

Corporate Liquidity, Acquisitions, and Macroeconomic Conditions

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March 22, 2019

ABSTRACT

This paper evaluates how the relation between firms' cash holdings and their acquisition decisions changes over macroeconomic cycles using a sample of 47,378 acquisitions from 36 countries between 1997 and 2014. Higher cash holdings and stronger macroeconomic conditions each increase the likelihood that a firm will make an acquisition. However, larger cash holdings decrease the sensitivity of acquisitions to macroeconomic factors, suggesting that cash holdings lower financing constraints during times when the cost of external finance is high. Announcement day abnormal returns for acquirers follow a consistent pattern: they decrease with acquirer cash holdings and with better macroeconomic conditions.

JEL Classification: G31, G34

Keywords: corporate liquidity, financial constraints, acquisitions, financial frictions, macroeconomic conditions

* The authors are Fellows of the National Center for the Middle Market at the Fisher College of Business, Ohio State University, and acknowledge the Center's support for this research. Some of this research was completed when Michael Weisbach was a visiting scholar at the University of Hong Kong. We thank Greg Allen, Dongxu Li, and Sam Osea for excellent research assistance and Murillo Campello, Shan Ge, Charlie Hadlock, Jarrad Harford, Peter Iliev, an anonymous referee, and participants at 2017 Midwest Finance Association conference for helpful discussions.

1. Introduction

One of the most important decisions a financial manager must make is to determine how liquid his firm's balance sheet should be. More liquidity means that a firm can make investment decisions without having to raise external capital.¹ Consequently, liquidity on the balance sheet is most valuable to a firm when the cost of external finance is relatively high. One such time occurs during poor macroeconomic conditions, since both practitioners' viewpoints and the academic literature suggest that most firms' ease of financing is strongly pro-cyclical.² Therefore, liquidity should be particularly important in facilitating firms' abilities to invest efficiently during poor macroeconomic conditions.

Liquidity, however, comes at a cost. In addition to being inefficient from a tax perspective, too much liquidity can exacerbate agency problems, since managers are less likely to face capital market discipline for their investments. In other words, if firms hold sufficient liquidity to ensure optimal investments even in bad times, then they will have too much liquidity in normal times, when cash flows tend to be larger and financial markets have fewer frictions. A cost of having too much liquidity is that firms potentially will use this excess liquidity to make value-reducing investments.

This paper provides evidence on the nature of this tradeoff. It considers the way that macroeconomic conditions and firms' liquidity affect firms' acquisition decisions, one of the most important investment decisions that firms face. The idea is that a firm chooses its liquidity with these factors (and possibly others) in mind. Once the choice is made, it will affect a firm's future

¹ The idea that liquidity can mitigate the cost of external financing was introduced in Keynes (1936) and developed by many others, most notably by Myers and Majluf (1984). The seminal paper about the way in which agency problems can occur when firms have too much liquidity is Jensen (1986), and many authors have provided related evidence.

² See Passov (2003) and Graham and Harvey (2001) for practitioners' viewpoints, and Erel et al. (2012) for empirical evidence on how firms' capital raising varies over the business cycle.

investment decisions in predictable ways. A more liquid balance sheet should provide insurance against unreliable capital markets in bad times at the potential cost of exacerbating the firm's free cash flow problem and leading to value-reducing investments in good times.

We study the effect of liquidity on the interaction of macroeconomic conditions and investment decisions using a sample of 47,378 acquisitions by public and private acquirers from 36 countries between 1997 and 2014. We focus on acquisitions because they are large, observable investments, over which firms have substantial discretion. Therefore, if liquidity affects investment, it is more likely to be observed doing so for acquisitions than for capital investments. We estimate the likelihood that a firm makes an acquisition as a function of both its own financial position and overall macroeconomic conditions. The international sample provides us with variation in economic conditions that allows us to identify the way that firms' liquidity affects their investment decisions in differing economic conditions.

Similar to Harford (1999), we find that firms with higher cash holdings are more likely to make acquisitions in our much larger and non-overlapping sample. This finding could mean that cash relieves financial constraints and allows firms to invest efficiently, or it could mean that cash leads firms to overinvest and to make value-reducing acquisitions. If firms are choosing liquidity to trade off the costs and benefits of incremental liquidity, this positive relation between cash holdings and acquisitions could reflect both effects. During bad times, we expect higher liquidity to lessen the impact of credit rationing and consequently lower the impact of poor economic conditions in firms' investments, while in normal times, we expect higher liquidity to lead to overinvestment.

We analyze the relation between cash holdings and the propensity to make acquisitions over different macroeconomic conditions. Since down cycles cannot be perfectly predicted and

have a large impact on the firm's ability to raise capital, they are an exogenous factor that identifies the impact of liquidity. We estimate the extent to which macroeconomic conditions affect the likelihood of making an acquisition, as well as the extent to which the impact of macroeconomic conditions on acquisitions is affected by firms' cash positions. If the purpose of holding cash is to provide liquidity in times when the cost of external finance is high, then we would expect that firms with large cash holdings would be less affected by macroeconomic shocks than firms with less liquid balance sheets.

The results suggest that macroeconomic conditions positively affect the likelihood of making an acquisition. This finding is consistent with the common observation that merger waves tend to be pro-cyclical (Harford (2005)). However, the results also suggest that impact of macroeconomic conditions on firms' acquisition behavior is smaller when firms have larger cash positions. The fact that cash holdings reduce pro-cyclicality suggests that part of the explanation for the cyclicity of merger waves comes from a financing channel. Since it is harder to raise external sources of capital when the economy is not doing well, firms neglect some potential value-increasing acquisitions (and other investments) during economic downturns. Holding cash mitigates this effect and enables firms to make valuable investments during poor times. However, incremental cash comes at the cost of potentially making financing too easy when macroeconomic conditions are strong, which can lead to poor quality acquisitions.

We evaluate the extent to which this result occurs because of the endogeneity of cash and the fact that macroeconomic cycles are partially predictable. We estimate a model predicting macroeconomic conditions and re-estimate our equation predicting acquisitiveness using the unexpected component of GDP growth in a particular country, our measure of macroeconomic conditions. The results are similar to those using the level of GDP growth. In addition, we follow

Fresard (2010) and instrument for cash holdings using two lags of cash holdings as well as the tangibility of the firms' assets, with similar results to those described above.

