Does Excess Cash Affect Bank Behavior?

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Abstract

In light of the recent regulatory changes and the increase in cash reserves after the financial crisis of 2007-08, we examine the effects of holding excess cash on bank's business policies, for both listed and unlisted banks. Investigating bank business policies (acquisition, market power, lending, and credit risk), our evidence does not support the hypothesis that excess cash exacerbates agency problems. We also document the importance of the listing status for bank holding companies with liquidity risk being more severe for unlisted banks, which are more reliant on excess cash to finance investments. Overall, the evidence supports precautionary and strategic motives as main drivers of the relationship between business policy choices and excess cash for listed and unlisted banks, respectively. Finally, in line with strategic motives to hoard cash, we find that the correlation between excess cash and acquisition investments increases after the crisis.

JEL classification: G20, G21, G28, G32, G34

Keywords: Cash, Liquidity, Acquisition, Lending, Listing status.

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1. Introduction

The lack of liquidity held at individual banks played a major role in triggering the great financial crisis of 2007-08 (Tirole, 2011). This has sparked a new interest in how banks manage their liquidity. Both academics and policy-makers have re-examined the measurement and importance of liquidity, introducing also new liquidity ratios as part of the Basel III agreement.[1] Various policy initiatives were enacted to ensure that US banks held sufficient liquidity by the US Treasuries and the Federal Reserve both during the crisis of 2007-08 and in the following years.[2] The Federal Reserve also started in October 2008 to pay interest on all reserves, increasing the marginal return of holding cash. Low interest rates in the federal funds market, where banks commonly parked their cash, and low yields on Treasury bills also decreased the opportunity cost of holding cash.[3] Because of all these changes, cash reserves, the most liquid among short term assets, increased from about 3% of total assets at the onset of the crisis to more than 7% in 2011 and so remained thereafter, as shown in Figure 1.[4]

[Please insert Figure 1 about here]

This sharp increase, which has not been reversed yet, poses several questions on the impact of cash holdings on bank's business policies. Theoretical models provide conflicting suggestions. High levels of liquidity might induce managers to accept excessive risks (Myers and Rajan, 1998), because high liquidity provides a kind of "insurance effect" for the managers, reducing the risk of a

[1] The Basel Committee on Banking Supervision (BCBS) introduced liquidity standards for banks in the December 2010 final document (the so-called Basel III agreement). Following the Basel III agreement, minimum liquidity coverage ratios for large banks have also been introduced in the US for the first time in 2014. See: http://www.federalreserve.gov/newsevents/press/bcreg/20140903a.htm

[2] For example, the massive cash injections associated to the Capital Purchase Program of the Treasury, the Federal Reserve's liquidity programs and the three phases of the quantitative easing.

[3] The Federal Reserve began paying interest on all reserve balances (both required and excess balances) held by depository institutions in October 2008. This interest rate was essentially equal to the target for the federal funds rate between mid-November 2008 until December 2008. The reduced cost of holding reserves was also caused by the large scale asset purchase programs, also known as quantitative easing, put in place by from November 2008 to the end of 2014 (see for example Hanckock and Passmore, 2014).

[4] This increase cannot be explained by required reserves. In fact, reserve requirements barely moved between 2007 and 2009 (see https://www.federalreserve.gov/monetarypolicy/reservereq.htm#table1). Moreover, Ennis and Wolmann (2012) show that required reserves have a very small increment in the post crisis period.

shortfall (Acharya and Navqi, 2012). In addition, excessive cash reserves may exacerbate conflicts between shareholders and the bank's managers (Jensen, 1986). So, agency conflicts may be a consequence of retainining too much cash. Strategic motivations could also be a reason why banks hoard liquidity. Excess cash may allow banks to be more aggressive, with cash-rich banks hoarding liquidity to prey on weaker competitors when the time is right (Acharya *et al.*, 2011; Allen and Gale, 2004b; Gorton and Huang, 2004). On the other hand, cash holdings may actually reduce risk taking if held outside of the bank (Calomiris *et al.*, 2015). Indeed, Calomiris *et al.* (2015) observe that cash requirements encourage proper risk management (see also Bias *et al.*, 2016). Thus, excess cash may reduce the probability of a liquidity crisis or, to put it differently, the impact of negative future events associated to liquidity shortages. In these situations, excess cash is therefore associated to precautionary reasons (Diamond and Dybvig, 1983; Allen and Gale, 2004a; Acharya and Skeie, 2011; Diamond and Rajan, 2011; Gale and Yorulmazer, 2013).

