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Liquid Stock as an Acquisition Currency

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Abstract

We examine how stock liquidity affects acquisitions. We hypothesize that liquidity enhances acquirer stock as an acquisition currency, especially when the target is relatively less liquid. As hypothesized, more liquid firms are more likely to make acquisitions and the *difference* in stock liquidity between acquirer and target firms increases payment with stock, reduces acquisition premiums, and improves acquirer announcement returns in equity deals. To exploit benefits of liquidity, firms take steps to improve stock liquidity prior to stock acquisitions. Our empirical identification relies on policy initiatives that exogenously increase stock liquidity.

JEL classification: G30, G34

Keywords: Stock Liquidity, Mergers and Acquisitions, Decimalization

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"The Covance board also discussed with Goldman Sachs [its financial advisor] the liquid market for LabCorp stock, which would allow Covance stockholders to either keep or trade the stock portion of the consideration."

From the Board of Directors of *Covance Inc.* on its proposed merger with *Laboratory Corp of America*

1. Introduction

The value of stock liquidity is well known and it has been shown to have a significant impact on many corporate decisions.[1] However, much less is known about the effect of stock liquidity – both of the acquirer and the target – on merger & acquisitions (henceforth "M&A"), even though M&A are among the most important decisions made by firms. This paucity of research is in sharp contrast to the reality connoted by various anecdotes, such as the quote above, that target firms' shareholders value the liquidity of acquirers' stock.[2] Moreover, market-level stock liquidity has experienced substantial changes following serial regulatory actions, such as the shift in the minimum tick size from \$1/8th to \$1/16th in 1997 and the introduction of decimalization in 2002. These regulatory changes heighten the necessity of understanding the role of stock liquidity in the market for corporate control. A germane paper is Maksimovic, Phillips, and Yang (2013) that shows that public firms participate more actively than private firms in merger waves and stock liquidity increases a firm's acquisitiveness: however, it remains unknown whether and how stock liquidity may affect deal terms and value creation from a deal.

In this paper, we propose and test an acquisition currency hypothesis about the effect of stock liquidity on M&A, which goes beyond the valuation and governance implications of stock liquidity documented in the literature. Our hypothesis is that higher liquidity of the acquirer's stock, and correspondingly lower liquidity of the target, can render an acquirer more attractive to target shareholders and increase the likelihood that the target will accept stock as the acquisition currency. Using a stylized model, we argue that greater liquidity of the merged firm would allow shorter-term investors of the target firm to trade their stock more quickly and with lower price impact. For most target shareholders, greater liquidity of the acquirer's stock mitigates the key difference between stock and cash payment in terms of liquidity provision while maintaining benefits that are unique to stock payment (such as deferred capital gains taxes).

[1] See, e.g., Fang, Noe, and Tice (2009), Jayaraman and Milbourn (2012), Bharath, Jayaraman, and Nagar (2013), Edmans, Fang, and Zur (2013), Fang, Tian, and Tice (2014), and Back, Collin-Dufresne, Fos, Li, and Ljungqvist (2017).

[2] There are many other similar cases, such as Northwest Bancshares Inc. acquiring LNB Bancorp Inc., FNB Corp. acquiring PVF Capital Corp., and Pacific Premier Bancorp Inc. acquiring San Diego Trust Bank. In all these deals, the acquirers' stock liquidity was considered to be an important factor in the M&A consideration by the targets. According to the disclosures on the deal negotiation process, comments such as "the lack of liquidity in acquirer B's stock" and "the liquidity of each party's stock" are often made in the boards' explanations on either accepting or rejecting a deal.

Our acquisition currency hypothesis delivers a number of testable predictions. First, since acquirers with more liquid stock (relative to target) are likely to make stock acquisitions on better terms, they are more likely to both make acquisitions and pay with stock, *ceteris paribus*. Second, more liquid acquirers are expected to pay lower premiums in stock acquisitions, but not in cash acquisitions. This is because target shareholders will be willing to pay a "liquidity premium" (i.e., accept a lower offer) for an acquirer's more liquid stock, while the liquidity of the acquirer's stock is irrelevant in cash acquisitions. Third, anticipating the benefits of using more liquid stock in stock acquisitions, firms will take deliberate steps to improve stock liquidity prior to stock acquisitions. Finally, the more liquid the acquirer's stock (relative to target), the more favorable the acquirer's deal announcement abnormal returns are expected to be for stock acquisitions. This is because acquirers' shareholders gain more (or lose less) from acquisitions paid with more liquid stock since they pay lower deal premiums.

Furthermore, our acquisition currency hypothesis predicts that the sensitivity of stock payment and deal premium to acquirer's liquidity in M&A could vary for targets with different shareholder characteristics. For instance, compared with long-term investors, short-term investors in the target will be more concerned with the acquirer's liquidity due to their relatively greater need to trade after the acquisition.

To test the predictions of our acquisition currency model, we use a sample of M&A by publicly-listed acquirers over 1985-2018. Using two different measures for stock liquidity, we find strong empirical support for our empirical predictions. Our first empirical result is that the likelihood of a firm making an acquisition and, in particular, a stock acquisition, is positively related to the firm's stock liquidity. This relationship is not only statistically significant, but also economically meaningful. The probability of making an acquisition increases by over 2.1 percentage points after a one standard deviation increase in a firm's liquidity, while the unconditional probability of acquisition for the sample firms is 7.5 percent. Also, the fraction of the acquisition payment that is made with stock increases with the acquirer's stock liquidity relative to the target's liquidity in deals involving public targets.

Second, for stock deals, the percentage premium paid by the acquirer to the target is negatively related to the acquirer's stock liquidity relative to the target's.[3] A one standard deviation increase in the acquirer-target liquidity difference is associated with a reduction of at least 4.46 percentage points in the premium paid, depending on the liquidity measure. This is economically significant, when compared with the average premium of 26.8 percent in acquisitions of public targets in our sample. Interestingly, a similar relation is not found in cash-paid deals, consistent with our claim that the acquirer's stock liquidity is irrelevant to target shareholders in these deals. Furthermore, as discussed,

[3] In robustness tests, we examine the impact of both the acquirer's and the target's liquidity separately. We find that the percentage premium is negatively related to the acquirer's liquidity and positively related to the target's liquidity. See more details in Section 4.3.1.

because investors with long investment horizons are less likely to trade soon after deal completion, we expect them to value relative stock liquidity less than shorter-term investors. Consistent with this notion, we find a weaker sensitivity of stock-payment and deal premium to relative-liquidity in deals where targets have more long-term investors in their investor base.

Both stock liquidity and acquisition decisions are endogenous. To identify the causal effect of stock liquidity, we follow the literature (e.g., Fang, Noe, and Tice, 2009; Edmans, Fang, and Zur, 2013; Fang, Tian, and Tice, 2014) and adopt the shift in the minimum tick size in 1997 and decimalization as two quasi-natural experiments that engendered an exogenous increase in stock liquidity. The tick-size shift in 1997 and decimalization have been shown to have narrowed the bid-ask spreads substantially and improved market quality (e.g., Bessembinder, 2003; Furfine 2003). Using various estimation methods based on the two experiments, we confirm the effect of stock liquidity on the likelihood of stock acquisitions and the acquisition premium for stock deals. These results indicate that the effect of stock liquidity is likely causal.

In further tests we find that, as predicted, firms tend to increase the frequency of earnings guidance and conduct stock splits prior to making stock acquisitions. By voluntarily disclosing more information than is mandated by regulations, these firms can reduce information asymmetry between insiders and investors, which improves liquidity prior to acquisitions (e.g., Diamond and Verrecchia, 1991; Beyer et al., 2010). Stock splits can lead to more trading, and thus more informative stock prices, because an increase in uninformed trading attracts more informed trading (e.g., Kyle, 1985). As the literature shows, and we also confirm, these actions indeed help to increase stock liquidity.[4]

Finally, for stock deals, acquirers' three-day [-1, 1] cumulative abnormal returns (CARs) around deal announcements are positively related to the acquirer's liquidity relative to the target's. For instance, a one standard deviation increase in the acquirer-target liquidity difference is associated with an increase in CARs by 0.47%-0.64%, depending on the liquidity measure. The average (median) three-day CARs for stock deals involving public targets in our sample is -3.65% (-2.79%). Therefore, the effect of the liquidity difference that we document is economically substantial. The value gains associated with more liquid acquirers are consistent with paying lower premiums for the targets. Again, consistent with our claim that the acquirer's stock liquidity is irrelevant to target shareholders in cash-paid deals, we do not find a similar relation in these deals.

There are, however, two (non-mutually exclusive) alternative channels – governance and valuation channels -- through which liquidity could affect acquisitions. While some of our predictions are consistent with those of the alternative channels, others are specific to the acquisition currency hypothesis. We rely on these unique predictions to test for the existence of a distinct acquisition

[4] See, for instance, Muscarella and Vetsuypens (1996), Coller and Yohn (1997), Lin, Singh, and Yu (2009), and Balakrishnan et al. (2014).

currency channel. We first consider the governance channel. Greater stock liquidity could reduce agency problems and enhance acquisition quality, either through stronger incentive contracts to managers due to reduced noise in stock prices, or through the creation of blockholders leading to better monitoring of managers.[5] At the same time, we are not aware of compelling theoretical arguments for why governance should be positively related to a firm's acquisitiveness. Note that the empire-building argument suggests instead a negative relation between governance and a firm's acquisitiveness. Further, the governance channel provides no clear prediction regarding the effect of target liquidity on stock payment nor a prediction that the acquisition premium would depend on the method of payment (cash or stock), as is predicted by the acquisition currency hypothesis.

The second alternative that we consider is the valuation channel. The prediction here is that liquidity could affect acquisitions because of the greater price informativeness that comes with greater stock liquidity. Hence, target shareholders may be less concerned about being paid with overvalued stock when the acquirer's stock is highly liquid. The more favorable valuation of firms with more liquid stocks (Fang, Noe, and Tice, 2009) could also increase firms' incentives to make acquisitions with stock swaps. Under the valuation channel, an illiquid target will be paid lower premium if acquirers are concerned about its less-informative stock price and greater valuation uncertainty. We note that while the valuation channel could induce firms to rely more on stock-for-stock acquisitions, there is no prediction that the relation between acquisition premium and target liquidity would be affected by the mode of payment, as is predicted by the acquisition currency hypothesis.

Lastly, while the effect of investor horizon is predicted and confirmed by the acquisition currency channel, it is not implied by either of the alternative hypotheses.

Our study contributes to several different strands of literature. First, we add to the literature on the effect of stock liquidity on firms' decisions, governance, and performance. Existing empirical studies have shown that the stock liquidity is positively associated with firm value (Fang, Noe, and Tice, 2009), and can affect executive compensation (Jayaraman and Milbourn, 2012), corporate governance (e.g., Bharath, Jayaraman, and Nagar, 2013; Edmans, Fang, and Zur, 2013; Back, Collin-Dufresne, Fos, Li, and Ljungqvist, 2017), and corporate innovations (Fang, Tian, and Tice, 2014). More generally, our findings support the notion that stock markets have real effects, as suggested by a burgeoning literature (see Bond, Edmans, and Goldstein (2012) for a summary).

We show that stock liquidity has real implications for firms' acquisition decisions and helps to lower deal premiums paid, which enhances the deal value for acquirers. Prior studies have focused primarily on the (il)liquidity of *targets* and examined its implication on deal characteristics and pricing.[6]

[5] Roosenboom, Schlingemann, and Vasconcelos (2014) find support for greater acquirer stock liquidity enhancing the acquisition process through the governance channel when targets are public firms and the acquisition is in stock.
[6] See, for example, Shleifer and Vishny (1992), Koeplin, Sarin, and Shapiro (2000), Schlingemann, Stulz, and Walkling (2002), Officer (2007), and Massa and Xu (2013).

For instance, Koeplin, Sarin, and Shapiro (2000) and Officer (2007) document a price discount for unlisted targets because sellers cannot trade their equity easily.[7] Massa and Xu (2013) find that acquiring a more liquid target is associated with an increase in the liquidity of the combined firm, and public acquirers prefer more liquid targets and are willing to pay more for them. They, however, do not consider the impact of acquirers' liquidity. This is in contrast to our focus on stock liquidity of *acquirers* jointly with the liquidity of targets. As discussed, Maksimovic, Phillips, and Yang (2013) is an exception, although their focus is the difference between public and private firms and how their buying/selling of plant assets is affected by macro and financial variables and merger waves. Among their key findings are that there are productivity gains from acquisitions/divestments of assets; there are fundamental productivity differences between public and private firms; public firms gain more from acquisitions and this may be a reason for these firms to chooses to be public. Although they do show (along with various macro and financial variables) that stock market liquidity (and valuation) is a predictor of asset acquisitions/sales, there is no analysis of whether liquidity actually influences the stock acquisitions and the acquisition price, which are key elements of our paper.[8] And, unlike our paper, they do not address the endogeneity of stock liquidity.[9]

Our study proposes a novel hypothesis about the benefits of liquid stock as acquisition currency and provides consistent evidence in support of it above and beyond the impact of stock liquidity on a firm's acquisitiveness. Our finding that acquirer's stock liquidity is positively related to acquirer's announcement returns in stock acquisitions of publicly-listed targets is consistent with Roosenboom, Schlingemann, and Vasconcelos (2014). However, they focus primarily on the relation between stock liquidity and acquirer returns in acquisitions of unlisted targets, scenarios where they argue that institutional monitoring through voice is more important than the threat of exit.

More importantly, unlike all of the above studies, we also examine how firms proactively manage stock liquidity prior to M&A in anticipation of the impact that stock liquidity has on M&A and the mode of payment. The literature has documented that firms may take actions to improve stock liquidity in general (e.g., Coller and Yohn, 1997; Lin, Singh, and Yu, 2009). Our results suggest that the timing of some liquidity improvements may be motivated by acquisition plans.[10] In addition, we are among the first to address the potential endogeneity of stock liquidity and delineate a causal impact of stock liquidity on M&As.

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[7] Fuller, Netter, and Stegemoller (2002) posit that the better market reactions to acquisitions of private targets versus acquisitions of public targets may be due to such a liquidity discount for private targets.

[8] Since these are not of primary concern for our analysis, we control for many of the time series and macro effects by using Industry×Year fixed effects in most of our regression models.

[9] There is also a literature that links the IPO decision to the need for acquisition currency (e.g., Brau and Fawcett, 2006; and Celikyurt, Sevilir, and Shivdasani, 2010).

[10] Literature on acquirer actions prior to stock acquisitions suggests that, in their attempt to push up their stock price, acquirers also tend to manage earnings up (Erickson and Wang, 1999; Louis, 2004), disclose good news or withhold bad news (Ge and Lennox, 2011), or manipulate financial media coverage (Ahern and Sosyura, 2014).

This study also enhances our understanding of the determinants of modes of payment in M&A. The literature has examined acquisition payment choice based on adverse selection, corporate control, and financial capacity.[11] As per this literature, factors that bidders consider include debt capacity when financing with cash, loss of corporate control from ownership dilution, the informational opaqueness of target assets, and whether they perceive their stock as being overvalued when financing with stock. For targets, uncertainty regarding acquirers' growth opportunities and valuations as well as deferred tax benefits with stock payment are among the main considerations when deciding whether to accept stock payment. The listing status of targets is often used as a proxy for the liquidity needs of target shareholders in the examination of their cash preference (e.g., Faccio and Masulis, 2005). But there is little known about how acquirers' stock liquidity may affect corporate M&A activity and acquisition payment choice.[12]

2. Hypothesis Development and Discussion of Alternative Channels

There are several channels through which stock liquidity could potentially affect M&A, the mode of payment, and the acquisition premium. We start with the development of our acquisition currency hypothesis as a particular liquidity channel. We then discuss the alternative channels and elaborate on tests that allow us to distinguish our hypothesis from the alternatives.

2.1. The Acquisition Currency Hypothesis

We offer a simple model to sharpen intuition and develop predictions. For brevity, the model is presented in Appendix B and we discuss the main intuition here. Our main hypothesis is that, in stock-for-stock acquisitions, target shareholders prefer stock that is more liquid. This preference derives from future trading costs that target shareholders expect to bear. On account of such a preference, target shareholders would be willing to accept a lower acquisition premium from acquirers with more liquid stock. *Ceteris paribus*, we expect the acquisition premium to be decreasing in the liquidity of acquirer stock, while increasing in the liquidity of target stock. As a consequence, acquirers with more liquid stock are more likely to engage in acquisitions and to pay in stock when they acquire. This leads to our first testable prediction:

Prediction 1: Firms with more liquid stock are more likely to make acquisitions and pay for these acquisitions with stock, ceteris paribus. Also, the more liquid is acquirers' stock relative to targets', the greater the fraction of payment in acquirer's stock.

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[11] There is a large literature on acquisition payment method (e.g., Hansen, 1987; Travlos, 1987; Stulz, 1988; Fishman, 1989; Amihud, Lev, and Travlos, 1990; Berkovitch and Narayanan, 1990; Eckbo, Giammarino, and Heinkel, 1990; Brown and Ryngaert, 1991; Martin, 1996; Ghosh and Ruland, 1998; Eckbo and Thorburn, 2000; and Fuller, Netter, and Stegemoller, 2002). See Faccio and Masulis (2005) for a literature review.

[12] The literature has linked stock liquidity to lower reliance on debt financing and to lower investment banking fees in seasoned equity offerings (e.g., Butler, Grullon, and Weston, 2005; Bharath, Pasquariello, and Wu, 2009; Lipson and Mortal, 2009). But less has dealt directly with how acquirers' stock liquidity affects the method of payment.

The above arguments imply that when the cost of paying with cash is greater, as with cash constrained firms, the marginal benefit of stock liquidity and the use of stock as an acquisition currency will be correspondingly greater. This leads to an extension of *Prediction 1*, that is, the likelihood of stock acquisitions should be more sensitive to acquirer liquidity for a financially constrained firm.

Our next prediction follows from the above argument that the acquisition premium is lower if the acquirer's (target's) stock is highly liquid (illiquid). We note that this prediction applies only to stock-for-stock acquisitions, but not cash deals, because acquirers' stock liquidity is not relevant for the pricing of an acquisition financed with cash. We can state the second testable prediction as:

Prediction 2: In stock-financed acquisitions, the higher the liquidity of acquirers' stock relative to that of targets', the lower will be the acquisition premium paid. This is not the case in cash-financed acquisitions.

Knowing that target shareholders will prefer more liquid stock in a stock-for-stock deal, which can in turn put acquirers' shareholders in a more favorable position in the exchange (e.g., paying lower premium), acquirers have an incentive to increase their stock liquidity in anticipation of a stock deal in the near future. They can, for instance, improve their transparency in the stock market by disclosing more information than what regulations mandate (e.g., providing more informative earnings guidance). They can also conduct stock splits to facilitate more trading by uninformed investors. Market makers can thus provide liquidity services at lower cost, which would result in higher propensity of trading and increased liquidity. It has been argued that with a higher level of trading, the stock price can become more informative if the greater presence of uninformed trading attracts more trading from informed investors (Kyle, 1985).

The extant literature provides evidence that enhanced information disclosure and stock splits help to increase stock liquidity. For instance, Coller and Yohn (1997) find that bid-ask spread reduces following management forecasts, while Lin, Singh, and Yu (2009) find declining incidence of no trading and lower liquidity risk following stock splits.[13] This leads to our third prediction:

Prediction 3: Acquirers are more likely to take actions, such as providing earnings guidance and conducting stock splits, to increase their stock liquidity prior to stock deals.

It follows from our earlier predictions that firms with more liquid stocks will be better positioned to make acquisitions and pay lower premiums than firms that are otherwise similar but have less liquid stocks. This leads to our fourth testable prediction:

Prediction 4: The more liquid the acquirer's stock is relative to that of the target's stock, the more the gains to acquirer shareholders in a stock deal, ceteris paribus.

[13] Several other papers find similar evidence. For instance, Balakrishnan, et al. (2014) show that firms respond to an exogenous loss of public information by providing more timely and informative earnings guidance, which results in an improvement in liquidity. Muscarella and Vetsuypens (1996) study splits of American Depositary Receipts (ADRs) that are not associated with splits in their home-country stock and argue that the positive announcement return of stock splits reflect the increase in liquidity.

Note that the above analysis hinges on the preference of target shareholders for more liquid stock, and thus the investment horizons of shareholders in targets are expected to matter. Due to their relatively long horizon in trading needs, long-term investors are likely to value acquirer's stock liquidity less. Hence, we expect that, *ceteris paribus*, the sensitivity to the acquirer's stock liquidity of stock payment, deal premium, and value gain to the acquirer will decrease with ownership by long-term investors in the target.

