***	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
L.Wilshire 5000	0.000	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
L.Shillers's CAPE		-0.001***		-0.000
		(0.000)		(0.000)
L.Excess Bond Premium		-0.002		0.000
		(0.001)		(0.001)
L.IP growth		0.000		-0.000
		(0.001)		(0.001)
L.CPI inflation		-0.007***		-0.003
		(0.002)		(0.002)
L.# of Industry Mergers			-0.000***	-0.000**
			(0.000)	(0.000)
L. Prior Acquisition History			-0.006***	-0.006***
			(0.002)	(0.002)
L.Age			0.000**	0.000**
			(0.000)	(0.000)
L.Dividend Payer			0.008**	0.008***
			(0.003)	(0.003)
L.Leverage			0.006	0.007*
			(0.004)	(0.004)
L.Log Total Assets (Real)			-0.007***	-0.007***
			(0.001)	(0.001)
L.Net liquidity ratio			-0.012**	-0.012**
			(0.005)	(0.005)
L.Tobin's Q			-0.002***	-0.002***
			(0.000)	(0.000)
L.EBITDA-to-assets ratio			-0.051**	-0.052**
			(0.025)	(0.025)
Constant	0.006**	0.021***	0.065***	0.069***
	(0.003)	(0.003)	(0.005)	(0.006)
N	19,643	19,643	19,643	19,643
Controls	No	Macro	Firm	Macro, Firm

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls for leverage, net liquidity ratio, Tobin's Q, and EBITDA-to-assets ratio are constructed as 4 quarter averages.

less productive firms.

7   Conclusion

In this paper, we study the effect of monetary policy on M&A activity in the U.S. both on the aggregate and the firm level. We find that contractionary monetary policy lowers aggregate M&A activity both in terms of the total number of deals and their total value. The macroeconomic evidence is confirmed at the firm level. A one percentage point increase in the 1y-Treasury rate reduces the likelihood of engaging in a M&A transaction within the following 4 quarters by 1.1 percentage points. Considering the unconditional likelihood of engaging in a M&A transaction is 13.7% in any given year, this presents an 8% reduction in the likelihood of becoming an acquirer. We show that financially constrained firms react much more to the monetary policy impulse than their more unconstrained peers. We, furthermore, show that M&A transactions are on average associated with large positive CARs. Contractionary monetary policy has a positive effect on the average CAR around our sample of M&A transaction announcements. This effect, however, is not robust to including firm characteristics, providing additional evidence of a selection into acquiring following a contractionary monetary policy shock. Taken together, our results suggest that contractionary monetary policy leads to fewer but higher-quality M&A transactions since the set of firms which are still able to engage in M&A are financially more sound and have better post-merger growth prospects. We propose a stylised partial equilibrium model of a firm's M&A decision to rationalise our empirical findings.

References

Abadie, A., S. Athey, G. W. Imbens, and J. Wooldridge (2017). When Should You Adjust Standard Errors for Clustering.

Adra, S., L. G. Barbopoulos, and A. Saunders (2020). The impact of monetary policy on M&A outcomes. *Journal of Corporate Finance 62*(C).

Almeida, H., M. Campello, and D. Hackbarth (2011). Liquidity mergers. *Journal of Financial Economics 102*(3), 526–558.

Angrist, J. D. and J. S. Pischke (2008). *Mostly harmless econometrics: An empiricist's companion.*

Bernanke, B. S. and M. Gertler (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. Technical Report 4.

Bernanke, B. S., M. Gertler, and S. Gilchrist (1999). The Financial Accelerator in a Quantitative Business Cycle Framework. In J. B. Taylor and M. Woodford (Eds.), *Handbook of Macroeconomics*, Volume 1, Chapter 21, pp. 1231–1745. North-Holland.

Betton, S., B. E. Eckbo, and K. S. Thorburn (2007). Corporate Takeovers. *Handbook of Empirical Corporate Finance SET 1*, 291–429.

Bonaime, A., H. Gulen, and M. Ion (2018). Does policy uncertainty affect mergers and acquisitions? *Journal of Financial Economics 129*(3), 531–558.

Choi, S. H. and B. N. Jeon (2011). The impact of the macroeconomic environment on merger activity: Evidence from US time-series data. *Applied Financial Economics 21*(4), 233–249.

Cloyne, J., C. Ferreira, M. Froemel, and P. Surico (2018). Monetary Policy, Corporate Finance and Investment.

David, J. (2021). The Aggregate Implications of Mergers and Acquisitions. *Review of Economic Studies 88*(4), 1796–1830.

De Loecker, J., J. Eeckhout, and G. Unger (2020). The rise of market power and the macroeconomic implications. *Quarterly Journal of Economics 135*(2), 561–644.

Dealogic M&A Research (2019). M&A Highlights: Full Year 2018.

Drechsel, T. (2020). *Earnings-Based Borrowing Constraints and Macroeconomic Fluctuations.* Ph. D. thesis, London School of Economics.

Eisfeldt, A. L. and A. A. Rampini (2006, 4). Capital reallocation and liquidity. *Journal of Monetary Economics 53*(3), 369–399.

Eisfeldt, A. L. and A. A. Rampini (2008, 1). Managerial incentives, capital reallocation, and the business cycle. *Journal of Financial Economics 87*(1), 177–199.

Fama, E. F. and K. R. French (1996). Multifactor explanations of asset pricing anomalies. *Journal of Finance 51*(1), 55–84.

Faria, A. L. (2008). Mergers and the Market for Organization Capital. *Journal of Economic Theory 138*(1), 71–100.

Favara, G., S. Gilchrist, K. F. Lewis, and E. Zakrajšek (2016). Recession Risk and the Excess Bond Premium. Technical report, Board of Governors of the Federal Reserve System (U.S.).