In this paper we address the paucity of evidence concerning how cash holdings, and in particular the fraction of these reserves held in excess of the bank's needs (henceforth defined as *Excess cash*), affect banks' and executives' behavior. Cash is a key component of liquid assets, accounting in our sample between is 15% and 30% of total liquid assets.[5] Using a sample of all US bank holding companies (henceforth BHCs) over the period 2002-2014, we investigate the effect of excess cash on the following bank business policies: acquisitions (Harford, 1999; Harford *et al.*, 2008; Dittmar and Mahrt-Smith, 2007; Gao *et al.*, 2013); market power (Berger and Roman, 2015); lending (Acharya and Navqi, 2012); and credit risk (Berger and Bouwman, 2013). The relationship between excess cash and the bank's behavior is also a function of the ability of banks to obtain funding from financial markets. To this end, we use the listing status of the bank as a proxy for the availability of external capital for a bank. Everything else equal, we expect unlisted banks to be more financially

[5] We define liquid assets as the sum of the following liquid assets: cash and due from other institutions; held-to-maturity securities; available-for-sale securities; trading assets; federal funds sold; and securities purchased under agreements to resell. DeYoung and Yang (2016) note that US banks supervisors have for decades included about several different liquidity ratios in the Uniform Bank Performance Reports (UBPRs) to recognize the standards used by US banks.

constrained than listed banks, because they have a more limited supply of capital available. For this reason, the precautionary motive to hold cash is expected to be more relevant for unlisted banks than for listed banks. Indeed, Falato and Scharfstein (2016) document a more cautious behavior of unlisted banks compared to listed banks, which are more eager to increase risk. Listed firms, usually with a more diffuse ownership than unlisted firms, also suffer from more severe agency problems between shareholders and managers, increasing the cost of funding for these banks (Gao *et al.*, 2013). On the other hand, the conflicts should also provide incentives to take more risks. Strategic considerations could also lead unlisted banks to hoard more cash than listed banks. In fact, given their reduced ability to raise capital on short notice, they have to rely on internal resources if they want to act as buyers during fire asset sales.

The main results of the empirical analysis can be summarized as follows. Using the residuals from a model for cash holdings as a proxy of excess cash,[6] we do not find evidence supporting the view that excess cash generates agency costs resulting in value destroying acquisitions or an increase in lending. Banks do not use excess cash to increase their market power, which actually decreases. Regarding lending and the credit risk of their loan portfolios, we do not find evidence supporting the view that banks adopt a riskier behavior when they are cash-rich. Our analysis documents significant differences between listed and unlisted banks, emphasizing the different role of cash reserves in the two subsamples. Excess cash is associated with a less aggressive behavior by listed banks, which refrain from making acquisition investments, and do not increase credit risk. Overall, these results indicate that managers of listed firms build up large liquidity buffers mainly for precautionary reasons, and not for taking on more risks. On the other hand, unlisted banks use excess cash to increase acquisition. Managers of unlisted banks increase acquisition spending, reduce market power, and take on more credit risk when cash is plentiful, which is a behavior consistent with strategic

[6] The results of our analysis do not change if we use definitions of excess cash that do not rely on a first-stage estimation. We discuss these alternative definitions and the relative results in Section 6.4.

motivations to hoard cash. Having less funding opportunities, excess cash is indeed one of the few options that unlisted bank managers have to fund risky investment projects.

We also offer a series of additional important results. First, we show that the increase in cash is mostly due to interest bearing balances, which are held outside of the bank as suggested by Calomiris *et al.* (2015). At least for listed banks, our results support the prediction that higher cash reduces risk-taking. Second, we provide evidence suggesting that the great financial crisis of 2007-08 represents a significant break with the past. Indeed, the correlation between excess cash and acquisition investments increases in the post-crisis period. This result is in line with a strategic use of cash: deep-pocket banks position themselves as buyers during the crisis. Finally, we document that our findings are robust to different definitions of excess cash, mitigating concerns that an error-in-variable problem may drive our results.

Our paper provides several contributions to the literature. First, we offer new evidence that excess cash does not increase agency conflicts between managers and shareholders in the banking industry. Understanding the incentives of cash on bank managers is of paramount importance in the light of the introduction of minimum liquidity ratios, and the substantial increase of cash holdings in the aftermath of the financial crisis. While regulation may have opened the door for managers to increase their power in the bank they manage, our evidence suggests that this concern appears of negligible importance. Second, we provide compelling evidence about the importance of the listing status for bank holding companies, highlighting that liquidity risk could be more severe for unlisted banks. This distinction is also important at policy level, often too focused on systemic risks and too-big-too-fail banks, and adds to the literature about the cost of ignoring small banks (Croci *et al.*, 2016). Third, our results indicate that cash reserves are an important tool in managing liquidity risk as well as risk-taking incentives. Finally, our findings lead to important policy implications: cash affects bank's behavior, so policies aimed at creating liquidity buffers should also focus directly on cash. Our results, especially for listed firms, support the introduction of a pure cash requirement as

proposed by Calomiris *et al.* (2015). Another implication for regulators is that excess cash impacts listed and unlisted banks differently, suggesting that a one-size-fits-all type of liquidity coverage ratios may not be the optimal choice.

The remainder of the paper is organized as follows. We review the literature and develop our hypotheses in the Section 2. We describe our sample and present summary statistics in Section 3. We examine the determinants of cash levels in Section 4. The effects of excess cash on bank's policies are presented in Section 5, and additional analyses are presented in Section 6. We conclude in Section 7.