An issue that deserves discussion is the anticipated liquidity of the post-acquisition merged firm. This would be the liquidity that target firm shareholders would expect to face after the acquisition. In our model (Appendix B), we consider various factors that determine stock liquidity of the merged firm. The first is based on the nature of the underlying assets and informational frictions that could make valuation difficult for outside investors. For expositional ease, we take the liquidity of the merged firm to be the value weighted average of the liquidities of the target and acquirer firm. The potential decrease in liquidity after the acquisition of an illiquid target is taken to be costly to the acquirer, referred to as a dissynergy effect of liquidity. However, we assume that liquidity of the merged firm can also be affected by the firm engaging in costly activities such as enhanced disclosure and stock splits in order to improve stock liquidity. Hence, in equilibrium, the liquidity of the merged firm is the outcome of the both the underlying assets as well optimal actions by the firm to improve its liquidity. Our analysis implies that if the potential target is relatively large and illiquid, its impact on the liquidity of the post-acquisition firm may be sufficiently negative such that the acquirer either foregoes the acquisition or chooses to pay for it with cash.

As shown in Appendix B in greater detail, our results show that acquirers are much larger than targets in most cases. Among the few rare cases where targets are slightly larger, they are more liquid than acquirers and hence the dissynergy effect is not an issue. Instead, the dissynergy issue appears to be a more serious concern in cases where targets tend to be more illiquid than acquirers. But, these are also precisely cases where acquirers are much larger than targets. Thus, due to the targets' relatively small size, the dissynergy effect is small. As such, while the dissynergy effect is a legitimate concern in theory, it does not seem to be a significant issue empirically in terms of the observed stock acquisitions. Moreover, consistent with acquirers being likely to take actions to increase their post-acquisition liquidity, we find that acquirers' post-acquisition liquidity is almost always greater than their pre-acquisition liquidity. This makes the potential dissynergy effect even less of a concern.

2.2. Alternative Channels

Governance: A channel that has received theoretical and empirical attention in the extant literature is the potential effect of liquidity on the firm's governance and incentive contracting. It has been argued (e.g., Holmstrom and Tirole, 1993) that greater stock liquidity leads to stock prices that are more accurate in terms of reflecting firm value and managerial performance. As a result, managers could be offered stronger stock-based incentive contracts, thereby reducing agency problems and enhancing firm value. Greater stock liquidity could also ease the formation of blockholdings and strengthen monitoring (e.g., Maug, 1998; Edmans, et al., 2013). On the other hand, greater liquidity could have adverse effects on governance if lower costs of exiting stock positions reduce incentives of blockholders/institutions to monitor (e.g., Bhide, 1993). Roosenboom, Schlingemann, and Vasconcelos (2014) find evidence that the effect of acquirer liquidity in stock acquisitions is affected by whether the target is a public or private firm. For private targets, acquirer liquidity is associated with weaker acquirer stock market announcement reactions, though the opposite is the case for public targets. Their interpretation is that the monitoring role of voice and exit differs in these cases.

As discussed above, the acquisition currency channel has predictions that are distinct from those of the governance channel. For instance, the governance channel has no clear predictions in terms of the effect of acquirer's liquidity on its acquisitiveness or the effect of target's liquidity on stock payment, as predicted by our acquisition currency hypothesis. Furthermore, it could be argued that an illiquid target, if it was also poorly governed, would command a lower acquisition premium. However, under the governance channel, the relation between target liquidity and premium should not depend on whether the acquisition is paid in stock or in cash. This is different from the acquisition currency hypothesis which predicts that the target liquidity and deal premium relation should hold only in acquisitions that are paid in stock, not cash.

Valuation: A second channel for the effect of stock liquidity on M&A could operate through acquirer's valuation and reduction in asymmetric information. Hence, with greater acquirer liquidity, target shareholders may be less concerned about being paid with overvalued stock. Overvaluation is a concern since acquirer stock overvaluation can motivate stock acquisitions (e.g., Shleifer and Vishny, 2003).[14] Similarly, it is plausible that an illiquid target might receive a lower premium if acquirers are concerned about less informative stock prices and greater valuation uncertainty. However, empirical predictions differ between the valuation and acquisition currency channels in terms of the effect of target liquidity and mode of payment on the acquisition premium. According to the valuation channel, as with the governance channel, the lower valuation of an illiquid target should imply a lower premium regardless of whether the target is acquired with stock or with cash. On the other hand, the acquisition currency channel predicts that target liquidity should affect the acquisition premium only when the payment is in stock but not when it is in cash.

[14] There are several other studies that examine stock acquisitions with overvalued stock of the acquirer; these include Rhodes-Kropf, Robinson, and Viswanathan (2005), Ang and Cheng (2006), Dong et al. (2006), and Fu, Lin, and Officer (2013).

Lastly, as discussed above, the investment horizon of target shareholders matters under our acquisition currency hypothesis. The alternative governance and valuation hypotheses have no such predictions.

3. Data and Summary Statistics

3.1. Data and sample

We obtain our data on M&A from Thomson One Securities Data Company's (SDC) U.S. Mergers and Acquisitions database. We start with all M&A that were announced between January 1, 1985 and December 31, 2018. We then impose the following selection criteria in reaching the final sample of 10,627 deals: (1) the acquirer is publicly listed and has accounting and financial information in Compustat and CRSP, (2) the acquirer acquires more than 50% of the target, (3) the target is either a public or a private firm, (4) the deal value is at least $50 million, (5) information on deal payment method and status, acquirer characteristics (to be discussed below), and target characteristics (for public targets) is available,[15] and (6) the deal is completed by October 2019.[16] We exclude subsidiary targets because the payment of acquisitions of subsidiary targets is mostly in cash and, thus, acquirer's stock liquidity is less likely to play a significant role in the acquisition.

The tests of *Prediction 1* and *Prediction 3* require the inclusion of all firm-years, whether or not there is an acquisition. We thus start with all publicly-listed firms in Compustat/CRSP and require data on a firm's main characteristics in a year to be available in order for it to be included in the sample. These characteristics include two measures of stock liquidity, total assets, market-to-book ratio, leverage, asset tangibility, stock return, and return volatility. The final sample consists of 15,670 firms and 142,053 firm-years for the period of 1984-2018.[17]

3.2. Summary statistics

Given our large sample size, we choose stock liquidity measures based on daily, instead of intraday, data for computational ease. We use two measures widely used in the literature that are related to price impact and spread, respectively. The first is Amihud's (2002) illiquidity ratio. Goyenko, Holden, and Trzcinka (2009) find that this measure captures price impact most accurately among liquidity measures based on daily data. Following Amihud and Mendelson (1986), the second is the relative bid-ask spread which has been found to be negatively related to liquidity characteristics such as trading volume and price continuity. Major M&A deal characteristics, such as method of payment and deal premium, are constructed following the convention in the literature. We also use a set of control variables that have

[15] Our main findings are robust if we exclude financial institutions from the sample. The results are shown in Table O-8 of the online appendix.
[16] The date on which we last accessed the M&A data.
[17] We start our sample one year earlier than the M&A sample starting year because our tests involve the examination of the impact of a firm's lagged stock liquidity on its acquisition decision.

been shown in the literature to affect a firm's acquisition decisions, method of payment, and deal premium. Definitions of all variables are provided in Appendix A. To reduce the impact of outliers, we winsorize all continuous variables at the 1st and 99th percentiles.[18]

Table 1 reports summary statistics of key firm and deal characteristics for sample firms. Panel A presents summary statistics of Compustat/CRSP sample firms' characteristics. The average (median) Amihud's Illiquidity ratio is –6.83 (–5.79), while the average (median) bid-ask spread is 4.57 (4.23). The Amihud and the natural logarithm of bid-ask spread measures are multiplied by "-1" so that we can interpret them as measures of liquidity, rather than illiquidity. Acquisitions occur in about 7.5% of the firm-years, while slightly less than half of them are paid in stock. Panel B shows characteristics of acquirers in 3,032 deals where the target is publicly listed. Consistent with *Prediction 1*, the average acquirer has higher stock liquidity (as per both measures) than the average Compustat-CRSP firm (reported in Panel A), and their differences in both means and medians are statistically significant (results of statistical tests are not tabulated for brevity). Also, acquirers have higher prior-year industry-adjusted stock returns and market-to-book ratios, but lower stock return volatility than the average Compustat-CRSP firm.

Panel C reports characteristics of the public targets in the 3,032 deals. On average, public targets appear to have lower liquidity, but significantly higher market-to-book ratios, than acquirers. Panel D presents characteristics of the deals involving public targets. In an average deal, 57.5% of the payment is in stock and the acquirer pays a premium of 26.8% over the target's stock price as of two days prior to the deal announcement. The average (median) three-day announcement abnormal returns for acquirers are –2.0% (–1.4%). 15.3% of the deals are tender offers and there are competing bidders in 6.9% of the deals.

4. Main Empirical Results

In this section, we present the methodologies and results from our empirical tests. We test our predictions regarding the effect of liquidity on firms' acquisition decisions, deal premiums, and deal announcement returns as well as firms' actions to influence stock liquidity prior to acquisitions.

4.1. The Decision to Acquire and Pay for the Acquisition with Stock

To test *Prediction 1* about the effect of stock liquidity on the likelihood of firms making acquisitions and the likelihood of acquisitions being paid with stock, we start with an OLS estimation to assess the

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[18] For instance, the lowest (highest) cumulative abnormal announcement returns (CARs) for acquirers in the sample is -63% (59%). After winsorization, the lowest (highest) CAR is -21% (15%). However, we have also conducted our main tests without winsorizing all the continuous variables and find that our main findings are robust (untabulated for brevity but available upon request).

relation between a firm's stock liquidity and its acquisition decisions. However, stock liquidity is not exogenously given. Indeed, our hypothesis is that firms may take deliberate actions to endogenously increase stock liquidity prior to making stock acquisitions. Also, failure to control for any omitted factor that is related to both firms' liquidity and acquisition decisions can result in a biased estimate of the effect of liquidity. To address this empirical challenge, we follow the literature (e.g., Fang, Noe, and Tice, 2009; Edmans, Fang, and Zur, 2013; Fang, Tian, and Tice, 2014; Brogaard, Li, and Xia, 2017) and exploit two quasi-natural experiments that utilize policy changes in the minimum tick size for quotes and trades on the three major U.S. exchanges, which serve as an exogenous shock to firms' stock liquidity. We now present our analysis based on OLS regressions as well as four identification strategies derived from the two quasi-natural experiments.

4.1.1. OLS Regressions

We use the sample of all Compustat-CRSP firms and estimate the following linear probability model to analyze the effect of a firm's stock liquidity on its acquisition decision:

$$Y_{it} = \alpha_0 + \alpha_1\, Liquidity_{it-1} + \alpha_2\, Controls_{it-1} + \mu_t + \varepsilon_{it}\,. \qquad (1)$$

Y_{it} is an indicator variable that equals one if firm *i* makes an acquisition (or, alternatively, stock acquisition) in year *t*, and zero otherwise. $Liquidity_{i,t-1}$ is firm $i's$ stock liquidity as of year *t–1* and $Controls_{i,t-1}$ include a set of firm $i's$ characteristics as of year *t–1*, such as *Leverage*, *ΔLeverage*, *PPE/Asset*, *Market-to-Book*, *Ind_stock_return*, *Firm Size*, and *Volatility*. Definitions of these variables are provided in Appendix A. The first three variables capture a firm's ability to issue debt in financing a potential acquisition. *Market-to-Book* and *Ind_stock_return* are included to control for the firm's valuation and performance, respectively. We use a firm's stock volatility, *Volatility*, to capture its information environment that may affect the firm's acquisition decision. As per *Prediction 1*, we expect a significantly positive coefficient on $Liquidity_{i,t-1}$ for both of the dependent variables – the acquisition indicator and the stock acquisition indicator. In all the regressions here and throughout the paper, unless otherwise specified, we include the within industry-year fixed effects (industries defined using Fama-French 48-industry classification) to account for all time-series difference in firm acquisition decisions within industries.[19] Robust standard errors are clustered by firm to allow for within-firm error correlation since firms may, for instance, be involved in a series of acquisitions and these acquisitions may be correlated.

Panel A of Table 2 presents the results obtained from estimating Specification (1) in the full sample. In Columns (1) and (2), the dependent variable is a firm's decision to acquire. The estimated coefficients on both liquidity measures (the negative of Amihud's illiquidity ratio and bid-ask spread) have the predicted positive sign and are statistically significant at the 1% level. This suggests that, *ceteris*

[19] Therefore, the potential impact of merger waves that often occur within industries is accounted for.

paribus, firms are more likely to make acquisitions when their stock liquidity is higher. Our estimates suggest that the probability of acquisition increases by 3.2 percentage points and 2.1 percentage points after a one standard deviation decrease in Amihud's illiquidity ratio and bid-ask spread, respectively. Note that the unconditional probability of an acquisition by the sample firms is 7.5 percent. Thus, the impact of stock liquidity on the likelihood of making an acquisition is economically significant. We also find that the likelihood of acquisition is positively related to prior-year industry-adjusted stock returns, firm size, and market-to-book ratio and negatively related to change in leverage and asset tangibility, suggesting that larger firms with better stock performance, less tangible assets, or more growth opportunities as well as firms with a decline in leverage are more likely to make acquisitions.

In Columns (3) and (4), we repeat the analysis with another binary dependent variable that equals one for stock acquisitions and zero otherwise. Consistent with our prediction, a firm's likelihood of making a stock acquisition also increases with its stock liquidity. Specifically, the estimated coefficients on both stock liquidity measures are positive and statistically significant at the 1% level. Compared with its effect on the likelihood of acquisition, the economic impact of stock liquidity on the likelihood of a stock acquisition is even greater. The probability of stock acquisition increases by 2.11 percent points and 0.33 percent points for a one standard deviation decrease in Amihud's illiquidity ratio and bid-ask spread, respectively, while the unconditional probability of stock acquisition is only 3.1 percent. We also find that the likelihood of stock acquisition is significantly related to certain firm characteristics. A firm is more likely to make stock acquisitions when its prior-year industry-adjusted stock returns, stock volatility, and market-to-book ratio are higher, when its assets are less tangible, or when its leverage is lower.

We conduct two robustness checks with different estimation methods and report the results in Table O-1 of the Online Appendix. In Panel A, we estimate equation (1) with firm fixed effects in addition to year fixed effects and cluster standard errors by firm. Exploiting the within-firm variation in firms' acquisition decisions allows us to control for time-invariant firm-specific characteristics, which might not be captured by the industry-year fixed effects. All the findings continue to hold. In Panel B, we show that our results are robust when we estimate equation (1) with a logit model including industry-year dummies and robust standard errors clustered at firm level. We prefer the linear probability model because it: (1) allows for interaction terms without having to make adjustments, (2) helps us estimate the economic significance of our results more easily and intuitively, and (3) makes it easy to control for either industry-year or firm fixed effects.

As discussed in Section 2, the beneficial role of stock liquidity should be more pronounced in firms that are financially constrained and, thus, have less access to cash to pay for acquisitions. As such, we examine whether the effect of stock liquidity on the decision to make stock acquisitions is stronger in firms that are financially constrained. We use three measures of financial constraints based on Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock-Pierce Index (2010), respectively.[20] Our sample is divided into terciles every year based on the three respective measures and firms in the middle tercile are dropped. A dummy variable, *Constraint Dummy*, is then defined to be equal to one if a firm is in the most-constrained tercile and zero if it is in the least-constrained tercile in the given year. We augment the linear probability model based on equation (1) by interacting $Liquidity_{i,t-1}$ with $Constraint\ Dummy_{i,t-1}$. We predict a positive coefficient on the interaction term, indicating a stronger relation between stock liquidity and the likelihood of stock acquisition for financially-constrained firms. The results, reported in Panel B of Table 2, are consistent with this prediction. The estimated coefficients on the interaction term are positive and statistically significant for both liquidity measures, while the coefficients on the liquidity measures themselves remain strongly positive.[21] This finding provides further support for our prediction about the beneficial role of stock liquidity in acquisitions.

4.1.2. Difference-in-Differences Estimation: Decimalization in 2001

Our first identification strategy is to use a Difference-in-Differences (DID) approach to determine the effect that an exogenous change in stock liquidity around decimalization in 2001 has on a firm's acquisition decision. This approach compares the acquisition decisions of a sample of treatment firms that experienced the most significant increases in stock liquidity (top tercile) around decimalization in 2001 with the acquisition decisions of a closely matched sample of control firms that are otherwise similar but experienced the least significant increases in stock liquidity (bottom tercile).

The NYSE and Amex switched from fractional pricing to decimal pricing in January 2001 while NASDAQ did the same in April 2001. The change to decimalization has been shown to have substantially narrowed bid-ask spreads and improved market quality (e.g., Bessembinder, 2003; Furfine 2003). Such an exchange policy initiative changes stock liquidity exogenously because it directly targets liquidity, but it is unlikely to directly affect firms' acquisition decisions. Moreover, there is heterogeneity across firms in the stock liquidity changes surrounding decimalization as different stocks are affected differently. Both the exogeneity of the shock to stock liquidity and the cross-sectional variation in the magnitude of the shock are critical to our use of the DID approach.

[20] Hadlock-Pierce Index is calculated as -0.737 x Firm size + 0.043 x Firm age^2 - 0.040 x Firm age, where Firm size is the natural log of inflation-adjusted book assets, and Firm age is the number of years elapsed since the year the firm first appears on CRSP. Both Firm size and Firm age are capped at the 95th percentile.

[21] The only exception is when AMH is used as the liquidity measure and a firm's financial constraint is measured based on Whited and Wu (2006), the interaction term is positive but statistically insignificant.

The DID approach has some key advantages in identification. First, like the OLS estimation with firm fixed-effects above, it rules out the impact of any time-invariant firm-specific factors surrounding decimalization. Second, it purges away the impact of omitted factors that have a common, additive effect on both the treatment firms and the control firms. For example, a positive market-wide sentiment may lead to active trading (and thus liquidity) and at the same time build up managerial overconfidence which could cause a wave of M&A. Third, the exogeneity of the policy initiation helps to establish the causality that firms respond to the change in stock liquidity and make acquisition decisions accordingly. One caveat with this DID approach is that it does not address the possibility that an unobservable factor may affect treatment and control firms differently around decimalization. We thus present identification strategies other than the DID approach and explain these below.

For either measure of stock liquidity (negative AMH or Spread), we construct the samples of treatment and control firms using propensity score matching. We start with measuring the change in liquidity for all sample firms from the pre-decimalization year (year -1) to the post-decimalization year (year +1), where year 0 is the firm's fiscal year in which decimalization occurred. We then sort firms into terciles based on the respective change in liquidity ranking. We retain firms in the top (1708 firms for *AMH* and 1698 firms for *Spread*) and bottom terciles (1729 firms for *AMH* and 1729 firms for *Spread*), which experience the largest and smallest increase in liquidity following decimalization, respectively. We then find matches between firms in the top tercile and firms in the bottom tercile using propensity scores. Specifically, we estimate a probit model in which the dependent variable is set to one for firms in the top tercile and zero for firms in the bottom tercile. To ensure that the DID estimator is not driven by any differences in industry or firm characteristics, we include in the model all control variables from our baseline regression measured in the year immediately preceding decimalization. Robust standard errors are adjusted for heteroskedasticity.

Columns (1) and (2) in Panel A of Table 3 report the results of the (pre-match) probit regressions for both measures of liquidity. The results show that the specification captures a significant amount of variation in a firm's classification into the top/bottom tercile, as indicated by a pseudo-R^2 of 36.4% (33.2%) and a *p*-value of 0.00 (0.00) from the χ^2 test of overall model fitness in the case of *AMH* (*Spread*). We then use the propensity scores (predicted probabilities) from the two columns to match firms in the two groups. Each firm in the top tercile (treatment firm) is matched to the closest firm in the bottom tercile (control firm) that is within 0.01 propensity score (i.e., nearest-neighbor propensity score matching with 1 neighbor and caliper of 0.01, and with no replacement allowed). In the case of multiple matches (ties), we retain the pair for which the distance between the two firms' propensity scores is the smallest. This matching procedure produces 671 treatment-control pairs for *AMH* and 746 pairs for *Spread.* [22]

We next conduct three diagnostic tests to verify that the propensity score matching procedure creates two groups of firms with similar observable pre-decimalization characteristics (except for the different impact from decimalization on their stock liquidity). First, we re-run the (post-match) probit regressions for the matched sample. The results in Columns (3) and (4) of Panel A, Table 3 show that none of the coefficients on the independent variables is statistically significant. The χ^2 test of overall model fitness with a p-value of 1.00 suggests that we cannot reject the null hypothesis that all of the coefficient estimates are insignificantly different from zero. Moreover, the pseudo-R^2 drops drastically to less than 1%. Second, in Panel B of Table 3, we plot the distributions of the propensity scores for the original sample and the matched sample, respectively. It can be clearly seen that there is a very broad area of common support for the treatment and control firms after the matching (almost perfect overlap in the distributions). Third, we conduct a univariate comparison of stock liquidity and other firm characteristics between treatment and control firms in the pre-decimalization year. As shown in Panel C of Table 3, none of the differences is statistically significant. In particular, the pre-decimalization stock liquidity for the two groups of firms is almost identical, although they are affected differently by decimalization.