Garfinkel, J. A. and K. W. Hankins (2011). The role of risk management in mergers and merger waves. *Journal of Financial Economics 101*(3), 515–532.

Gertler, M. and S. Gilchrist (1994). Monetary policy, business cycles, and the behavior of small manufacturing firms. *Quarterly Journal of Economics 109*(2), 309–340.

Gertler, M. and P. Karadi (2015). Monetary Policy Surprises, Credit Costs,and Economic Activity. *American Economic Journal: Macroeconomics 7*(1), 44–76.

Giannone, D., M. Lenza, and G. E. Primiceri (2015). Prior selection for vector autoregressions. *Review of Economics and Statistics 97*(2), 436–451.

Gorodnichenko, Y. and M. Weber (2016, 1). Are sticky prices costly?: Evidence from the stock market. *American Economic Review 106*(1), 165–199.

Gurkaynak, R. S., B. P. Sack, and E. T. Swanson (2005). Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements. *International Journal of Central Banking 1*(1), 55–93.

Gutiérrez, G. and T. Philippon (2017). Declining Competition and Investment in the U.S.

Haleblian, J., C. E. Devers, G. McNamara, M. A. Carpenter, and R. B. Davison (2009). Taking stock of what we know about mergers and acquisitions: A review and research agenda. *Journal of Management 35*(3), 469–502.

Jarociński, M. and P. Karadi (2020). Deconstructing monetary policy surprises-The role of information shocks. *American Economic Journal: Macroeconomics 12*(2), 1–43.

Jeenas, P. (2018). *Firm Balance Sheet Liquidity, Monetary Policy Shocks, and Investment Dynamics.* Ph. D. thesis, New York University.

Jorda, O. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review 95*(1), 161–182.

Kashyap, A. K. and J. C. Stein (1995). The impact of monetary policy on bank balance sheets. In *Carnegie-Rochester Conference Series on Public Policy 42*, Volume 42, pp. 151–195. North-Holland.

Kiyotaki, N. and J. Moore (1997). Credit cycles. *Journal of Political Economy 105*(2), 211–248.

Lian, C. and Y. Ma (2020). Anatomy of Corporate Borrowing Constraints*. *The Quarterly Journal of Economics 136*(1), 229–291.

Liu, E., A. R. Mian, and A. Sufi (2019). Low Interest Rates, Market Power, and Productivity Growth. *SSRN Electronic Journal*.

Maksimovic, V. and G. Phillips (2001). The market for corporate assets: Who engages in mergers and asset sales and are there efficiency gains? *Journal of Finance 56*(5), 2019–2065.

Mertens, K. and M. O. Ravn (2013). The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States. *103*(4), 1212–1247.

Miranda-Agrippino, S. and G. Ricco (2021). The Transmission of Monetary Policy Shocks. *American Economic Journal: Macroeconomics forthcoming*.

Nakamura, E. and J. Steinsson (2018). High-frequency identification of monetary non-neutrality: The information effect. *Quarterly Journal of Economics 133*(3), 1283–1330.

Ottonello, P. and T. Winberry (2020). Financial Heterogeneity and the Investment Channel of Monetary Policy. *Econometrica 88*(6), 2473–2502.

Owen, S. and A. Yawson (2010). Corporate life cycle and M&A activity. *Journal of Banking and Finance 34*(2), 427–440.

Rousseau, P. L. and B. Jovanovic (2002). The Q-Theory of Mergers. *American Economic Review 92*(2), 198–204.

Shleifer, A. and R. W. Vishny (2003). Stock market driven acquisitions. *Journal of Financial Economics 70*(3), 295–311.

Stock, J. H. and M. W. Watson (2018). Identification and Estimation of Dynamic Causal Effects in Macroeconomics Using External Instruments. *The Economic Journal 128*(5), 917–948.

A Data

Monetary Policy Shocks. For our main results, we use the high-frequency identified monetary policy shocks by Jarociński and Karadi (2020). We also examine the sensitivity of our results to using the information-robust monetary policy surprises by Miranda-Agrippino and Ricco (2021) which disentangle monetary policy surprises into macroeconomic information and pure policy shocks. The two shock series are plotted in figure A.1a and figure A.1b, respectively.

(a) High-frequency Surprises

(b) Information-robust high-frequency surprises
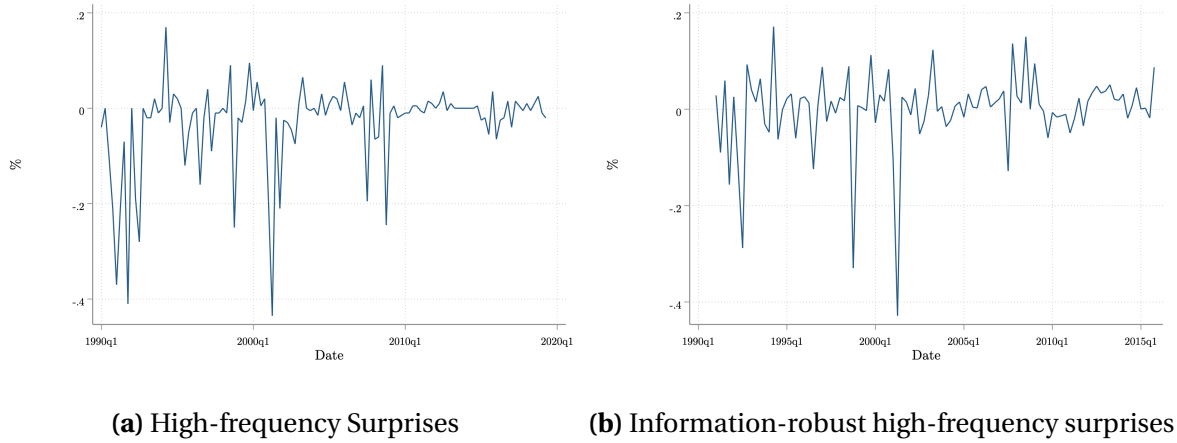
Note: The first panel shows the quarterly financial market surprises from Jarociński and Karadi (2020). The second panel shows the information-robust high-frequency surprises by Miranda-Agrippino and Ricco (2021).