2. Literature review and hypothesis development

The disruptions caused by the financial crisis of 2007-08 have highlighted the importance of bank liquidity. Liquidity problems generated a downward spiral, which led to fire sales that in turn further intensified the crisis and slowed the whole economy (Brunnermeier and Pedersen, 2009; Adrian and Shin, 2010). Despite the large body of theoretical works that examine the incentives to hoard liquidity,[7] fewer studies conduct empirical analyses on the consequences of holding cash.

Cash reserves may impact how banks manage risk because of agency costs, strategic implications, and precautionary reasons. Myers and Rajan (1998) show that cash reserves kept inside the bank may lead to greater risk-taking. Protected by high cash reserves, managers have greater incentives to take more risks creating a wedge between shareholders and debtholders, for example engaging in aggressive lending (Acharya and Navqi, 2012). Moreover, excess cash has also the potential to generate new agency conflicts, allowing managers to pursue their own agenda, which could even lead to a destruction of firm value (Jensen, 1986). Explanations based on agency costs are not the only ones that can lead banks to use the cash reserves they accumulated. Indeed, managers

[7] See, for example, Allen and Gale, 2004a; Allen and Gale, 2004b; Gorton and Huang, 2004; Acharya and Skeie, 2011; Diamond and Rajan, 2011; Tirole, 2011; Gale and Yorulmazer, 2013; Heider et *al.*, 2015.

could use their financial slack to position themselves as buyers in fire asset-sales (Allen and Gale, 2004b; Gorton and Huang, 2004; Acharya *et al.*, 2011). Under this scenario, cash is used strategically to exploit competitors' weaknesses. On the other hand, because cash is observable and riskless, greater cash holdings incentivize banks to reduce risks in their non-cash assets (Calomiris *et al.*, 2015). This attenuates default risk, which in turn alleviates liquidity risk. Additionally, due to the importance of liquidity management and the higher costs of mismanaging cash reserves in the banking industry compared to non-financial sectors, managers could be very reluctant to use the hoarded cash to finance their own pet projects if this could lead to negative career and compensation changes (Eckbo *et al.*, 2016).[8] For these reasons, the precautionary motive, which allows banks to protect themselves against their depositors' uncertain liquidity needs, may also explain why banks accumulate cash (Acharya and Skeie, 2011; Diamond and Rajan, 2011; Gale and Yorulmazer, 2013).

The effect of cash on how the bank behaves also depends on its ability to obtain funding from financial markets: banks that are more financially constrained relay more on cash reserves for their investments. Recent literature (Brav, 2009; Saunders and Steffen, 2011) has observed that privately owned companies usually face higher costs of external financing than publicly listed firms. For this reason, listed banks, which can more easily sell equity and debt to the public, have a larger supply of capital available than unlisted banks, everything else equal. Thus, the listing status of the bank can serve as a proxy for the availability of external capital for a bank. Since unlisted banks are more financially constrained, we expect that the precautionary motive to hold cash is more important for unlisted banks than for listed banks. Consistent with this views, Falato and Scharfstein (2016) document that banks increase risk when they transition from private to public ownership. Lacking easy access to financial markets, unlisted banks may be also prone to build large liquidity buffers for strategic reasons. On the other hand, public ownership of listed firms usually implies a diffuse

[8] Another motivation, transaction reasons (Bates et *al.* 2009), is ignored in this paper because scarcely relevant in our analysis. We also ignore tax considerations (Foley et *al.* 2007) because the great majority of the banks considered does not have foreign operations.

ownership, increasing agency problems between managers and shareholders. As a consequence of the severity of these agency conflicts, listed firms retain more cash (Gao *et al.*, 2013; Farre-Mensa, 2015). Because of these considerations, listed banks should retain more cash than privately owned ones if agency problems dominate.

The presence of cash above the optimal level might have implications on bank business policies. While acquisitions, market power, lending and change in credit risk are not an exhaustive list of the bank business policies cash can affect, their analysis provides insights helpful to understand and disentangle the effects of excess cash. We now discuss how excess cash is expected to affect the various business policies under the three different hypotheses (agency costs, strategic implications, and precautionary reasons). Table 1 summarizes the expected signs according under the three hypotheses.

[Please insert Table 1 about here]

Cash and agency costs

Since larger liquidity buffers increase risk-taking incentives (Acharya and Navqi, 2012), we expect a positive relation between excess cash and risky bank business policies if cash increases agency conflicts. Acquisitions are a textbook example of investments where agency conflicts may arise. While the banking literature has examined the potential divergence of interests between managers and shareholders (see, for example, DeYoung *et al.*, 2009), these studies do not investigate whether excess cash holdings affect acquisition choices and the associated wealth effect.[9] If excess cash exacerbates agency problems, we expect cash rich banks to be more acquisitive than other banks, but we expect these acquisitions to generate lower abnormal returns because of their poor average quality. Taking additional risks could also increase market power because riskier customers pay

[9] Studies on acquisitions mostly focus on size (Berger and Hannan, 1988); CEO ownership (Hadlock *et al.*, 1999; Hughes *et al.*, 2003); CEO compensation (Bliss and Rosen, 2001); and CEO incentives (Chen *et al.*, 2006; Gupta and Misra, 2007; Hagendorff and Vallascas, 2011; Minnick *et al.*, 2011; DeYoung *et al.*, 2013).

higher interest rates (increased moral-hazard channel) (Berger and Roman, 2015). Regarding the bank's lending policy, abundant cash reserves may also induce managers to take excessive risk because of the lower risk of failure in case of a negative outcome. Liquidity buffers above the optimal level could lead managers to pay less attention to the quality of the loans, resulting in an increase of the riskiness of their loan portfolio.