Lastly, Panel D of Table 3 presents the results of the DID estimation based on the following regression specification:

$$Y_{it} = \beta_0 + \beta_1\, Treated_i + \beta_2\, Decimal_i + \beta_3\, Treated * Decimal_i + \beta_4\, Controls_{it-1} + \delta_j + \varepsilon_{it}, \quad (2)$$

where *Treated* is an indicator of a firm being in the treatment group and *Decimal* is a dummy that equals one for the period 2002-onwards and zero for the year 2000 or earlier. We leave the year 2001 out because decimalization occurred in the middle of that year. We take three examination windows to run the regressions, namely [-3, +3], [-2, +2], and [-1, +1], where [-3, +3] refers to the six-year period from the pre-decimalization years 1998-2000 to the post-decimalization years 2002-2004 and the other two windows are defined accordingly. We find consistent results across different windows. For brevity, we report the results for the window [-3, +3] and leave the results for the other two windows in Table O-2 of the Online Appendix. $Controls_{it-1}$ refers to the set of independent variables included in the baseline regression. We include industry fixed effects, δ_j, in the regressions and cluster robust standard errors by firm.

[22] The numbers of matched pairs are similar to those in Fang, et al. (2014) and Brogaard, et al. (2017).

In Columns (1) and (2) of Panel D, Table 3, where we examine a firm's probability of making acquisitions in a year, the estimated coefficients β_3 are positive and significant for both liquidity measures, indicating that the likelihood of treatment firms making acquisitions increases more significantly than for control firms. Based on estimated β_3, the relative increase in the probability of acquisition by treatment firms amounts to a 4.2 percent points (3.0 percent points) in the case of AMH (Spread), which is substantial given that the unconditional probability of acquisition by a sample firm in a given year is 7.5 percent. The significant difference in the change in the probability of acquisition between treatment and control firms is consistent with the different impact of decimalization on their stock liquidity. As shown in the literature (e.g., Brogaard, Li, and Xia, 2017), we find that the relative increase in stock liquidity in treatment firms amounts to 39-63% of the pre-decimalization level, depending on the liquidity measure.

In Columns (3) and (4), where we examine a firm's probability of making stock acquisitions in a year, the results are even stronger. The estimated coefficients β_3 are not only significantly positive, but economically more substantial. The relative increase in the probability of stock acquisition by treatment firms is 1.9 percent points (1.9 percent points) for AMH (Spread), whereas the unconditional probability for a sample firm to make stock acquisition in a given year is 3.1 percent. Overall, the results suggest that compared with control firms, treatment firms are more likely to conduct acquisitions and pay for acquisitions in stock when their stock liquidity experiences an increase following decimalization.

To verify that the key parallel trend assumption of DID estimation is satisfied for the treatment and control groups, we modify the *Decimal* dummy in equation (2) with four time indicators for the examination window [-3, +3]: *Before (t-2 & t-3)* for 1998 or 1999, *Current* for 2001, *After (t+1)* for 2002, and *After (t+2 & t+3)* for 2003 or 2004. The original interaction term *Treated*Decimal* is replaced by each of their interactions with *Treated* accordingly. The year prior to decimalization, 2000, is thus the benchmark year. Note that in this test, the decimalization year 2001 (*Current*) is included to capture the change from the year prior to the decimalization year. The results of regressions with this modified specification are reported in Panel E of Table 3. The coefficient on *Before (t-2 & t-3)*Treated* captures how the change in the dependent variable – the likelihood of (stock) acquisition – from *t-2 & t-3* to *t-1* differs between treatment and control firms, and similarly, the coefficient on *Current*Treated* captures the relative change of it from *t-1* to *t*. Neither of them is statistically significant for each measure of stock liquidity, confirming the parallel trend of the likelihood of (stock) acquisition prior to decimalization for the two groups of firms. Instead, the coefficients on *After (t+1)*Treated* and *After (t+2 & t+3)*Treated* reflect how the relative change of the (stock) acquisition probability evolves from *t-1* to *t+1* and to *t+2 & t+3*, respectively. The results show that both coefficients are positive and statistically significant with only one exception where the likelihood of stock acquisition is the dependent variable and *Spread* is used as the liquidity measure. Thus, the relative increase in the probability of (stock) acquisition by treatment firms occurs in the year right after decimalization and continues in the next two years.

4.1.3. *Difference-in-Differences Estimation: Shift in Minimum Tick Size in 1997*

As our second identification strategy, we exploit another policy initiative that exogenously affects stock liquidity. The three major U.S. exchanges reduced the minimum tick size from \$1/8th to \$1/16th over the period of May 7, 1997 to June 24, 1997. Although its impact on stock liquidity is not as substantial as decimalization, such a shift in 1997 ("shift in 1997" hereinafter) improved stock liquidity (see Chordia, Roll, and Subrahmanyam (2008)). We thus repeat the analysis of decimalization above using the shift in 1997.

The results in Table 4 echo those in Table 3. In Columns (1) and (2) of Panel A, we show the results of the probit regressions that are used to form treatment-control pairs using the propensity score matching method. We end up with 1024 pairs for *AMH* and 998 pairs for *Spread*. Three diagnostic tests are then conducted, and the results reported in Columns (3) and (4) of Panel A as well as in Panels B and C confirm that the treatment and control firms are similar in pre-1997 stock liquidity and other characteristics except for the change in liquidity surrounding the tick-size shift in 1997. Panel D shows the results of the DID estimation based on equation (2) for the time window [-3, +3] with *Decimal* being replaced by *Shift in 1997*, a dummy that equals one for the period after 1998 (including 1998) and zero for the year 1996 or earlier.[23] Echoing the findings with decimalization in Panel D of Table 3, the likelihood of treatment firms making acquisitions, and especially acquisitions paid in stock, increases more significantly than that of control firms following the shift in 1997. In both cases, the estimated coefficients β_3 are positive and significant for the two liquidity measures. Panel E of Table 4, like Panel E of Table 3, confirms the parallel trend of the likelihood of (stock) acquisition prior to *Shift in 1997* for treatment and control firms, a key condition for the DID estimation.

4.1.4. *Change in Stock Liquidity Surrounding Decimalization in 2001 and Shift in Minimum Tick Size in 1997*

As noted earlier, one concern with the DID estimation is that it does not eliminate the possibility that the estimate can be biased by an unobserved factor affecting treatment and control firms differently around the exogenous shock to liquidity. Thus, following Fang, Noe, and Tice (2009) and Edmans, Fang, and Zur (2013), we also examine how the actual change in stock liquidity surrounding decimalization and shift in 1997 affects firms' acquisition decisions. Specifically, using the following

[23] The results for the other two windows ([-1, +1] and [-2, +2]), reported in Table O-3 of the Online Appendix, are qualitatively similar.

OLS regression model that is similar to equation (1), we estimate the relation between the change in firms' acquisition decisions and the change in stock liquidity surrounding the two policy initiatives:

$$\Delta Y_{i,t-1\ to\ t+1} = \gamma_0 + \gamma_1\ \Delta Liquidity_{i,t-1\ to\ t+1} + \gamma_2\ \Delta Controls_{i,t-1\ to\ t+1} + \varepsilon_{i,t-1\ to\ t+1}\ , \quad (3)$$

where t is the fiscal year during which decimalization or shift in 1997 occurred for firm i. The implicit assumption is that the change in stock liquidity was entirely due to the two policy initiatives, and even if part of the change was driven by other factors, these factors are not systematically related with firms' acquisition decisions.

The results reported in Table 5 (Panel A for decimalization and Panel B for the shift in 1997) show that the change in liquidity around both policy initiatives is positively associated with the change in the likelihood of a firm's acquisition decision and its decision to acquire with stock; and this relation is statistically significant for both measures of liquidity.

4.1.5. The Effect of Decimalization Stratified by Acquirers' Stock Price

Another way to address the concern that decimalization may be capturing other changes that affect treatment and control firms differently is to exploit, as in Edmans et al. (2013), the cross-sectional variation of the impact of decimalization on different stocks. Intuitively, decimalization should have a greater impact on liquidity of stocks whose trading is more affected by the change in tick size, namely, those with low prices.[24] The effect of decimalization on firms' acquisitions should thus vary accordingly. Therefore, we run regressions based on the following specification:

$$Y_{i,t} = \alpha_0 + \alpha_1 Low\ Price_{it-1} + \alpha_2\ Low\ Price_{it-1}\ X\ Decimal + \alpha_3 Decimal + \alpha_4 Controls + \epsilon_{i,t} \quad (4)$$

where $Y_{i,t}$ is the outcome variable regarding a firm's acquisition decision. $Low\ Price_{it-1}$ is a dummy variable which equals one if a firm's closing price at the end of fiscal year *t-1* falls below the median closing price in that year, and zero otherwise. The coefficient on the interaction variable, α_2, is of key interest, as it captures the expected greater impact of decimalization on the liquidity, and thus on acquisition decisions, of firms with low-priced stocks.

In determining the sample period for this test, we face a trade-off as follows. On the one hand, a long sample period around decimalization allows more observations to make a powerful comparison of firm acquisition decisions before and after decimalization. For instance, Edmans, et al. (2013) take the sample period from 1996 to 2007 in examining the impact of decimalization on low- and high-

[24] We note that one potential issue with this test is that stock prices are endogenous and can be manipulated. But since we rank all sample firms' stock prices and compare between firms with relatively low prices and firms with relatively high prices, the impact of an individual firm's stock price manipulation is small.

priced firms' governance. On the other hand, acquisitions made well after decimalization are more likely to have been affected by confounding factors. We therefore conduct the tests for both the full sample period (1985-2018) and the [-3, +3] window around decimalization.[25] We also include the same control variables as in the baseline regression of equation (1).

Columns (1) through (4) in Panel A of Table 6 report results of tests based on equation (4). We find robust and consistent evidence regarding the impact of liquidity on a firm's acquisition decision. For the full sample period, Columns (1) and (2) present results regarding a firm's likelihood of making acquisitions and of making acquisitions paid in stock, respectively. In both cases, the coefficient α_1 is negative but the coefficient α_2 is positive, and both are statistically significant. This suggests that while low-priced firms are less likely to make (stock) acquisitions before decimalization, the pattern is less evident after decimalization due to the improvement in stock liquidity, especially for acquisitions paid in stock. Correspondingly, Columns (3) and (4) present results for the [-3, +3] window. They are similar to the results for the full sample period, suggesting that our finding is robust to using different examination windows.

4.2. Fraction of Acquisition Payment in Stock

4.2.1. Baseline Analysis

To test the other implication of *Prediction 1* regarding the effect of liquidity on the extent to which stock is used to pay for an acquisition, we focus on the sample of acquisitions that involve public targets and estimate regressions based on the following Tobit model:

$$Stockpay_{it} = \beta_0 + \beta_1\, Relative\ Liquidity_{it-1} + \beta_2\, Controls_{it-1} + \mu_t + \varepsilon_{it}\ . \qquad (5)$$

$Stockpay_{it}$ is the fraction of equity used in the payment for an acquisition by firm *i* in year *t*; it takes a value between 0 and 1. $Relative\ Liqudity_{it-1}$ is the difference of stock liquidity between acquirer *i* and its target, both as of year *t*-1. $Controls_{it-1}$ includes most of the variables from equation (1) and several additional variables that are meant to capture deal characteristics such as *Ln(deal size)*, Acquirer's and Target's *Firm Size*, *Cash/Deal*, and *Tender Offer.* If the deal size is large, the target is large relative to the acquirer, or the acquirer has small cash holdings relative to the deal size, then the fraction of equity used for payment is likely to be larger. Cash financing is also more likely in tender offers (Martin, 1996).

A few more firm characteristics that capture the differences between acquirers and targets, which may also be correlated with their liquidity difference, are also included in $Controls_{it-1}$. Illiquid targets are often smaller, more opaque, and may have a less informative stock price than more liquid targets.

[25] For robustness, we also use the [-1, +1] and [-2, +2] windows and find the results are qualitatively similar.

The acquirer may thus be more likely to make a stock offer since this contingency pricing allows the target to share part of the valuation risk and incentivizes target managers to make the deal a success. On the other hand, more liquid acquirers with a better information environment may be less likely to be mispriced, making the target more likely to accept stock payment. As a result, the fraction of stock payment can be higher to reflect the difference in information environment and the uncertainty involved when the acquirer-target liquidity difference is greater. In addition to deal payment in stock, transaction prices and thus announcement returns can be affected. To preclude the confounding impact of these alternative explanations, we include both the acquirer's and the target's *Market-to-book*, size (*Firm size*), *profitability*, cash flows (*FCF*), and analyst following (*Analyst)*) as additional control variables in examining the impact of *Relative liquidity* on the fraction of deal payment in stock, deal premium, and abnormal returns around deal announcement.

Our hypothesis suggests that both the acquirer's as well as the target's liquidity will affect the form of acquisition payment. The coefficient β_1 in equation (5) captures the preference for any incremental liquidity that target shareholders expect to have as shareholders of the merged firm, relative to their status-quo liquidity. We expect β_1 to be significantly positive: that is, the more liquid the acquirer's stock is relative to the target's stock, the greater will be its use of stock to pay for the acquisition. We also estimate an alternative specification that includes acquirer's and target's liquidity as separate covariates in equation (5). In this alternative specification, we expect a positive coefficient on acquirer's liquidity and a negative coefficient on target's liquidity.

The results from this analysis, presented in Panel A of Table 7, show that stock liquidity has a significantly positive effect on the fraction of acquisition payment made in stock. The estimated coefficient on *Relative Liquidity* is positive and statistically significant. The more liquid the acquirer's stock is relative to the target's, the higher is the fraction of acquisition payment made in stock. For example, in Column (1), a one standard deviation increase in *Relative Liquidity* is associated with as much as an increase of 4.5 percentage points in the average fraction of payment that is made in stock. In robustness tests, we find that the results hold if we instead include both the acquirer's and the target's liquidity separately as explanatory variables. In particular, the coefficient on the acquirer's liquidity is significantly positive and the coefficient on the target's liquidity is significantly negative (results tabulated in Table O-4 of the Online Appendix).[26] Moreover, we find that the fraction of payment in stock is also highly related to both firm and deal characteristics. For example, acquirers

[26] The literature has established that most acquisitions made by private acquirers are paid with cash. For example, in their sample of M&As involving public targets during 1987-2007, Massa and Xu (2013) find that of all transactions involving a private (public) acquirer, 71% (35%) are paid for with cash, 2% (29%) with stock, and the rest with a mixture of both. Although we do not examine cases involving private acquirers due to the lack of data on their characteristics, this empirical regularity seems to be consistent with our finding that target shareholders tend to prefer cash over stock when acquirers' stock is "extremely illiquid" for private acquirers.

with higher return run-up, more volatile stock returns, lower asset tangibility, lower leverage, lower profitability, or higher market-to-book ratios pay more in stock. Also, more stock is paid in larger deals and when the target is large in size relative to the acquirer.

4.2.2. The Effect of Decimalization Stratified by Acquirers' Stock Price

We next deal with the endogeneity of stock liquidity by examining the effect of decimalization stratified by acquirers' stock price based on equation (4) as in Section 4.1.5. And we use the sample of acquisitions that involve public targets. Note that the other approaches like DID estimation and the actual change in liquidity around decimalization or shift in 1997 are not applicable here because that would require a sample of acquirers that acquire public targets both before and after decimalization (or shift in 1997), which results in too small a sample to yield any meaningful inferences.[27]

In this test, the dependent variable and other control variables included are the same as in Panel A of Table 7. The results, presented in Column (5) in Panel A of Table 6, show that while low-priced firms pay acquisitions with significantly less stock before decimalization, they pay with significantly more stock after decimalization due to the greater improvement in liquidity. The coefficient α_1 is negative but the coefficient α_2 is positive with a greater magnitude, and both are statistically significant.

4.2.3. The Effect of Target Shareholder Characteristics

In this section, we examine the effect of target shareholder characteristics – specifically, ownership by blockholders – on the relation between stock acquisitions and *Relative Liquidity*. In general, blockholders (typically with longer horizon) would not be expected to place as much value on an acquirer's stock liquidity in the near term as short-term investors.[28] In Panel B of Table 7, we interact *Relative Liquidity* with *Blockholder*. The full sample of public targets is ranked into terciles based on the number of blockholders (who own 5% or more stock ownership) in the firm in the quarter prior to deal announcement. *Blockholder* is thus defined as taking a value of one for firms that fall in the top tercile and zero for firms that fall in the bottom tercile.[29] According to the results, the coefficients on *Relative Liquidity* remain significantly positive with a greater economic magnitude than those in Panel A,

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[27] For instance, to test the fraction of stock payments conditional on M&A using Diff-in-Diff around decimalization, there were only 19 such acquirers in the treatment group that were successfully matched with an acquirer in the control group (using the propensity score matching procedure) in a window of [-3, +3] years. The count is even smaller for the premium and CAR tests later since we need to further split this subsample based on the payment method, stock or cash.

[28] In addition to blockholders, we also measure the investment horizon of target shareholders using their portfolio turnover over the past four quarters, following Yan and Zhang (2009). With the classification of institutional investors into short- and long-term investors based on this measure, we find similar results with those using blockholders. However, investors' portfolio turnover is likely to result from their discretionary trades, which are endogenously determined by firm performance. As a result, it is likely a noisy measure of investors' liquidity needs. We thus choose to not tabulate the results with this measure (but they are available upon request).

[29] Firms in the middle tercile are thus removed in this test.

suggesting that the effect of the acquirer's stock liquidity (relative to the target's) on stock payment is greater for targets with no blockholders (*Blockholder* = 0). The coefficients on the interaction term *Relative Liquidity × Blockholder* are negative and statistically significant at the 1% level. The results indicate that the impact of the acquirer's relative stock liquidity on stock payment for the acquisition becomes weaker when there are more blockholders in the target. As noted, blockholders tend to be longer-term investors, and because blockholders are not expected to exit the firm in the near term, they may attach less value to acquirer's stock liquidity. Moreover, due to their large holdings, the benefits of greater liquidity may be quite small as they will face significant costs in liquidating their positions post-acquisition when such a need rises. Overall, this would make a cash offer more likely.[30] Economically, each additional blockholder in the target reduces the sensitivity of stock-payment to *Relative Liquidity* by 1.1 to 1.7 percentage points (depending on the liquidity measure), when compared with the benchmark case of no blockholders in the target.

In sum, our finding is consistent with our prediction that the impact of the acquirer's relative liquidity on stock payment decreases in the presence of long-term shareholders in the target, who value liquidity less due to their relatively smaller need for trading in the short term. It also helps to distinguish this hypothesis from the alternative governance and valuation hypotheses that lack any clear predictions regarding the impact of target shareholder attributes.

4.3. Acquisition Premium

4.3.1. Baseline Analysis

We examine the effect of the acquirer-target difference in stock liquidity on deal premium to test *Prediction 2* using the same sample of acquisitions as in Section 4.2.1, which involves public targets. In particular, we estimate an OLS regression using equation (5) with the dependent variable being deal premium. Because the deal premium implication of *Prediction 2* applies to stock deals but not to cash deals, we estimate regressions separately for the two types of deals. In these regressions, we control for both acquirer's and target's characteristics as well as deal characteristics used in the tests of *Prediction 1*. We expect the coefficient β_1 to be significantly negative for stock deals, but we expect no such relation for cash deals. Alternatively, we include acquirer's and target's liquidity separately in the regressions and for stock deals (but not for cash deals), we expect a negative coefficient on acquirer's liquidity and a positive coefficient on target's liquidity.

[30] Also, when corporate control is a concern for an acquirer, the acquirer is less likely to accept blockholders into its investor base of the new firm and thus may avoid payment in stock. Consistent with this, Harford, Humphery-Jenner, and Powell (2012) find that when entrenched managers make offers to buy private targets or public targets with blockholders, they are less likely to use all-equity offers so as to avoid blockholders in the combined firm. Therefore, when targets are owned by blockholders, the acquirer's stock liquidity is, not surprisingly, less relevant for acquisition payment in stock.

Panel A of Table 8 presents results that are consistent with *Prediction 2*. In the subsample of stock acquisitions (Columns (1) and (3)), the estimated coefficient on *Relative Liquidity* is negative and statistically significant for both liquidity measures. In particular, the price premium is lower by 4.46 to 4.67 percentage points (depending on the liquidity measure) for a one standard deviation increase in *Relative Liquidity*. Note that the average premium is 26.8 percent, and thus the result is economically significant, amounting to approximately 17% of the mean premium. In robustness tests, we include both the acquirer's and the target's liquidity separately as explanatory variables. We find that the coefficient on the acquirer's liquidity is significantly negative and the coefficient on the target's liquidity is significantly positive (results tabulated in Table O-5 of the Online Appendix).

Our finding complements that of Officer (2007), who finds that premiums in cash acquisitions are smaller than in stock acquisitions, because cash provides immediate liquidity and stock does not. On the other hand, in the subsample of cash acquisitions (Columns (2) and (4)), the estimated coefficient on *Relative Liquidity* is not statistically significant; this is consistent with the notion that acquirer's stock liquidity is irrelevant for target shareholders in a cash deal.