Figure A.1: Monetary Policy Shocks

Variable Definitions and Summary Statistics. For our firm-level analysis, we use detailed quarterly financial statement data for publicly listed U.S. companies from Compustat. Table A.1 provides the precise variable definitions, including the item codes from Compustat.

Table A.1: Variable Definitions

Variable	Definition
Age	–
Leverage	(DLCQ + DLTTQ)/ATQ
Total Assets	ATQ
Net Liquidity	(ACTQ - LCTQ)/ATQ
Tobin's Q	(ATQ + PRCCQ*CSHOQ - CEQQ)/ATQ
EBITDA-to-Assets	EBITDAQ/L.ATQ
Dividend Payer	$\mathbb{I}_{DVQ>0,\{t,t-3\}}$
Acquisition history	$\mathbb{I}_{Transaction>0,\{t,t-19\}}$
# Industry Mergers	$\Sigma_{i\in ffind}\mathbb{I}_{i,Transaction>0,\{t,t-3\}}$

Note: Age is constructed using WorldScope information (accessed via Datastream) on the firm's foundation date. If this is missing, we use the firm's incorporation date (BEGDAT) from CRSP.

In table A.2, we provide summary statistics for the main variables of interest.

Table A.2: Summary Statistics

	Observations	Mean	Std. Dev	Min	Max
Age	798,482	24.40	27.45	0.00	235.00
Leverage Ratio	699,740	0.30	0.62	0.00	18.11
Net Liquidity Ratio	608,405	0.13	0.77	-10.00	7.13
Tobin's Q	642,829	3.29	11.86	0.44	467.56
EBITDA to Total Assets	574,603	-0.01	0.20	-5.56	0.17
Log Total Assets (real)	738,846	5.31	2.81	-6.97	15.09

Note: Firm-level variables are trimmed at the 1st and 99th percentile. Trimming is done by year.

Cumulative Abnormal Return: Mean & 95% Confidence Limits

There are 31219 events in total with non–missing returns.
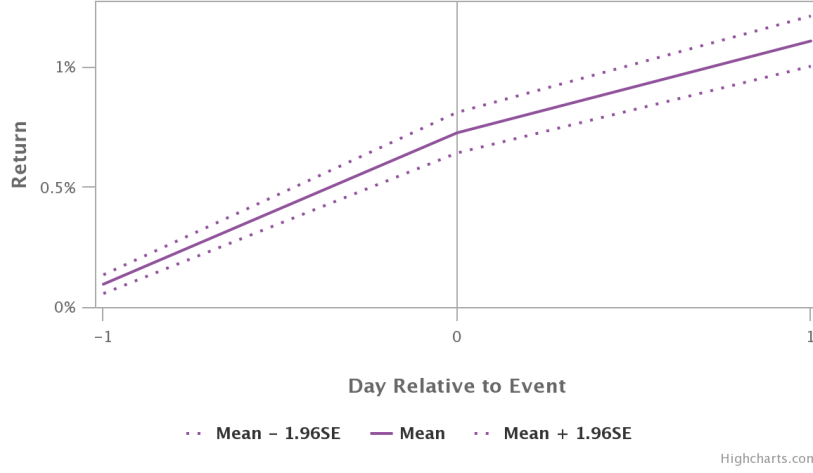
Figure A.2: Average Cumulative Abnormal Return Around M&A Announcement Dates

B VAR Specification and Robustness

B.1 Prior and Posterior Distribution

In reduced form, the model can be written as

$$y_t = C + \sum_{l=1}^{p} A_l y_{t-l} + u_t$$

where u_t are the reduced-form error terms with zero mean and covariance matrix Σ. Stacking the regressors into a single matrix this can be written as $Y = XB + u$. The prior and the posterior belong to the normal-inverse-Wishart distribution, where the posterior takes the form:

$$p(\Sigma|y) = \mathscr{IW}(\alpha_1, S_1)$$

$$p(B|y) = \mathscr{MT}(B_1, S_1, \Phi_1, \alpha_1)$$

where $\mathscr{IW}$ denotes the Inverted Wishart distribution and $\mathscr{MT}$ is a matrix-variate student distribution with mean B_1, scale matrices S_1 and Φ_1, and degrees of freedom α_1. The parameters describing the posterior distribution are related to the prior in the following way

$$B_1 = \Phi_1 [\Phi_0^{-1} B_0 + X'Y]$$

$$S_1 = Y'Y + S_0 + B_0' \Phi_0^{-1} B_0 - B_1' \Phi_1^{-1} B_1$$

$$\Phi_1 = [\Phi_0^{-1} + X'X]^{-1}$$

$$\alpha_1 = \alpha_0 + T$$

33

We use a conventional Minnesota prior for B_1, setting the own first lag coefficients to one and all other coefficients (including the intercept) to zero. This assumes that all the non-stationarity in the variables is stochastic, and accounted for by the unit-root embedded in the priors. We furthermore set $\alpha_0 = n+2$, the prior scale matrix S_0 to the diagonal covariance matrix obtained from individual AR(1) regressions for each of the respective endogenous variables, and finally

$$\Phi_0 = \mathrm{diag}\left(\lambda_c, \phi_{1,1}, ..., \phi_{1,n}, ..., \phi_{p,1}, ..., \phi_{p,n}\right)$$

