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The effects of bank capital constraints on post-acquisition performance

Chris Brune · Kevin Lee · Scott Miller

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Abstract Researchers have shown that capital constrained firms make better acquisition decisions. However, the literature on bank mergers and acquisitions is silent on this issue. We investigate whether banks constrained by capital requirements make better acquisition decisions than non-constrained banks. We also examine the characteristics of acquisitions to identify the determinants of positive post-acquisition performance. While there are few capital constrained banks that make acquisitions, those that do demonstrate better post-acquisition performance than their non-constrained counterparts. On average, capital constrained banks pay a lower premium for their target and favor cash over equity financing. We also find that capital constrained banks improve their capital ratios in the years after the acquisition. We employ two-way clustered error regressions using alternative definitions of capital constraint. We also provide a matched pair analysis to confirm that our results are robust.

Keywords Banks · Bank Mergers · Acquisitions · Capital Constraints · Reserve Requirements

JEL Classification G21 · G28 · G34

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1 Introduction

The recent financial crisis has generated numerous questions about the financial stability of the U.S. banking system. Some have focused on the loan production process, from underwriting requirements to the securitization of mortgages. Others have pointed to the proprietary trading activities of banks, and in some cases, the use of credit default swaps and other forms of derivatives. However, few topics are more central to a discussion of banking system stability than capital reserve requirements.

Reserve requirements enable a bank to meet the withdrawal requests of depositors. A bank that holds a high level of reserves is in a better position to meet depositor demands and is therefore more financially stable. Liquidity risk is reduced, but so is the potential return: if a bank is required to maintain significant reserves, it has fewer funds available for issuing loans. A mandatory reserve requirement therefore can act as a type of constraint that may artificially limit the loan production of a bank.[1]

However, in light of the recent crisis, some have advocated raising capital requirements. In a recent interview, Eugene Fama advocated a dramatic increase in capital requirements, to as much as 40 or 50 %.[2] Such a dramatic increase would have an obvious impact on the lending capabilities of banks, but how would other bank activities be affected? Would banks modify their trading behavior or alter their approach to capital investment? What affect would an increase in reserve requirements have on the trend toward consolidation in the banking industry?

While the complete answers to these questions are beyond the scope of this paper, we examine the relationship between capital constraints and the wealth effects of bank acquisitions. Specifically, we analyze the post-acquisition performance of 348 acquirers involved in transactions between 1990 and 2008. In doing so, we find that capital-constrained banks outperformed non-constrained banks. Our results suggest that capital constraints do not prevent a bank from engaging in a successful acquisition; instead, they may actually result in better acquisition decisions. Furthermore, to the extent that capital requirements act as a type of constraint, an increase in the mandatory level of reserves would not appear to negatively affect a change in post-acquisition bank performance.

Our interest in the relationship between capital constraints and bank acquisitions has received little, if any, attention in the literature. However, there are other well-developed streams of research that have provided ample inspiration. In Section 2, we begin with a glimpse into the role of general financial constraints on investment decisions made by firms. Given that an acquisition is a unique form of capital investment, we then consider the firm acquisition literature, especially the subset that considers large cash holdings at the time of the acquisition. Finally, we make the jump from firm acquisitions and shift the focus to pertinent bank acquisition literature. Section 3 outlines the data and methodology. Section 4 offers our primary results. We conclude in Section 5.

[1] See Peek and Rosengren (1997) for a discussion of capitalization requirements as a safeguard against financial insolvency.

[2] CNBC, May 28, 2010. http://www.cnbc.com/id/15840232/?video=1506628338&play=1

2 Literature review

To study the effects of capital constraints on bank acquisition decisions, it is helpful to begin with a broad understanding of the role of general financial constraints on non-bank firms. Fazzari et al. (1988) address the impact of financial constraints on corporate investment. If external capital cannot be obtained, the firm must rely on internal sources and any investment decisions become increasingly sensitive to cash flow. They conclude that external constraints influence investment spending. However, Kaplan and Zingales (1997) offer contrasting evidence: in their analysis, firms that are less constrained demonstrate more sensitivity to cash flow, which leads them to question whether cash-flow sensitivity is a fair measure of financial constraint. Moyen (2004) provides a potential explanation of the conflicting results by creating separate models for constrained and unconstrained firms: she finds that the apparent contradiction disappears with various definitions of constraint. Almeida et al. (2004) offer yet another alternative approach and present evidence of higher cash savings for constrained firms, which again points to a relationship between constraints and cash flow sensitivity.

Denis and Sibilkov (2010) extend the discussion as they examine why constrained firms may value cash holdings more than non-constrained firms. They show a greater increase in firm value after investment for constrained firms. They conclude that constrained firms value cash holdings because they offer greater potential gains than costly external financing. These results are somewhat inconsistent with Alshwer et al. (2011), who link financial constraints to the form of payment in mergers and find that constrained firms are more likely to use stock.[3] The apparent contradiction between Denis and Sibilikov and Alshwer, Sibilkov and Zaiats highlights an important consideration: the effects of constrained firm *investment* decisions may not fully represent the effects of constrained firm *acquisition* decisions.

To address additional issues relevant to acquisitions, we also highlight key points from the varied and well-developed literature on firm mergers and acquisitions. In the broader literature, topics range from post-acquisition corporate performance[4] to market efficiency implications[5] to differences between domestic and cross-border acquisitions.[6] Other studies have focused on the nature of the transactions, particularly as they relate to the transaction type and the form of payment made by the acquiring firm.

The form of payment is of particular interest in this study. Because firms are in a unique position to assess the true value of their stock, they are more likely to issue shares when the stock is overvalued (Myers and Majluf 1984). It follows that the current valuation of the stock price will influence whether an acquirer will fund an acquisition through cash or stock.

[3] Interestingly, this may also support another finding of Denis and Sibilikov, who note that constrained firms may not maintain a large cash position because of a lack of cash flow.

[4] See Caves (1989) for a survey of the conflicting evidence surrounding positive event-study stock performance and ex-post corporate performance.

[5] See Franks et al. (1991) and Agrawal et al. (1992), among others

[6] See Moeller and Schlingemann (2005), Aw and Chatterjee (2004), and Eckbo and Thorburn (2000), among others

Travlos (1987) tests this conjecture empirically and finds significant differences in abnormal returns between acquisitions funded with cash and those funded with stock. Loughran and Vijh (1997) further support this distinction in their matched-sample of 947 acquisitions between 1970 and 1989. Their results show significantly lower ex-post returns for stock-based acquisitions and significantly higher ex-post returns for acquisitions funded with cash.

Yet while a cash (as opposed to stock) acquisition may lead to better returns, having too much cash prior to an acquisition is value decreasing. Harford (1999) follows Lang et al. (1991) in linking Jensen's (1986) free cash flow hypothesis to acquisitions. As managers accumulate cash, they may look to make investments that are not optimal for shareholders in order to reduce personal risk. Acquisitions provide a medium through which excess cash can be reduced; Harford (1999) employs acquisitions as a vehicle for evaluating the free cash flow hypothesis and reports that cash-rich bidders destroy value. There may be other reasons for using cash acquisitions as opposed to stock. For example, there could tax implications for capital gains associated with stocks. If stock prices are higher for the target firm, then there could be capital gains tax consequences for accepting cash instead of stocks.

An interesting twist is found in the relationship between available capital and merger waves. Andrade et al. (2001) show strong industry clustering of acquisitions during the 1990s. They build on the work of Mitchell and Mulherin (1996), among others, who show that mergers occur in waves and tend to cluster by industry. Harford (2005) offers additional evidence of economic, regulatory, and technological shocks that drive waves, but also identifies the importance of capital liquidity. He reports that if a shock is to result in a wave, sufficient capital must be available.