4.3.2. The Effect of Decimalization Stratified by Acquirers' Stock Price

As in Section 4.2.2 above, we also study the effect of decimalization stratified by acquirers' stock price and estimate the model presented in equation (4), but with deal premium as the dependent variable. The results are reported separately for stock deals and cash deals in Panel B of Table 6. In Column (1) for stock deals, the coefficient α_2 is negative and statistically significant while the coefficient α_1 is insignificantly positive with a smaller absolute magnitude than α_2. Hence, while there is a decline in the premiums post-decimalization for all acquirers in stock deals (significant negative coefficient on *Decimal*), the decline in the premiums paid by low-priced acquirers is significantly larger. We do not find similar results for cash deals in Column (2), which is consistent with the finding in Panel A of Table 8. Neither of the two estimated coefficients of key interest in Column (2) is statistically significant. Overall, the results with decimalization as an exogenous shock to liquidity are consistent with those obtained in the OLS regressions, and thus the endogeneity of stock liquidity is unlikely to bias our findings.

4.3.3. The Effect of Target Shareholder Characteristics

We also investigate the interaction effect of target shareholders' investment horizon and *Relative Liquidity* on deal premium. Under our acquisition currency hypothesis, greater equity ownership by target shareholders with long investment horizons would mitigate the impact of *Relative Liquidity* on deal premium. The results, presented in Panel B of Table 8, are consistent with this prediction. Take the case of stock deals first. In Columns (1) and (3), the coefficients on *Relative Liquidity* remain significantly negative, as in Panel A. The coefficients on the interaction term *Relative Liquidity x Blockholder* are positive and statistically significant. The results indicate that the negative effect of the acquirer's relative stock liquidity on deal premium becomes weaker when there are more blockholders in the target. Economically, when compared with the benchmark case of no blockholders in the target, each additional blockholder reduces the sensitivity of deal premium to *Relative Liquidity* by 3.7 to 10.1 percentage points, depending on the liquidity measure.

Interestingly, in the case of cash deals, the results reported in the even-numbered columns show that neither *Relative Liquidity* nor the interaction term has any significant impact on deal premium. The estimated coefficients on both terms are statistically insignificant. This contrasting finding further lends support to our acquisition currency hypothesis in that liquidity matters only for stock deals.

4.4. Acquirers Enhance Their Stock Liquidity Before Acquisitions

To test *Prediction 3*, we investigate whether potential acquirers exhibit a greater propensity to undertake liquidity-enhancing steps prior to making stock acquisitions. Our test is based on the following model specification:

$$Liqenhance_{it} = \gamma_0 + \gamma_1\, Stockacq_{it+1} + \gamma_2\, Cashacq_{it+1} + \gamma_3\, Hybridacq_{it+1} + \gamma_4\, Controls_{it} + \mu_t + \varepsilon_{it} \quad (6)$$

$Liqenhance_{it}$ represents the liquidity-enhancing steps that acquirer *i* undertakes in year *t*. $Stockacq_{i,t+1}$, $Cashacq_{it+1}$, and $Hybridacq_{it+1}$ on the right-hand side are dummies that equal one if a stock, cash, or hybrid-payment acquisition is made by firm *i* in year *t*+1, and zero otherwise, respectively. The first liquidity-enhancing step that we consider is a stock split, which we define as a dummy variable that equals one if a stock split is conducted in year *t*, and zero otherwise. We estimate the coefficients of equation (6) using a logit model. The second action that we consider is the guidance on earnings provided by the firm; in this case, the coefficients are estimated using an OLS regression. We define the measure of earnings guidance as the difference in the frequency of earnings guidance provided by the management from year *t*-1 to *t*.[31] We test *Prediction 3* using the sample of all Compustat-CRSP firms. *Prediction 3* implies a significantly positive coefficient γ_1 on $Stockacq_{i,t+1}$, but not so for coefficient γ_2 on $Cashacq_{i,t+1}$ or γ_3 on $Hybridacq_{i,t+1}$.

The prior literature (discussed earlier) has shown that stock splits and other actions that can mitigate information asymmetry, such as providing earnings guidance, are associated with a subsequent improvement in a firm's stock liquidity. Before testing *Prediction 3*, we verify that the findings in the prior literature on the impact of stock-splits and earnings guidance on stock liquidity hold in our sample.

[31] Alternatively, we define the measure of earnings guidance as the natural logarithm of one plus the frequency of earnings guidance provided by the management in year t, and the results (unreported for brevity) also hold.

To that end, we regress the liquidity measures as of year *t* on a dummy variable indicating whether the firm splits its stock in year *t–1* and on the frequency of earnings guidance in year *t–1*, while controlling for various characteristics of the firm and its information environment.

We obtain data on earnings guidance from First Call. The sample period for the tests involving earnings guidance is from 1994 to 2018; this is governed by the availability of data coverage. The results, presented in Table O-6 of the Online Appendix, show that stock splits and the frequency of earnings guidance are both strongly associated with greater stock liquidity in the following year. The estimated coefficients on the two main variables of interest are positive and statistically significant for both measures of stock liquidity. As expected, firms with larger size, higher market-to-book ratios, more cash holding, lower leverage, better operating performance, lower stock return volatility, and more analysts' coverage have higher stock liquidity. Also, stocks of firms with more R&D investment and lower asset tangibility are more liquid.

Next, we test *Prediction 3* and present the baseline results from estimating equation (6) in Panel A of Table 9. Consistent with our prediction, the estimated coefficients on the main variable of interest, $Stockacq_{it+1}$, are positive and significant. Firms are more likely to split stocks or provide more earnings guidance in the year prior to stock acquisitions. In comparison, the coefficients on $Cashacq_{i,t+1}$ are even negative, although they are statistically insignificant. The coefficients on $Hybridacq_{i,t+1}$ are mixed, depending on the liquidity measure, and not statistically significant. The results reinforce our argument on the role of liquidity in stock acquisitions.[32]

One might be concerned that both stock splits/earnings guidance provisions and the decision to engage in stock acquisitions are endogenous, and thus the estimated coefficients on $Stockacq_{it+1}$ might be biased. To address this concern, we instrument $Stockacq_{it+1}$ with the total number of acquisitions that occurred in the same year and in the same Fama-French 48 industry. To the extent that acquisitions occur in waves (e.g., Harford, 2005) and it is reasonable to assume that acquisitions made in the industry are unlikely to be related to an individual firm's stock split/earnings guidance decisions except through its decision to make stock acquisitions, this instrument satisfies both the relevance and exclusion conditions for the IV estimation.

Panel B of Table 9 reports both first- and second-stage estimates from this IV regression. In the first stage, the decision of stock acquisitions is shown to be positively related to the number of acquisitions made in the industry and the correlation is statistically significant at the 1% level. We also

[32] We note that providing earnings guidance prior to stock acquisitions can be beyond and above the consideration of liquidity improvement, because it also helps to reduce information asymmetry, allowing the acquirer to pay lower premium. Thus, earnings guidance can play multiple (and non-mutually exclusive) roles. Of course, stock splits do not have this additional function.

find that the number of acquisitions made in the industry is a strong instrument, as seen from the large F-value for the first-stage regression.[33] The second-stage results confirm those in Panel A, that the coefficients on the instrumented $Stockacq_{it+1}$ remain positive (with larger magnitudes than those in OLS) and statistically significant. In sum, the evidence provides support to *Prediction 3* that firms tend to take steps to improve stock liquidity prior to making stock acquisitions.

4.5. Acquisition Announcement Returns

4.5.1. Baseline Analysis

Lastly, we test *Prediction 4* using an OLS regression model based on equation (1), except that the dependent variable is the three-day [-1, 1] cumulative abnormal return (CAR) around deal announcement and the explanatory variable of interest is $Relative\ Liquidity_{it-1}$. Since the test requires target firm's liquidity and we need to control for the effect of both acquirer and target characteristics, our sample consists of stock acquisitions only involving public targets. We estimate the three-day CARs using the CRSP equally-weighted index and the market model, where the parameters for the market model are estimated over the (–120, –30) day interval. We control for both acquirer's and target's characteristics (described earlier) as well as other relevant deal characteristics. In particular, we add two additional controls of deal characteristics: *Competing_Bid* and *Related Deal.* Acquirers may pay higher premiums in competing bids as well as in diversification deals that are not related to the acquirer's primary industry. We expect the estimated coefficient on the main variable of interest, $Relative\ Liquidity_{it-1}$, to be significantly positive.

According to the results in Columns (1) and (2) in Panel A of Table 10, we find that for both liquidity measures, the acquirer's announcement CARs are positively and statistically significantly related to *Relative Liquidity* in a stock deal. The more liquid the acquirers' stock is relative to the targets', the higher (or less negative) are the acquirers' announcement CARs. For a one standard deviation increase in *Relative Liquidity*, the CARs increase by 0.47%-0.64%, depending on the measure of liquidity. This improvement in acquirer's announcement returns is economically significant, given that the average (median) CAR for stock deals in our sample of public targets is –3.65% (–2.79%). Consistent with prior literature, acquirers' CARs are negatively related to their price run-up, but positively related to the target's market-to-book ratio. Wang and Xie (2009) find that both acquirer and target announcement returns increase with the shareholder-rights difference between the acquirer and the target, because higher synergy can be achieved when better-governed acquirers take over poorly-

[33] Note that an F-value over 10 is typically considered as a sign of a strong instrument.

governed targets and the synergy is shared by both parties. Following their study, we control for the difference in acquirers' and targets' anti-takeover measures, and confirm that our finding is robust.[34]

Columns (3) and (4) of Panel A report the results for cash deals. For either liquidity measure, the estimated coefficient on *Relative Liquidity* is insignificant, both economically and statistically.[35] The finding that stock liquidity is not relevant for acquirers' returns in cash deals is further evidence consistent with our acquisition currency hypothesis. In robustness tests, we include acquirer's and target's liquidity separately in the regressions. The results, tabulated in Panel A of Table O-7 of the Online Appendix, show that the acquirer's announcement returns are positively (negatively) and significantly related to the acquirer's (target's) liquidity in stock deals, but not in cash deals.

In Panel B of Table O-7 of the Online Appendix, we also present the results for acquirers' announcement returns with the control for deal premium. Our acquisition currency hypothesis suggests that the announcement returns are greater for acquirers when the relative acquirer-target liquidity is higher as the acquirers pay lower premium. And thus the effect of relative liquidity shall be attenuated once deal premium is controlled for. We find it is indeed the case; the coefficients on *Relative Liquidity* are smaller and less significant for both liquidity measures.[36]

We also examine the combined announcement CARs of both the acquirer and the target.[37] The results are reported in Panel B of Table 10. For stock deals, the estimated coefficients on *Relative Liquidity* are positive and statistically significant. This suggests that the total value creation from the deal is positively related to the liquidity difference. For cash deals, however, the estimated coefficient on *Relative Liquidity* is insignificant for either liquidity measure. The irrelevance of stock liquidity in cash deals further reinforces our acquisition currency hypothesis. As is the case for acquirers' returns, Panel C of Table O-7 of the Online Appendix shows that the coefficients on *Relative Liquidity* are attenuated with the control for deal premium.

4.5.2. The Effect of Target Shareholder Characteristics

We also investigate the interaction effect of target shareholders' investment horizon and *Relative Liquidity* on acquirer's announcement CARs in stock deals. The results are reported in Panel C of Table 10 for stock deals. In all columns, the coefficients on *Relative Liquidity* remain significantly positive as

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[34] The results are available upon request. Because the data on anti-takeover measures are not available for all of our sample firms, we do not include this variable in our main test.

[35] In results that are not tabulated for brevity (available upon request), we also find insignificant coefficient on *Relative Liquidity* for deals with hybrid payment.

[36] The coefficient on *Relative Liquidity* (*Spread*) is 0.00527 in Panel A of Table 10 and 0.00454 in Panel B of Table O-7. It is shown as 0.005 in both tables due to rounding.

[37] For completeness, we have examined the announcement CARs for the target alone too, and the results are tabulated in Panel D of Table O-7 of the Online Appendix. We find that CARs for the target increase with the acquirer-target relative liquidity for stock deals, but not cash deals.

in Panel A for stock deals. The coefficients on the interaction term *Relative Liquidity × Blockholder* are negative and statistically significant. The results indicate that the positive effect of the acquirer's relative stock liquidity on deal announcement returns becomes weaker when there are more blockholders in the target, consistent with liquidity being less value relevant for them.

5. Conclusion

We claim that liquidity can enhance the role of acquirer stock as an acquisition currency. Firms with more liquid stocks are more likely to make acquisitions and pay for them with equity, especially when the target's stock liquidity is relatively low. Acquirers with more liquid stock pay lower price premiums and experience less negative deal announcement abnormal returns in stock deals. To exploit the benefits of more liquid stock in M&A, firms tend to take actions to enhance their information environment and improve stock liquidity prior to stock acquisitions.

Our study sheds light on some stylized facts in corporate decisions. For instance, we provide a new perspective in understanding why M&A may come in waves and stock payment is more popular in good times (because stock liquidity tends to be pro-cyclical). Our findings are also consistent with results documented in prior studies that higher acquisition activity typically follows IPOs.[38] Public stock, relative to private stock, is a better acquisition currency due to the greatly improved post-IPO stock liquidity. Thus, our study has important implications for the debate on whether stock liquidity should be restricted or improved because, for instance, it lowers the costs to institutions of exiting a stock.[39] It also provides another venue linking capital market conditions and corporate decisions, consistent with the real effects of the stock market.

[38] See, e.g., Brau and Fawcett (2006), Hovakimian and Hutton (2010), and Celikyurt, Sevilir, and Shivdasani (2010).
[39] See, e.g., Bhide (1993).

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Appendix A: Variable Definitions

A.1. Key variables

A.1.1. Stock liquidity

We use two measures of liquidity in our analysis that are common in the literature. The first is Amihud's (2002) Illiquidity ratio. It is defined as the natural logarithm of $AvgILLIQ \times 10^9$ where *AvgILLIQ* is the yearly average of illiquidity, which is measured as the absolute return divided by dollar trading volume:

$$AvgILLIQ_{i,t} = \frac{1}{Days_{i,t}} \sum_{d=1}^{Days_{i,t}} \frac{|R_{i,t,d}|}{DolVol_{i,t,d}}.$$

Here $Days_{i,t}$ is the number of valid observation days for stock *i* in fiscal year *t*, and $R_{i,t,d}$ and $DolVol_{i,t,d}$ are the daily return and daily dollar trading volume, respectively, for stock *i* on day *d* of fiscal year *t*. This measure reflects the average stock price sensitivity to one dollar trading volume. Higher *AvgILLIQ* is interpreted as lower stock liquidity. In our analysis, we multiply Amihud's Illiquidity ratio by "–1" so that it measures a stock's liquidity instead of illiquidity.

The second measure is the natural logarithm of the yearly average of daily bid-ask spread:

$$Bid - Ask\ Spread_{i,t} = \frac{1}{Days_{i,t}} \sum_{d=1}^{Days_{i,t}} \frac{Ask_{i,t,d} - Bid_{i,t,d}}{\frac{(Ask_{i,t,d} + Bid_{i,t,d})}{2}}$$

where $Days_{i,t}$ is the number of valid observation days for stock *i* in fiscal year *t*, and $Ask_{i,t,d}$ and $Bid_{i,t,d}$ are the closing ask and bid prices of stock *i* on day *d* of fiscal year *t*. Higher Bid-Ask Spread is interpreted as lower stock liquidity. Like the Amihud's Illiquidity ratio, we multiply the Bid-Ask $Spread_{i,t}$ by "–1" so that it also measures a stock's liquidity instead of illiquidity.

A.1.2. Major deal characteristics

- *Stock acquisition (Stockacq)*: In the literature, definitions of stock deals vary across studies. For example, some define deals paid 100% in stock as well as deals paid with a combination of stock and cash as "stock" deals (e.g., Chang, 1998; Officer, Poulsen, Stegemoller, 2009). In other studies, "stock" deals are defined as those containing only stock, and "cash" deals are defined similarly (e.g., Moeller, Schlingemann, and Stulz, 2007). We take two approaches in the examination of payment method. First, we take the proportion of stock paid in each deal. Second, we define a deal as "stock" deal if the proportion of stock in the total payment is no less than 60% (i.e., a large majority of the payment is in the form of stock) and a deal as "cash" deal if the proportion of cash in the total payment is also no less than 60%. A "hybrid" deal is thus referred to as a deal where both the proportion of stock and cash are between 40% and 60%. In robustness checks, we also define "stock" ("cash") deals as those containing stock (cash) payment only and find that our results are qualitatively similar.
- *Deal Premium*: It is the market value of the acquisition premium offered to the target, and is measured by the effective offer price as a percentage premium over the target firm's market share price as of two days prior to the takeover announcement.

A.2. All other variables

- *Acquisition* is a dummy variable that takes a value of one if a firm makes an acquisition in the fiscal year, and zero otherwise.
- *Analyst* is the maximum number of analysts following the stock for the year. It is coded as 0 if there is no analyst coverage in *I/B/E/S*.

- *Blockholder* is the number of blockholders with 5% or more stock ownership in the target firm in the quarter prior to deal announcement.
- *CAR* is the three-day [-1,+1] cumulative abnormal return around deal announcement, computed using the CRSP equally-weighted index and the market model, where the parameters for the market model are estimated over the [-120,-30] day interval.
- *Cashacq* is a dummy variable that takes a value of one if the firm makes a cash acquisition in the fiscal year, and zero otherwise.
- *Cash/Deal* is the amount of acquirer cash plus marketable securities normalized by the value of the merger or acquisition.
- *Competing_Bid* is a binary variable that takes one if there was a competing bid, and zero otherwise.
- *Decimal* is a dummy variable equal to one for 2002 and later, and zero for 2000 or earlier.
- *Earnings Guidance* is the difference between the number of earnings guidance provided by the firm in year *t* and *t-1*.
- *FCF* is free cash flow scaled by total assets.
- *Firm Age* is defined as one plus the number of years elapsed since the year the firm first appears on CRSP.
- *Firm Size* is the natural log of book value of total assets.
- *Hadlock-Pierce Index* is the index of firms' external finance constraints proposed by Hadlock and Pierce (2010). It is calculated as –0.737 x Firm Size + 0.043 x Firm Age^2 – 0.040 x Firm Age, where *Firm Size* and *Firm Age* are the same as defined above. Both Firm size and Firm age are capped at 95th percentile.
- *Hybridacq* is a dummy variable that takes a value of one if the firm makes a hybrid-payment acquisition in the fiscal year, and zero otherwise.
- *Ind_stock_return* is the annual stock return in the prior year, adjusted for the mean contemporaneous industry stock return.
- *Kaplan-Zingales Index* is calculated as follows:
$$KZ_{i,t} = -1.002\frac{CF_{i,t}}{AT_{i,t-1}} - 39.398\frac{Div_{i,t}}{AT_{i,t-1}} - 1.315\frac{C_{i,t}}{AT_{i,t-1}} + 3.319Leverage_{i,t} + 0.283Q_{i,t}$$
where cash flow (CF) is the sum of income before extraordinary items and depreciation and amortization; dividends (DIV) are measured as common and preferred dividends; C is the amount of cash and short term investments; AT refers to the firm's total book assets; Leverage is the ratio of total debt to assets; and Q is the ratio of the market value of the firm to its total book assets.
- *Leverage* is the total debt to assets ratio.
- *Ln(1+credit rating)* is the natural logarithm of one plus the *credit rating* of the firm, where *credit rating* equals 1 if the firm has AAA long term credit rating, 2 if the rating is AA+, 3 if the rating is AA, and so on.
- *Ln(deal size)* is the natural logarithm of the value of transaction.
- *Low_Price* is a dummy variable that equals one if a firm's closing price at the end of fiscal year *t-1* falls below the median closing price in that year, and zero otherwise
- *Market-to-Book* is the ratio of market value to book value of total assets.
- *Number of acquisitions* is the total number of M&As in the given year and in the same industry (defined using Fama-French 48 industry) as the firm.
- *Profitability* is income before extraordinary items scaled by total assets.
- *Related Deal* is a binary variable that takes one if both firms (acquirer and target) are from the same two-digit SIC code, and zero otherwise.
- *Relative Liquidity* is the difference between the acquirer's and the target's stock liquidity.

- *Runup* is the firm's market-adjusted cumulative return for the 90 trading days [-120, -30] prior to the acquisition announcement date.
- *Shift* is a dummy variable equal to one for 1998 and later, and zero for 1996 and earlier.
- *Short Horizon* is the ratio of shareholding by short-term investors to shareholding by long-term investors in the quarter prior to the announcement date.
- *Stockacq* is a dummy variable that takes a value of one if the firm makes a stock acquisition in the fiscal year, and zero otherwise.
- *Stockpay* is the fraction of equity in the payment for an acquisition by a firm; it takes a value between 0 and 1.
- *Stock Split* is a binary variable that indicates whether or not there was a stock split.
- *Tangibility* is the net total value of property, plant and equipment, divided by total assets.
- *Tender Offer* is a binary variable that takes a value of one if the acquirer involves a tender offer as reported in SDC, and zero otherwise.
- *Volatility* is the volatility in the firm's stock return over the 12 months preceding the acquisition.
- *Δ Leverage* is the change in leverage from $t–2$ to $t–1$.
- *Whited-Wu Index* is the index of firms' external finance constraints proposed by Whited and Wu (2006).