Cash and Strategic Implications

Strategic motives imply that banks are increasing cash reserves to exploit opportunities to improve their competitive position and take advantage of rivals' weaknesses. Thus, cash-rich banks will make more acquisitions during fire sales, which usually are associated with crisis periods. For this reason, if strategic motives drive the increase in cash reserves, we expect that the relation between excess cash and acquisitions will be stronger in crisis times and will not generate a negative market reaction. Excess cash may be used strategically to compete more aggressively in the product market (Funderberg and Tirole, 1986; Bolton and Scharfstein, 1990). For example, cash-rich banks may offer customers lower rates and fees on loans and loan commitments and higher rates on deposits and other funds to drive weaker competitors out of their markets (predation channel). Excess liquidity may signal a willingness to take less risk, shifting to safer portfolios, and therefore to lower market power, for precautionary reasons.[10] Strategic considerations may also drive a positive association between excess cash and lending, in particular when the increase in lending is aimed at weakening competitors.

Cash and Precautionary Motives

Excess cash may also signal that the bank is less willing to take risks, and that it is hoarding cash as a buffer against unexpected negative liquidity shocks. If precautionary motives drive the surge in cash reserves beyond the optimal level, we expect that fewer acquisitions will be carried out. Banks

[10] We do not consider the stigma channel mentioned by Berger and Roman (2015). Our cash surplus is not associated to a signal of financial distress.

may exploit excess cash to improve their competitive position (Berger and Roman, 2015). Customers may be willing to pay more for credit from banks with large liquidity buffers and creditors may demand lower interest rates, because of the lower default risk of these banks (safety channel). If excess cash is a manifestation of a desire for a "quiet-life" (Hicks, 1935; Keeley, 1990; and Cordella and Yeyati, 2003), banks have decreasing incentives for aggressive behavior, leading to higher market power (high fees and rates for credit; low rates for deposits). If precautionary motives cause banks to increase their cash reserves, then lending and credit risk-taking will decrease as documented in Cornett *et al.* (2011).

3. Dataset and sample

Our sample is composed of all US bank holding companies (henceforth BHCs) with consolidated data available from the Federal Reserve Bank of Chicago (FR Y-9C) with total assets larger than $500 million over the period 2002-2014. Since the asset-size threshold for filing the FR YR-9C form was increased from $150 million to $500 million in March 2006, our sample includes only bank holding companies exceeding the $500 million threshold to avoid the inclusion of small BHCs in the early part of our sample period that do not to have to file the FR Y-9C report after 2005.[11] The final sample comprises 46,629 bank-quarter observations.

We also employ data from several other sources. Merger data are from the Federal Reserve Bank of Chicago BHC Merger data file.[12] Data on participation to the Capital Purchase Program (CPP), as well as the amounts received and reimbursed under such program, are obtained from the US Treasury's Troubled Asset Relief Program (TARP) Investment Program Transaction Reports.[13] Data on Federal liquidity injections during the financial crisis are from the Board of Governors of the

[11] The asset-size threshold for filing the FR YR-9C form was increased to $1 billion starting from March 2015.
[12] https://www.chicagofed.org/banking/financial-institution-reports/merger-data
[13] https://www.treasury.gov/initiatives/financial-stability/reports/Pages/TARP-Investment-Program-Transaction-Reports.aspx

Federal Reserve System. The term facilities used by the Federal Reserve to provide liquidity to the banking system we consider include the Term Auction Facility (TAF)[14], the Term Securities Lending Facility (TSLF), the Primary Dealer Credit Facility (PDCF), the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), and the Term Asset-Backed Securities Loan Facility (TALF). Fleming (2012) provides in-depth descriptions of these facilities. Finally, we also use CRSP for stock market data and Compustat for additional data.

4. Cash Holdings, Excess Cash, and Variables

In this section, we introduce and discuss cash holdings and excess cash. First we start with the definition of cash holdings that we use throughout the paper as well as their summary statistics. Then, we present the model we employ to determine excess cash and the variables used in models.

We measure cash holdings as cash and due from depository institutions scaled by total assets (*Cash*). *Cash* is a component of liquid assets, a traditional proxy of bank liquidity. Panel A of Table 2 decomposes liquid assets into its components. As it appears clear from the table, liquid assets share the same increasing trend of *Cash*. However, a close look at the components show that *Cash* is together with available-for-sale securities the main driver of the increase in liquid assets. Indeed, the incidence of cash and due from other institutions on liquid assets has gone substantially up after 2007.