But what if that capital is not available? Aside from the clustering effect, what happens when a firm does not have sufficient internal financing, and also has difficulty in acquiring funding through external markets? In short, what happens when a firm faces some form of capital constraint?

In a 2011 working paper, Khatami, Marchica, and Mura address this question in their study on the effects of financial constraints on returns from merger and acquisition premiums. In their analysis of 2810 acquisitions between 1985 and 2007, they find that constrained firms make more profitable acquisition decisions and conclude that "funding limitations lead to investments in the most profitable opportunities".

Given their results, we ponder whether constrained banks behave in a similar manner. Because banks are clearly different than firms, it would not be appropriate to generalize conclusions about firm acquisition behavior to banks. Several key differences prevent an apples-to-apples comparison. The role in economic instability and early government regulation (Benston 2004) are just two of many additional complexities that may not be faced by non-bank firms.

Furthermore, banks are not constrained in the same way as firms. A financially constrained firm may have to forego potential positive NPV projects due to a lack of capital or a high cost of capital, whereas a bank has access to unique sources of low cost capital. The constraints that apply to a non-bank firm may not apply in the same way to a bank. This is not to say that banks cannot be constrained, but rather that the type of constraint is different. For a bank, a primary constraint is the capital requirement that must be maintained. This regulatory burden works as a constraint that prohibits a bank from using all available capital to pursue investment (acquisition) opportunities.

Nevertheless, the findings from Khatami, Marchica, and Mura provide sufficient motivation to test whether the same relationship between financial constraints and firm acquisition performance holds with banks. In doing so, we also will add to the existing literature on bank acquisitions.

Given the volume of research on corporate mergers and acquisitions, it is not surprising that the literature on bank acquisitions is fairly broad. Perhaps the most developed area examines post-acquisition stock performance, where numerous studies point to negative stock price reactions. Baradwaj et al. (1992) show negative stock price movements after acquisitions; Madura and Wiant (1994) discover negative reactions that continue for as long as 36 months. Knapp et al. (2005) extend the discussion from banks to bank holding companies, with similar results. One exception is in the area of corporate operating performance, where Cornett and Tehranian (1992) find a positive reaction to mergers. However, their sample highlights a challenge with much of the bank acquisition literature: it is largely based on mergers and acquisitions within a short time period, and almost all focus exclusively on transactions prior to 1990. We examine a data set that captures acquisitions between 1990 and 2008.

Other studies provide information about the determinants of bank acquisitions and the subsequent performance of the acquirers. Hadlock et al. (1999) find that high levels of management ownership lead to a decreased probability of a bank being acquired. Subrahmanyam et al. (1997) consider the role of outside directors on post-acquisition abnormal returns. Houston and Ryngaert (1994) point to the acquisition attributes that are most attractive to investors. Shawky et al. (1996) identify several determinants of bank merger premiums, but focus exclusively on target characteristics. However many questions still remain, especially relative to the comparable literature for non-bank firms.

Indeed, the intersection of firm literature on acquisitions, cash holdings, and constraints highlights areas for additional study on banks. Do cash acquisitions by banks lead to higher returns than stock acquisitions? Do large cash holdings dampen post-acquisition returns? Are constrained banks more likely to make value-increasing acquisitions than non-constrained banks? Our focus on the relationship between bank capital constraints and post-acquisition performance brings together a stream of existing literature on firm constraints and gaps in the existing literature on bank acquisitions.

3 Data and methodology

The key objectives of this paper are to investigate whether constrained banks make better acquisition decisions and if there are characteristics of the deal that prompt better performance. In this section, we discuss the dataset and empirical methodology used to examine these issues.

Our dataset contains acquisitions of capital-constrained and unconstrained banks between 1990 and 2008. Publicly traded bank holding companies (BHCs) are identified using an algorithm that matches the Federal Reserve's quarterly Consolidated Financial Statements for Bank Holding Companies (FR Y-9 C) reports with monthly stock return data from the Center for Research in Security Prices

(CRSP). The Securities Database Company (SDC) Platinum M&A Database is used to collect data for the targets of the acquisitions. Acquisitions in which the acquiring bank owns less than 50 % of the target after the deal are dropped from the sample. We also require the size of the deal to be at least $25 million. To avoid confounding effects of multiple acquisition deals by a single firm, we require that the acquisition occurs at least 3 years after the bank's most recent acquisition and at least 3 years before the bank's next acquisition. Based on these criteria, the sample contains 354 unique bank acquisitions made by 348 unique acquirers.

We find that all acquiring banks have total risk based capital adequacy ratios greater than the regulatory minimum of 8 % and the vast majority of banks have capital adequacy ratios greater than 10 % (the threshold for a bank to be considered well capitalized).[7] It is therefore important to note that, *from a regulatory perspective*, none of the acquiring banks were required to obtain regulatory approval at the time of their acquisition decisions. However, as banks approach the minimum requirement, they may be less inclined to pursue an acquisition that may weaken their capital adequacy ratios and thus acts as a constraint. We therefore do not define constrained banks as those below the regulatory minimum, but rather those whose proximity to the minimum may hinder investment activity. Nine acquisitions were made by banks with a capital adequacy ratio of less than 10 % and were therefore classified as capital constrained in our study. These banks are classified as "Group 1" for our sample of capital constrained banks.

Since this method results in such a small sample of constrained banks, we construct an alternative definition of constraint. We rank each bank at the time of acquisition based on three separate criteria. First, we identify banks in the bottom decile of our sample based on the tier 1 capital ratio. Since tier 1 capital is the highest quality capital, a bank with low tier 1 capital may be more constrained than the overall capital adequacy ratio indicates. Second, we identify the bottom decile based on the total capital to assets ratio. Third, we identify the bottom decile based on tier 1 leverage ratio. We classify banks as constrained if they fall into any two of the previous three categories. All nine of the original constrained group also met this alternative definition of constraint. Overall, 41 of the 348 banks in the sample are classified as constrained using this alternative definition. These 41 banks are categorized into "Group 2" of the capital constrained banks in this sample. All banks in our sample that had multiple acquisitions were defined as unconstrained. All nine banks of Constrained Group 1 also meet the alternative definition of Constrained Group 2 and therefore are also included in Constrained Group 2.

Our first objective is to determine if post-acquisition performance is better for capital constrained banks than non-constrained banks. We run 2D clustered error regression to control for firm specific characteristics as well as temporal differences. Although it is common to use fixed effects for panel data, Petersen (2009) points out that this method can result in biased estimates. Instead, he states that a linear regression controlling for correlation in the error terms across time and across firms provides unbiased estimates. Specifically, using clustered errors for cross-sectional data across firms is robust and unbiased, and unlike fixed effects, this method is

[7] See Appendix 1 for full description of capitalization categories provided by the FDIC. Any bank with less than 8 % risk based capital requires prior approval of any acquisition pursuant to FDICIA.

robust even if firm effects are not permanent or are varying over time. Clustered errors are unbiased in time series data, as shown with the Fama-MacBeth method (Fama and MacBeth 1973), as long as there are enough time periods. In our study we have a minimum of 56 time periods which is sufficient to ensure unbiased results. Finally, for panel data where there are firm and time effects, one can cluster on multiple dimensions. When there are a sufficient number of clusters in each dimension, the results are unbiased. This regression model is displayed in Eq. (1) below.

$$\Delta ROA_{it} = \alpha + \beta_1 Constraint_{it} + \beta_2 Size_{it} + \beta_3 ROA_{it} + \beta_4 NII_{it} + \beta_5 Loans_{it} + \beta_6 NCO_{it} + \beta_7 Payout_{it} + \beta_8 IBA_{it} + \varepsilon_{it} \quad (1)$$

We use change in return on assets (ΔROA) and change in return on equity (ΔROE) for each quarter as proxies for changes in performance. We then regress these performance measures on a constraint dummy variable representing our two groups of capital constrained banks and seven control variables. *Constraint* is a binary variable that is assigned a value of 1 if the bank is considered capital constrained and 0 if it is not using the definitions discussed above.