Appendix B: A Simple Model of Liquid Stock as an Acquisition Currency

We sketch a simple model to illustrate the potential effect of stock liquidity – of publicly-traded acquirers and targets – on the market for corporate control and use of acquirer stock as the acquisition currency. We begin by describing the timing of events in our single-period model. There are three salient dates $\mathrm{t} = 0{,}1$ & $2.$ On date $\mathrm{t} = 0$, firm A decides on whether to acquire a target firm T. Both the target and acquirer firms are publicly traded. If there is an acquisition, its terms are negotiated, and the acquisition is completed on date 0. As we explain below, the premium paid for an acquisition can depend on a number of factors such as the synergy value created by the merger, bargaining power of A and T, as well as the preferences of target investors with regard to stock liquidity. We consider trade-offs that the acquirer faces in affecting the liquidity of the combined firm that is likely to emerge after the acquisition is completed. The anticipated liquidity of the subsequent combined firm will affect the terms on which the merger takes place. In the model, the post-acquisition liquidity is affected by the nature of the assets/asymmetric information in $A, T,$ but it could also be strongly affected by disclosure policies of the acquirer as well as discretionary actions such as stock splits.

Date 1 is an intermediate date on which the stock market is open, and trading occurs. It is on date 1 that the liquidity properties of the target and acquirer stock can have a material effect on the payoffs to investors. Date 2 represents the terminal date on which any uncertainty regarding firm values is resolved. For simplicity, all market participants are taken to be risk-neutral and there is no discounting of value between dates. Absent an acquisition, target stock price (or payoff) is expected to be V_T per share on the terminal date $t = 2,$ while the value of the acquirer per share is expected to be V_A. We assume that there are synergistic benefits that result in an expected value enhancement of V_0 (net of acquisition and related costs). This information is public knowledge after the acquirer appears. The quantity of shares outstanding for each firm is normalized to 1.

We now describe the liquidity preferences of target firm shareholders. We take the target firm T to have two types of shareholders: the first type is not subject to liquidity shocks, while the second type is subject to liquidity shocks causing investors to liquidate holdings at $t = 1$. Specifically, the first type are atomistic investors. They are not subject to liquidity shocks and expect to hold the stock till the terminal date. We establish a pre-acquisition stock price, by assuming that on date 0, prior to the arrival of the acquirer, there is trading among atomistic investors. At this stage, the likelihood of an acquisition is considered to be very low (essentially zero) by these investors and the stock price is V_T reflecting the stand-alone value of the target firm. The assumption that the acquisition is unlikely is made for expositional simplicity and, as we discuss later (in Extension 1), has no qualitative implications for our analysis.

The second investor type is exposed to liquidity shocks. These are large investors, say institutional investors, who in aggregate own a significant fraction α of target stock. These institutional investors face the risk of liquidity shocks on date 1. An example of such institutional investors are mutual funds that, for instance, face the risk of large redemptions that can induce a sale of assets, often at depressed prices.[1] The liquidity shocks faced by individual institutional investors are assumed to be correlated and there is a probability π that the institutional investors are forced to liquidate, in aggregate, their holdings of α shares of target stock at date 1. These aggregate orders are submitted to and absorbed by a market maker.

[1] See, for instance, Coval and Stafford (2007) on mutual fund fire sales.

We assume that when there are large redemptions, the stock price is depressed on account of the inventory holding costs that the market maker has to bear as well, as the price discounts that may be necessary to attract sufficient new investors to clear the market.[2] The extent to which stock prices are depressed and the speed with which the prices recover depends on the stock's liquidity that encapsulates investor demand for the stock.

The larger investors, who are subject to liquidity shocks, face a liquidity cost of λ_T per share in target stock with probability π (in the absence of a merger). On date 1, in the event of a liquidity shock, the large investors sell their holdings and receive a price of $(V_T - \lambda_T)$. As is common in the literature, we refer to λ_T as a liquidity parameter, though it actually represents (il)liquidity. Hence, at date 0, the large investors' valuation of the stock is $(V_T - \pi\lambda_T)$.

To provide a rationale for these investors' holding of target stock, we assume that large investors might be receiving offsetting benefits from their position in the stock. For instance, their holdings may be part of a broader portfolio diversification or investment strategy. In reduced form, we represent these potential benefits to a large investor by ψ. Hence, from the perspective of these investors on date 0, their shares are worth $(V_T + \psi - \pi\ \lambda_T)$ in the absence of an acquisition, taking account of both the liquidity costs and the offsetting benefits. The assumption here is that the net-benefit $\psi - \pi\,\lambda_T = \kappa_T \geq 0$, otherwise the shares would tend not to be retained by large investors. For κ_T to be non-negative, the benefits ψ must be large enough to offset the expected liquidity costs $\pi\,\lambda_T$. This suggests that for shares that are held by large investors, the relationship between λ_T and κ_T is not direct and is moderated by ψ.

The acquirer stock, in the absence of an acquisition, has a liquidity parameter of λ_A where we assume that $\lambda_T > \lambda_A$, i.e., target stock is less liquid than acquirer stock, which is the empirically relevant case of interest. To determine the post-acquisition liquidity of the combined firm, we assume that if the acquirer does not expend any resources, the liquidity parameter will be λ_{AT}. However, if the post-acquisition firm was to expend resources c (cost of additional disclosures, stock splits etc.) in equilibrium, the resulting liquidity of the firm would be λ^* such that:

$$\lambda^* = \lambda_{AT} - f(c).$$

The term $f(c)$ represents the improvement in liquidity from expending resources c and where $f(0) = 0; f' > 0\ \&\ f'' < 0$. We assume that in equilibrium market participants correctly anticipate that the firm will choose the disclosure policies through its choice of transparency, stock splits, managerial guidance to analysts at a cost of c, and the liquidity parameter of the merged firm λ^*, to maximize firm value. For now, we take the optimal equilibrium λ^* as given and solve for the acquisition premium. The equilibrium λ^* is then characterized. λ_{AT} (the liquidity parameter of the combined firm with $c = 0$) is taken to be exogenously determined by the underlying assets of A and T. One reasonable assumption, which we make, is that λ_{AT} can be expressed as the value weighted average of the pre-acquisition liquidities of the acquirer and target[3]: λ_A and λ_T i.e., $\lambda_{AT} = \omega\lambda_A + (1 - \omega)\lambda_T$, where $\omega = \frac{V_A}{V_A + V_T}$. Under this assumption: $\lambda_T > \lambda_{AT} \geq \lambda^* > \lambda_A$. Hence, there will be a liquidity loss from the merger for the acquirer if the target firm is less liquid. With the additional cost of c, the acquirer can take actions to moderate the loss of liquidity. The cost c is determined optimally by the

[2] See Duffie (2010) on the role of slow-moving capital.

[3] Under restrictive assumptions about information asymmetry it is possible to obtain a weighted average liquidity in a Milgrom-Glosten setting. Such a model is available from the authors.

acquirer after the acquisition. As we will see, c and the anticipated decrease in liquidity will reduce the synergy value of the merger and can affect the acquirer's acquisition decision.

We next consider the negotiation over the acquisition premium and the decision to merge. To determine the acquisition premium, the acquirer and the target boards of directors are taken to bargain over the acquisition price in an effort to maximize the total wealth of their respective shareholders, including the anticipated trading costs of the target's shareholders. The benefits received by shareholders are weighted by their respective share ownership of the firms.

If the acquisition currency is stock, we assume that the likelihood that the target's large shareholders will face a liquidity shock and sell the shares of the merged firm is unaffected by the merger. The surplus that is potentially created by the merger then consists of two pieces. One is the synergistic value V_0' (unadjusted for costs associated with the acquisition) that we assume inherits the liquidity properties of the merged firm. Note that V_0 represents the synergy value adjusted for various costs, including the loss from lower liquidity. The second is the anticipated reduction in liquidity costs when the target's large shareholders obtain the stock in the merged firm in exchange for their holdings in the target. To obtain the surplus created by the merger, we note that in the absence of a merger, the large shareholder faces a probability π of being subject to liquidity shocks and a resulting trading cost of λ_T. While a merger does not affect the likelihood of a liquidity shock, the anticipated trading cost is reduced since the liquidity parameter is expected to decrease to λ^*. We assume for simplicity that there is no change to the value of ψ. Hence, the total surplus value (weighted value per share) created by the merger relative to the stand-alone value of the target firm can be expressed as:

$$\Delta V_S = V_0 + \alpha\,\pi(\lambda_T - \lambda^*). \qquad \text{(E-1)}$$

Note that since ψ is not affected by the acquisition, it does not appear in the merger surplus equation (E-1). The second term on the right side, $\alpha\pi(\lambda_T - \lambda^*)$, represents the expected reduction in liquidity costs times the fraction of shares that are liquidated. We assume that the bargaining between the boards of the target and the acquirer can be treated as a Nash bargaining game in which (for simplicity) the bargaining powers of the two parties are taken to be equal. As a result, the acquisition that takes place at a price, say $P_{\{Stock\}}$, will be such that the surplus ΔV_S is shared equally between A and T.

To obtain $P_{\{Stock\}}$, we note that the surplus value that the acquirer receives from the acquisition is given by: $V_T + V_0 - P_{\{Stock\}}$, while the weighted-average surplus value received by shareholders of the target is given by:

$$P_{\{Stock\}} - V_T + \alpha\pi(\lambda_T - \lambda^*).$$

Given their equal bargaining power, we equate the surplus value received by the shareholders of the two firms to obtain the equation below:

$$P_{\{Stock\}} - V_T + \alpha\pi(\lambda_T - \lambda^*) = V_T + V_0 - P_{\{Stock\}}, \qquad \text{(E-2)}$$

or,

$$P_{\{Stock\}} = V_T + \frac{1}{2}(V_0 + \alpha\pi(\lambda_T - \lambda^*)). \qquad \text{(E-3)}$$

Observe that the acquisition premium $\frac{1}{2}(V_0 + \alpha\pi(\lambda_T - \lambda^*))$ is decreasing in the liquidity of the acquirer (i.e., decreasing as λ_A decreases since, as discussed above, we take λ_{AT} to be weighted average of λ_A, λ_T and it can be shown that $\lambda_T - \lambda^* = \omega(\lambda_A - \lambda_T) + f(c)))$ and increasing in the liquidity of the target (i.e., increasing in λ_T, which follows from the expression for $\lambda_T - \lambda^*$).

Next, we consider the effect of a non-pecuniary effort cost E, which might affect the merger decision (e.g., search for a suitable target). This cost is borne by the management of the acquirer prior to any merger negotiations (hence, cost E is sunk and does not affect acquisition terms). The acquirer management will be willing to spend resources to uncover a target as long as:

$$\frac{1}{2}(\Delta V_S) \geq E. \qquad \text{(E-4)}$$

The above (weak) inequality implies that an increase in acquirer stock liquidity and a decrease in target stock liquidity (which increases the left-hand-side of (E-4)), makes it more likely that the inequality is satisfied and, hence, increases the likelihood of a stock-for-stock acquisition. The expression for the total surplus ΔV_S can be modified, as appropriate, to incorporate additional factors such as, for instance, the cost borne by target investors to investigate the quality and value of the acquirer firm.

We now obtain an expression for the equilibrium value of λ^* that is determined post-acquisition. It is assumed that the acquirer cannot pre-commit to a particular policy at the time of acquisition negotiation. However, since there is no information asymmetry, all market participants can fully anticipate the optimal choice that the acquirer will make after the merger has taken place. In reduced form we assume that greater liquidity costs tend to reduce firm value. This could happen, for instance, because it is more costly for the firm to raise external capital when the firm is less transparent. For simplicity, the value reduction is taken to be linear in the liquidity parameter λ^*, i.e., $L.\lambda^*$. The value of the merged firm (V_M) can be expressed as below, taking account of the cost of the liquidity as well as the cost c that the acquirer can optimally expend to improve liquidity. Note that in the expression below the synergistic benefit is expressed as V_0', the unadjusted synergy benefit:

$$V_M = V_A + V_T + V_0' - L.(\lambda^*) - c$$

$$\Rightarrow \quad V_M = V_A + V_T + V_0' - L.\left(\lambda_{AT} - f(c)\right) - c. \qquad \text{(E-5)}$$

Hence, the optimal choice of c is c^*such that: $L\, f'(c^*) = 1$. We can, therefore, express the adjusted synergy: $V_0 = V_0' - L\lambda^* - c^*$. As can be seem from this expression, if there is a substantial decrease in liquidity, the cost of liquidity might reduce the adjusted synergy value V_0 to a level at which a stock acquisition is no longer desirable.

For comparison purposes, we now discuss the effect of liquidity if the acquisition payment is in cash. If there are some dissipative costs to buying and selling shares on date 0, it will be optimal for the acquirer to pay in cash when the large investors would prefer to exit the ownership of the merged firm. This will be the case, for instance when $\psi - \pi\lambda^* < 0$. In other words, while the large investors were willing to hold target stock, this can change if, for instance, the liquidity of the acquirer is sufficiently low i.e., when λ_A is sufficiently larger than λ_T.

In this case, the surplus created from the merger is $\Delta_C = (V_0{}' - \kappa_T)$, where the term κ_T represents the loss in value to the large investors from the acquisition. The price for a cash acquisition, obtained as above, will be: $P_{\{Cash\}} = V_T + \frac{1}{2}(V_0{}' - \kappa_T)$. Unlike $P_{\{Stock\}}$, the acquisition price in cash deals is not affected by the acquirer's liquidity. Target liquidity can have an effect because, as noted earlier, retention of target shares by large investors suggests an indirect relationship between κ_T and target liquidity, moderated by ψ. The choice between stock and cash comes down to which mode of acquisition generates the greater surplus. A stock acquisition would be preferred when:

$$\Delta V_S > \Delta V_C \tag{E-6}$$

Our simple model above yields a number of predictions that we test in our empirical analysis. We note that some of these predictions are specific to the acquisition currency hypothesis and allow us to distinguish this channel from the two alternatives we have discussed.

Prediction 1: Firms with more liquid stock are more likely to make acquisitions and pay for these acquisitions with stock, ceteris paribus. Also, the more liquid is acquirers' stock relative to targets', the more of the overall payment for the acquisitions is paid in stock.

Prediction 1 follows directly from equations (E-3) and (E-4) that, as discussed, imply that greater (lower) acquirer (target) stock liquidity lowers the premium paid and, thereby, increases the likelihood of a stock-for-stock acquisition. The above arguments imply that when the cost of paying with cash is greater, as with cash constrained firms, the marginal benefit of stock liquidity and the use of stock as an acquisition currency will be correspondingly greater. In the model, for a cash constrained firm, the benefit from paying with stock rather than cash (E-6) can be interpreted in terms of an increase in total surplus ΔV_S from a stock acquisition. From Equation (E-6), this suggests that it will be easier to satisfy for a constrained firm, for a given level of acquirer liquidity.

Prediction 1 provides a test that separates the acquisition currency hypothesis from the alternatives. This is because our hypothesis predicts that the method of payment will depend on the liquidity of *both* the acquirer and the target. The alternative governance and valuation hypotheses have no such predictions.

The investment horizons of shareholders in targets are expected to matter as well. Due to their relatively short horizon in trading needs, short-term investors are likely to value acquirer's stock liquidity more. Hence, we expect that, *ceteris paribus*, the sensitivity of stock payment to the acquirer's stock liquidity will increase in shareholding by short-term investors in the target.

Equation (E-5) suggests that the dissynergy in acquirer liquidity from the acquisition of an illiquid target, i.e., the negative effect of λ_T on λ_{AT} and ultimately λ^*, depends not only on the relative liquidity of A and T but also on their relative size. Everything else being equal, the larger A (acquirer's asset value) is relative to T (target's asset value), the smaller the negative effect of λ_T on post-acquisition liquidity. In practice, A is often larger than T, and thus we expect the negative effect of the post-acquisition dissynergy on account of target illiquidity to be small – relative to the positive effect of the acquirer-target liquidity difference on deal premium and the likelihood of stock acquisition.

To confirm this from the data, we first sort the deals into deciles based on the relative size of the public acquirer and target (market capitalizations one month prior to the deal announcements). For each decile, in the table below, we present the mean of the pre-acquisition acquirer liquidity ($-\lambda_A$), the pre-acquisition target liquidity ($-\lambda_T$), the value-weighted average of the pre-acquisition liquidities of the acquirer and target ($-\lambda_{AT}$), and the post-acquisition acquirer liquidity ($-\lambda^*$). For the pre-acquisition liquidity, it is as of the year prior to the acquisition; for the post-acquisition liquidity, it is as of the year subsequent to the acquisition. The results are presented below for both liquidity measures, as constructed in Appendix A (so larger values of the measures indicate higher liquidity), respectively. As the liquidity notations in our model capture the illiquidity of a firm, we add a negative sign to these notations here (e.g., $-\lambda_A$) to indicate liquidity:

Deciles	1	2	3	4	5	6	7	8	9	10
Relative size (Acquirer/Target)	0.92	1.59	2.34	3.32	4.69	6.85	10.31	16.63	31.03	107.70
AMH										
$-\lambda_T$	-4.87	-5.10	-6.28	-6.36	-6.17	-6.48	-6.15	-6.33	-5.85	-6.63
$-\lambda_A$	-5.17	-4.68	-5.32	-4.97	-4.28	-4.26	-3.37	-3.17	-2.04	-2.19
$-\lambda_{AT}$	-4.97	-4.84	-5.61	-5.29	-4.61	-4.55	-3.61	-3.35	-2.17	-2.25
$-\lambda^*$	-4.68	-4.36	-4.64	-4.48	-4.14	-4.03	-3.50	-3.23	-2.33	-2.48
Spread										
$-\lambda_T$	5.14	4.87	4.94	4.65	4.65	4.79	4.42	4.60	4.41	4.49
$-\lambda_A$	5.04	5.10	5.31	5.15	5.33	5.62	5.43	5.71	5.69	6.05
$-\lambda_{AT}$	5.11	5.01	5.20	5.03	5.21	5.52	5.34	5.64	5.65	6.03
$-\lambda^*$	5.31	5.34	5.55	5.42	5.60	5.90	5.71	5.92	5.88	6.19

As is clear from the first row indicating relative sizes, acquirers are much larger than targets for all deciles except the bottom decile (Decile 1) in which acquirers are on average slightly smaller than targets (the relative size ratio is 0.92). However, in the bottom decile, targets are *more* liquid than acquirers as $-\lambda_T$ is greater than $-\lambda_A$, and hence the dissynergy effect is not an issue. Instead, the dissynergy issue appears to be a more serious concern in the top deciles where targets tend to be more illiquid than acquirers. But, due to the targets' relatively small size, the dissynergy effect is in fact minimal as can be seen from the small difference between $-\lambda_A$ and $-\lambda_{AT}$. As such, while the dissynergy effect is a legitimate concern in theory, it does not seem to be a significant issue empirically in terms of the stock acquisitions observed. Consistent with the discussion above (equations (E-4) and (E-6)), if the dissynergy is expected to be large, there will either be no acquisition or an acquisition using cash.

Moreover, consistent with the acquirers being likely to take actions with an optimal c^* to increase their post-acquisition liquidity, acquirers' post-acquisition liquidity ($-\lambda^*$) are almost always greater than their pre-acquisition liquidity ($-\lambda_A$). This makes the potential dissynergy effect even less of a concern.

Our next prediction follows from equation (E-3) that the acquisition premium is lower (higher) if the acquirer's (target's) stock is highly liquid (illiquid). We note that this prediction applies only to stock-for-stock acquisitions. As discussed above, this prediction does not apply to cash deals, because acquirers' stock liquidity does not directly affect $P_{\{Cash\}}$. As noted earlier, this helps to distinguish the valuation and governance channels from the acquisition currency channel. According to the alternative channels, we would expect an illiquid target to be acquired at a lower premium if acquirers were concerned about poor governance, lower information issues and uncertain valuation. However, this lower premium would be present no matter whether the target is acquired with stock or with cash. On the other hand, the acquisition currency channel predicts that target liquidity should affect the acquisition premium only when the payment is in stock – but not when it is in cash. We can state the second testable prediction:

Prediction 2: In stock-financed acquisitions, the higher the liquidity of acquirers' stock relative to that of targets', the lower will be the acquisition premium paid. This is not the case in cash-financed acquisitions.