The view that firms choose liquidity to trade off the agency costs coming from excess liquidity with the benefit of ensuring the ability to invest even in bad times also has predictions about the quality of investments over the business cycle. It suggests that firms will be more prone to overinvest when they have high cash balances, and that more cash will lead to lower quality acquisitions, especially during bull markets. In addition, if firms are credit-rationed during poor financial times, incremental cash will help to alleviate these constraints. If managers would undertake only the most valuable investments in the absence of cash, then additional cash would allow them to take some positive NPV investments that the firm could not finance otherwise. These additional investments, while creating value, are nonetheless worse than the investments that the firm would have taken without the cash on hand. Thus, the incremental effect of cash on investment quality is negative, irrespective of business cycles, despite the fact that the cash enables firms to finance positive NPV investments.

To evaluate this idea, we rely on the market reaction to the announcement of the acquisition, which measures the market's expectation of the value added to the acquiring firm from the deal. For our sample, market reactions tend to be slightly positive, with a mean of 0.77% and a median of 0.29%. In the cross-section, we find that acquirers' announcement returns are, on average, negatively related to the acquirer's cash holdings. These negative returns are consistent with the argument that, when acquirers have more cash, the acquisitions they make tend to be worse.

In addition, acquisition announcement returns are negatively related to macroeconomic conditions. Combined with the result that there is a lower probability of a firm of making an acquisition in worse macroeconomic conditions, this pattern suggests that financing constraints

force firms to be relatively selective during bad economic times, undertaking fewer but higher quality deals. During normal times, firms undertake relatively more deals, but potentially lower quality ones since they are able to raise capital to finance any deal more easily. Overall, the results support the idea that firms view incremental liquidity as insurance against poor states of the world. Higher liquidity allows them to make better investments in bad states but the cost is that they will make worse ones in good states, on average.

The paper combines the ideas in several disparate literatures in corporate finance, including work on the precautionary demand for corporate liquidity, on the effect of free cash flow on firms' investments, and on the impact of macroeconomic conditions on the cost of raising external financing. The literature on the precautionary demand for cash dates to Keynes (1936), who originally proposed that firms can hold cash as a hedge against potential future financial constraints. Opler, Pinkowitz, Stulz, and Williamson (1999) was the first to examine this idea empirically, and started a literature that generally concludes that the precautionary motive is an important determinant of firms' liquidity management decisions.³ This paper contributes to this literature by documenting directly that cash helps enable firms to finance investments during poor macroeconomic times when liquidity is likely to be scarce. While most of the literature on liquidity examines it from an *ex ante* sense by studying the factors that affect firms' choices of liquidity, our paper extends the analysis by looking *ex post* at the way that firms' liquidity choices actually affect their investment decisions at times when it is needed.

³ See Almeida, Campello, and Weisbach (2004), Bates, Kahle, and Stulz (2009), Lins, Servaes, and Tufano (2010), Campello, Giambona, Graham, and Harvey (2011), Hoberg, Phillips, and Prabhala (2014), Morellec, Nikolov and Zucchi (2014), and Lin, Schmid, and Weisbach (2018). Dittmar, Mahrt-Smith, and Servaes (2003), and Kalcheva and Lins (2007) focus on international issues related to cash management. Almeida, Campello, Cunha, and Weisbach (2014) provide a survey of this literature.

Jensen (1986) and Stulz (1990) introduced the notion that liquidity can have a dark side, and that too much liquidity can lead firms to take value-reducing investments. A number of papers have documented that firms with unusually large cash holdings take a number of poor investments, especially acquisitions.⁴ This paper supports the notion that cash can contribute to poor acquisitions in good economic times, since it is relatively easy to raise capital and retained cash becomes superfluous. When economic conditions are strong, firms can more easily raise capital than when economic conditions are weak, so the cash firms have saved historically becomes superfluous, and can be used for value-reducing investments such as poor acquisitions.

Finally, an emerging literature has documented that firms' capital raising decisions differ substantially over the business cycle (see Koraczyk and Levy (2003), Erel, Julio, Kim, and Weisbach (2012), Kahle and Stulz (2013), and Covas and Den Haan (2013)). This literature finds that during booms, even poorly rated firms are able to raise capital through equity or debt issues. However, during poor macroeconomic times, raising capital appears to be much more expensive. During downturns, equity issues are rare and bond issues are restricted to the highest quality issuers. Our paper suggests that because of the high costs of external finance during poor times, firms hold cash to be able to make investments during these poor times without having to raise external financing.

⁴ See Lehn and Poulsen (1989), Lang, Stulz and Walkling (1991), Blanchard, Lopez de Silanes and Shleifer (1994), Harford (1999), Richardson (2006), and Cunha (2015).

2. Sample

2.1. Data Sources

Our sample of firms is taken from the *OSIRIS* database that provides financial information on publicly traded and major unlisted companies.⁵ We require firms to report at least one year of financial information during the fiscal year of 1997 and 2014. We exclude financial firms (US SIC code 6000-6999), as well as firm-years for which the firm has less than 10 employees or total asset less than \$1 million USD. *OSIRIS*'s coverage of firm-level financial information varies widely by country. We restrict our sample to countries with at least 20 firms in every fiscal year to ensure a comprehensive set of firms in each country in our analysis. These sample selection criteria limit our sample to 36 countries.

To identify acquisitions made by the sample firms, we rely on the *Zephyr* database on worldwide mergers and acquisition transactions.⁶ We include all mergers and acquisitions announced between January 1, 1997 and December 31, 2014 and completed as of December 31, 2014. We focus on acquisitions of majority interests in which the acquirer owns less than 50% of the target shares prior to the deal, but more than 50% subsequent to the deal. We additionally exclude buyouts, privatizations, reverse mergers, restructurings, and exits from private equity deals. Finally, we merge the acquisition transactions information in *Zephyr* to the firm-year panel data of *OSIRIS*.