where $\lambda_c = 10^5$ is the prior variance on the intercept, $\phi_{li} = \left(\frac{1}{\sigma_i^2}\right)\left(\frac{\lambda^2}{l^2}\right)$, and λ controls the overall tightness of the priors (with a smaller value placing more weight on the prior). Extending the argument in Giannone et al. (2015), we treat the parameter λ as an additional model parameter coming from a gamma distribution with mean 0.4 and standard deviation 0.1, and choose it as the maximiser of the posterior likelihood.
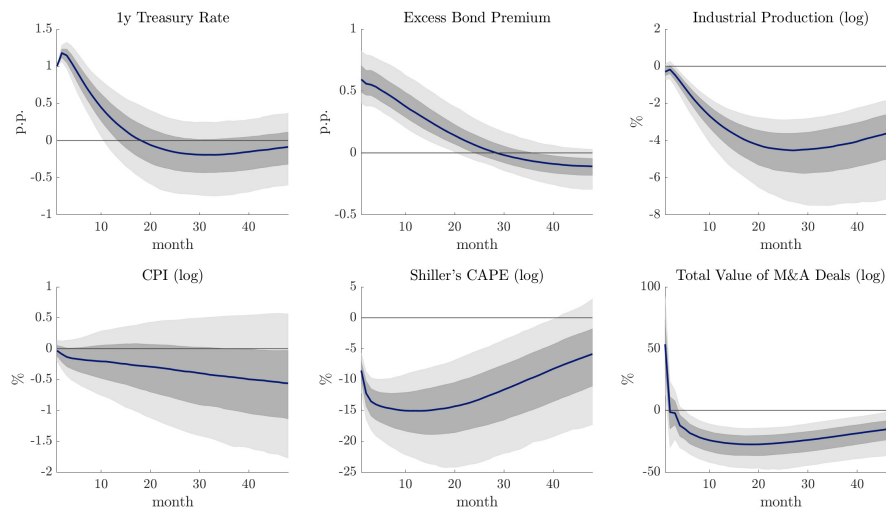
B.2   VAR Robustness

B.2.1   Only Public Firms
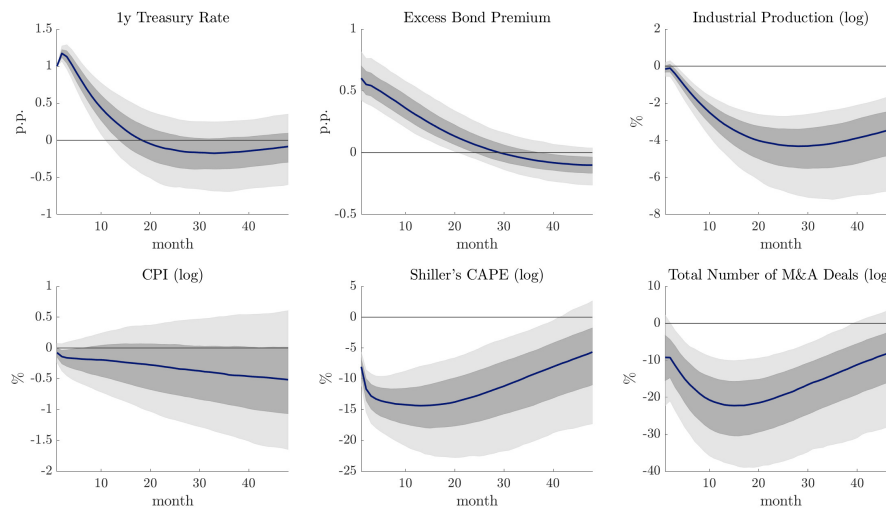
Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure B.1: Response of Aggregate Deal Volume to a Monetary Policy Shock

Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure B.2: Response of Aggregate Deal Volume to a Monetary Policy Shock

B.2.2 No Bayesian Prior

Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure B.3: Response of Aggregate Deal Volume to a Monetary Policy Shock

Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure B.4: Response of Aggregate Deal Volume to a Monetary Policy Shock

B.2.3 AIC Lag Length

Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

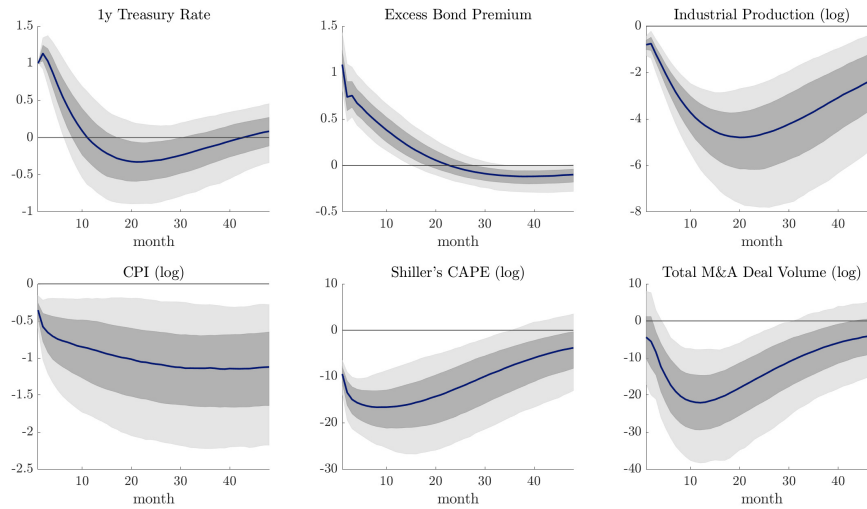**Figure B.5:** Response of Aggregate Deal Volume to a Monetary Policy Shock