Knowing that target shareholders will prefer more liquid stock in a stock-for-stock deal, which can in turn put acquirers' shareholders in a more favorable position in the exchange (e.g., paying lower premium), acquirers have an incentive to increase their stock liquidity in anticipation of a stock deal in the near future. They can, for instance, improve their transparency in the stock market by disclosing more information than what regulations mandate (e.g., providing more informative earnings guidance). They can also conduct stock splits to facilitate more trading by uninformed investors. Market makers can thus provide liquidity services at lower cost, which would result in higher propensity of trading and increase in liquidity.

The extant literature provides evidence that enhanced information disclosure and stock splits help to increase stock liquidity. For instance, Coller and Yohn (1997) find that bid-ask spread reduces following management forecasts, while Lin, Singh, and Yu (2009) find declining incidence of no trading and lower liquidity risk following stock splits.[4] This leads to our third prediction:

Prediction 3: Acquirers are more likely to take actions, such as providing earnings guidance and conducting stock splits, to increase their stock liquidity prior to stock deals.

It follows from our model that firms with more liquid stocks will be better positioned to make acquisitions and pay lower premiums than firms that are otherwise similar but have less liquid stocks. This leads to our fourth testable prediction:

Prediction 4: The more liquid the acquirer's stock is relative to that of the target's stock, the more the gains to acquirer shareholders in a stock deal, ceteris paribus.

Extension 1: Acquisition is Anticipated with Non-Zero Probability on Date 0

At the start of date 0 we assumed that there is trading between atomistic investors of the target firm. When the likelihood of acquisition is almost zero, the stock price will be V_T, representing the anticipated payoffs on date 2. Now, we consider the possibility that target investors expect an acquisition to occur later on date 0 with a probability denoted by ϕ.

Trading between the risk-neutral atomistic investors in this case would occur at a stock price P_0^* reflecting the expected possibilities. There will be no difference in the price at which the acquisition would occur. If the acquisition is expected to occur at a price of $P_{\{stock\}}$, we have:

$$P_0^* = \phi P_{\{stock\}} + (1-\phi)V_T.$$

The higher price will have a quantitative, though not a qualitative effect on the announcement premium.

The acquisition premium will be:

$$P_{\{stock\}} - P_0^* = (1-\phi)\left[P_{\{stock\}} - V_T\right].$$

Hence, the premium will be affected by a 'lack of surprise' factor (ϕ). This does not affect the nature of the effect of the liquidity on the acquisition premium, though these effects would be tempered by the 'lack of surprise' factor. However, the effect of anticipation is not unusual in our setting and is a concern in any study in which stock market announcement effects are of interest.

[4] Several other papers find similar evidence. For instance, Balakrishnanet al. (2014) show that firms respond to an exogenous loss of public information by providing more timely and informative earnings guidance, which results in an improvement in liquidity. Muscarella and Vetsuypens (1996) study splits of American Depositary Receipts (ADRs) that are not associated with splits in their home-country stock and argue that the positive announcement return of stock splits reflect the increase in liquidity.

Table 1: Summary Statistics

This table presents summary statistics of firm and deal characteristics. Panel A presents firm characteristics for the overall sample of Compustat-CRSP firms over the sample period 1984-2018. Panel B reports characteristics for acquirers of only public targets. Panel C presents characteristics of public targets, and Panel D shows characteristics of deals involving public targets.

Variable	N	Mean	SD	Median
Panel A: Overall Sample of Compustat-CRSP Firms				
AMH	142053	-6.830	5.281	-5.794
Spread	142053	4.568	1.663	4.234
Acquisition (Dummy)	142053	0.075	0.263	0.000
Stockacq (Dummy)	142053	0.031	0.174	0.000
Firm Size	142053	5.802	2.236	5.715
Ind_Stock_Return	142053	-0.005	0.572	-0.065
Leverage	142053	0.319	0.334	0.265
Δ Leverage	142053	0.001	0.274	0.000
Market-to-Book	142053	1.981	2.348	1.314
Tangibility	142053	0.237	0.245	0.146
Volatility	142053	0.699	0.439	0.585
Panel B: Acquirers of public targets				
AMH	3032	-3.947	4.776	-1.857
Spread	3032	5.442	1.518	5.004
Analysts	3032	9.895	11.356	6.000
Credit rating	3032	15.161	7.084	15.000
FCF	3032	0.005	0.185	0.022
Firm Size	3032	7.945	1.910	7.959
Leverage	3032	0.374	0.269	0.357
Market-to-Book	3032	1.996	1.830	1.421
Runup	3032	0.044	0.234	0.014
Profitability	3032	0.027	0.092	0.029
Panel C: Public Targets				
AMH	3032	-6.022	5.141	-4.610
Spread	3032	4.697	1.464	4.294
Analysts	3032	4.306	6.813	1.000
FCF	3032	-0.004	0.093	0.000
Firm Size	3032	6.287	1.714	6.221
Leverage	3032	0.337	0.287	0.309
Market-to-Book	3032	20.508	50.839	3.512
Profitability	3032	-0.008	0.149	0.014
Panel D: Characteristics of deals involving public targets				
Relative Liquidity (AMH)	3032	2.056	2.123	1.748
Relative Liquidity (Spread)	3032	0.755	0.934	0.655
Acquirer's CAR	2949	-0.020	0.081	-0.014
Competing Bid	3032	0.069	0.254	0.000
Ln(deal size)	3032	1.592	2.576	0.379
Stockpay	3032	0.575	0.437	0.712
Premium	2837	0.268	0.383	0.253
Related Deal	3032	0.514	0.500	1.000
Tender Offer	3032	0.153	0.360	0.000

Table 2: The Effect of Liquidity on Likelihood of (Stock) Acquisition

Panel A of this table presents coefficient estimates from OLS regressions that examine the impact of firms' stock liquidity on the likelihood of making acquisitions (columns 1-2) and the likelihood of making stock acquisitions (columns 3-4) for the full sample. In columns 1-2 (columns 3-4), the dependent variable is a dummy variable that takes a value of one if a firm makes an (stock) acquisition in the fiscal year, and zero otherwise. Panel B of this table presents coefficient estimates from OLS regressions that examine how the impact of firms' stock liquidity on the likelihood of making stock acquisitions varies across firms with varying degree of financial constraints for the full sample. The dependent variable is a dummy variable that takes a value of one if a firm makes a stock acquisition in the fiscal year, and zero otherwise. The full sample is divided into terciles based on the financial constraint measure (Kaplan-Zingales Index in columns 1-2; Whited-Wu Index in columns 3-4; and Hadlock-Pierce index in columns 5-6). *Constraint Dummy* takes a value of one for firms that fall in the highest tercile and zero for firms that fall in the lowest tercile. The liquidity measure used in each regression is indicated at the top of the column. Other explanatory variables are defined in Appendix A. Year x Industry fixed effects are included in all regressions. Robust standard errors are clustered by firm and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A				
Dependent Variable:	*Acquisition*		*Stock Acquisition*	
Liquidity measure:	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Liquidity	0.006***	0.014***	0.004***	0.002***
	(0.000)	(0.001)	(0.000)	(0.001)
Leverage	-0.013***	-0.002	-0.010***	-0.007***
	(0.003)	(0.003)	(0.002)	(0.002)
Δ Leverage	-0.012***	-0.017***	-0.002	-0.004*
	(0.003)	(0.003)	(0.002)	(0.002)
Tangibility	-0.055***	-0.055***	-0.018***	-0.019***
	(0.005)	(0.005)	(0.002)	(0.003)
Market-to-Book	0.001***	0.002***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Size	0.006***	0.002***	0.002***	0.003***
	(0.001)	(0.001)	(0.000)	(0.000)
Ind_Stock_Return	0.022***	0.020***	0.012***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
Volatility	0.006**	-0.018***	0.018***	0.004***
	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.096***	0.020***	0.030***	-0.002
	(0.005)	(0.005)	(0.003)	(0.003)
Observations	142053	142053	142053	142053
Adjusted R^2	0.039	0.036	0.042	0.039
Year x Industry F.E.	Yes	Yes	Yes	Yes

Panel B						
Dependent Variable:	*Stock Acquisition*					
	Kaplan-Zingales Index		Whited-Wu Index		Hadlock-Pierce Index	
	AMH	Spread	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)	(5)	(6)
Liquidity	0.003***	0.001	0.004***	0.000	0.003***	0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Liquidity x Constraint Dummy	0.002***	0.004***	0.000	0.007***	0.001***	0.008***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Constraint Dummy	0.005***	0.007***	-0.000	0.003	0.005**	0.012***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Leverage	-0.013***	-0.010***	-0.008***	-0.004*	-0.008***	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ Leverage	-0.002	-0.003	-0.003	-0.004*	-0.005*	-0.006**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Tangibility	-0.020***	-0.021***	-0.019***	-0.020***	-0.020***	-0.020***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Market-to-Book	0.002***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm Size	0.002***	0.003***	0.001*	0.002***	0.003***	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ind_Stock_Return	0.013***	0.012***	0.011***	0.010***	0.011***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Volatility	0.020***	0.005***	0.015***	0.005***	0.016***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	0.027***	0.003	0.042***	0.018***	0.026***	0.002
	(0.004)	(0.003)	(0.006)	(0.007)	(0.004)	(0.004)
Observations	98077	98077	95103	95103	99437	99437
Adjusted R^2	0.043	0.039	0.048	0.045	0.045	0.042
Year x Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes

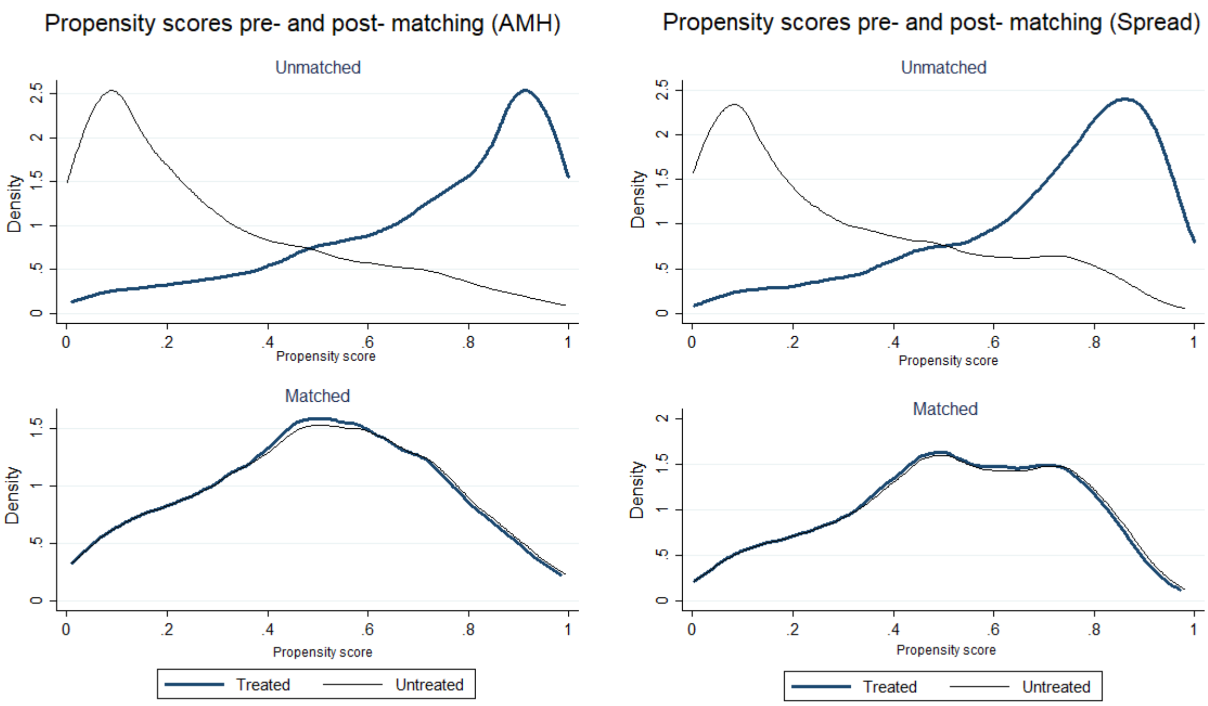
Table 3: The Effect of Liquidity on Likelihood of (Stock) Acquisition: Diff-in-Diff Approach using Decimalization of 2001

This table presents estimates from the difference-in-differences approach using decimalization. The treatment and control groups are constructed using propensity score matching. First, we measure the change in liquidity (AMH and Spread separately) from the pre-decimalization year (*t – 1*) to the post-decimalization year (*t + 1*). We then assign firms into terciles based on the respective change in liquidity ranking. We retain firms in the first and third tercile, which experience the smallest and the largest increase in liquidity following decimalization, respectively. We then estimate a probit model in which the dependent variable is set to one for firms in the third tercile and zero for firms in the first tercile. The probit model includes all control variables from our baseline regression measured in year immediately preceding decimalization. Panel A reports the results of the probit regressions for pre- and post-match. The liquidity measure used to compute the change variable is highlighted at the top of the column. We then use the propensity scores (predicted probabilities) to match firms in the two groups. Each firm in the third tercile is matched to a firm in the first tercile with the closest propensity score and with a propensity score match within 0.01 (nearest-neighbor propensity score matching with 1 neighbor and caliper of 0.01 and with no replacement allowed). In the case of multiple matches (ties), we retain the pair for which the distance between the two firms' propensity scores is the smallest. Panel B plots the distribution of predictions of the propensity scores estimated in the original sample and in the matched subsample. Panel C presents the univariate comparisons between the treatment and control firms' pre-decimalization characteristics and their corresponding *p*-values. Panel D reports the diff-in-diff analyses in a regression framework where *Treated* is a dummy variable equal to one (zero) if a stock is part of the treatment (control) group. *Decimal* is a dummy variable equal to one for 2002 and later, and zero for 2000 or earlier. Panel E reports regression estimates of the (stock) acquisition dynamics of treatment and control firms surrounding decimalization. Robust standard errors are clustered by firm and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A: Pre-and Post-match probit regressions

	Pre-match		Post-match	
Dependent Variable	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
$Liquidity_{t-1}$	-0.117***	-0.703***	-0.007	0.058
	(0.016)	(0.038)	(0.033)	(0.085)
$Leverage_{t-1}$	0.085	-0.158*	-0.034	0.161
	(0.100)	(0.094)	(0.195)	(0.190)
Δ $Leverage_{t-1,t-2}$	0.087	0.010	-0.147	-0.049
	(0.096)	(0.095)	(0.213)	(0.191)
$Tangibility_{t-1}$	0.266*	0.110	0.495	0.189
	(0.165)	(0.167)	(0.347)	(0.334)
Market-to-$Book_{t-1}$	0.008	0.046***	0.006	-0.012
	(0.010)	(0.010)	(0.023)	(0.022)
Firm $Size_{t-1}$	0.157***	0.255***	-0.003	-0.044
	(0.025)	(0.020)	(0.053)	(0.043)
Ind_Stock_$Return_{t-1}$	0.698***	0.542***	-0.249	0.023
	(0.048)	(0.047)	(0.181)	(0.101)
$Volatility_{t-1}$	-1.054***	-1.008***	-0.135	-0.072
	(0.085)	(0.087)	(0.180)	(0.181)
Constant	-0.958***	1.514***	-0.344	0.499
	(0.322)	(0.282)	(0.661)	(0.555)
Observations	3437	3427	1340	1492
Pseudo R^2	0.364	0.332	0.009	0.009
Industry F.E.	Yes	Yes	Yes	Yes

Panel B: Overlay of density distributions of propensity scores before and after propensity score matching.



Panel C: Differences in variables in pre-decimalization year				
	Using AMH			
	Treatment	Control	Difference	P-value
Liquidity$_{t-1}$	-5.40	-5.35	-0.05	0.72
Leverage$_{t-1}$	0.33	0.33	0.00	0.89
Δ Leverage$_{t-1,t-2}$	-0.01	0.00	-0.01	0.60
Tangibility$_{t-1}$	0.26	0.24	0.02	0.17
Market-to-Book$_{t-1}$	2.09	2.17	-0.08	0.61
Firm Size$_{t-1}$	5.28	5.27	0.01	0.91
Ind_Stock_Return$_{t-1}$	-0.01	0.03	-0.04	0.16
Volatility$_{t-1}$	0.81	0.82	-0.01	0.49
	Using Spread			
Liquidity$_{t-1}$	3.76	3.76	0.00	0.98
Leverage$_{t-1}$	0.35	0.34	0.01	0.81
Δ Leverage$_{t-1,t-2}$	-0.01	-0.01	0.00	0.97
Tangibility$_{t-1}$	0.25	0.24	0.01	0.43
Market-to-Book$_{t-1}$	2.11	2.12	-0.01	0.92
Firm Size$_{t-1}$	5.61	5.65	-0.04	0.68
Ind_Stock_Return$_{t-1}$	0.03	0.02	0.01	0.57
Volatility$_{t-1}$	0.77	0.77	0.00	0.93

Panel D: Difference-in-Difference Analysis of the Effect of Stock Liquidity on Likelihood of (Stock) Acquisition				
Dependent Variable:	*Acquisition*	*Acquisition*	*Stock Acquisition*	*Stock Acquisition*
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Treated x Decimal	0.042***	0.030**	0.019***	0.019**
	(0.014)	(0.015)	(0.007)	(0.010)
Treated	0.031***	0.038***	0.004	0.012
	(0.011)	(0.012)	(0.005)	(0.009)
Decimal	-0.038***	-0.042***	-0.030***	-0.039***
	(0.008)	(0.009)	(0.005)	(0.006)
Leverage	-0.032***	-0.013	-0.015**	-0.006
	(0.011)	(0.013)	(0.006)	(0.008)
Δ Leverage	-0.008	-0.016	0.003	-0.005
	(0.013)	(0.014)	(0.007)	(0.008)
Tangibility	-0.091***	-0.085***	-0.042***	-0.026**
	(0.022)	(0.022)	(0.011)	(0.012)
Market-to-Book	0.002	0.001	0.004***	0.003**
	(0.002)	(0.002)	(0.001)	(0.001)
Firm Size	0.013***	0.019***	0.008***	0.014***
	(0.003)	(0.003)	(0.001)	(0.002)
Ind_Stock_Return	0.020***	0.011**	0.008***	0.004
	(0.006)	(0.006)	(0.003)	(0.004)
Volatility	0.014	0.023*	0.041***	0.042***
	(0.012)	(0.012)	(0.006)	(0.008)
Constant	0.025	-0.018	-0.030***	-0.058***
	(0.020)	(0.022)	(0.011)	(0.015)
Observations	7341	8179	7341	8179
Pseudo R^2	0.035	0.046	0.030	0.045
Industry F.E.	Yes	Yes	Yes	Yes
Window	[t-3, t+3]	[t-3, t+3]	[t-3, t+3]	[t-3, t+3]

Panel E				
Dependent Variable:	*Acquisition*		*Stock Acquisition*	
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Before (t-2 & t-3) x Treated	0.014	-0.023	0.018	-0.003
	(0.024)	(0.021)	(0.016)	(0.013)
Current x Treated	0.037	0.001	0.012	-0.006
	(0.023)	(0.025)	(0.016)	(0.020)
After (t+1) x Treated	0.089***	0.058**	0.028**	0.004
	(0.024)	(0.026)	(0.014)	(0.014)
After (t+2 & t+3) x Treated	0.075***	0.038**	0.019*	0.016*
	(0.020)	(0.019)	(0.012)	(0.010)
Before (t-2 & t-3)	0.026	0.047**	0.003	0.012
	(0.017)	(0.019)	(0.011)	(0.016)
Current	-0.034**	-0.028*	-0.017	-0.023*
	(0.015)	(0.015)	(0.011)	(0.012)
After (t+1)	-0.059***	-0.051***	-0.041***	-0.042***
	(0.014)	(0.012)	(0.009)	(0.009)
After (t+2 & t+3)	-0.050***	-0.048***	-0.037***	-0.046***
	(0.013)	(0.012)	(0.010)	(0.009)
Treated	0.011	0.051*	-0.004	0.024
	(0.018)	(0.028)	(0.013)	(0.023)
Constant	0.084***	0.083***	0.043***	0.050***
	(0.012)	(0.018)	(0.009)	(0.015)
Observations	8641	9634	8641	9634
Adjusted R^2	0.033	0.046	0.021	0.042
Industry F.E.	Yes	Yes	Yes	Yes