To evaluate the impact of liquidity on firms' decisions to make acquisitions, we wish to estimate the likelihood that a given firm makes an acquisition in a particular year. Our goal is to

⁵ The *OSIRIS* database mainly includes public companies over the world, but major private companies are included in the database if they are subsidiaries of public companies, they have issued a public bond, or they keep reporting financial information after delisting. Thirty-four percent of firms in our sample are private firms with the average total assets of \$1,230 million USD. Our main results are not qualitatively different when we exclude private firms in our sample.

⁶ We rely on *Zephyr* instead of *SDC* because our two databases – *OSIRIS* and *Zephyr*- are provided by the same data provider, *Bureau Van Dyck*, reducing any errors that could potentially come from data merging process.

construct as large a sample of potential acquirers as possible, but only to include firms that realistically could make an acquisition. For this reason, we include all firms into our sample that, according to the *Zephyr* database, make at least one acquisition in our sample period.⁷

One limitation of the *Zephyr* database is that, for about 45% of deals, deal values are not reported. We neither drop these deals nor impose a size criterion for our acquisitions to avoid oversampling larger deals (see the discussion by Netter, Stegemoller, and Wintoki (2011)). We rather focus our filters on firms' decisions on whether to make at least one acquisition in a particular year, regardless of the acquisition's size.⁸ When we pool firms across countries and years, the final sample contains 129,874 firm years, in which 47,378 acquisitions are made.

We organize the sample in two ways, depending on the type of the analysis for which it will be used. First, when estimating the likelihood of acquisitions, we use the firm-year panel data that include 132,257 observations of 12,660 firms in 36 countries from 1997 to 2014. Second, in the analysis of acquirers' cumulative abnormal returns around announcement dates, we organize the sample at the individual deal level. For this second test, we use stock return data from *Datastream* and estimate the acquiring firm's CAR from day -1 to day +1 (CAR [-1,+1]) relative to the acquisition announcement date. Abnormal returns are calculated from the market model estimated from day -260 to day -100 relative to the announcement date with at least 60 days of returns available. When a firm makes multiple acquisition announcements in a short period, we take the first acquisition transaction and drop any other transactions that are announced within 30 days. We additionally include the acquiring firm's return from day -210 to -10 in the regression as

⁷ Thirty-three percent of firms are dropped from the sample because they do not make any acquisitions during our sample period.

⁸ We repeat our main tests using only acquisitions for which we know the valuation, imposing minimum size criteria of \$1 million and \$10 million. The results are similar to those we report.

a control, losing 837 deals from our sample. We end up with using a sample of 33,717 acquisition transactions in 36 countries with cumulative abnormal announcement returns available.

We use annual GDP growth in constant 2015 US dollars obtained from the World Bank to measure country-level macroeconomic conditions. We construct indicator variables for high (low) GDP growth years when we evaluate whether the effect of cash holdings changes across macroeconomic cycles. Because countries have different distributions of GDP growth, to identify abnormal levels of GDP growth rates, we first normalize the GDP growth for each country by subtracting the mean and scaling by the standard deviation. For an observation of GDP growth for a particular country and year, the mean and standard deviation that are used for normalization are estimated from time-series GDP growth rates over the previous 20 years ending two years before the event time (i.e. from $t-23$ to year $t-3$). *High (Low GDP) Growth* is defined as the years when normalized GDP growth rate is in the top (bottom) 20th percentile of the normalized GDP growth distribution of 648 country-year observations. We also use *unexpected GDP growth* in a subset of regressions to address the possibility that firms adjust their cash holdings based on their expectations of economy-wide growth. *Unexpected GDP growth* is measured as the residuals from a model predicting future macroeconomic conditions, using a specification suggested by Barro (2000). These estimates are presented in Appendix Table A1.

Our main measure for corporate liquidity is cash, scaled by the book value of total assets, which has been the literature's standard measure of corporate liquidity since Opler, Pinkowitz, Stulz, and Williamson (1999). The literature has likely focused on this measure of liquidity for two reasons. First, cash normalized by assets is straightforward to measure.⁹ Second, there are

⁹ However, its name is somewhat misleading because for most firms their "cash" holdings actually are an aggregation of a number of different securities, some of which are risky. See Duchin, Gilbert, Harford, and Hrdlicka (2017) for more discussion and a characterization of the "cash" portfolios of typical public firms.

theoretical reasons why cash is the preferred way of managing liquidity. Lines of credit and debt capacity can disappear during poor financial conditions when they are most needed, effectively being used to fund overinvestments in good times rather than efficient investments in poor times (see Acharya, Almeida, and Campello (2007) or Almeida, Campello, Cunha, and Weisbach (2014)).

As firm-level control variables, we use firm size, profitability, and sales growth, all of which are taken from *OSIRIS*. At the deal level, we construct indicator variables for public targets, cross-border deals and related-industry deals from *Zephyr*. To minimize the effect of outliers, we winsorize cash, profitability, and sales growth variables, and trim CARs.¹⁰ Detailed definitions for all variables are provided in Appendix A.

2.2. Sample Description

Table 1 summarizes the distribution of our sample of firms and acquisition transactions. Panel A presents the way in which the sample changes over the sample period. It begins in 1997 with 4,002 firms in 17 countries. The sample increases to 36 countries and more than 8,000 firms for most of the sample period. The “Acquisition Rate”, which is the fraction of sample firms making at least one acquisition, varies from 16.0% to 30.8%, with an average of 24% per year. In addition, the last column shows the mean for one-year lagged GDP growth rates of 36 countries by fiscal year. There is a substantial year-to-year variation in average GDP growth rates over time, from a high of 4.8% in 2007 to a low of -0.7% following the financial crisis in 2010.

Panel B of Table 1 breaks down the sample by country. Countries range in size from Columbia, with an average of 7 firms per year, to the United States, with over 2,600 firms per year.

¹⁰ Cash is winsorized at the top and bottom 1% of the distribution. After examining the outliers, profitability is winsorized at the top 1% and bottom 5%, and sales growth at the top 5% and bottom 1%. Because of the extreme outliers, CARs are trimmed at the top and bottom 1% of the distribution.