The reason for using both ROA and ROE as performance measures is that one takes into consideration leverage while the other does not. Specifically, Eq. (2), derived using the DuPont Equation, shows that ROE is essentially ROA*Leverage. This will allow us to ascertain whether changes in leverage post-acquisition affected our results because ROE takes leverage into account.

$$\begin{aligned} ROE &= \frac{Net\ Income}{Pretax\ Profits} * \frac{Pretax\ Profits}{EBIT} * \frac{EBIT}{Sales} * \frac{Sales}{Total\ Assets} * \frac{Total\ Assets}{Total\ Equity} \\ &= \frac{Net\ Income}{Total\ Assets} * \frac{Total\ Assets}{Total\ Equity} = ROA * Leverage \end{aligned} \quad (2)$$

The seven control variables are consistent with those used in Knapp et al. (2005). *Size* is defined as the log of total assets in thousands to control for the size of the bank.[8] *ROA* or *ROE* is used to control for the level of performance in relation to the change in performance. Over the past 20 years, a major development in the banking industry has been an increase in the importance of fee-based revenue. We use non-interest income as a percentage of net income (*NII*) as a measure of the extent of fee-based revenue. Weakness in non-interest income can be a signal of unobserved weakness in the bank's ability to extract fees from customers. Total loans to total assets (*Loans*) is a control variable for the extent of subsequent investment in riskier assets. Another important factor in successful banking institutions is credit quality. Net charge-offs to total equity (*NCO*) measures credit quality. Since we are examining capital adequacy ratios which represent a measure of a bank's ability to ride out tough times, we must also control for the dividend payout ratio (*Payout*), which shows management adjustments to the banks' capitalization. Interest bearing assets to total assets (*IBA*) measures the percentage of assets invested in traditional activities. Because there is potential for multicollinearity amongst the independent variables, we examine the VIF scores after each regression. The largest VIF for any individual coefficient from all of the regressions is 3.84 and the largest mean VIF for any single

[8] Assets are reported in thousands in our data. When we take the natural log of size, we do not multiply the asset size by 1000 prior to the log operation. However, when we discuss differences in size we keep this issue in mind.

regression was 2.55. These scores indicate that multicollinearity should not be a large concern.

We also construct a sample of matched pairs for the original group of nine constrained banks. The sample is matched on size and leverage, while ROA at the time of acquisition is used as a tiebreaker. This allows us to determine whether a capital-constrained bank exhibits different deal characteristics than an unconstrained bank.

4 Results

Table 1 shows the descriptive statistics of acquiring banks at the time of acquisition. Constrained Group 1 includes banks with a capital adequacy ratio of less than 10 %.

Table 1 Bank characteristics

	N	MEAN	STD DEV	MIN	MAX
Non Constrained Group 1					
ROA	345	0.0066	0.0040	−0.0104	0.0202
ROE	345	0.0749	0.0475	−0.1246	0.2453
Net Interest Income	345	0.0077	0.0070	0.0009	0.0589
Log of Total Assets	345	17.5019	19.1530	12.4821	21.5819
RBC Ratio	345	0.1293	0.0259	0.1003	0.3908
Debt to Equity	345	0.1053	0.0261	0.0461	0.2888
Constrained Group 1					
ROA	9	0.0057	0.0029	0.0022	0.0109
ROE	9	0.0736	0.0358	0.0292	0.1494
Net Interest Income	9	0.0068	0.0030	0.0022	0.0122
Log of Total Assets	9	14.7852	14.2265	13.8180	15.3809
RBC Ratio	9	0.0968	0.0077	0.0822	0.0973
Debt to Equity	9	0.0861	0.0224	0.0706	0.1435
Non Constrained Group 2					
ROA	313	0.0068	0.0041	−0.0104	0.0202
ROE	313	0.0765	0.0485	−0.1246	0.2453
Net Interest Income	313	0.0079	0.0072	0.0009	0.0589
Log of Total Assets	313	17.5767	19.2000	12.4821	21.5819
RBC Ratio	313	0.1316	0.0259	0.1056	0.3908
Debt to Equity	313	0.1055	0.0263	0.0461	0.2888
Constrained Group 2					
ROA	41	0.0052	0.0027	0.0001	0.0109
ROE	41	0.0626	0.0335	0.0015	0.1494
Net Interest Income	41	0.0061	0.0047	0.0016	0.0235
Log of Total Assets	41	15.9328	16.9156	12.8527	18.5250
RBC Ratio	41	0.1028	0.0117	0.0822	0.1054
Debt to Equity	41	0.1000	0.0252	0.0561	0.1476

Constrained Group 2 consists of capital constrained banks identified by using the alternative definition discussed in the previous section. The average capital adequacy ratio of the Constrained Group 1 is 9.68 % while it is 10.28 % for Constrained Group 2. When comparing either of the constrained groups with the unconstrained groups at the time of acquisition, it becomes clear that capital constrained banks have lower ROA and ROE, less interest income per total asset, higher debt to equity and are substantially smaller. The lower ROA, ROE and lower capital adequacy ratio suggests that these banks are more constrained than their counterparts.

Table 2 shows the deal characteristics of the acquiring banks. The deal characteristics of Constrained Group 1 are significantly different than the unconstrained group. The banks in Constrained Group 1 use a considerably larger portion of cash

Table 2 Deal characteristics

	N	MEAN	STD DEV	MIN	MAX
Non Constrained Group 1					
% of Cash	345	23.3399	32.9080	0.0000	100.0000
% of Other	345	0.5245	4.2200	0.0000	50.0000
% of Stock	345	70.3035	36.9615	0.0000	100.0000
% of Unknown	345	5.8321	22.8056	0.0000	100.0000
GW %	345	0.0419	0.0409	−0.0058	0.3503
Deal Size	345	0.3683	0.3402	0.0028	2.4196
Constrained Group 1					
% of Cash	9	49.4644	38.5841	0.0000	100.0000
% of Other	9	0.0000	0.0000	0.0000	0.0000
% of Stock	9	39.4244	48.7553	0.0000	100.0000
% of Unknown	9	11.1111	33.3333	0.0000	100.0000
GW %	9	0.0355	0.0239	0.0007	0.0704
Deal Size	9	0.4032	0.3044	0.1035	1.0486
Non Constrained Group 2					
% of Cash	313	23.4467	33.0254	0.0000	100.0000
% of Other	313	0.3994	3.6947	0.0000	50.0000
% of Stock	313	71.5953	36.3330	0.0000	100.0000
% of Unknown	313	4.5587	20.1662	0.0000	100.0000
GW %	313	0.0399	0.0419	−0.0058	0.3503
Deal Size	313	0.3852	0.3394	0.0048	2.4196
Constrained Group 2					
% of Cash	41	28.2596	37.8837	0.0000	100.0000
% of Other	41	1.3644	6.7745	0.0000	41.1500
% of Stock	41	53.6634	42.9573	0.0000	100.0000
% of Unknown	41	16.7124	37.3528	0.0000	100.0000
GW %	41	0.0548	0.0255	0.0000	0.0953
Deal Size	41	0.4100	0.3362	0.0028	1.5182

(49.46 %) to finance their acquisitions than non-constrained banks (23.34 %), and significantly less equity (39.42 % versus 70.30 %). This is likely due to the fact that the common stock of constrained banks may be underpriced and therefore it is a relatively more expensive source of funding when acquiring a target. This is consistent with the findings of Myers and Majluf (1984). Table 2 also shows that banks in the Constrained Group 1 pay a smaller premium to acquire their target measured by change in goodwill. On average, the constrained bank pays a 3.55 % premium above the book value of all identifiable assets of the target while unconstrained banks pay 4.19 %.