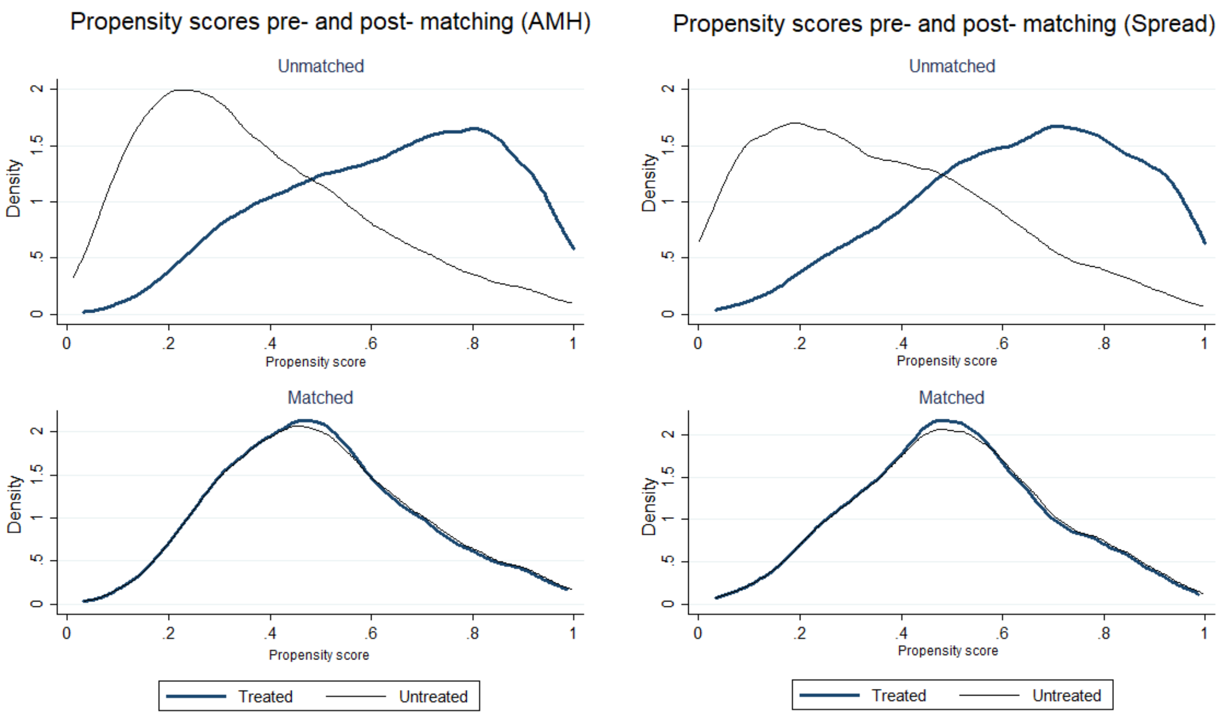
Table 4: The Effect of Liquidity on Likelihood of (Stock) Acquisition: Diff-in-Diff Approach using Shift in Minimum Tick Size of 1997

This table presents estimates from the difference-in-differences approach using the shift in the minimum tick size of 1997 from \$1/8th to \$1/16th. The treatment and control groups are constructed using propensity score matching. First, we measure the change in liquidity (AMH and Spread separately) from the pre-shift year (*t – 1*) to the post-shift year (*t + 1*). We then assign firms into terciles based on the respective change in liquidity ranking. We retain firms in the first and third tercile. Firms in the first (third) tercile experience the smallest (largest) increase in liquidity following the shift in minimum tick size in 1997. We then estimate a probit model in which the dependent variable is set to one for firms in the third tercile and zero for firms in the first tercile. The probit model includes all control variables from our baseline regression measured in year immediately preceding 1997. Panel A reports the results of the probit regressions for pre- and post-match. The liquidity measure used to compute the change variable is highlighted at the top of the column. We then use the propensity scores (predicted probabilities) to match firms in the two groups. Each firm in the third tercile is matched to a firm in the first tercile with the closest propensity score and with a propensity score match within 0.01 (nearest-neighbor propensity score matching with 1 neighbor and caliper of 0.01 and with no replacement allowed). In the case of multiple matches (ties), we retain the pair for which the distance between the two firms' propensity scores is the smallest. Panel B plots the distribution of predictions of the propensity scores estimated in the original sample and in the matched subsample. Panel C presents the univariate comparisons between the treatment and control firms' pre-1997 characteristics and their corresponding p-values. Panel D reports the diff-in-diff analyses in a regression framework where *Treated* is a dummy variable equal to one (zero) if a stock is part of the treatment (control) group. *Shift* is a dummy variable equal to one for 1998 and later, and zero for 1996 or earlier. Panel E reports regression estimates of the (stock) acquisition dynamics of treatment and control firms surrounding decimalization. Robust standard errors are clustered by firm and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A: Pre-and Post-match probit regressions

	Pre-match		Post-match	
Dependent Variable	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*	*Dummy=1 if in treatment group; 0 if in control group*
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
$Liquidity_{t-1}$	-0.208***	-0.334***	0.012	0.067
	(0.015)	(0.047)	(0.031)	(0.094)
$Leverage_{t-1}$	-0.269***	-0.535***	0.024	0.083
	(0.087)	(0.094)	(0.172)	(0.187)
Δ $Leverage_{t-1,t-2}$	0.108	0.209**	-0.055	-0.001
	(0.078)	(0.086)	(0.152)	(0.171)
$Tangibility_{t-1}$	-0.356**	-0.178	-0.001	0.168
	(0.143)	(0.151)	(0.281)	(0.303)
$Market\text{-}to\text{-}Book_{t-1}$	0.097***	0.024**	0.021	0.011
	(0.012)	(0.012)	(0.025)	(0.022)
$Firm\ Size_{t-1}$	0.340***	0.016	0.018	-0.013
	(0.025)	(0.022)	(0.051)	(0.045)
$Ind\_Stock\_Return_{t-1}$	0.775***	0.604***	-0.003	0.107
	(0.044)	(0.045)	(0.092)	(0.092)
$Volatility_{t-1}$	0.834***	1.293***	0.226	0.164
	(0.102)	(0.112)	(0.196)	(0.233)
Constant	-3.701***	0.410***	0.069	-0.434
	(0.288)	(0.267)	(0.589)	(0.517)
Observations	3789	3781	2047	1996
Pseudo R^2	0.214	0.231	0.008	0.007
Industry F.E.	Yes	Yes	Yes	Yes

Panel B: Overlay of density distributions of propensity scores before and after propensity score matching.



Panel C: Differences in variables in pre-shift in minimum tick size year				
	Using AMH			
	Treatment	Control	Difference	P-value
Liquidity$_{t-1}$	-5.35	-5.39	0.04	0.75
Leverage$_{t-1}$	0.30	0.30	0.00	0.70
Δ Leverage$_{t-1,t-2}$	-0.01	-0.01	0.00	0.94
Tangibility$_{t-1}$	0.25	0.24	0.01	0.51
Market-to-Book$_{t-1}$	2.34	2.24	0.10	0.27
Firm Size$_{t-1}$	4.80	4.83	-0.03	0.72
Ind_Stock_Return$_{t-1}$	0.03	0.02	0.01	0.81
Volatility$_{t-1}$	0.62	0.61	0.01	0.31
	Using Spread			
Liquidity$_{t-1}$	3.61	3.61	0.00	0.96
Leverage$_{t-1}$	0.31	0.31	0.00	0.78
Δ Leverage$_{t-1,t-2}$	0.00	0.00	0.00	0.90
Tangibility$_{t-1}$	0.23	0.22	0.01	0.17
Market-to-Book$_{t-1}$	2.40	2.33	0.07	0.52
Firm Size$_{t-1}$	5.27	5.27	0.00	0.92
Ind_Stock_Return$_{t-1}$	0.07	0.03	0.04	0.14
Volatility$_{t-1}$	0.56	0.56	0.00	0.65

Panel D: Difference-in-Difference Analysis of the Effect of Stock Liquidity on Likelihood of (Stock) Acquisition				
Dependent Variable:	*Acquisition*		*Stock Acquisition*	
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Treated x Shift	0.053***	0.048***	0.022**	0.029***
	(0.015)	(0.017)	(0.011)	(0.010)
Treated	0.022*	0.010	0.027***	0.016**
	(0.014)	(0.016)	(0.010)	(0.008)
Shift	-0.058***	-0.095***	-0.036***	-0.072***
	(0.010)	(0.013)	(0.007)	(0.008)
Leverage	0.014	0.023	-0.020**	-0.009
	(0.012)	(0.014)	(0.009)	(0.009)
Δ Leverage	-0.019	-0.032*	0.009	-0.004
	(0.013)	(0.019)	(0.010)	(0.010)
Tangibility	-0.074***	-0.069***	-0.032**	-0.041**
	(0.022)	(0.026)	(0.015)	(0.017)
Market-to-Book	0.003*	0.004**	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.001)
Firm Size	0.010***	0.024***	0.011***	0.021***
	(0.003)	(0.003)	(0.002)	(0.002)
Ind_Stock_Return	0.040***	0.044***	0.027***	0.030***
	(0.006)	(0.007)	(0.005)	(0.004)
Volatility	-0.006	0.021*	0.034***	0.052***
	(0.012)	(0.013)	(0.009)	(0.009)
Constant	0.071***	0.020	-0.025*	-0.049***
	(0.021)	(0.023)	(0.014)	(0.014)
Observations	10293	10280	10293	10280
Pseudo R^2	0.047	0.074	0.048	0.082
Industry F.E.	Yes	Yes	Yes	Yes
Window	[t-3, t+3]	[t-3, t+3]	[t-3, t+3]	[t-3, t+3]

Panel E				
Dependent Variable:	*Acquisition*		*Stock Acquisition*	
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Before (t-2 & t-3) x Treated	-0.037	0.000	-0.021	-0.004
	(0.023)	(0.024)	(0.013)	(0.019)
Current x Treated	0.024	0.002	0.006	-0.005
	(0.026)	(0.028)	(0.019)	(0.022)
After (t+1) x Treated	0.084***	0.031	0.036**	0.014
	(0.025)	(0.026)	(0.018)	(0.020)
After (t+2 & t+3) x Treated	0.076***	0.064***	0.040***	0.031*
	(0.021)	(0.023)	(0.016)	(0.019)
Before (t-2 & t-3)	-0.003	-0.013	0.006	-0.008
	(0.016)	(0.016)	(0.011)	(0.013)
Current	0.005	0.036*	0.012	0.031**
	(0.017)	(0.020)	(0.011)	(0.015)
After (t+1)	-0.026*	0.008	-0.009	-0.003
	(0.016)	(0.018)	(0.012)	(0.013)
After (t+2 & t+3)	-0.056***	-0.072***	-0.018	-0.041***
	(0.014)	(0.016)	(0.012)	(0.012)
Treated	0.031	0.022	0.033*	0.031*
	(0.019)	(0.021)	(0.017)	(0.017)
Constant	0.103***	0.140***	0.038***	0.077***
	(0.013)	(0.015)	(0.011)	(0.011)
Observations	11683	11778	11683	11778
Adjusted R^2	0.039	0.055	0.029	0.069
Industry F.E.	Yes	Yes	Yes	Yes

Table 5: The Effect of Actual Change in Liquidity around Decimalization and Shift in 1997 on Likelihood of (Stock) Acquisition

Panel A (Panel B) of this table presents coefficient estimates from linear probability regressions on the relation between a firm's change in stock liquidity surrounding decimalization of 2001 (shift in minimum tick size of 1997) and the probability of (stock) acquisitions immediately following the change in liquidity. Δ denotes the change in each variable from the fiscal year before decimalization/shift in minimum tick size of 1997 (year *t–1*) to the fiscal year after decimalization/shift in minimum tick size of 1997 (year *t+1*) where *t* indicates the year during which decimalization/shift in minimum tick size of 1997 went into effect for the firm. Robust standard errors are clustered by firm and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A: Effect of changes in liquidity surrounding decimalization of 2001 on likelihood of (stock) acquisition

Dependent Variable:	*Acquisition*		*Stock Acquisition*	
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Δ Liquidity	0.013***	0.025***	0.003*	0.007*
	(0.003)	(0.007)	(0.002)	(0.004)
Δ Leverage	-0.006	-0.006	0.003	0.004
	(0.009)	(0.009)	(0.007)	(0.006)
Δ Tangibility	-0.018	-0.022	0.001	0.001
	(0.048)	(0.048)	(0.028)	(0.026)
Δ Market-to-Book	-0.004	-0.004	-0.002*	-0.002
	(0.003)	(0.003)	(0.001)	(0.001)
Δ Firm Size	0.021**	0.028***	0.001	0.001
	(0.010)	(0.010)	(0.005)	(0.006)
Δ Ind_Stock_Return	-0.008	-0.009	-0.004	-0.005
	(0.006)	(0.006)	(0.003)	(0.003)
Δ Volatility	-0.016	-0.015	-0.011	-0.010
	(0.012)	(0.012)	(0.007)	(0.008)
Constant	0.078***	0.063***	0.026***	0.022***
	(0.005)	(0.005)	(0.003)	(0.002)
Observations	5256	5256	5256	5256
Pseudo R^2	0.036	0.035	0.011	0.011
Industry F.E.	Yes	Yes	Yes	Yes

Panel B: Effect of changes in liquidity surrounding minimum tick size shift of 1997 on likelihood of (stock) acquisition

Dependent Variable:	*Acquisition*		*Stock Acquisition*	
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
Δ Liquidity	0.020***	0.048***	0.014***	0.036***
	(0.006)	(0.015)	(0.004)	(0.012)
Δ Leverage	-0.026*	-0.028*	-0.008	-0.010
	(0.015)	(0.015)	(0.010)	(0.010)
Δ Tangibility	-0.071	-0.073	0.047	0.046
	(0.056)	(0.056)	(0.043)	(0.043)
Δ Market-to-Book	0.006**	0.006**	0.006***	0.007***
	(0.003)	(0.003)	(0.002)	(0.002)
Δ Firm Size	0.141***	0.145***	0.073***	0.075***
	(0.017)	(0.017)	(0.013)	(0.013)
Δ Ind_Stock_Return	0.009	0.006	0.002	0.001
	(0.008)	(0.008)	(0.006)	(0.006)
Δ Volatility	0.028	0.028	0.034**	0.036**
	(0.021)	(0.021)	(0.014)	(0.014)
Constant	0.119***	0.116***	0.069***	0.067***
	(0.005)	(0.005)	(0.004)	(0.004)
Observations	6673	6673	6673	6673
Pseudo R^2	0.064	0.064	0.063	0.063
Industry F.E.	Yes	Yes	Yes	Yes

Table 6: Cross-sectional Variations in the Impact of Decimalization on Likelihood of (Stock) Acquisition, Fraction of Payment in Stock, and Deal Premium

This table presents coefficient estimates from regressions of the following specification:

$$Y_{i,t} = \alpha_0 + \alpha_1 \textit{ Low Price}_{i,t-1} + \alpha_2 \textit{ Low Price}_{i,t-1} \text{ x Decimal} + \alpha_3 \text{ Decimal} + \alpha_4 \text{ Controls} + \varepsilon_{i,t}.$$

In panel A, $Y_{i,t}$ is the outcome variable regarding a firm's acquisition decision (Columns (1) and (3)), a firm's stock acquisition decision (Columns (2) and (4)), and the fraction of payment in stock (Column 5). In panel B (C), $Y_{i,t}$ is deal premium (CAR) for the subsamples of stock (Column 1) and cash acquisitions (Column 2) involving public targets. *Low Price* is a dummy variable that equals one if an acquirer's closing price at the end of fiscal year *t–1* falls below the median closing price in that year, and zero otherwise. *Decimal* is a dummy variable equal to one for 2002 and later, and zero for 2000 or earlier. Other explanatory variables are defined in Appendix A. We include Year x Industry fixed effects for the periods of 1985-1999 and 2003-2018. Standard errors are clustered by firm in columns (1)-(4) of panel A and by Year x Industry in the rest, and are reported in the parentheses. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Panel A: Likelihood of (Stock) Acquisition and Fraction of Payment in Stock					
	OLS	**OLS**	**OLS**	**OLS**	**TOBIT**
Dependent Variable:	*Acquisition*	*Stock Acquisition*	*Acquisition*	*Stock Acquisition*	*Fraction of payment in stock*
	(1)	(3)	(3)	(4)	(5)
Low Price	-0.027***	-0.021***	-0.034***	-0.020***	-0.291***
	(0.003)	(0.002)	(0.005)	(0.003)	(0.020)
Low Price x Decimal	0.010***	0.026***	0.010*	0.025***	0.441***
	(0.003)	(0.002)	(0.006)	(0.004)	(0.022)
Decimal	-0.029***	-0.038***	-0.003	-0.016***	-5.726***
	(0.004)	(0.002)	(0.006)	(0.004)	(0.021)
Leverage	-0.008***	-0.009***	-0.022***	-0.016***	-0.005
	(0.003)	(0.002)	(0.005)	(0.003)	(0.033)
Δ Leverage	-0.015***	-0.004*	-0.011**	-0.005	
	(0.003)	(0.002)	(0.006)	(0.004)	
Tangibility	-0.062***	-0.022***	-0.084***	-0.029***	-0.404***
	(0.005)	(0.003)	(0.008)	(0.005)	(0.041)
Market-to-Book_a	0.003***	0.004***	0.004***	0.005***	0.110***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.006)
Firm Size_a	0.008***	0.005***	0.011***	0.009***	-0.102***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.003)
Ind_Stock_Return	0.017***	0.010***	0.013***	0.010***	
	(0.001)	(0.001)	(0.002)	(0.002)	
Volatility	-0.009***	0.011***	0.019***	0.038***	0.467***
	(0.002)	(0.001)	(0.005)	(0.004)	(0.031)
Leverage_t					-0.356***
					(0.032)
Target's Liquidity					-0.006
					(0.004)
Runup					0.442***
					(0.012)
ln(deal size)					-0.068***
					(0.004)
Cash/Deal					-0.014***
					(0.001)
Tender Offer					-1.715***
					(0.017)
Market-to-Book_t					0.000
					(0.000)
Analyst_a					-0.000
					(0.001)
Analyst_t					0.002
					(0.001)
Firm Size_t					0.184***
					(0.003)
Profitability_a					-0.885***
					(0.073)
Profitability_t					-0.254***
					(0.034)

FCF_a					-0.384***
					(0.031)
FCF_t					-0.349***
					(0.040)
Ln(1+credit rating)					0.019***
					(0.007)
Constant	0.075***	0.020***	0.042***	-0.027***	0.902***
	(0.005)	(0.003)	(0.009)	(0.006)	(0.005)
Observations	135982	135982	36516	36516	2887
Adjusted/Pseudo R^2	0.036	0.042	0.033	0.043	0.289
Year x Industry F.E.	Yes	Yes	Yes	Yes	Yes
Window	Full sample	Full sample	[-3,+3]	[-3,+3]	Full sample

Panel B: Deal Premium

	OLS	**OLS**
Dependent Variable:	*Deal premium (stock deals)*	*Deal premium (cash deals)*
	(1)	(2)
Low Price	0.057	0.160
	(0.048)	(0.162)
Low Price x Decimal	-0.137***	-0.209
	(0.051)	(0.190)
Decimal	-0.339***	-0.096
	(0.099)	(0.229)
Target's Liquidity	0.051***	-0.024
	(0.018)	(0.054)
Runup	0.114***	-0.163
	(0.030)	(0.151)
Related Deal	-0.040*	-0.055
	(0.023)	(0.071)
Competing Bid	-0.042	0.088
	(0.069)	(0.111)
Leverage_a	-0.042	-0.144
	(0.065)	(0.140)
Leverage_t	0.089*	0.133
	(0.048)	(0.150)
Tender Offer	0.034	0.083
	(0.100)	(0.051)
ln(deal size)	-0.035	-0.010
	(0.023)	(0.036)
Market-to-Book_a	-0.016***	0.009
	(0.004)	(0.023)
Market-to-Book_t	-0.000	-0.000
	(0.000)	(0.000)
Analyst_a	0.001	-0.002
	(0.001)	(0.003)
Analyst_t	0.001	-0.000
	(0.002)	(0.004)
Firm Size_a	-0.013	0.044*
	(0.012)	(0.025)
Firm Size_t	-0.002	-0.005
	(0.015)	(0.037)
Profitability_a	-0.193*	-0.419
	(0.119)	(0.429)
Profitability_t	0.050	-0.190
	(0.067)	(0.208)
FCF_a	0.038	0.094
	(0.060)	(0.211)
FCF_t	-0.219	-0.167
	(0.163)	(0.265)
Constant	0.323***	0.241
	(0.059)	(0.260)
Observations	1536	940
Adjusted R^2	0.034	-0.011
Year x Industry F.E.	Yes	Yes

Table 7: The Effect of Liquidity on Fraction of Acquisition Payment in Stock

Panel A of this table presents coefficient estimates from Tobit regressions that examine the impact of relative liquidity on the fraction of deal payment in stock for the sample of deals involving public targets. The *Relative Liquidity* measure used in each regression, indicated at the top of the column, is the difference between the acquirer's and the target's liquidity. Panel B augments the tests in Panel A by interacting *Relative Liquidity* with *Blockholder*. The full sample is divided into terciles based on the number of blockholders with 5% or more stock ownership in the target in the quarter prior to deal announcement. *Blockholder* takes a value of one for firms that fall in the highest tercile and zero for firms that fall in the lowest tercile. Other explanatory variables are defined in Appendix A. Constant is included in the regression but not reported for brevity. Year x Industry dummies are included in all regressions. Robust standard errors are clustered by Year x Industry and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