The acquisition rate varies substantially across countries as well, from a low of Hong Kong with an acquisition rate of 11.5%, to a high of Netherlands, in which firms make acquisitions in 35.5% of years. The large difference in acquisition rates could reflect a number of factors, including legal or cultural obstacles to acquisitions, or differences in reporting requirements, across countries that affect the likelihood that we can observe a given acquisition, so that it makes it into our sample. Regardless of the reason why they occur, these differences strongly suggest that it is important to control for country specific factors in any equations of acquisition rates.

In addition, there is substantial variation in economic growth rates across countries. China has the largest average growth rate, with an average of 10.2% while Italy has the smallest, with a growth rate of 0.5%. Even within countries, GDP growth rates change over time at different rates, with the standard deviation of GDP growth equal to 0.8% in Australia and 4.2% in Ireland.

Table 2 summarizes the characteristics of the acquirers in our sample. Since our focus is on the factors that lead to acquisitions, we compare the characteristics of firms in acquisition years to those in non-acquisition years. These comparisons between acquisition years and non-acquisition years include both cross-sectional differences in the likelihoods that different firms will make acquisitions, and differences over time in the likelihood of a particular firm doing an acquisition.

Table 2 indicates that there are stark differences between acquirers and non-acquirers. Acquirers have about 50% larger total book assets. In addition, acquirers tend to be more profitable and have higher sales growth. However, the differences in cash holdings, while statistically significant, are small. In addition, there is no noticeable difference in GDP growth rates between acquirers and non-acquirers' countries. This pattern could reflect the fact that some firms in developed countries like the U.S. and the U.K., which compose 45% of the sample firms, have

relatively low GDP growth rates but a large number of acquisitions. To account for the different level and volatility of GDP growth rates by country, we compare the difference in normalized GDP growth rates between acquirers and non-acquirers. We find that acquisitions tend to occur when the GDP growth, normalized by the historical mean and standard deviation, is higher than usual and when unexpected GDP growth is high.

3. Estimating the Effects of Liquidity and Macroeconomic Conditions on Acquisition Likelihoods

3.1. Specification

Using this sample of firms and acquisitions, we estimate the likelihood that a firm makes an acquisition in a particular year. Because we include interaction terms in some specifications and there are well-known problems interpreting interacted coefficients in probit or logit specifications (Ai and Norton (2003)), we estimate the equation using a linear probability model. As our independent variable, we use our measure of corporate liquidity, a firm's cash holdings normalized by its assets.

An important consideration in designing an empirical specification to understand acquisition decisions is the substantial cross-firm differences in both firms' propensities to hold cash and their likelihood to make acquisitions. As documented in Panel B of Table 1, firms' cash holdings vary noticeably across countries, as do the fraction of firms that make acquisitions. There are a number of reasons for why such cross-country variation could exist, including tax, regulatory and cultural factors. In addition to cross-country factors, there are firm-specific factors that affect firms' cash holdings (see Opler, Pinkowitz, Stulz, and Williamson (1999)). Because of the importance of firm and country specific factors that affect both cash holdings and acquisitiveness, we include firm-specific fixed effects into the specification. Consequently, our results should be

interpreted as estimates of the effect of additional cash on a particular firm's acquisition decisions, rather than on cross-firm differences.¹¹

We also wish to control for other factors that potentially affect the likelihood that firms make acquisitions. Larger firms generally have better access to capital and more synergies with potential targets, both of which make it more likely to make acquisitions. For this reason, we include $\ln(\text{Assets})$ and $\ln(\text{Assets})^2$ into the specification. In addition, more profitable firms and ones that have been growing recently are more likely to make deals, so we also include *Profitability* and *Sales Growth* in the equation. Finally, in a number of specifications, we include measures of one-year lagged macroeconomic conditions in the acquirer's home country; when these variables are not included, we add year fixed effects to the equation to control for any potential omitted factors that vary over time.

3.2. Estimates of Factors Affecting Acquisitiveness

3.2.1. The Effect of Cash

We present estimates for the effect of additional cash on acquisition likelihoods in Column 1 of Table 3. The statistically significant coefficient of 0.276 on *Cash* means that the likelihood of an acquisition increases with additional cash. Since the standard deviation of cash holdings is 0.14 (see Table 2), this equation implies that a one standard deviation increase in cash holdings leads to about a 3.86 percentage point increase in the likelihood of an acquisition. Given the average acquisition rate of 24%, this increase corresponds to about a 16.2% increase in the acquisition rate.

This finding replicates a well-known result from Harford (1999), who estimates similar equations on large US corporations between 1977 and 1993. Our sample period begins in 1997, after Harford's ends, is from 36 countries and contains smaller as well as private acquirers. Our

¹¹ Our main results hold when we use alternative specifications that include country and industry fixed effects rather than firm fixed effects.

sample, therefore, is both non-overlapping and very different in makeup from Harford's. The fact that cash holdings predict acquisition likelihoods in such different samples suggests that the pattern is robust, and reflects the way that additional cash is associated with higher acquisition rates for all types of firms.

The causal interpretation of this finding is that having more cash allows firms to make more acquisitions. If financial conditions are strong, this effect could lead to a free cash flow problem, and provide capital for managers to undertake acquisitions that shareholders would prefer them not to undertake. If financial markets are weak and it is costly for firms to raise capital, managers can use cash on the balance sheet to finance valuable investments at times when accessing external capital markets would be difficult.

3.2.2. Macroeconomic Conditions

A potential approach to identify the effect of cash on acquisitions comes from the insight that while the quantity of cash that firms hold is under their control, the value of their cash holdings is not. As Keynes (1936) originally noted, if financial markets allowed firms to transact costlessly at assets' fundamental values, then there would be no reason for firms to hold cash. When macroeconomic conditions are strong, financial markets tend to work well. In good times, therefore, cash becomes less important since financial markets approach Keynes' benchmark in which transactions costs are negligible. However, when the economy is weak, it becomes harder to raise capital externally through financial markets, and transactions costs tend to be higher.¹² Consequently, cash becomes more valuable in bad economic times than in good times. We use this idea to identify the effect of firms' cash holdings on their acquisition decisions.