At first glance, it would seem that financing acquisitions with cash and paying a lower premium would indicate that the constrained banks are making better acquisitions. However, these differences are much smaller and in some cases even reversed when comparing Constrained Group 2 with the non-constrained group. In this case, constrained banks still finance more with cash than the non-constrained banks (28.26 % versus 23.45 %), but the difference is substantially smaller. The premium paid is actually higher for the banks in Constrained Group 2 (5.48 % versus 3.99 %).

There are two possible reasons that the descriptive statistics are different for banks in Constrained Groups 1 and 2. First, there is a possibility that the banks in Constrained Group 1 are more severely constrained. Therefore, the differences could be hidden when these nine banks are combined with 32 other banks that did not fall into the first definition of constraint. The second possibility may be that the banks in Constrained Group 1 are so much smaller than the non-constrained banks that the results are essentially showing a transaction size effect. Since the size of the average bank (measured in total assets) in Constrained Group 2 is 3.15 times larger and the size of the deal is 3.2 times larger, the small transaction size effect may disappear. To test these two possibilities, we conduct a matched pair analysis for the original nine constrained banks in addition to running multivariate analysis.

The dependent variables used in the regression analysis, ΔROA and ΔROE, are defined as the change in ROA and ROE respectively from time period t to t+1. Table 3 shows the pair wise correlation matrix for the dependent and the independent variables used in our regression analysis while Table 4 shows the correlation between the dependent variables and the deal characteristic variables used in Table 2. Table 3 shows that both measures of performance are highly correlated with each other; ΔROA and ΔROE have a correlation of 0.7944 while *ROA* and *ROE* have a correlation of 0.9338. The negative correlation between ΔROA and *ROA* (−0.6541) and between ΔROE and *ROE* (-0.6463) indicate strong mean reversion in performance. This means that a bank with a high (low) level of *ROA* or *ROE* will tend to see a decline (increase) in these values in the future.

Net interest income (*NII*) and net charge offs (*NCO*) are positively correlated with each other. However, *NII* is positively correlated to both the level and change measures of performance while *NCO* is negatively correlated to these measures. They are all significant at the 1 % level. Loans to total assets ratio (*Loans*) with the exception of a positive correlation with ΔROA, show a similar pattern of correlation with that of *NCO*. Size, which is measured as the log of total assets, is also significantly correlated with *NII*, *NCO* and *Loans*. This indicates that although *Size*

Table 3 Correlation matrix

	Δ ROA	Δ ROE	ROA	ROE	NII	Size	NCO	Loans	Payout	IBA	Constraint1	Constraint2
Δ ROA	1											
	(< 0.001)											
Δ ROE	**0.7944**	1										
	(< 0.001)	(< 0.001)										
ROA	**−0.6541**	**−0.6554**	**1**									
	(< 0.001)	(< 0.001)	(< 0.001)									
ROE	**−0.6274**	**−0.6463**	**0.9338**	**1**								
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)								
NII	**0.365**	**0.3804**	**0.3209**	**0.2771**	**1**							
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)							
Size	0.0375	0.042	−0.0309	0.0196	**0.2067**	**1**						
	(0.4966)	(0.4462)	(0.5662)	(0.7153)	(< 0.001)	(< 0.001)						
NCO	**−0.0222**	**−0.5846**	**−0.1136**	**−0.2743**	**0.0232**	**0.0147**	**1**					
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)	(0.0058)	(0.0803)	(< 0.001)					
Loans	**0.0868**	**−0.0142**	**−0.1055**	**−0.1573**	**0.3864**	**0.1219**	**0.2250**	**1**				
	(< 0.001)	(0.0968)	(< 0.001)	(< 0.001)	(< 0.001)	(0.0003)	(< 0.001)	(< 0.001)				
Payout	**−0.1622**	**−0.1611**	**−0.1399**	**−0.1435**	−0.0036	0.0469	0.0179	0.0219	**1**			
	(0.0031)	(0.0033)	(0.0091)	(0.0074)	(0.9465)	(0.3797)	(0.7379)	(0.6815)	(< 0.001)			
IBA	−0.0285	−0.006	−0.0443	−0.086	**−0.0945**	**−0.3582**	−0.0506	−0.0241	−0.0819	**1**		
	(0.6831)	(0.9315)	(0.5189)	(0.2100)	(< 0.001)	(< 0.001)	(0.4562)	(0.7232)	(0.2275)	(< 0.001)		
Constraint1	0.038	0.0399	−0.0357	−0.0043	−0.0207	−0.0286	0.0243	0.0079	−0.0032	**0.1513**	**1**	
	(0.4909)	(0.4690)	(0.5066)	(0.9369)	(0.6977)	(0.5918)	(0.6489)	(0.8826)	(0.9516)	(0.0251)	(< 0.001)	
Constraint2	0.0617	0.0782	**−0.1262**	**−0.0954**	−0.0802	−0.0541	−0.0526	−0.0869	0.0469	**0.2445**	**0.4463**	**1**
	(0.2626)	(0.1558)	(0.0186)	(0.0754)	(0.1320)	(0.3104)	(0.3240)	(0.1026)	(0.3793)	(0.0003)	(< 0.001)	(< 0.001)

P-Values in parentheses

Statistically significant values are in bold

does not have a statistically significant correlation with *ΔROA*, *ΔROE*, *ROA* or *ROE*, it may impact these performance measures through other means. Larger banks tend to give more loans relative to their size, which drives net interest income and net charge offs.

Interestingly, interest bearing assets (*IBA*), which consist mainly of loans and certificates of deposit that are held to maturity, are negatively associated with *Size* and *NII*. Therefore, smaller banks may be compensating for their lack of fee income by investing in interest bearing assets. Both definitions of constrained banks show a positive correlation with *IBA*, which is not surprising since they are smaller in size than the unconstrained banks. Banks in Constrained Group 1 show a negative correlation with ROA and ROE. Banks in Constrained Group 2 also show a negative correlation with *ROA* and *ROE* at the 5 % and 10 % level of significance, respectively.

The dividend payout ratio (*Payout*) is negatively associated with all measures of performance. This suggests that lower performing banks pay more dividends. One possibility is that more profitable banks may have higher future growth potential and therefore distribute fewer dividends to maintain a higher internal growth rate.

Table 4 shows a significantly negative correlation (−0.2287) between the relative deal size (*Rel Deal Size*) of the acquisition and the percentage premium paid as measured by the percentage change in goodwill (*GW %*). This suggests that larger acquisitions tend to be associated with smaller premiums. Larger acquisitions also tend to be financed more with stocks (*% Stocks*) and less with cash (*% Cash*). We also find that acquisitions that are primarily financed with cash tend to pay a higher premium. Constrained Group 1 is positively correlated with acquisitions financed with cash and negatively correlated with acquisitions financed with stock and is significant at the 5 % level. This provides more evidence that the first group of constrained banks finance more of their acquisitions with cash and less with equity as compared to non-constrained banks. The second group of constrained banks also shows correlations with respect to cash and equity that are in the same direction but not statistically significant.