	Panel A	
Dependent Variable:		*Stockpay*
	AMH	Spread
	(1)	(2)
Relative Liquidity	0.021***	0.017**
	(0.003)	(0.007)
Runup	0.375***	0.370***
	(0.012)	(0.012)
Volatility	0.619***	0.601***
	(0.029)	(0.029)
ln(deal size)	-0.087***	-0.090***
	(0.004)	(0.004)
Cash/Deal	-0.015***	-0.014***
	(0.001)	(0.001)
Leverage_a	-0.060*	-0.060*
	(0.031)	(0.031)
Leverage_t	-0.372***	-0.354***
	(0.030)	(0.029)
Tangibility	-0.340***	-0.336***
	(0.039)	(0.039)
Market-to-Book_a	0.101***	0.103***
	(0.005)	(0.005)
Market-to-Book_t	0.000	0.000
	(0.000)	(0.000)
Tender Offer	-1.662***	-1.665***
	(0.016)	(0.016)
Analyst_a	0.001	0.001
	(0.001)	(0.001)
Analyst_t	0.000	0.000
	(0.001)	(0.001)
Firm Size_a	-0.109***	-0.095***
	(0.002)	(0.002)
Firm Size_t	0.211***	0.192***
	(0.003)	(0.003)
Profitability_a	-0.974***	-0.970***
	(0.068)	(0.068)
Profitability_t	-0.198***	-0.210***
	(0.033)	(0.033)
FCF_a	-0.348***	-0.349***
	(0.029)	(0.029)
FCF_t	-0.340***	-0.324***
	(0.040)	(0.040)
Ln(1+credit rating)	0.029***	0.032***
	(0.007)	(0.007)
Constant	0.899***	0.899***
	(0.005)	(0.005)
Observations	3032	3032
Pseudo R^2	0.283	0.282
Year x Industry Dummies	Yes	Yes

Panel B		
Dependent Variable:	*Stockpay*	
	AMH	Spread
	(1)	(2)
Relative Liquidity	0.031***	0.031***
	(0.004)	(0.008)
Relative Liquidity x Blockholder	-0.017***	-0.011*
	(0.004)	(0.007)
Blockholder	-0.151***	-0.180***
	(0.016)	(0.016)
Runup	0.427***	0.425***
	(0.012)	(0.012)
Volatility	0.532***	0.515***
	(0.025)	(0.025)
ln(deal size)	-0.075***	-0.075***
	(0.002)	(0.002)
Cash/Deal	-0.014***	-0.014***
	(0.001)	(0.001)
Leverage_a	-0.077**	-0.073**
	(0.032)	(0.032)
Leverage_t	-0.436***	-0.421***
	(0.031)	(0.030)
Tangibility	-0.190***	-0.183***
	(0.039)	(0.038)
Market-to-Book_a	0.128***	0.129***
	(0.006)	(0.006)
Market-to-Book_t	0.000	0.000
	(0.000)	(0.000)
Tender Offer	-1.674***	-1.677***
	(0.016)	(0.016)
Analyst_a	-0.000	-0.000
	(0.001)	(0.001)
Analyst_t	0.002**	0.002**
	(0.001)	(0.001)
Firm Size_a	-0.122***	-0.110***
	(0.002)	(0.002)
Firm Size_t	0.228***	0.211***
	(0.003)	(0.003)
Profitability_a	-0.911***	-0.905***
	(0.074)	(0.073)
Profitability_t	-0.149***	-0.148***
	(0.030)	(0.031)
FCF_a	-0.611***	-0.612***
	(0.033)	(0.033)
FCF_t	-0.206***	-0.199***
	(0.041)	(0.041)
Ln(1+credit rating)	0.046***	0.049***
	(0.007)	(0.007)
Constant	0.912***	0.912***
	(0.005)	(0.005)
Observations	2478	2478
Pseudo R^2	0.287	0.287
Year x Industry Dummies	Yes	Yes

Table 8: The Effect of Liquidity on Deal Premium

Panel A of this table presents the coefficient estimates from OLS regressions that examine the impact of stock liquidity on the deal premium for the subsamples of stock and cash acquisitions involving public targets, respectively. The dependent variable is *Deal Premium* which is defined as the effective offer price as a percentage premium over the target firm's market price as of two days prior to the takeover announcement. The liquidity measure used in each regression, indicated above the column headings, is the difference between the acquirer's and the target's liquidity (*Relative Liquidity*). Panel B augments the tests in Panel A by interacting *Relative Liquidity* with *Blockholder*. The full sample is divided into terciles based on the number of blockholders with 5% or more stock ownership in the target in the quarter prior to deal announcement. *Blockholder* takes a value of one for firms that fall in the highest tercile and zero for firms that fall in the lowest tercile. Other explanatory variables are defined in Appendix A. Year x Industry fixed effect is included in all regressions. Robust standard errors are clustered by Year x Industry and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A

Dependent Variable:	*Deal Premium*			
	AMH		Spread	
	(1) Stock	(2) Cash	(3) Stock	(4) Cash
Relative Liquidity	-0.021**	-0.004	-0.050***	0.026
	(0.011)	(0.026)	(0.014)	(0.032)
Runup	0.122***	-0.193	0.129***	-0.177
	(0.031)	(0.133)	(0.030)	(0.122)
Related Deal	-0.036*	-0.041	-0.035*	-0.039
	(0.021)	(0.073)	(0.021)	(0.072)
Competing Bid	-0.051	0.074	-0.046	0.071
	(0.084)	(0.124)	(0.085)	(0.122)
Leverage_a	-0.027	-0.084	-0.040	-0.078
	(0.068)	(0.133)	(0.068)	(0.131)
Leverage_t	0.088*	0.172	0.087*	0.158
	(0.054)	(0.155)	(0.048)	(0.142)
Tender Offer	0.053	0.066	0.043	0.071
	(0.128)	(0.056)	(0.123)	(0.057)
ln(deal size)	-0.027	-0.013	-0.028	-0.004
	(0.025)	(0.031)	(0.026)	(0.032)
Market-to-Book_a	-0.006	0.013	-0.006	0.009
	(0.005)	(0.025)	(0.005)	(0.026)
Market-to-Book_t	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Analyst_a	0.001	-0.001	0.001	-0.001
	(0.001)	(0.003)	(0.001)	(0.003)
Analyst_t	0.002	-0.001	0.002	-0.000
	(0.002)	(0.004)	(0.002)	(0.004)
Firm Size_a	0.013	0.045	0.006	0.037
	(0.021)	(0.030)	(0.014)	(0.029)
Firm Size_t	-0.016	-0.018	-0.006	-0.004
	(0.020)	(0.045)	(0.018)	(0.036)
Profitability_a	-0.143	-0.442	-0.142	-0.466
	(0.143)	(0.428)	(0.148)	(0.426)
Profitability_t	0.037	-0.159	0.026	-0.140
	(0.069)	(0.227)	(0.072)	(0.225)
FCF_a	0.001	0.023	0.002	0.022
	(0.054)	(0.226)	(0.057)	(0.224)
FCF_t	-0.235	-0.179	-0.216	-0.189
	(0.165)	(0.270)	(0.163)	(0.272)
Constant	0.303***	0.107	0.291***	0.043
	(0.067)	(0.232)	(0.078)	(0.203)
Observations	1536	940	1536	940
Adjusted R^2	0.050	-0.002	0.048	0.001
Year x Industry F.E.	Yes	Yes	Yes	Yes

Panel B				
Dependent Variable:	*Deal Premium*			
	AMH		Spread	
	(1) Stock	(2) Cash	(3) Stock	(4) Cash
Relative Liquidity	-0.041***	0.001	-0.093***	0.041
	(0.014)	(0.033)	(0.026)	(0.045)
Relative Liquidity x Blockholder	0.037***	0.021	0.101***	-0.011
	(0.013)	(0.033)	(0.029)	(0.050)
Blockholder	-0.026	0.029	-0.022	0.097
	(0.032)	(0.087)	(0.027)	(0.086)
Runup	0.103***	-0.126	0.105***	-0.140
	(0.041)	(0.128)	(0.042)	(0.128)
Related Deal	-0.046*	-0.028	-0.047*	-0.025
	(0.026)	(0.082)	(0.026)	(0.081)
Competing Bid	0.039	0.092	0.041	0.090
	(0.046)	(0.138)	(0.046)	(0.135)
Leverage_a	-0.068	-0.127	-0.082	-0.123
	(0.056)	(0.153)	(0.056)	(0.151)
Leverage_t	0.108*	0.079	0.102*	0.082
	(0.061)	(0.119)	(0.060)	(0.118)
Tender Offer	-0.096*	0.070	-0.087	0.071
	(0.062)	(0.063)	(0.060)	(0.063)
ln(deal size)	-0.020	-0.014	-0.020	-0.005
	(0.015)	(0.035)	(0.016)	(0.035)
Market-to-Book_a	0.000	0.020	-0.001	0.016
	(0.006)	(0.027)	(0.006)	(0.028)
Market-to-Book_t	-0.001	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Analyst_a	0.001	-0.002	0.001	-0.002
	(0.001)	(0.004)	(0.001)	(0.004)
Analyst_t	0.003*	-0.002	0.003*	-0.002
	(0.002)	(0.004)	(0.002)	(0.004)
Firm Size_a	0.026*	0.048*	0.014	0.050*
	(0.016)	(0.031)	(0.013)	(0.030)
Firm Size_t	-0.040***	0.018	-0.024*	0.011
	(0.017)	(0.040)	(0.014)	(0.040)
Profitability_a	-0.221	-0.685	-0.223	-0.695
	(0.154)	(0.549)	(0.154)	(0.560)
Profitability_t	-0.025	-0.195	-0.038	-0.176
	(0.096)	(0.252)	(0.095)	(0.258)
FCF_a	0.020	0.122	0.013	0.101
	(0.062)	(0.308)	(0.062)	(0.282)
FCF_t	0.023	-0.232	0.020	-0.249
	(0.156)	(0.303)	(0.154)	(0.301)
Constant	0.574***	-0.178	0.526***	-0.207
	(0.074)	(0.194)	(0.071)	(0.201)
Observations	1205	822	1205	822
Adjusted R^2	0.038	0.035	0.040	0.033
Year x Industry F.E.	Yes	Yes	Yes	Yes

Table 9: Liquidity-enhancing Activity Prior to Stock Acquisitions

This table reports estimates on the effect of future stock acquisitions on a firm's liquidity-enhancing activities that include stock splits and increases in earnings guidance. In Column (1) of Panel A, we estimate an OLS regression where the dependent variable is a dummy that equals one if the firm's stock is split in year *t*. In Column (2) of Panel A, we estimate an OLS regression where the dependent variable is the difference between the number of earnings guidance provided by the firm in year *t* and *t–1*. The sample period for the regression of Column (2) is 1994-2018. The main explanatory variable, *Stockacq* (*Cashacq/Hybridacq*) is a dummy variable that takes a value of one if the firm makes a stock (cash/hybrid-payment) acquisition in year *t+1*, and zero otherwise. Other explanatory variables are defined in Appendix A. In panel A, firm and year fixed effects are included in all regressions. Robust standard errors are clustered by firm in both panels and reported in parentheses. Panel B reports the IV estimation results of the regressions in Panel A with *Stockacq* being instrumented using the total number of M&A in the same industry (defined using Fama-French 48 industry) of the firm in the year (*Number of acquisitions*). Both the first-stage and second-stage estimation results are reported. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A		
Dependent Variable:	*Stock Split*	*Earnings Guidance*
	(1)	(2)
Stockacq	0.019***	0.037*
	(0.004)	(0.022)
Cashacq	-0.003	0.030
	(0.003)	(0.032)
Hybridacq	0.003	-0.039
	(0.009)	(0.071)
Leverage	-0.022***	-0.046***
	(0.002)	(0.015)
Δ Leverage	0.014***	-0.001
	(0.001)	(0.013)
Market-to-Book	0.008***	0.011***
	(0.001)	(0.002)
Firm Size	0.012***	0.009*
	(0.001)	(0.005)
Ind_Stock_Return	0.016***	-0.024***
	(0.001)	(0.007)
Volatility	0.020***	0.003
	(0.002)	(0.013)
Constant	-0.030*	0.033
	(0.017)	(0.031)
Observations	142053	125452
Adjusted/ Pseudo R^2	0.025	0.064
Firm & Year F.E.	Yes	Yes

Panel B				
	1st stage	2nd stage	1st stage	2nd stage
Dependent Variable:	*Stockacq*	*Stock Split*	*Stockacq*	*Earnings Guidance*
	(1)	(2)		(3)
Number of acquisitions	0.001***		0.001***	
	(0.000)		(0.000)	
Instrumented Stockacq		0.172***		0.371***
		(0.033)		(0.113)
Leverage	-0.010***	-0.022***	-0.011***	-0.045***
	(0.002)	(0.001)	(0.002)	(0.007)
Δ Leverage	-0.002	0.015***	-0.002	-0.007
	(0.002)	(0.001)	(0.002)	(0.010)
Market-to-Book	0.003***	0.005***	0.003***	0.008***
	(0.000)	(0.000)	(0.000)	(0.001)
Firm Size	0.007***	0.008***	0.007***	0.006***
	(0.001)	(0.000)	(0.001)	(0.001)
Ind_Stock_Return	0.012***	0.019***	0.012***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.006)
Volatility	0.008***	0.004***	0.009***	-0.013**
	(0.001)	(0.001)	(0.002)	(0.006)
Constant	-0.022***	0.007	0.007*	-0.009
	(0.009)	(0.015)	(0.004)	(0.008)
Observations	142053		125452	
Year F.E.	Yes		Yes	
Kleibergen-Paap Wald rk F statistic	382.66		357.98	
Kleibergen-Paap rk LM statistic	351.98		330.03	

Table 10: Stock Liquidity and Acquirer's Announcement Returns

Panel A (Panel B) of this table presents coefficient estimates from OLS regressions that examine the effect of stock liquidity on the acquirer's (acquirer-target combined) three-day [-1, 1] cumulative abnormal returns (CARs) around the announcements of stock acquisition (columns 1-2) and cash acquisition (columns 3-4) involving public targets. The liquidity measure used in each regression, indicated at the top of the columns, is the difference between the acquirer's and the target's liquidity (*Relative Liquidity*). Panel C augment the tests in Panel A (restricted to stock acquisitions) by interacting *Relative Liquidity* with *Blockholder*. The full sample is divided into terciles based on the number of blockholders with 5% or more stock ownership in the target in the quarter prior to deal announcement. *Blockholder* takes a value of one for firms that fall in the highest tercile and zero for firms that fall in the lowest tercile. Other explanatory variables are defined in Appendix A. Year x Industry fixed effect is included in all regressions. Robust standard errors are clustered by Year x Industry and reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% respectively.

Panel A

Dependent Variable:	*CAR* (Acquirer)			
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
	Stock Deals		Cash Deals	
Relative Liquidity	0.004**	0.005*	-0.001	-0.003
	(0.002)	(0.003)	(0.004)	(0.006)
Runup	-0.040***	-0.041***	-0.048	-0.048
	(0.009)	(0.009)	(0.033)	(0.032)
Tender Offer	0.025	0.026	-0.002	-0.002
	(0.021)	(0.021)	(0.010)	(0.010)
Competing Bid	0.020*	0.019*	-0.012	-0.012
	(0.011)	(0.011)	(0.015)	(0.015)
Related Deal	-0.002	-0.002	0.018*	0.018*
	(0.005)	(0.005)	(0.010)	(0.010)
Volatility	-0.015	-0.018	0.017	0.017
	(0.016)	(0.016)	(0.036)	(0.035)
Market-to-Book_a	-0.005***	-0.004***	-0.009*	-0.009*
	(0.001)	(0.001)	(0.005)	(0.005)
Leverage_a	0.002	0.003	0.005	0.004
	(0.013)	(0.013)	(0.026)	(0.025)
Market-to-Book_t	0.000**	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage_t	0.004	0.005	0.002	0.002
	(0.011)	(0.011)	(0.019)	(0.020)
Analyst_a	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Analyst_t	0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Firm Size_a	0.001	0.003	-0.002	-0.002
	(0.003)	(0.003)	(0.006)	(0.006)
Firm Size_t	-0.003	-0.006**	-0.001	-0.001
	(0.003)	(0.003)	(0.008)	(0.006)
Profitability_a	0.013	0.010	0.093	0.092
	(0.031)	(0.031)	(0.098)	(0.098)
Profitability_t	-0.005	-0.005	0.010	0.009
	(0.019)	(0.019)	(0.033)	(0.033)
FCF_a	0.018	0.019	0.011	0.011
	(0.014)	(0.014)	(0.079)	(0.079)
FCF_t	-0.014	-0.012	-0.004	-0.005
	(0.032)	(0.032)	(0.042)	(0.042)
Constant	-0.018	-0.012	0.025	0.025
	(0.020)	(0.020)	(0.051)	(0.047)
Observations	1617	1617	948	948
Adjusted R^2	0.196	0.194	0.149	0.149
Year x Industry F.E.	Yes	Yes	Yes	Yes

Panel B				
Dependent Variable:	*Combined CAR*			
	AMH	Spread	AMH	Spread
	(1)	(2)	(3)	(4)
	Stock Deals		Cash Deals	
Relative Liquidity	0.029***	0.042***	0.012	0.032
	(0.009)	(0.013)	(0.012)	(0.023)
Runup	0.034	0.022	-0.098	-0.102
	(0.030)	(0.031)	(0.081)	(0.081)
Tender Offer	0.130	0.138	0.065	0.065
	(0.090)	(0.098)	(0.043)	(0.042)
Competing Bid	0.005	-0.000	-0.105	-0.104
	(0.053)	(0.055)	(0.064)	(0.064)
Related Deal	-0.002	-0.005	0.011	0.013
	(0.027)	(0.029)	(0.041)	(0.041)
Volatility	-0.044	-0.066	0.067	0.068
	(0.051)	(0.048)	(0.118)	(0.117)
Market-to-Book_a	-0.009	-0.008	-0.001	-0.005
	(0.009)	(0.008)	(0.017)	(0.018)
Leverage_a	-0.073	-0.070	0.015	0.022
	(0.052)	(0.055)	(0.088)	(0.088)
Market-to-Book_t	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage_t	0.012	0.030	0.030	0.029
	(0.051)	(0.051)	(0.078)	(0.079)
Analyst_a	0.001	0.001	-0.003	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)
Analyst_t	0.000	0.000	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)
Firm Size_a	-0.013	0.001	0.049**	0.050***
	(0.016)	(0.014)	(0.019)	(0.019)
Firm Size_t	0.007	-0.013	-0.030	-0.032*
	(0.018)	(0.014)	(0.021)	(0.018)
Profitability_a	0.045	0.029	-0.075	-0.062
	(0.129)	(0.124)	(0.270)	(0.273)
Profitability_t	0.096	0.103	-0.139	-0.129
	(0.071)	(0.073)	(0.167)	(0.166)
FCF_a	0.023	0.023	-0.132	-0.131
	(0.071)	(0.071)	(0.201)	(0.203)
FCF_t	-0.207	-0.197	0.044	0.052
	(0.161)	(0.163)	(0.227)	(0.230)
Constant	0.160**	0.215***	0.051	0.050
	(0.081)	(0.079)	(0.166)	(0.163)
Observations	1063	1063	836	836
Adjusted R^2	0.066	0.050	0.127	0.132
Year x Industry F.E.	Yes	Yes	Yes	Yes

Panel C		
Dependent Variable:	*CAR*	
	AMH	Spread
	(1)	(2)
Relative Liquidity	0.005**	0.007**
	(0.002)	(0.003)
Relative Liquidity x Blockholder	-0.005***	-0.009***
	(0.002)	(0.003)
Blockholder	0.011	0.007
	(0.008)	(0.006)
Runup	-0.035***	-0.035***
	(0.009)	(0.009)
Tender Offer	0.020	0.019
	(0.016)	(0.016)
Competing Bid	-0.000	-0.001
	(0.012)	(0.012)
Related Deal	0.002	0.002
	(0.007)	(0.007)
Volatility	-0.033**	-0.035***
	(0.012)	(0.013)
Market-to-Book_a	-0.004*	-0.004*
	(0.002)	(0.002)
Leverage_a	0.023*	0.024*
	(0.014)	(0.014)
Market-to-Book_t	0.000***	0.000***
	(0.000)	(0.000)
Leverage_t	-0.001	-0.000
	(0.008)	(0.008)
Analyst_a	0.000	0.000
	(0.000)	(0.000)
Analyst_t	-0.000	-0.000
	(0.000)	(0.000)
Firm Size_a	-0.002	0.000
	(0.003)	(0.002)
Firm Size_t	-0.000	-0.003
	(0.003)	(0.003)
Profitability_a	-0.021	-0.022
	(0.050)	(0.050)
Profitability_t	-0.007	-0.006
	(0.030)	(0.030)
FCF_a	0.024*	0.024*
	(0.012)	(0.012)
FCF_t	-0.034	-0.033
	(0.047)	(0.047)
Constant	-0.019	-0.010
	(0.015)	(0.016)
Observations	1267	1267
Adjusted R^2	0.111	0.108
Year x Industry F.E.	Yes	Yes