¹² See Erel, Julio, Kim, and Weisbach (2012) for evidence about the way in which firms' capital raising varies over the business cycle. A related literature has argued that cash is more valuable for constrained firms than for unconstrained ones (see Denis and Sibilkov (2011) and the references therein).

To estimate the direct impact of macroeconomic conditions on acquisition activity, we include the GDP growth in the acquirer's country to the equation reported in Column 1 of Table 3. Because of the international nature of the sample, there is substantially more variation in this variable than there would be if the data were only from one country, since macroeconomic conditions are not perfectly correlated across countries. The estimates indicate that GDP growth positively affects the likelihood that a firm makes an acquisition in a particular year even after controlling for a firm's cash holdings. The coefficient on GDP growth of 0.338 implies that a one standard-deviation increase in *GDP Growth* (0.027) leads to about a one percentage point increase in the likelihood a potential acquirer makes an acquisition. This finding is consistent with the prior literature documenting the pro-cyclicality of acquisitions (Harford (2005), Netter, Stegemoller, and Wintoki (2011)).

3.2.3. Interactions of Cash and Macroeconomic Conditions

We next analyze the interaction of macroeconomic conditions with the effect of cash holdings on acquisitions. Under the causal interpretation, we expect cash holdings to have a larger effect on acquisition likelihoods during poor times than during normal times, since cash holdings will serve to mitigate the impact of financial constraints. Econometrically, in the equation estimating acquisition likelihoods, we expect to observe a negative effect on the interaction between macroeconomic conditions and cash holdings. If incremental cash increases the likelihood of a firm making an acquisition, the extent to which it does should vary counter-cyclically.

In Column 2 of Table 3, we present estimates in which we add *GDP Growth* interacted with *Cash* to the prior specification. The estimated coefficient on this variable is -1.694, which is statistically significantly different from zero. This negative coefficient suggests that the effect of cash on acquisitions is countercyclical. Cash holdings appear to affect acquisition likelihoods more

when the economy is doing poorly, consistent with the notion that its value is higher when the economy is doing poorly and the cost of accessing external capital markets is high.

As an alternative specification, we measure macroeconomic conditions using the indicator variables, *High GDP Growth* and *Low GDP Growth* that indicate whether the GDP is substantially higher or lower than its historical average. The estimated coefficient on *High (Low) GDP Growth* in Column 3 of Table 3 implies that in unusually good (bad) periods of growth, the annual likelihood of an acquisition increases (decreases) by 2.7 (2.2) percentage points. In Column 4 of Table 3, we include interactions of each *High/Low GDP Growth* indicator variable with firms' cash holdings. Similar to the results in Column 2 using GDP growth, cash appears to affect acquisitions more during periods of extreme low growth.¹³ While these periods contain fewer acquisitions, the effect of cash holdings mitigates this effect, presumably by allowing firms to make acquisitions that they could not have financed if they had to access external capital markets.

3.3. Endogeneity of Acquiring Firms' Cash Holdings

A possible alternative interpretation of the results is that the observed relation between cash and acquisitions reflects firms accumulating cash when their managers think it is likely that future acquisitions will occur. In other words, acquisitions could occur following cash accumulation not because the acquiring firms' cash affects their financing policies, but because the cash is accumulated to pay for acquisitions that are likely to occur in the near future. Cash holdings could change because of expectations about future demand for capital to finance acquisitions and could result from either economy-wide or firm-specific factors. Since macroeconomic conditions are partially predictable, firms will adjust their cash holdings based on their expectation of future

¹³ One standard-deviation increase in cash holdings (0.14) reduces the adverse effect of low GDP growth period on the acquisition rate by 40% ($0.097 \times 0.14 / 0.034$), which is statistically significant at the 1% level. However, it reduces the impact of high growth period by only 16% ($0.035 \times 0.14 / 0.031$), which is not statistically significant.

macroeconomic conditions. In addition, managers will adjust their firms' cash holdings based on their expectations of their firms' investment opportunities. Each of these channels could lead to a spurious relation between firms' cash and their investments.

3.3.1. *Unanticipated Macroeconomic Growth*

We address the possibility that firms adjust their cash holdings based on their expectations of economy-wide growth by estimating a model predicting future macroeconomic conditions. We use a specification suggested by Barro (2000) and present these estimates in Appendix Table A1. We use the residuals of this regression as a measure of unexpected GDP Growth and examine the way cash mitigates the effect of unexpected macroeconomic conditions.

In Column 5 of Table 3, we include *Unexpected GDP Growth* into the equation predicting the likelihood of an acquisition. The coefficient on *Unexpected GDP Growth* of 0.415 is statically significantly different from zero, but not statistically or meaningfully different from the coefficient of 0.338 on *GDP growth* in Column 1 of Table 3. In Column 6 of Table 3, we also include interaction of *Unexpected GDP Growth* with *Cash*. The estimated coefficient on *Unexpected GDP Growth* is 0.665 and on the interaction term is -1.933. These coefficients are similar to those in Column 2 that use *GDP Growth*, suggesting that the results from the prior equations do not occur because of firms altering their cash holdings depending on their expectations of macroeconomic conditions.

3.3.2. *Instrumental Variables Estimates*

If the factors affecting firms' investment opportunities are a function of firm-specific rather than macroeconomic factors, it is impossible for an outsider to gauge managers' expectations of future investments. Consequently, one cannot tell if a correlation between cash holdings and firms' investments is causal, or a result of firms changing both cash and investments as a function of

investment opportunities. However, if deviations in cash from historical levels reflect expectations about future investments, then Fresard (2010) argues that lagged cash levels would be a valid instrument for cash today. Lagged cash levels presumably reflect the amount of cash a firm holds in normal times, but not information about investment opportunities today. We follow Fresard (2010) and use two lags of cash as well as the firm's asset tangibility, which is likely to affect a firm's ability to raise debt, as instruments for cash.