Using linear regressions with 2D error clustering, we test to see if there are differences in post-acquisition changes in performance between capital constrained and unconstrained banks. We control for size (log of total assets), the level of performance at the time of acquisition (*ROA* or *ROE*), net interest income as a percentage of net income (*NII*), loans to total assets (*Loans*), net charge offs to total equity (*NCO*), dividend payout ratio (*Payout*), and the percentage of interest bearing assets to total assets (*IBA*) as suggested by Knapp et al. (2005).

Table 5 shows that banks in Constrained Group 1 have significantly higher changes in ROA post-acquisition in comparison to non-constrained banks. Columns 1, 2, and 3 show the results for changes in ROA over 1, 2, and 3 year periods. In year one, the coefficient for the constraint variable is 0.0015 and highly significant. In years two and three, the coefficient remains positive and significant at the 5 % level. In all three regressions, the negative coefficients for *ROA* again indicate the mean reverting nature of performance. Net interest income has a positive impact on the change in performance in all 3 years. Loans to assets and net charge offs are also consistently positive, although significant only in 2 of the 3 years. Dividend

Table 4 Correlation matrix

	Δ ROA	Δ ROE	GW %	Rel Deal Size	% Cash	% Others	% Stocks	% Unknown	Constraint1	Constraint2
Δ ROA	**1**									
	(< 0.001)									
Δ ROE	**0.7944**	**1**								
	(< 0.001)	(< 0.001)								
GW %	0.0121	−0.0137	**1**							
	(0.8271)	(0.8032)	(< 0.001)							
Rel Deal Size	−0.0518	−0.0656	**−0.2287**	**1**						
	(0.3470)	(0.2340)	(< 0.001)	(< 0.001)						
% Cash	0.0392	0.0506	**0.2446**	**−0.1719**	**1**					
	(0.4772)	(0.3584)	(< 0.001)	(0.0017)	(< 0.001)					
% Other	−0.0025	−0.0045	0.0754	−0.0531	0.0573	**1**				
	(0.9637)	(0.9355)	(0.1706)	(0.3349)	(0.2825)	(< 0.001)				
% Stock	−0.0404	−0.0594	**−0.2827**	**0.2463**	**−0.7877**	**−0.1655**	**1**			
	(0.4636)	(0.2810)	(< 0.001)	(< 0.001)	(< 0.001)	(0.0018)	(< 0.001)			
% Unknown	0.009	0.0235	0.0886	**−0.139**	**−0.1852**	0.0053	**−0.4497**	**1**		
	(0.8698)	(0.6696)	(0.1070)	(0.0112)	(0.0005)	(0.9206)	(< 0.001)	(< 0.001)		
Constraint1	0.038	0.0399	−0.0258	0.0168	**0.1226**	−0.0198	**−0.1297**	0.0361	**1**	
	(0.4909)	(0.4690)	(0.6396)	(0.7608)	(0.0211)	(0.7098)	(0.0146)	(0.4989)	(< 0.001)	
Constraint2	0.0617	0.0782	0.0013	0.0452	0.043	−0.0036	−0.0477	0.0155	**0.4463**	**1**
	(0.2626)	(0.1558)	(0.6160)	(0.4120)	(0.4195)	(0.9455)	(0.3711)	(0.7707)	(< 0.001)	(< 0.001)

P-Values in parentheses

Statistically significant values are in bold

Table 5 ΔROA Constrained Group 1

	Year 1	Year 2	Year 3
Intercept	−0.0066 ***	−0.0067 ***	−0.0067 ***
	(<0.001)	(<0.001)	(<0.001)
Constraint	0.0015 ***	0.0011 **	0.0010 **
	(<0.001)	(0.028)	(0.040)
Size	0.0005	0.0003	−0.0005
	(0.571)	(0.970)	(0.417)
ROA	−0.7487 ***	−0.7110 ***	−0.6617 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.0426 *	0.0526 **	0.0686 **
	(0.057)	(0.039)	(0.015)
Loans	0.1929	0.3159 ***	0.3866 ***
	(0.113)	(<0.001)	(<0.001)
NCO	0.0065	0.0005 ***	0.0003 ***
	(0.550)	(0.001)	(0.001)
Payout	0.0001	0.0000	0.0000
	(0.534)	(0.170)	(0.221)
IBA	0.0009	0.0011	0.0012
	(0.474)	(0.441)	(0.728)
R Square	0.4601	0.4902	0.4627
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses
*** Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

payout ratio and interest bearing assets are both insignificant explanatory variables for ΔROA.

The results in Table 6 are very similar to those in Table 5. The constrained banks have significantly higher ΔROE after acquisitions compared to non-constrained banks. These results are significant at the 10 % level or better. Once again, the highly negative coefficients for *ROE* indicate that performance is mean reverting. The results for net interest income and loans to assets are very similar to Table 5. Net charge offs on the other hand show a negative impact on ΔROE. Overall, Tables 5 and 6 indicate that constrained banks, relative to unconstrained banks, significantly improve their performance after an acquisition.

To test the robustness of our results, we rerun the regression analysis of Tables 5 and 6 but this time using the alternative definition of constraint (Constrained Group 2). In this case, the bank must rank in the bottom 10 % of the sample in at least two out of three categories (tier 1 capital ratio, total capital ratio, and tier 1 leverage ratio). There are 41 banks classified as constrained based using this definition. The results in Tables 7 and 8 are substantially consistent with those of Tables 5 and 6.

Table 6 ΔROE Constrained Group 1

	Year 1	Year 2	Year 3
Intercept	−0.0765 ***	−0.0713 ***	−0.0715 ***
	(<0.001)	(<0.001)	(<0.001)
Constraint	0.0157 ***	0.0133 **	0.0122 *
	(<0.001)	(0.025)	(0.054)
Size	0.0027	−0.0052	−0.0017
	(0.820)	(0.939)	(0.642)
ROE	−0.8309 ***	−0.7278 ***	−0.7467 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.4881 *	0.6561 **	0.7364 **
	(0.055)	(0.034)	(0.040)
Loans	0.6772	0.8951 ***	0.4204 ***
	(0.744)	(<0.001)	(<0.001)
NCO	−0.2096	−0.1763 ***	−0.1771 ***
	(0.349)	(<0.001)	(<0.001)
Payout	0.0015	−0.0009	0.0002
	(0.290)	(0.380)	(0.234)
IBA	0.0130	0.0102	0.0115
	(0.313)	(0.384)	(0.630)
R Square	0.4451	0.5433	0.8761
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses
*** Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

Once again, constrained banks are associated with improvements in *ΔROA* and *ΔROE*. The coefficients of the control variables are also similar to those in Tables 5 and 6. This indicates that our results are robust to different definitions of capital constraint. The first definition is more precise and may be more appropriate, but the results could be driven by small sample bias since it results in only nine constrained banks. The second definition of constraint is more inclusive and results in a sample of 41 banks. This alleviates the small sample bias, but may not totally reflect the behavior of constrained banks since these banks are not as severely constrained. However, since both results are consistent with each other, it gives credence that our results are valid.