Note: Light (dark) grey shaded areas indicate 95% (68%) confidence intervals

Figure B.6: Response of Aggregate Deal Volume to a Monetary Policy Shock
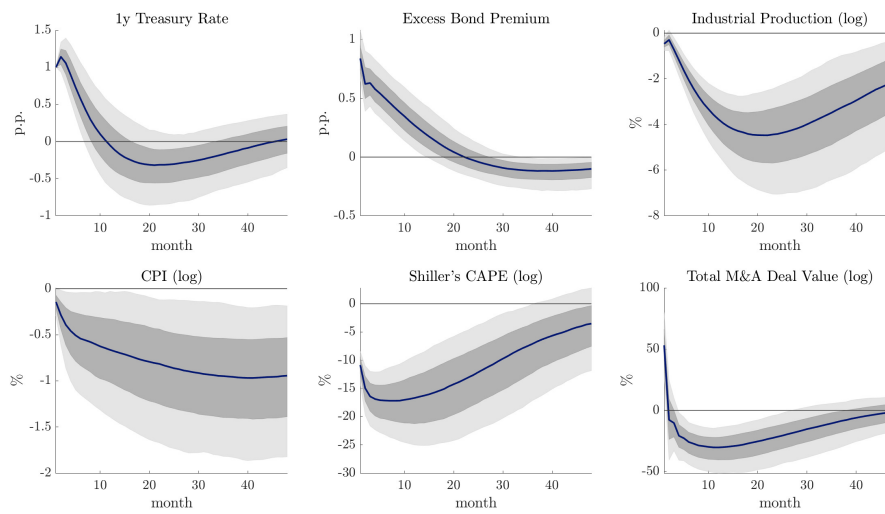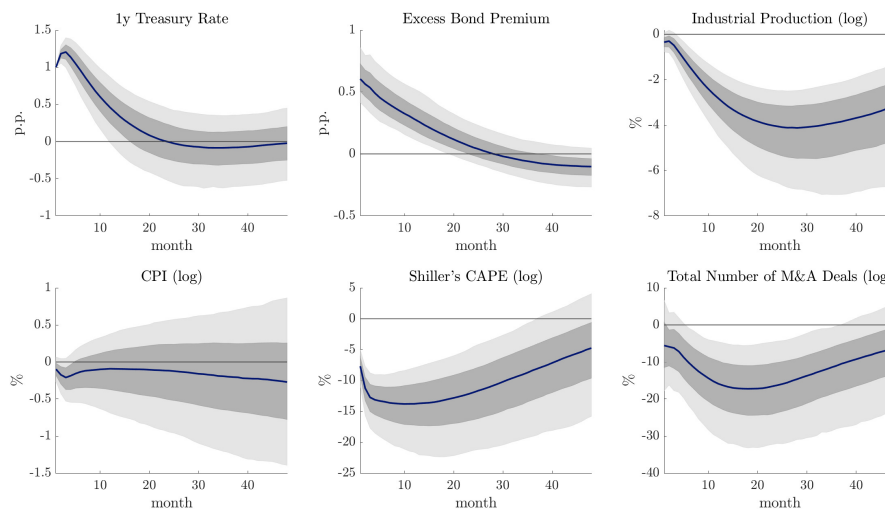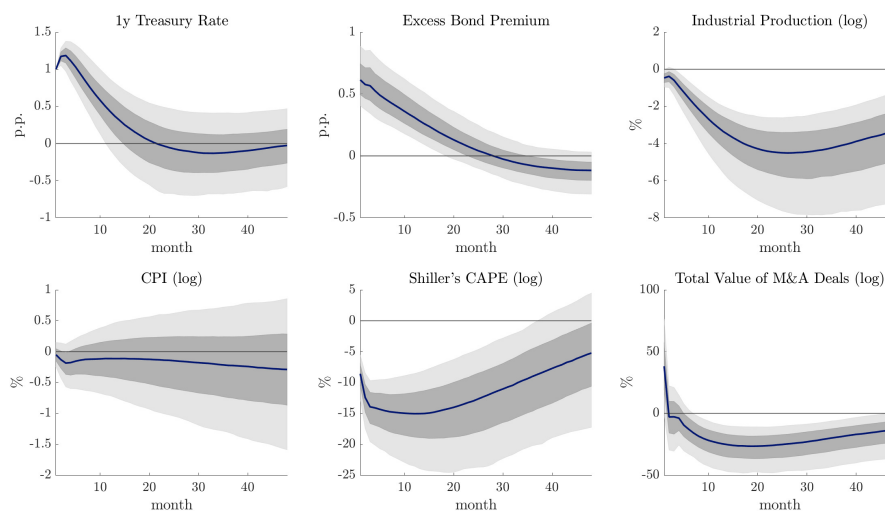
C Sensitivity Analysis

In this appendix, we report the results from the sensitivity checks of our firm-level analysis outlined in section 5.3.2.

Sub-Sample Stability and Sectoral Effects. In table C.1, we report robustness checks of the average effect of monetary policy on the acquisition likelihood. We focus on our preferred specification including the full set of firm-level, macroeconomics, and M&A control variables. Column (1) estimates the average effect on the pre-crisis sample from 1990Q1 to 2007Q4. Column (2) estimates the average effect over the entire sample including industry-year fixed effects alongside the firm fixed effects. Column (3) estimates the average effect over the entire sample excluding the finance, insurance, and real estate (FIRE) sectors. Finally, column (4) reports the average effect when standard errors are clustered at the firm and the quarter level.