Table 4 presents instrumental variables estimates of the equations predicting acquisitiveness. The first stage equation (predicting cash levels) is in Column 4. Both lags of cash and the level of asset tangibility are positively and statistically significantly related to current cash levels. The other columns of the table replicate the specifications from Columns 2, 4, and 6 from Table 3, except that they instrument for cash. In each column, the coefficients are similar to the corresponding OLS estimates. Therefore, it appears that endogeneity of cash holdings is not an important consideration in the relation between cash holdings, macroeconomic conditions, and a firm's propensity to make acquisitions.

4. Interpreting the Patterns of Corporate Liquidity over the Business Cycle

4.1. The Method of Payment

The results presented in Tables 3 and 4 suggest that holding liquidity can play a role in facilitating acquisitions and presumably other investments during poor financial times. In particular, the finding that higher cash levels mitigate the cyclicalities of acquisition likelihoods suggests that firms use incremental cash to pay for incremental acquisitions. An implication of this interpretation is that higher cash holdings should affect the likelihood of cash-financed acquisitions in poor financial times but should not affect the likelihood of stock-financed acquisitions. To test

this hypothesis, we estimate multinomial logit equations, in which the dependent variable varies depending on whether the firm makes an acquisition using cash to finance it, makes an acquisition using stock to pay for it, or does not make an acquisition at all in a given year.¹⁴ We present these estimates in Table 5.

The estimates indicate that cash-financed acquisitions are strongly pro-cyclical while the likelihood of stock-financed acquisitions does not vary with the business cycle. This finding holds in each specification, using GDP Growth itself as a measure of macroeconomic conditions (Columns 1-2), the dummy variables indicating whether GDP growth was high or low (Columns 3-4), and our estimate of unexpected GDP Growth (Columns 5-6). Moreover, the effect of cash holdings clearly depends on the method of payment. Cash holdings tend to mitigate the cyclicity of cash-financed acquisitions, and have no effect on the impact of macroeconomic conditions on the likelihood of stock-financed acquisitions.

4.2. The Cost of Financing

Presumably, the reason why cash holdings mitigate the effect of macroeconomic conditions on acquisition likelihoods is because of the impact of macroeconomic conditions on the cost of financing the acquisitions. If interest rates increase during poor macroeconomic times, then the cost of financing increases, leading firms to be less likely to make acquisitions. However, if firms can avoid raising external capital by financing deals through their cash holdings, then acquisition policies should be less affected by macroeconomic conditions.

This argument is predicated on the assumption that borrowing rates do in fact vary with macroeconomic conditions. To evaluate this assumption, we estimate equations predicting bank

¹⁴ If a firm makes multiple acquisitions in a year using both methods of payment, we consider this firm-year to be in the “stock” category. The results are similar if we classify these observations in the “cash” category. 1.8% of firm-year observations are categorized as stock-financed acquisitions, while 22% of firm-year observations as cash-financed acquisitions.

lending rates as a function of GDP growth for the sample of the countries in which our sample is based.¹⁵ Estimates of these equations are presented in Appendix Table A2. In each specification, *GDP Growth* (or *Unexpected GDP Growth*) is negatively related to bank lending rates.

The effect is illustrated in Figure 1, which plots the relation between GDP Growth and bank lending rates for the U.S. and the U.K. For each country, consistent with the estimates presented in Appendix Table A2, the two variables are negatively related to one another. This pattern is consistent with the notion that during poor macroeconomic times, cash holdings can facilitate acquisition financing so that they do not have to raise external financing when rates are high.

4.3. Constrained vs. Unconstrained Firms

The argument that the value of cash varies over the business cycle depends on the idea that macroeconomic conditions affect firms' abilities to access capital markets. However, the impact of macroeconomic conditions on firms' access to capital varies substantially across firms. For example, Erel, Julio, Kim, and Weisbach (2012) find that poorly rated firms decrease capital raising substantially during market downturns, but highly rated firms actually increase capital raising during these periods. Therefore, we expect cash to have a larger impact on the acquisition decisions of lower-rated or non-rated firms during market downturns than on those of highly rated firms.

In Table 6, we re-estimate the equations from Table 3 on the subsamples of investment grade public firms, on public firms with either a speculative rating or no rating, and on private firms.¹⁶ The results suggest that while more cash affects all firms' acquisition likelihoods similarly,

¹⁵ The dependent variable is the bank rate for short and medium term financing to the private sector provided by the IMF. The sample covers 35 countries (all our sample countries except Norway) for the period 1997-2014.

¹⁶ Ratings are taken from *S&P Issuer Ratings* as of the time of the potential acquisition. We obtain these ratings from *Capital IQ*.

the impact of macroeconomic conditions is different among the three groups. In the estimates in Columns 1-3 using investment grade public firms, the effect of GDP growth on the likelihood of making an acquisition varies across specifications, with it being small and insignificant using *GDP Growth* or *Unexpected GDP Growth*. However, using the indicator variable specification in Column 2, the *High GDP Growth* indicator variable significantly increases acquisition likelihoods. In addition, the interaction of the *High GDP Growth* indicator and cash is negative and significant.¹⁷

In contrast, in the estimates using the subsamples of speculative and unrated public firms and private firms, *GDP Growth* and *Unexpected GDP Growth* are strongly positively related to the likelihood of an acquisition. For these firms, which are likely to be relatively financially constrained, the effect of *GDP growth* and *unexpected GDP growth* on the likelihood of an acquisition is mitigated to some extent if the firm has more cash. The coefficient on the interaction term between GDP growth and cash holdings is negative and statistically significant at the 1% level. The clear interpretation of this finding is that when the economic conditions are poor, public firms without an investment grade rating and private firms have a difficult time raising capital so they are unlikely to make acquisitions. However, if these firms have more cash, then their acquisition decisions become less sensitive to macroeconomic conditions since they can finance acquisitions through their cash holdings during downturns.