To further test the reliability of our results in Tables 5, 6, 7 and 8, we rerun our analysis in Tables 9 and 10. This time, we substitute in a continuous variable, the Risk Based Capital Ratio (*RBC Ratio*), for our categorical variable *Constraint*. The results in Tables 9 and 10 are once again consistent with the previous tables. The negative coefficients for *RBC Ratio* indicate that the more capital a bank has prior to acquiring a target, the worse the financial performance after the acquisition measured by either *ΔROA* or *ΔROE*. These results are statistically significant at or better than the 1 %

Table 7 ΔROA Constrained Group 2

	Year 1	Year 2	Year 3
Intercept	−0.0066 ***	−0.0067 ***	−0.0067 ***
	(<0.001)	(<0.001)	(<0.001)
Constraint	0.0006 *	0.0007 *	0.0006 *
	(0.092)	(0.060)	(0.057)
Size	0.0005	0.0005	−0.0005
	(0.552)	(0.950)	(0.423)
ROA	−0.7528 ***	−0.7141 ***	−0.6656 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.0426 *	0.0529 **	0.0702 **
	(0.057)	(0.030)	(0.012)
Loans	0.1869	0.3147 ***	0.3910 ***
	(0.135)	(<0.001)	(<0.001)
NCO	0.0067	0.0005 ***	0.0003 ***
	(0.531)	(<0.001)	(0.001)
Payout	0.0001	0.0000	0.0000
	(0.546)	(0.207)	(0.274)
IBA	0.0008	0.0009	0.0011
	(0.607)	(0.551)	(0.846)
R Square	0.4599	0.491	0.4626
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses
*** Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.10 level

level in the first 2 years for both Tables 9 and 10. The coefficients for the control variables show a very similar pattern to the previous tables with the lone exception that *IBA* becomes statistically significant at the 10 % level for the 1 year and 2 year *ΔROE*.

As a final check to ensure the regression results for banks in Constrained Group 1 were not being driven by other factors (acquirer and target banks in Constrained Group 1 are on average smaller than the unconstrained banks), we construct a matched pairs sample to investigate the differences in deal characteristics. The sample was matched on total asset size (the unconstrained match must fall between 95 % and 105 % of the constrained bank) and the debt to asset ratio (the banks must be within 1 % of each other). If there was more than one candidate for a match, ROA was used as a tiebreaker and we chose the bank with the closest ROA to the constrained bank.

The results in Table 11 confirm that the nine matched unconstrained banks and the nine matched constrained banks are very similar in size (14.7844 versus 14.7852 for log of total assets), capital structure (0.9081 versus 0.9210 debt to assets) and have similar

Table 8 ΔROE Constrained Group 2

	Year 1	Year 2	Year 3
Intercept	−0.0712 ***	−0.0703 ***	−0.0693 ***
	(<0.001)	(<0.001)	(<0.001)
Constraint	0.0078 **	0.0073 **	0.0047
	(0.034)	(0.042)	(0.113)
Size	−0.0042	−0.0032	−0.0040
	(0.664)	(0.968)	(0.570)
ROE	−0.7716 ***	−0.7311 ***	−0.7353 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.6235 **	0.6557 **	0.6839 **
	(0.022)	(0.047)	(0.037)
Loans	−0.2060	0.8979 ***	0.4718 ***
	(0.929)	(<0.001)	(<0.001)
NCO	−0.4599 *	−0.5023 ***	−0.1780 ***
	(0.056)	(<0.001)	(<0.001)
Payout	0.0013	0.0009	0.0001
	(0.471)	(0.296)	(0.671)
IBA	0.0068	0.0074	0.0070
	(0.661)	(0.578)	(0.890)
R Square	0.3917	0.5438	0.8521
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses

*** Significant at the 0.01 level

** Significant at the 0.05 level

* Significant at the 0.10 level

performance (*ROA* and *ROE*) at the time of the acquisition. The target sizes are also very similar. However, there is a significant difference in how the acquisition is financed. The constrained bank uses substantially more cash and less equity to finance the transaction compared to its non-constrained counterpart. Also, the constrained bank pays less of a premium than the matched unconstrained bank even though the target sizes are relatively the same. The correlation matrix indicates that all else being equal, acquisitions made with cash pay a higher premium. Yet constrained banks pay a lower premium even though they use more cash as a source of funding for an acquisition. Finally, we examined the nine constrained banks in Group 1 after the acquisition and found that their risk based capital ratio increases on average to 10.10 % by the end of year 1 and continues to increase to 11.29 % by the end of year 2.

Figures 1 and 2 show graphically the spread between the constrained banks and the matched unconstrained banks in regards to the change in ROA and

Table 9 ΔROA constrained risk based capital

	Year 1	Year 2	Year 3
Intercept	−0.0044 **	−0.0027 *	−0.0039 ***
	(0.045)	(0.076)	(0.002)
Risk Based Capital Ratio	−0.0326 ***	−0.0317 ***	−0.0370 ***
	(<0.001)	(0.005)	(<0.001)
Size	0.0005	−0.0006	−0.0003
	(0.936)	(0.935)	(0.377)
ROA	−0.7378 ***	−0.6299 ***	−0.6602 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.0637	0.0615 ***	0.0670 ***
	(0.116)	(0.004)	(0.001)
Loans	0.3503 **	0.3255 ***	0.3566 ***
	(0.037)	(<0.001)	(<0.001)
NCO	0.0030	0.0004 ***	0.0002 *
	(0.851)	(<0.001)	(0.081)
Payout	−0.0001	0.0000	0.0000
	(0.519)	(0.430)	(0.172)
IBA	0.0023	0.0027	0.0023
	(0.127)	(0.107)	(0.138)
R Square	0.4124	0.4950	0.4694
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses

*** Significant at the 0.01 level

** Significant at the 0.05 level

* Significant at the 0.10 level

change in ROE, respectively. The horizontal line represents quarters after the acquisition. As can be seen, performance (ΔROA) is higher for constrained banks in the first quarter after the acquisition. The constrained bank's performance continues to outpace the non-constrained bank for at least 12 more quarters. When ΔROE is used as a proxy for performance, the results are noisier, but similar. Constrained banks have a higher ΔROE than unconstrained banks after the acquisition. The annualized geometric mean of the spread in ΔROA between constrained and non-constrained banks is 26.67 basis points. The geometric mean of the spread in ΔROE is 84.45 basis points. The average size, measured by total assets, of the constrained and matched non-constrained banks is $2.637 billion. This indicates, for example, that the 26.67 basis points for ΔROA represent over $7 million higher return on asset. Therefore, the differences in ΔROA and ΔROE between constrained and unconstrained banks after an acquisition are economically significant.

Table 10 ΔROE constrained risk based capital

	Year 1	Year 2	Year 3
Intercept	−0.0533 ***	−0.0094 ***	−0.0518 ***
	(<0.001)	(<0.001)	(<0.001)
Risk Based Capital Ratio	−0.3278 ***	−0.3920 ***	−0.3066 *
	(0.002)	(0.001)	(0.052)
Size	0.0008	−0.0001	−0.0004
	(0.614)	(0.836)	(0.611)
ROE	−8.2765 ***	−6.9116 ***	−7.126 ***
	(<0.001)	(<0.001)	(<0.001)
NII	0.6974	0.7482 ***	0.7835 ***
	(0.129)	(0.009)	(0.009)
Loans	1.4328	1.3766 ***	1.4574 ***
	(0.534)	(<0.001)	(<0.001)
NCO	0.3239	−0.5195 ***	−0.1788 ***
	(0.164)	(<0.001)	(<0.001)
Payout	−0.0009	−0.0008	0.0002
	(0.583)	(0.441)	(0.172)
IBA	0.0255 *	0.0288 *	0.0241
	(0.096)	(0.071)	(0.160)
R Square	0.3955	0.3840	0.4036
#of ID Clusters (rssd_bhc)	348	328	309
# of Time Clusters (quarter_num)	64	60	56

P-Values in parentheses

*** Significant at the 0.01 level

** Significant at the 0.05 level

* Significant at the 0.10 level

5 Conclusion

Much of the previous literature has established that bank holding companies experience poor post-acquisition performance.[9] However, it does not examine the post-acquisition performance and deal characteristics of banks that are capital constrained in comparison to those that are not. As the banking industry continues to struggle through the subprime lending crisis and experiences increasing constraints on its capital, these issues are becoming increasingly relevant and important.