Table C.1: Sensitivity Tests - Average Effect

	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se
1y Treasury Rate	-0.004***	-0.002	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.002)
L.Leverage	-0.033***	-0.014***	-0.015***	-0.015***
	(0.005)	(0.003)	(0.002)	(0.003)
L.Age	-0.000	-0.002***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.000)	(0.001)
L.Log Total Assets (real)	0.004**	0.004**	0.004***	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
L.Net Liquidity Ratio	0.010***	0.007***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
L.Tobin's Q	0.003***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
L.EBITDA-to-Assets Ratio	0.083***	0.028***	0.029***	0.028***
	(0.011)	(0.006)	(0.006)	(0.007)
L.Dividend Payer	-0.001	-0.003	-0.004	-0.005
	(0.005)	(0.005)	(0.005)	(0.005)
L.# Industry Mergers	0.000***	-0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
L.Prior Acquisition History	-0.084***	-0.047***	-0.042***	-0.043***
	(0.005)	(0.004)	(0.004)	(0.005)
L.IP Growth	0.005***	0.003**	0.003**	0.003
	(0.002)	(0.001)	(0.001)	(0.005)
L.CPI Inflation	-0.018***	-0.002	-0.016***	-0.015
	(0.003)	(0.002)	(0.003)	(0.010)
L.Excess Bond Premium	-0.027***	-0.008***	-0.024***	-0.024***
	(0.002)	(0.002)	(0.002)	(0.004)
L.Shillers's CAPE	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
N	309,994	442,665	438,440	452,714
FE	Firm	Firm, Industry x Year	Firm	Firm
Cluster	Firm	Firm	Firm	Firm, Quarter
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro
Sample	1990Q1 - 2007q4	1990Q1 - 2019Q2	1990Q1 - 2019Q2 (excl. FIRE)	1990Q1 - 2019Q2

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls for leverage, net liquidity ratio, Tobin's Q, and EBITDA-to-assets ratio are constructed as 4 quarter averages.

In tables C.2, C.3, and C.4, we repeat the above sensitivity checks for our main results

Table C.2: Sensitivity Tests - Credit Channel (Leverage Ratio)

	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se
1y Treasury Rate	-0.004***	-0.000	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.002)
1y Treasury Rate × L.Leverage Ratio	-0.001	-0.006***	-0.005***	-0.005***
	(0.003)	(0.002)	(0.002)	(0.002)
L.Leverage	-0.029**	-0.004	-0.007**	-0.006*
	(0.012)	(0.003)	(0.003)	(0.003)
L.Age	-0.000	-0.002***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.000)	(0.001)
L.Log Total Assets (real)	0.004**	0.004**	0.004***	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
L.Net Liquidity Ratio	0.010***	0.006***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
L.Tobin's Q	0.003***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
L.EBITDA-to-Assets Ratio	0.083***	0.030***	0.029***	0.029***
	(0.011)	(0.006)	(0.006)	(0.007)
L.Dividend Payer	-0.001	-0.003	-0.004	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)
L.# Industry Mergers	0.000***	-0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
L.Prior Acquisition History	-0.084***	-0.046***	-0.042***	-0.043***
	(0.005)	(0.004)	(0.004)	(0.005)
L.IP Growth	0.005***	0.003**	0.003*	0.003
	(0.002)	(0.001)	(0.001)	(0.005)
L.CPI Inflation	-0.018***	-0.002	-0.015***	-0.015
	(0.003)	(0.002)	(0.003)	(0.010)
L.Excess Bond Premium	-0.027***	-0.008***	-0.024***	-0.024***
	(0.002)	(0.002)	(0.002)	(0.004)
L.Shillers's CAPE	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
N	309,994	442,665	438,440	452,714
FE	Firm	Firm, Industry x Year	Firm	Firm
Cluster	Firm	Firm	Firm	Firm, Quarter
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro
Sample	1990Q1 - 2007q4	1990Q1 - 2019Q2	1990Q1 - 2019Q2 (excl. FIRE)	1990Q1 - 2019Q2

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

pertaining to the role of financial constraints.

Identification of Monetary Policy Shocks. In table C.5, we report the robustness of our results to using the information-robust high-frequency monetary policy surprises by Miranda-Agrippino and Ricco (2021).

Table C.3: Sensitivity Tests - Credit Channel (Liquidity Ratio)

|	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se
1y Treasury Rate	-0.001	-0.007***	-0.013***	-0.013***
	(0.001)	(0.002)	(0.003)	(0.004)
1y Treasury Rate × L.Liquidity Ratio	0.003**	0.005***	0.007***	0.006***
	(0.001)	(0.002)	(0.002)	(0.002)
L.Leverage	-0.034***	-0.016***	-0.018***	-0.017***
	(0.005)	(0.003)	(0.003)	(0.003)
L.Age	0.001*	-0.002***	-0.003***	-0.004***
	(0.000)	(0.001)	(0.001)	(0.001)
L.Log Total Assets (real)	0.004*	0.004**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
L.Net Liquidity Ratio	-0.001	-0.004	-0.010**	-0.008
	(0.006)	(0.004)	(0.004)	(0.005)
L.Tobin's Q	0.003***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
L.EBITDA-to-Assets Ratio	0.083***	0.031***	0.032***	0.032***
	(0.011)	(0.006)	(0.006)	(0.008)
L.Dividend Payer	-0.001	-0.003	-0.004	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)
L.# Industry Mergers	0.000***	-0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
L.Prior Acquisition History	-0.083***	-0.046***	-0.041***	-0.043***
	(0.005)	(0.004)	(0.004)	(0.005)
L.IP Growth	0.003**	0.002*	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.005)
L.CPI Inflation	-0.028***	0.000	-0.013***	-0.013
	(0.004)	(0.002)	(0.004)	(0.012)
L.Excess Bond Premium	-0.025***	-0.008***	-0.026***	-0.025***
	(0.002)	(0.002)	(0.002)	(0.005)
L.Shillers's CAPE	0.001***	0.001***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
N	309,994	442,665	438,440	452,714
FE	Firm	Firm, Industry x Year	Firm	Firm
Cluster	Firm	Firm	Firm	Firm, Quarter
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro
Sample	1990Q1 - 2007q4	1990Q1 - 2019q2	1990Q1 - 2019q2 (excl. FIRE)	1990Q1 - 2019q2

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls and interaction terms are constructed as 4 quarter averages.