[Please insert Table 2 about here]

Table 2 reports summary statistics of *Cash* for the full sample of all BHCs (Panel B) and the sub-samples of listed and unlisted BHCs (Panel C). Overall, we find evidence of a noteworthy increase in cash and due from other institutions starting around the financial crisis (see also Figure 1), which has not been reversed yet. Differently from Gao *et al.* (2013) that show that private non-financial firms hold on average about half as much cash as publicly listed corporations, we find that unlisted bank holding companies responded to the crisis by increasing their liquidity buffers more

[14] http://www.federalreserve.gov/newsevents/reform_taf.htm

sharply than listed banks (7.9% vs. 6% at the end of 2011). This larger increase for unlisted banks is consistent with unlisted banks being more financially constrained than listed banks, and therefore more prone to managing liquidity risk.

To compute the excess cash held by the bank *i*, we estimate the model shown in Equation (1) on quarterly basis from 2002Q1 to 2014Q4. The residuals of the cross-sectional regressions are our measure of excess cash (*Excess cash*), i.e. the deviation from the target level of cash for that particular quarter obtained from the model.

$$CASH_i = \beta_1 Ln(size)_i + \beta_2 ROA_i + \beta_3 CIR_i + \beta_4 ETA_i + \beta_5 Diversification_i + \beta_6 NPL_i + \beta_7 ROA\,Volatility_i + \beta_8 Core\ deposits_i + \beta_9 Unrealized\ losses_i + \beta_{10} Unused\ commitments_i + \beta_{11} FED\ liquidity_i + \beta_{12} CPP_i + \beta_{13} CPP\ reimbursement_i + \beta_{14} Listed_i + \epsilon_i \quad (1)$$

Following the related literature (see Cornett *et al.*, 2011), we include both bank-specific factors and variables relating to the liquidity injections occurred during the credit financial crisis as explanatory variables of *Cash* in regression (1). We present definition and construction of all variables used in the paper in Table A.1 in the Appendix. Among bank-specific variables, we use the natural logarithm of bank's total assets, *Ln(size)*, to proxy for bank size. Foley *et al.* (2007), Bates *et al.* (2009), and Duchin (2010) document a negative association between size and cash holdings for non-financial companies. Large banks could also retain less cash reserves for precautionary reasons due to the expectation of a government bailout in case of distress (Bayazitova and Shivdasani, 2012; and Duchin and Sosyura, 2012). We employ the return on average assets (*ROA*) as proxy for bank profitability. Cash increases as consequence of a higher profitability (Bourke, 1989), but the relationship may turn negative if banks, in light of their positive *ROA*, reduce cash holdings (Molyneux and Thornton, 1992). Operational inefficiency, proxied by the cost-to-income-ratio (*CIR*), should increase the cash held by the banks because less efficient banks tend to have higher costs to face (Altunbas *et al.*, 2007). Since highly capitalized banks have an easier access to the capital market

and may decide to keep less cash for precautionary reasons (Castiglionesi *et al.*, 2014), we expect a negative sign for the relation between *ETA* and *Cash*. Following Duchin (2010), we expect a negative sign between *Diversification* and cash reserves, given that diversification attenuates liquidity risk. We also expect that banks will increase their liquidity buffers for precautionary reasons when credit risk, proxied by non-performing loans (*NPL*), and operating profit volatility (*ROA volatility*) are substantial (see Altunbas *et al.*, 2007 for credit risk). Core deposits (*Core deposits*) are a stable source of funding for the bank (Cornett *et al.*, 2011), and banks that rely more on core deposits retain less cash. We also include in the model *Unrealized losses* and *Unused commitments*, which proxy for additional sources of liquidity risks due to losses in securities holdings and exposure to undrawn commitments (Cornett *et al.*, 2011; and Berrospide, 2013). Both variables are expected to increase the level of cash holdings. Finally, a binary variable for the listing status is included (*Listed*) to account for the different opportunities of funding of listed and unlisted banks.

Liquidity injections programs carried out by the Federal Reserve (henceforth FED) (Fleming, 2012) in the first phase of the quantitative easing (QE1, see for example Hankcock and Passmore, 214) and the CPP of the US Treasury (see, for example, Bayazitova and Shivdasani, 2012; Duchin and Sosyura, 2012) have the potential to positively affect the level of cash reserves held by banks. To control for the effects associated with the FED programs, we include a binary variable, *FED liquidity*, taking value 1 in the quarters in which the bank received liquidity under one or more programs described in Section 3. Regarding the CPP, part of the larger TARP, we add variables capturing both the liquidity injections (positive effect on cash reserves) and the capital repayments (negative effect), which often took place years after the liquidity injection. We control for cash injections and capital repayments using either binary variables (*CPP* and *CPP reimbursement*, respectively) or the amount of the original investment/capital repayment scaled by total assets (*CPP amount* and *CPP amount reimbursed*, respectively).