In this paper, we find that capital constrained banks tend to finance their acquisitions with more cash and less stock, and pay a lower premium, than unconstrained

[9] See Baradwaj et al. (1992), Madura and Wiant (1994) and Knapp et al. (2005)

Table 11 Matched pair's descriptive statistics

	N	MEAN	STD DEV	MIN	MAX
Non Constrained					
ROA	9	0.0051	0.0029	0.0020	0.0117
ROE	9	0.0580	0.0235	0.0319	0.1345
Debt to Assets	9	0.9081	0.0173	0.8759	0.9338
Log of Total Assets	9	14.7844	0.5982	13.7520	15.4637
% of Cash	9	27.2635	22.5666	0.00	55.00
% of Stock	9	72.7444	22.5666	45.00	100.00
% of Unknown	9	0.00	0.00	0.00	0.00
Δ Goodwill	9	61,710.35	91,214.06	0.00	283,872.10
Target Size	9	11.6082	1.0155	10.1464	12.9408
Constrained					
ROA	9	0.0051	0.0028	0.0022	0.0103
ROE	9	0.0645	0.0358	0.0200	0.1402
Debt to Assets	9	0.9210	0.0182	0.8745	0.9340
Log of Total Assets	9	14.7852	0.5950	13.8180	15.3809
% of Cash	9	49.4644	38.5841	0.00	100.00
% of Stock	9	39.4244	48.7553	0.00	100.00
% of Unknown	9	11.1111	33.3333	0.00	100.00
Δ Goodwill	9	36,776.46	57,667.09	360.00	185,185.10
Target Size	9	11.6010	0.9998	10.1842	12.7683

banks. We also find that capital constrained banks not only improve their performance after an acquisition, but they outperform unconstrained banks for up to 3 years

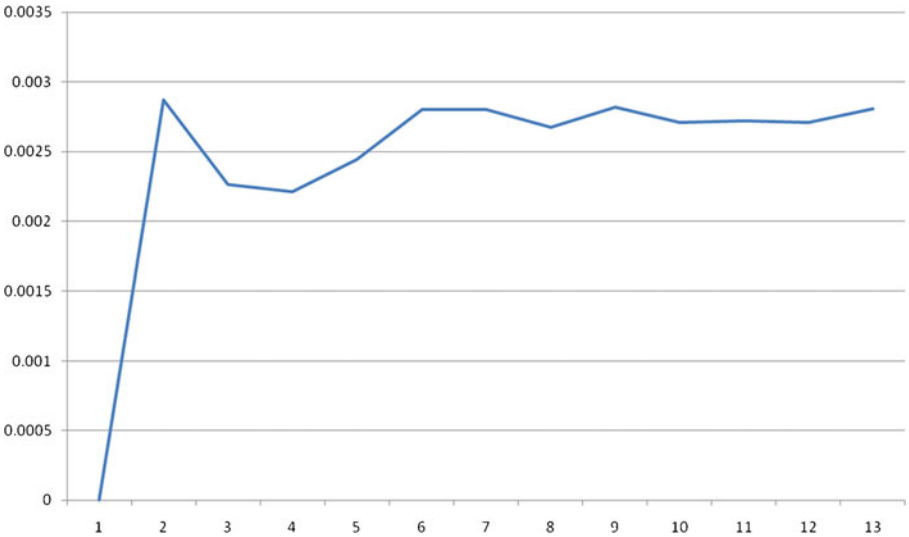

Fig. 1 Percentage change in ROA spread

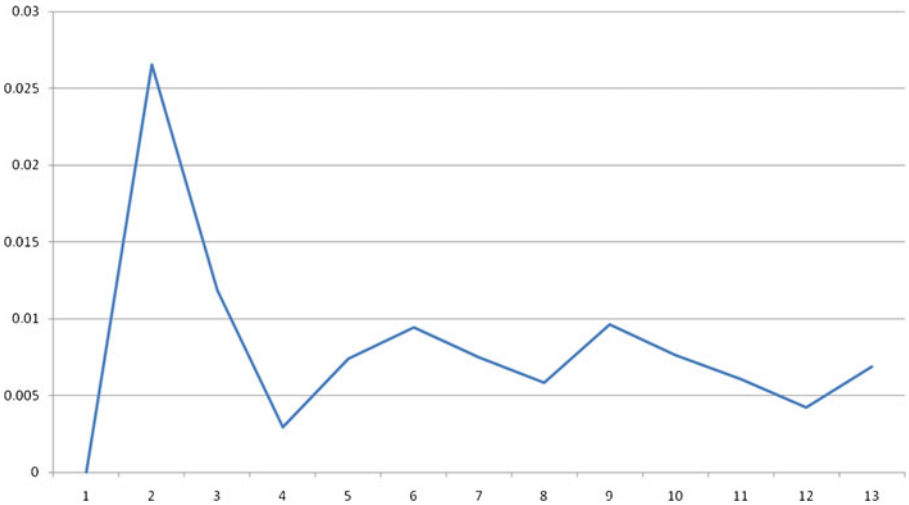

Fig. 2 Percentage change in ROE spread

after the acquisition. This evidence suggests that capital constrained banks make better acquisition decisions, which is encouraging. As the banking industry continues to struggle with finding new sources of capital, banks should improve their acquisition decisions under these circumstances.

Appendix 1

FDICIA Defined Categories	Risk-Based Capital	Leverage Ratio	Tier 1 Risk-Based Capital	Prior Approval Required for Acquisitions
Well Capitalized	≥ 10 %	≥ 5 %	≥ 6 %	No
Adequately Capitalized	≥ 8 %	≥ 4 %	≥ 4 %	No
Under Capitalized	< 8 %	< 4 %	< 4 %	Yes
Significantly Under Capitalized	< 6 %	< 3 %	< 3 %	Yes

FDICIA = Federal Deposit Insurance Corporation Improvement Act 1991

Variable	Y-9C	Definition
Tier 1 Capital	BHCK8274	Tier 1 capital consists of the bank's core equity capital (mainly common stock and retained earnings).
Tier 2 Capital	BHCK8275	Tier 2 capital consists mainly of subordinated debt.
Tier 3 Capital	BHCK1395	Tier 3 capital is capital allocated for Market risk.
Risk Based Capital	BHCK3792	Used by bank regulators to determine a bank's capital adequacy. Must be >8 % to be adequately capitalized and >10 % to be well capitalized.
Risk Weighted Assets	BHCKA223	Total assets, derivates and off balance sheet items

Variable	Y-9C	Definition
Non Interest Income	BHCK4079	Bank's income from non interest activities (fees, penalties, etc.).
Net Charge-offs	BHCK4635	Expense on the income statement. Typically bad debt expense.
Interest Bearing Assets	BHCK0395	Assets that pay interest. Typically CDs and loans.
	BHCK0397	
	BHCK5369	
	BHCKB529	

Federal Deposit Insurance Corporation

Figure 1 shows the spread of the percentage change in ROA between capital constrained and unconstrained banks for 12 quarters after the acquisition occurred. Each capital constrained bank is matched with a capital unconstrained bank on size (total assets) and ROA at the time of the merger/acquisition (T=1). The annual geometric mean of the percentage return is 0.2667 %, which suggests that capital constrained banks receive a return on assets that is 27 basis points higher than unconstrained banks following an acquisition

Figure 2 shows the spread of the percentage change in ROE between capital constrained and unconstrained banks for 12 quarters after the acquisition occurred. Each capital constrained bank is matched with a capital unconstrained bank on size (total assets) and ROE at the time of the merger/acquisition (T=1). The annual geometric mean of the percentage return is 0.8445 %, which suggests that capital constrained banks receive a return on equity that is 84 basis points higher than unconstrained banks following an acquisition

Table 1 shows the descriptive statistics for constrained and unconstrained banks immediately prior to the acquisition. In general, capital constrained banks are smaller in size, have lower capital ratios and have higher debt to equity ratios

Table 2 shows the descriptive statistics of the deal characteristics for constrained and unconstrained banks. In general, capital constrained banks offer more cash and pay a lower premium for the acquisition.