Table C.4: Sensitivity Tests - Credit Channel (EBITDA-to-Assets Ratio)

	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se
1y Treasury Rate	-0.001	-0.006***	-0.012***	-0.012***
	(0.001)	(0.002)	(0.003)	(0.004)
1y Treasury Rate × L.EBITDA-to-Assets	0.014**	0.031***	0.041***	0.039***
	(0.006)	(0.006)	(0.006)	(0.008)
L.Leverage	-0.033***	-0.015***	-0.017***	-0.017***
	(0.005)	(0.003)	(0.002)	(0.003)
L.Age	0.001*	-0.002***	-0.003***	-0.003***
	(0.000)	(0.001)	(0.001)	(0.001)
L.Log Total Assets (real)	0.004**	0.004**	0.004***	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
L.Net Liquidity Ratio	0.010***	0.007***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
L.Tobin's Q	0.003***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
L.EBITDA-to-Assets Ratio	0.034	-0.025**	-0.042***	-0.039***
	(0.021)	(0.012)	(0.011)	(0.014)
L.Dividend Payer	-0.001	-0.003	-0.004	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)
L.# Industry Mergers	0.000***	-0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
L.Prior Acquisition History	-0.084***	-0.047***	-0.042***	-0.043***
	(0.005)	(0.004)	(0.004)	(0.005)
L.IP Growth	0.003**	0.002*	0.002*	0.002
	(0.002)	(0.001)	(0.002)	(0.005)
L.CPI Inflation	-0.028***	0.000	-0.012***	-0.012
	(0.004)	(0.002)	(0.004)	(0.012)
L.Excess Bond Premium	-0.025***	-0.008***	-0.026***	-0.025***
	(0.002)	(0.002)	(0.002)	(0.005)
L.Shillers's CAPE	0.001***	0.001***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
N	309,994	442,665	438,440	452,714
FE	Firm	Firm, Industry x Year	Firm	Firm
Cluster	Firm	Firm	Firm	Firm, Quarter
Controls	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro
Sample	1990Q1 - 2007q4	1990Q1 - 2019q2	1990Q1 - 2019q2 (excl. FIRE)	1990Q1 - 2019q2

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls and interaction terms are constructed as 4 quarter averages.

	(1) P(Acq, 1y) b/se	(2) P(Acq, 1y) b/se	(3) P(Acq, 1y) b/se	(4) P(Acq, 1y) b/se	(5) P(Acq, 1y) b/se
1y Treasury Rate	-0.018**	-0.006*	-0.004	-0.008**	-0.007*
	(0.008)	(0.004)	(0.004)	(0.004)	(0.004)
1y Treasury Rate × L.Leverage ratio			-0.010***		
			(0.002)		
1y Treasury Rate × L.Liquidity ratio				0.004***	
				(0.002)	
1y Treasury Rate × L.EBITDA-to-assets ratio					0.029***
					(0.005)
L.Leverage		-0.017***	-0.001	-0.019***	-0.020***
		(0.003)	(0.004)	(0.003)	(0.003)
L.Age		-0.002**	-0.002**	-0.002**	-0.002**
		(0.001)	(0.001)	(0.001)	(0.001)
L.Log Total Assets (real)		0.004**	0.004**	0.004**	0.004**
		(0.002)	(0.002)	(0.002)	(0.002)
L.Net Liquidity Ratio		0.007***	0.005***	-0.003	0.007***
		(0.002)	(0.002)	(0.004)	(0.002)
L.Tobin's Q		0.001***	0.001***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)	(0.000)
L.EBITDA-to-Assets Ratio		0.035***	0.037***	0.037***	-0.017
		(0.007)	(0.007)	(0.007)	(0.011)
L.Dividend Payer		-0.006	-0.005	-0.005	-0.006
		(0.005)	(0.005)	(0.005)	(0.005)
L.# Industry Mergers		0.000***	0.000***	0.000***	0.000***
		(0.000)	(0.000)	(0.000)	(0.000)
L.Prior Acquisition History		-0.052***	-0.052***	-0.052***	-0.053***
		(0.004)	(0.004)	(0.004)	(0.004)
L.IP Growth		0.003*	0.003	0.003*	0.003
		(0.002)	(0.002)	(0.002)	(0.002)
L.CPI Inflation		-0.015***	-0.014***	-0.015***	-0.014***
		(0.003)	(0.003)	(0.003)	(0.003)
L.Excess Bond Premium		-0.023***	-0.023***	-0.024***	-0.024***
		(0.003)	(0.003)	(0.003)	(0.003)
L.Shillers's CAPE		0.001***	0.001***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)	(0.000)
N	406,938	406,938	406,938	406,938	406,938
FE	Firm	Firm	Firm	Firm	Firm
Cluster	Firm	Firm	Firm	Firm	Firm
Controls	No	Firm, Macro	Firm, Macro	Firm, Macro	Firm, Macro
Sample	1991q1 - 2015q4	1991q1 - 2015q4	1991q1 - 2015q4	1991q1 - 2015q4	1991q1 - 2015q4