Table 3 reports summary statistics of the variables used in empirical analysis. Pairwise correlations between variables are presented in Appendix A.2. Listed banks are larger, more efficient,

characterized by a higher quality loan portfolio, and more likely to be included in the FED and Treasury liquidity programs than unlisted banks. On the other hand, unlisted banks are more diversified and rely more on core deposits than their listed counterparts. Finally, even if the differences are statistically significant, profitability and operating profit volatility are economically similar between the two subsamples.

[Please insert Table 3 about here]

Panel A of Table 4 reports summary statistics of the predicted cash level obtained from Equation 1, which we label target cash level, for the full sample of all BHCs and the sub-samples of listed and unlisted BHCs. Overall, we find that the average values of target cash level increase over the period 2002 – 2014. Hence, the values of cash predicted by the model show a similar trend of *Cash* observed in Table 2. Moreover, despite the growing trend of *Cash*, the number of banks with cash levels lower than the optimal level (see the number of observations with negative *Excess cash*) is substantially stable compared to the beginning of the period.

To conclude this section, we provide evidence about the determinants of cash reserves held by bank over the entire sample period. Results of panel regressions with bank and quarter fixed effects are shown in Panel B of Table 4. Overall, we find that larger, more profitable, and more capitalized banks retain less cash. Similarly to what found for non-financial corporations by Duchin (2010), more diversified banks hold less cash as well. Managerial inefficiencies, proxied by the cost-income ratio, have a positive coefficient, indicating that managers increase liquidity buffers because of these costs. Banks more exposed to operating profit volatility show an increase of their cash reserves. All these results are in line with the precautionary motive to retain cash. However, differently from Cornet *et al.* (2011), core deposits are positively correlated with cash holdings. We also observe that cash injections during the crisis and the subsequent repayments impact the bank cash holdings with the expected sign (positive and negative, respectively). Unrealized losses on security holdings affects positively the amount of cash held by banks, similarly to what observed by Berrospide (2013). On

the other hand, unused commitments have a negative effect on the cash holdings of the bank, which is line with the evidence provided by Cornett *et al.* (2011) for large commercial banks. Finally, the binary variable for listed banks has the expected negative sign, suggesting that listed banks retain less cash than unlisted banks.

[Please insert Table 4 about here]

Panel C of Table 4 estimates the same model for the subsamples of listed and unlisted BHCs. Splitting the sample highlights important differences between the two groups that are not captured in Panel A. *ROA* affects negatively cash reserves of unlisted banks, but not those of listed BHCs. Cash reserves of publicly listed bank holding companies are insensitive to their profitability, which is likely to be related to a supply of capital that relies less on internal funds than unlisted banks. Capital ratios and diversification affect only cash reserves of listed firms. We do not observe the same trade-off between *ETA* and liquidity for unlisted banks. Highly capitalized listed banks may issue equity as well as debt to the public more easily and at a lower cost than unlisted banks (Saunders and Steffen, 2011). Finally, cash reserves of unlisted banks increases with *Unrealized losses*, but the same does not happen for listed banks. Overall, the evidence suggests that profitability (proxied by the *ROA* and *Unrealized losses*) and its riskiness (*ROA volatility*) are the key determinants, together with managerial inefficiencies (*CIR*) and demand deposits (*Core deposits*), of the cash reserves of unlisted banks. Lacking an easy access to external capital markets, these banks manage their liquidity as a function of their internal cash flows and retail deposits. Listed banks present a different picture, exploiting diversification to reduce their liquidity needs and trading off liquidity for capital.

5. Bank Business Policies

To examine whether excess cash affects bank behavior, we identify the following business policy choices: acquisition investments; competition; lending policies, and increases in credit risk

(see Table A.1 in the Appendix for details on these dependent variables). While the list is certainly not exhaustive, choices concerning these policies could help us to distinguish and disentangle the different reasons to build a liquidity buffer. In all the models presented, the independent variables are lagged by one quarter with respect to the dependent variable.

5.1 Acquisitions

We analyze acquisitions in terms of both of acquisitiveness and abnormal returns around their announcements. More specifically, to assess the propensity to acquire, we employ a binary variable that takes the value of 1 if the bank completes at least an acquisition in the following quarter, and 0 otherwise (*Acquisition dummy*). We use the sum of total assets of the target banks acquired in the following quarter, scaled by the total assets of the acquiring bank (*Acquisition value*), to examine whether excess cash impacts acquisition volume. Cumulative abnormal returns (*CAR*) in the event window (-2, 2 and -1, 1) centered on the acquisition date are our proxy of the quality of acquisitions. As determinants of acquisitions, besides *Excess cash*, we use bank-specific factors (*Ln(size), ROA, CIR, ETA, Diversification, NPL, ROA volatility, Listed*). Following the literature (see, for example, Hagendorff and Vallascas, 2011), in the abnormal return regressions, we also consider the ratio of the target bank's total assets to the bidding bank's total assets (*Relative size*), a dummy variable that takes the value of 1 if target and bidder are from the same state, and 0 otherwise (*Same state*), a binary variable that takes the value of 1 if the target bank is listed, and 0 otherwise (*Public*), and CEO's delta and vega, *Ln(delta)* and *Ln(vega)* respectively.