Table 3 shows the correlations between the dependent variables (Δ ROA and Δ ROE) and the independent variables used in the regression analysis

Table 4 shows the correlations between the dependent variables (Δ ROA and Δ ROE) and the deal characteristics

In Table 5 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROA. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–8, and 9–12 after the acquisition. The binary variable *Constraint* equal 1 for banks with a risk based capital adequacy ratio of less than 10 % and zero otherwise prior to the acquisition. *Size* is the log of total assets in thousands. *ROA* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets

In Table 6 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROE. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–8, and 9–12 after the acquisition. The binary variable *Constraint* equals 1 for banks with a risk based capital adequacy ratio of less than 10 %, and zero otherwise, prior to the acquisition. *Size* is the log of total assets in thousands. *ROE* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets.

In Table 7 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROA. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–8, and 9–12 after the acquisition. The binary variable *Constraint* equals 1 for banks who are in the bottom decile in at least two out of tier 1 capital ratio, capital adequacy ratio, and tier 1 leverage ratio prior to the acquisition. *Size* is the log of total assets in thousands. *ROA* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets

In Table 8 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROE. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–8, and 9–12 after the acquisition. The binary variable *Constraint* equals 1 for banks who are in the bottom decile in at least two out of tier 1 capital ratio, capital adequacy ratio, and tier 1 leverage ratio prior to the acquisition. *Size* is the log of total assets in thousands. *ROE* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets

In Table 9 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROA. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–8, and 9–12 after the acquisition. In place of the binary constraint variable, *Risk Based Capital Ratio* prior to the acquisition is used. *Size* is the log of total assets in thousands. *ROA* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets

In Table 10 we use two dimensional clustered error regressions to investigate the impact of bank characteristics on the post acquisition change in performance measured as Δ ROE. All independent variables are measured in the quarter prior to the acquisition while the dependent variable is the average change over quarters 1–4, 5–

8, and 9–12 after the acquisition. In place of the binary constraint variable, *Risk Based Capital Ratio* prior to the acquisition is used. *Size* is the log of total assets in thousands. *ROE* is used to control for the level of performance prior to the acquisition. *NII* is non-interest income divided by net income. *Loans* is measured as loans to total assets. *NCO* is a ratio of net charge-offs to total equity. *Payout* is the dividend payout ratio and *IBA* is the interest bearing assets to total assets

Table 11 shows the descriptive statistics of the matched sample shown in Fig. 1. Each capital constrained bank is matched with a capital unconstrained bank on size (total assets) and ROA at the time of the merger/acquisition (T=0). After controlling for Size, ROA and ROE, the results of this matched pairs sample is consistent with the previous regressions. Capital constrained banks finance the acquisitions primarily in cash, while unconstrained banks use stock. Unconstrained banks also have a much larger change to goodwill

References

Agrawal A, Jaffe J, Mandelker G (1992) The post-merger performance of acquiring firms: a re-examination of an anomaly. J Finance 47:1605–1622

Almeida H, Campello M, Weisbach M (2004) The cash flow sensitivity of cash. J Finance 59:1777–1804

Alshwer A, Sibilkov V, Zaiats N (2011) Financial constraints and the method of payment in mergers and acquisitions. *Working Paper*

Andrade G, Mitchell M, Stafford E (2001) New evidence and perspectives on mergers. J Econ Perspect 15:103–120

Aw M, Chatterjee R (2004) The performance of UK firms acquiring large cross-border and domestic takeover targets. Appl Financ Econ 14:337–349

Baradwaj B, Dubofsky D, Fraser D (1992) Bidder returns in interstate and intrastate bank acquisitions. J Financ Serv Res 5:1573–0735

Benston G (2004) What's special about banks? Financ Rev 39:13–33

Caves R (1989) Takeovers and economic efficiency: foresight vs. hindsight. Int J Ind Organ 7:151–174

Cornett M, Tehranian H (1992) Changes in corporate performance associated with bank acquisitions. J Financ Econ 31:211–234

Denis D, Sibilkov V (2010) Financial constraints, investment, and the value of cash holdings. Rev Financ Stud 23:247–269

Eckbo B, Thorburn K (2000) Gains to bidder firms revisited: domestic and foreign acquisitions in Canada. J Financ Quant Anal 35:401–417

Fama E, MacBeth J (1973) Risk, return and equilibrium: empirical tests. J Polit Econ 81:607–636

Fazzari S, Hubbard R, Petersen B (1988) Financing constraints and corporate investment. Brookings PapEcon Act 1:141–206

Franks J, Harris R, Titman S (1991) The post-merger share-price performance of acquiring firms. J Financ Econ 29:81–96

Hadlock C, Houston J, Ryngaert M (1999) The role of managerial incentives in bank acquisitions. J Bank Financ 23:221–249

Harford J (1999) Corporate cash reserves and acquisitions. J Finance 54:1969–1997

Harford J (2005) What drives merger waves? J Financ Econ 77:529–560

Houston J, Ryngaert M (1994) The overall gains from large bank mergers. J Bank Financ 18:1155–1176

Jensen M (1986) Agency costs of free cash flow, corporate finance and takeovers. Am Econ Rev 76:323–329

Kaplan S, Zingales L (1997) Do financing constraints explain why investment is correlated with cash flow? Q J Econ 112:169–215

Khatami H, Marchica M, Mura R (2011) Returns from m&as and acquisition premiums: the case of financial constraints. *Working paper*

Knapp M, Gart A, Beecher D (2005) Post-merger performance of bank holding companies 1987–1998. Financ Rev 40:549–574

Lang L, Stulz R, Walkling R (1991) A test of the free cash flow hypothesis: the case of bidder returns. J Financ Econ 29:315–335
Loughran T, Vijh A (1997) Do long-term shareholders benefit from corporate acquisitions? J Finance 52:1765–1790
Madura J, Wiant K (1994) Long-term valuation effects of bank acquisitions. J Bank Financ 18:1135–1154
Mitchell M, Mulherin J (1996) The impact of industry shocks on takeover and restructuring activity. J Financ Econ 41:193–229
Moeller S, Schlingemann F (2005) Global diversification and bidder gains: a comparison between cross-border and domestic acquisitions. J Bank Financ 29:533–564
Moyen N (2004) Investment cash-flow sensitivities: constrained vs. unconstrained firms. J Finance 59:2061–2092
Myers S, Majluf N (1984) Corporate financing and investment decisions when firms have information that investors do not have. J Financ Econ 12:187–221
Peek J, Rosengren E (1997) How well capitalized are well-capitalized banks? New England Economic Review. Federal Reserve Bank of Boston, September Issue 41–50
Petersen M (2009) Estimating standard errors in finance panel data sets: comparing approaches. Rev Financ Stud 22:435–480
Shawky H, Kilb T, Staas C (1996) Determinants of bank merger premiums. J Econ Financ 20:117–131
Subrahmanyam V, Rangan N, Rosenstein S (1997) The role of outside directors in bank acquisitions. Financ Manag 26:23–36
Travlos N (1987) Corporate takeover bids, methods of payment and bidding firms' stock returns. J Finance 42:943–963

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