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: The firm level controls and interaction terms are constructed as 4 quarter averages.
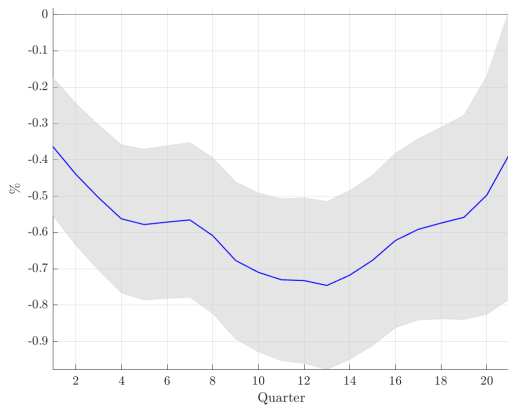
Dynamic Effects. To examine the dynamic response of the acquisition likelihood to a monetary policy shock, we estimate a linear probability local projection model in the style of Jorda (2005). That is, instead of estimating the probability of engaging in a M&A transaction in the 4 quarters following a monetary policy shock, we estimate the quarter by quarter likelihood of engaging in a M&A transaction over a horizon of 20 quarters. We estimate both an unconditional or baseline effect and a conditional effect depending on the firm's financial constraints.
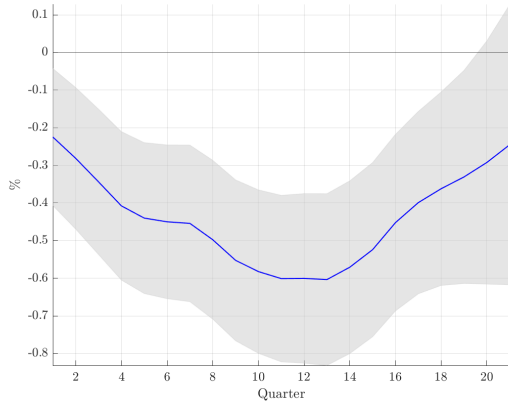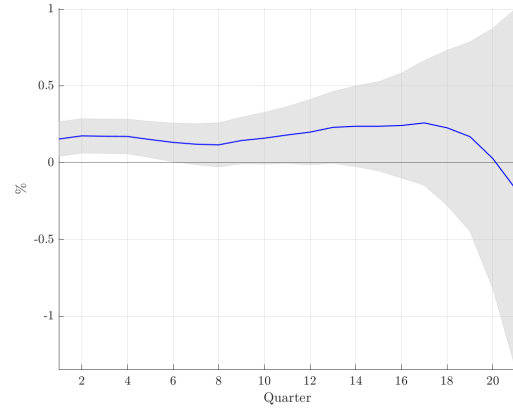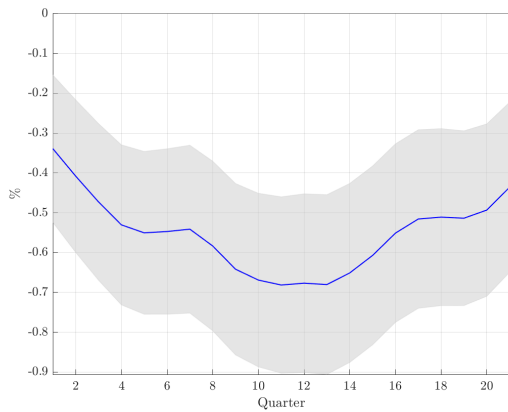
(a) Dynamic Effect: Baseline
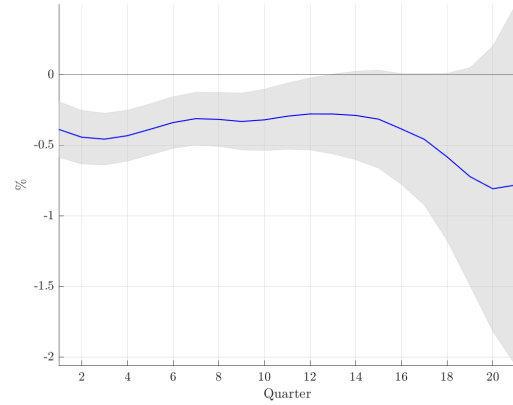
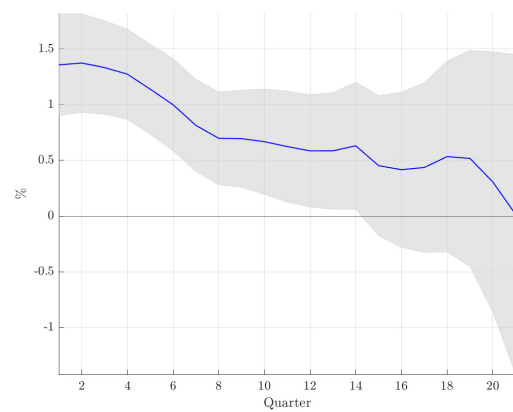**(b)** Dynamic Effect: Interaction Leverage Ratio

(c) Dynamic Effect: Baseline

(d) Dynamic Effect: Interaction Liquidity Ratio

(e) Dynamic Effect: Baseline

(f) Dynamic Effect: Interaction EBITDA-to-Assets

Note: The six panels show the dynamic response of the acquisition likelihood to a monetary policy shock as well as the interaction with indicators of financial constraints. Shaded areas indicate 95% confidence intervals.

Figure C.1: Dynamic Effect of Monetary Policy on M&A

D First-stage results

We report the first-stage results for both the unconditional and conditional estimations in table D. As can be seen the monetary policy shock predicts positively and significantly the short-term Treasury rate. The Kleibergen-Paap F statistic is well above the respective critical values.

Table D.1: First-stage Results

Dep. Var.	1y Rate	1y Rate x Leverage	1y Rate x EA Ratio	1y Rate x Liquidity
	(1)	(2)	(3)	(4)
IV	2.248***	2.251***	2.253***	2.271***
	(0.007)	(0.008)	(0.007)	(0.008)
IV x Leverage		3.073***		
		(0.0427)		
IV x EA Ratio			3.581***	
			(0.055)	
IV x Liquidity				3.144***
				(0.058)
Observations	426,289	426,289	426,289	426,289
Kl.-Paap F stat.	24,000	5,400	5,200	4,900
Stock-Yogo crit. val.	16.38	7.03	7.03	7.03
FE	Firm	Firm	Firm	Firm
Cluster	Firm	Firm	Firm	Firm

Note "IV" refers to the instrumental variable, i.e. the cumulative series of quarterly monetary policy surprises. "EA Ratio" refers to the EBITDA-to-Asset ratio. "1y Rate" refers to the 1-year Treasury Rate. "Leverage" and "Liquidity" refer to the leverage and liquidity ratio, respectively. All regressions include the usual set of firm-level, M&A, and macroeconomic control variables.