In Columns 5 and 8, we present estimates of the specification using the indicator variables to indicate particularly unusually high and low GDP growth rates for these two subsamples. Higher cash lowers the macroeconomic effect during unusually bad periods for growth since the coefficients on the interaction of *Cash* with *Low GDP Growth* are positive and statistically

¹⁷ The results in Column 2 are somewhat puzzling, with the interactions between cash and both the high growth and low growth indicator variables each decreasing acquisition likelihoods.

significant. In contrast, the coefficients on the interaction of *Cash* with *High GDP Growth* are insignificant. These findings support the causal interpretation of our results, in which firms with limited access to capital markets are less likely to make acquisitions during poor macroeconomic conditions because of a lack of access to external financial markets. However, holding more cash can mitigate this effect and provide financing for firms to make potentially valuable acquisitions regardless of the financial conditions they face.

5. Quality of Acquisitions

The causal interpretation of the results presented above is that additional cash eases financing constraints and allows firms to make value-increasing investments. The ability to make value-increasing investments is particularly important when macroeconomic conditions are poor and financial markets are relatively costly to access. However, when times are good and firms can raise capital easily in the financial markets, excess cash becomes superfluous and could even be harmful by exacerbating free cash flow problems.

The results we have presented so far concern the way in which the quantity of acquisitions varies with firms' cash holdings and business cycles. The view that cash holdings can affect firms' investments by relaxing financing constraints also has predictions for the quality of acquisitions we observe. If firms are capital-rationed during periods of poor macroeconomic conditions, then we expect them to undertake only the highest quality acquisitions and ignore some positive NPV ones. Therefore, during poor periods of macroeconomic conditions, while we expect there to be fewer deals, the ones that do occur should be of higher quality than those observed in better economic times. If firms are not capital constrained during poor macroeconomic conditions, additional cash allows firms to undertake some of the deals that would have been otherwise

forsaken, which are likely to be positive NPV but less valuable than the ones that would be taken with the capital constraints. Consequently, we expect to observe that, under poor macroeconomic conditions, higher cash holdings will be associated with lower quality acquisitions.

Similarly, in normal times, we expect that firms will be able to finance relatively more, if not all, valuable acquisitions. However, the increased access to finance in good times potentially will lead firms to overinvest and to undertake poor quality acquisitions in addition to good ones. Therefore, we expect acquisitions made during normal economic times to be lower quality than average. More cash potentially exacerbates this problem since it allows firms to make acquisitions without having to raise external capital.

5.1. Announcement Return Variation Across Cash Holdings and Macroeconomic Conditions

Measuring the success of acquisitions is difficult to do *ex post*, since target firms are integrated into acquirers, and one cannot separately identify the change in the performance of the acquired firm. For this reason, it has become standard at least since Jensen and Ruback (1983) to measure an acquisition's performance by the acquirer's abnormal stock movements around the time of the announcement of the deal. The average cumulative abnormal return (CAR) around the time of the acquisition is about 0.77%, regardless of whether we measure the returns in the 3 days around the announcement or the 5 days around the announcement. This small positive announcement return is similar to that reported by other studies that use samples similar to ours.¹⁸ The positive acquirer's CAR reflects the fact that the majority of our CAR sample is the acquisition of private targets (93%) and acquirer CARs for acquisitions of private targets tend to be positive (see Fuller, Netter, and Stegemoller (2002)).

¹⁸ See Table 6 of Betton, Eckbo, and Thorburn (2008) for a summary of the announcement day abnormal returns found by a number of merger studies.

To evaluate the extent to which cash holdings and macroeconomic factors affect announcement day abnormal returns, we estimate equations predicting these abnormal returns. In addition to *Acquirer Cash* and the variables indicating the macroeconomic conditions, we include a number of variables that also potentially affect announcement returns. In particular, our equation contains: *Acquirer Ln(Assets)*, *Acquirer Ln(Assets)²*, *Acquirer Profitability*, *Acquirer Sales Growth*, the indicator variables indicating whether the deal was for a public target, cross border or related industry, as well as the return for the period prior to the deal (from trading days -210 to -10 relative to the announcement day). In addition, we include country, year and industry fixed effects into the specification.¹⁹

In Column 1 of Table 7, we present estimates of the way that acquirer CARs vary with the acquiring firm's cash holdings, using *GDP Growth* as our measure of macroeconomic conditions. The estimated coefficient on cash holdings is negative and statistically significantly different from zero. Like the earlier finding on the relation between cash holdings and the likelihood of an acquisition, this finding replicates a similar finding in Harford (1999) on a much larger and non-overlapping sample. The estimated coefficient on GDP growth is also negative and statistically significantly different from zero. In Columns 3 and 5, we replace *GDP Growth* with the other measures of macroeconomic conditions used above, with similar results.

The finding that cash is negatively related to announcement abnormal returns is consistent with both effects of liquidity. During normal times, cash lowers returns by facilitating negative

¹⁹ Previous studies document that the relative size of the target firms would affect the acquisition announcements effects (e.g. Asquith, Bruner, and Mullins (1983), Travlos (1987), and Moeller, Schlingemann, and Stulz. (2004)). When we additionally control for the relative transaction value to acquirer's total assets in the regressions, we find the consistent results. Since in these equations, about 45% of the deals are dropped because of the missing transaction values, we do not include the relative target size as a control in our main regressions. Results are available upon request.

NPV acquisitions and making the free cash flow problem worse. However, in bad times, it lowers the financing constraints firms face, enabling them to take more positive NPV, but less valuable, acquisitions. The results on GDP growth are consistent with this interpretation, which suggests that regardless of the incremental effect of cash, the abnormal returns tend to be higher in worse markets because during poor macroeconomic conditions, firms only make the most profitable acquisitions.

An additional potential implication of this argument is that the incremental effect of cash on acquisitions' quality should be greater during recessions than during boom times. During recessions, a capital rationed firm potentially cannot undertake very valuable investments. And during boom times, incremental acquisitions occurring because of extra cash would be only marginal —i.e., somewhat worse than the very best acquisitions a capital-rationed firm would make. This argument implies that the effect of an additional dollar of cash on acquisition quality should be higher in recessions than in boom times. In other words, we conjecture that cash holdings provide valuable liquidity that enables firms to make acquisitions during poor macroeconomic times but do so at the cost of providing too much liquidity during good times. Therefore, one would expect that the quality of the marginal acquisition undertaken because of higher cash holdings during good times will be lower than the quality of the marginal acquisition undertaken because of high cash holdings during bad times.