Panel A of Table 5 provides the results for the acquisitiveness of bank holding companies. We estimate models using the full sample, and subsamples for listed and unlisted banks. We employ both a logit model, when the dependent variable is a binary variable for acquisitions in the next quarter, and a Tobit model for the volume of acquisitions. Consistently with Beccalli and Frantz (2013), results show that in the full sample, excess cash does not affect the bank's acquisition investment decisions. However, we observe substantial differences when we analyze the subsamples based on

the bank listing status. Excess cash has a negative effect on acquisitions when the BHC is listed. This negative coefficient does not support the agency view that excess cash either exacerbates agency conflicts and leads to empire building (Jensen, 1986) or leads managers to take additional risks.[15] On the other hand, the finding is consistent with banks hoarding cash in excess of their needs for precautionary motives. Unlisted banks, especially when we focus on the volume of acquisitions, exhibit a tendency to acquire more after accumulating excess cash. This pattern appears to be consistent with both an agency-driven story and the strategic motive for acquisitions. However, following Gao *et al.* (2013), unlisted banks are the least likely to suffer severe agency conflicts because ownership is usually more concentrated. Because of this consideration, together with the results of Table 4 where we show that unlisted banks manage their liquidity as function of their internal cash flows because of their financial constraints, strategic motivations appear the most plausible explanation.

Concerning the control variables, we find, as expected, that size increases the likelihood of acquisitions as well as being listed. Profitability and capital ratios are positive and significant, but only for listed firms. Diversification reduces the incentives to carry out acquisitions, but only for unlisted firms. Risk of operating profits, measured by the standard deviation of *ROA*, decreases the propensity to acquire of listed BHCs, but it does not affect the one of unlisted banks.

[Please insert Table 5 about here]

Regarding the quality of the acquisitions carried out in our sample period, we run an event study analysis around the announcement of acquisitions. Because the analysis requires stock returns, only listed banks are considered in the analysis. Panel B of Table 5 presents univariate statistics for the abnormal returns of the 609 acquisitions carried out by listed banks with stock prices available on

[15] Hagendorff and Vallascas (2011) and Craig and dos Santos (1997) show that acquisitions do not reduce default risk for the bidding bank.

CRSP.[16] Abnormal returns in the two event windows examined are indistinguishable from 0 at conventional levels. The multivariate analysis in Panel C surprisingly shows a positive coefficient for acquisitions of publicly listed banks. In line with Hagendorff and Vallascas (2011) and Croci and Petmezas (2015), CEO risk-taking incentives measured by vega positively impacts acquisition propensity.

Overall, results from acquisition investment policies do not support the view that excess cash increases agency conflicts. However, excess cash seems to be hoarded for precautionary reasons by listed banks and for strategic considerations by unlisted banks.

5.2 Competitive Effects

Berger and Roman (2015) provide evidence that liquidity injection under the TARP gave recipients competitive advantages with respect to non-recipient, in particular because this liquidity contributed to make these banks safer in the eyes of the investors. In this section, we analyze whether over a longer time period, which includes also expansionary years, excess cash has the same effect on market power. Market power is measured by the Lerner index (*Lerner*), i.e. price minus marginal cost divided by price, similarly to Berger and Roman (2015).[17] As for the other control variables, we include bank-specific factors (*Ln(size)*, *ROA*, *CIR*, *ETA*, *NPL*, *Non-interest income*, *Listed*) as well as variables to control for the CPP and FED cash injections and repayments.[18]

In Table 6, we find that *Excess cash* has a negative and significant coefficient, suggesting that excess cash is not used to increase market power. This result contrasts with Berger and Roman (2015). This negative coefficient is in line with the predation channel and the decreased-moral-hazard channel

[16] Abnormal returns are computed using a market model. Market returns are proxied by the returns of the CRSP value weighted portfolio. We employ the period [-240, -41] as estimation period and we require a minimum of 20 returns in this period.

[17] We describe the construction of the variable in Table A.1 of the Appendix. For a more detailed explanation of the Lerner Index, see Berger and Roman (2015).

[18] Differently from Berger and Roman (2015), we do not include age in our regression model because age is available only for a limited number of observations.

(increase in cash signals the willingness to move into safer portfolios). While the predation channel is associated with a strategic use of excess cash, the decreased-moral-hazard channel has clearly a more precautionary nature and is in contrast to an agency story. While the coefficient for listed banks is more negative, there is no statistically significant difference between listed and unlisted firms.

Together, the results for acquisitions and market competition suggest that predation (and so the strategic motive) is a better explanation for unlisted banks, which also increase their acquisitiveness when are cash rich. On the other hand, precautionary explanations are more suitable for listed banks given the negative relationship between excess cash and acquisitions.

[Please insert Table 6 about here]

5.3 Lending Policies

We investigate whether excess cash increases lending growth and credit risk-taking. Acharya and Navqi (2012) predict that higher liquidity buffers should induce managers to take excessive risks by increasing lending because of the higher security that liquidity provides. We present the results of panel regression estimations with bank and quarter fixed effects in Table 7.