To evaluate this implication, we include an interaction term between the acquirer's cash and GDP growth into the equation and present the estimates in Columns 2, 4 and 6 of Table 7. The coefficient estimate on the interaction term between *Acquirer Cash* and *GDP Growth* is negative in each specification. However, the estimated coefficient is not statistically significantly different

from zero. In addition, its inclusion reduces the coefficient estimates and statistical significance of the coefficients on acquirer cash and GDP growth.

5.2. Acquisition Announcement Date Returns Across Countries

Throughout this paper we have developed the idea that the effect of cash holdings on investment depends on external financing conditions. Thus, it is likely to be particularly relevant in countries with less developed capital markets. In these countries, firms are less likely to be able to raise external capital in all circumstances, and the impact of economic downturns on capital-raising is likely to be relatively severe. Consequently, the role of cash in relieving constraints is potentially more important in countries with less developed capital markets, so that the valuation consequences on the deals that do get consummated is likely to be greater in these countries.

To examine the effect of capital market development on the importance of cash holdings in ensuring corporate liquidity, we re-estimate the equations reported in Table 7 across subsamples in which the importance of cash holdings in financing investments are likely to be differentially important. In particular, we sort the countries by GDP per capita and the ratio of Bank Credit to GDP. A country is defined as *High (Low) GDP per capita* in a specific year if its real GDP per capita is in the top tercile (bottom two terciles) among the 36 countries over the period from 1996 to 2013. A country is defined as *High (Low) Bank Credit* in a specific year if its ratio of private credit to GDP is in the top tercile (bottom two terciles) among the 36 countries over the period from 1996 to 2013.

Table 8 presents the results of the regression for these subsamples. The striking observation from Table 8 is the negative and mostly significant coefficients on the interaction between cash holdings and the GDP Growth variables for the *Low GDP per capita* and *Low Bank Credit* countries. In contrast, the coefficients are positive (but not significant) for the *High GDP per capita*

and *High Bank Credit* countries. This negative coefficient implies that when macroeconomic conditions are poor, firms with more cash are able to take value-increasing acquisitions in these countries. Holding cash enables firms in countries with less developed capital markets to avoid having to rely on these capital markets in poor economic times to make valuable investments.

6. Summary and Discussion

When financial managers make decisions about the liquidity of their balance sheets, an important factor they consider is the possibility of shocks to their firms' cost of raising external capital that could affect future investment decisions. Higher liquidity, which usually comes in the form of cash holdings, increases the ability of firms to invest without having to raise capital from the external capital markets. However, it comes at the cost of exacerbating agency problems, potentially leading to overinvestment. Since an important source of shocks to financial markets are changes in macroeconomic conditions, an important role of corporate liquidity is to enable firms to invest efficiently at different parts of the business cycle. This paper provides evidence on the impact of liquidity management decisions by measuring the way that firms' investments respond to macroeconomic shocks as a function of the quantity of cash that they have on their balance sheets.

Using a sample of 12,660 firms from 36 countries between 1997 and 2014, we estimate the likelihood that our sample firms make at least one acquisition in a particular year. Consistent with the notion that mergers tend to follow pro-cyclical waves, we find that the likelihood of an acquisition increases with the GDP growth in the country where a firm is located. However, as firms' cash holdings increase, this effect becomes smaller, suggesting that higher cash holdings mitigate the effect of business cycles on firms' acquisitiveness. Larger cash holdings appear to

enable firms to make valuable acquisitions when they are available, even if there is a recession that increases the cost of external finance. This effect does not appear to occur because of the endogeneity of cash holdings. This relation between cash holdings, acquisitions and macroeconomic conditions is driven by cash-financed rather than stock-financed acquisitions, and is largest in public firms with speculative or no rating and private firms, for which capital market downturns have the largest impact on the cost of external financing.

We also consider the way that the abnormal returns on the announcements of these acquisitions vary with both cash holdings and macroeconomic conditions. Our estimates indicate that abnormal returns are negatively related to the country's GDP growth, so they are higher during market downturns than when the economy is doing well. This result is consistent with the view that when times are good, firms can raise capital and potentially overinvest. However, when times are bad, capital is rationed so the only deals that get done are the most profitable ones. In addition, more cash is associated with lower abnormal returns, suggesting that a more liquid balance sheet eases capital rationing during bad times but worsens free cash flow problems during good times. Overall, the abnormal return results are consistent with the estimates of the equations predicting acquisition likelihoods; they suggest that cash holdings provide valuable liquidity that enables firms to make acquisitions during poor macroeconomic conditions but do so at the cost of providing too much liquidity during good conditions.

The results in this paper have implications for our understanding of both corporate liquidity and the determinants of mergers and acquisitions. Much of the prior literature on liquidity focuses on the level of cash holdings, which serve as a hedge against potential financial shocks. This literature generally takes an *ex ante* perspective on liquidity management in that it considers the way firms choose their liquidity prior to any potential shocks. We extend this literature by using

an *ex post* approach in which we examine the way in which liquidity affects firms once the shocks have occurred. Subsequent to shocks to firms' financial conditions, differences in cash positions have a meaningful impact on firms' abilities to invest.

Firms decide to hold cash to ensure that they can invest efficiently, even at times when the cost of accessing external financial markets is extremely high. We provide evidence suggesting that liquidity does have this effect, as firms with higher liquidity appear to be less affected by market downturns in their investment decision. The cost of doing so is that cash can facilitate unprofitable acquisitions during other times.

A number of questions remain. While we focus our analysis on acquisitions, it is not clear whether cash holdings affect other types of investments during market downturns? Do other forms of liquidity such as lines of credit affect investments over the business cycle in the same manner as cash holdings? Can we identify if firms on average have the optimal level of cash, or if it is too high or too low in most firms? Finally, for a typical firm, does incremental cash add or destroy value? The 2008 Financial Crisis has stimulated research into some of these questions (see, for example, Duchin, Ozbas and Sensoy (2010) and Campello, Giambona, Graham and Harvey (2011, 2012)). Nonetheless, there is much more to be done, and the answers to these and other related questions would be excellent topics for future research.

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