To estimate the growth in volume of bank lending, we compute the growth rate of gross loans (*Loan growth*). We assess the propensity to increase credit risk-taking using the growth rate in risk-weighted loans and leases (*RW loan growth*). While previous literature use the difference between risk-weighted assets (*RWA*) in two consecutive quarters, scaled by lagged total assets as a proxy of credit risk (Shrieves and Dahl, 1992; Berger and Udell, 1994; Berger, 1995; and Aggarwal and Jacques, 2001), our measure allows us to capture the change in riskiness of the loan portfolio more closely. As determinants of *Loan growth* and *RW loan growth*, we use the bank-specific factors already employed in Equation (1) and the interaction between excess cash and the listed bank dummy.

We find that listed banks extend fewer loans when excess cash is high (Columns I to III). Again this result corroborates the view that cash hoarding does not lead to an increase in risk-taking in listed banks. Concerning control variables, size affects negatively the growth rate of lending while profitable banks extend more credit. Inefficient unlisted banks increase lending, probably to make up for the additional costs. Consistently with Gambacorta and Mistrulli (2004), Cornett *et al.* (2011), and Carlson *et al.* (2013), we find that better capitalized banks have higher growth rates. Diversification negatively affects lending growth, but only for unlisted banks. Banks with lot of nonperforming loans on their balance sheet restrain their lending (Carlson *et al.*, 2013) as well as banks with high operating profit volatility do. Differently from Ivashina and Sharfstein (2010) and Cornett *et al.* (2011), stable funding in the form of core deposits does not facilitate lending.

[Please insert Table 7 about here]

Results for credit risk-taking are presented in Columns IV to VI of Table 7. Excess cash is never significantly associated with the growth rate of risk-weighted loans. Listed and unlisted BHCs exhibit a similar behavior. Again, these results are inconsistent with the agency view, especially those of listed banks.

Size affects the change in *RW loan growth* negatively, a sign that contrasts with the view that large banks have a higher propensity to increase risks because their better access to external funds and the credit risk transfer market (Casu *et al.*, 2011). Consistent with Anderson and Fraser (2000), we find that *ETA* affects positively credit risk-taking. *ROA* increases risk-taking, consistent with the view that profitable banks are in a position to take more risks. As for lending growth, diversification hinders risk-taking for unlisted firms, which do not have resources to pursue credit risk-increasing strategies if they are diversified. Similarly, to what Casu *et al.* (2011) find, banks that are already facing high risks, both operating profit and credit risks, tend to avoid adding further risk.

Overall, the evidence on decisions related to the lending policies of the banks does not lend support to the view that excess cash increase bank managers' incentives to take risks.

6. Additional analysis and robustness checks

6.1 Instrumental Variable Approach

While the use of lagged variables and bank-fixed effects alleviate some endogeneity concerns, the relationships we uncover can be affected by reverse causality. To mitigate this concern, we use an instrument variable approach where we instrument excess cash using a house price index and the business bankruptcy cases in the bank state. We follow Chu (2016) and Granja *et al.* (2014) to create the house price index. The house price index is the weighted house price index in the metropolitan statistical areas (MSAs) in which the bank operates. We use the percentage of deposits of the bank holding company in the MSA as weight, and we exclude the MSA in which the bank has the largest amount of deposits from the index to reduce the effect of bank on the local house market. We rescale all house price index to assume value 100 at the end of 2001, the beginning of our sample period. As Chu (2016) observes, house price changes are likely to be out of the control of individual banks, which makes it a suitable instrument to satisfy the exclusion condition. House price indexes data are from the Federal Housing Finance Agency.[19] The second instrument is the log of 1 plus the number of business bankruptcy cases in the bank state, which are obtained from the F-2 U.S. Bankruptcy courts – Business and Non- Business cases filed, by Chapter of the Bankruptcy code. We use all business-related bankruptcies for every quarter in our sample. We use the two instruments together. Unreported, we find that the instruments pass the relevance condition, and they are statistically significant in the first stage regression.

Results are presented in Table 8. In the sake of brevity, we only present the coefficients of the instrumented variable (*Excess cash*). Acquisition and competition results are similar to what we show

[19] http://www.fhfa.gov/DataTools/Downloads/pages/house-price-index.aspx

in Tables 5 and 6, but with a weaker statistical significance level for the first ones (Panels A and B). Finally, in Panel C, we show that excess cash affects negatively lending and risk-weighted loans.

[Please insert Table 8 about here]

6.2 Financial Crisis

Figure 1 shows that the great financial crisis of 2007-08 represents a break point in the time series of cash holdings. In this section, we investigate whether the crisis affected how banks manage liquidity. Table 9 provides the results of our analysis in the three sub-periods: pre-crisis (2002Q1-2007Q2); crisis (2007Q3-2009Q2); and post-crisis (2009Q3-2014Q4).

The crisis has indeed an effect on how banks use excess cash for their acquisition policies.[20] While excess cash has the same negative coefficient we obtain in Table 5 in the pre-crisis period, this effect vanishes in the crisis and post-crisis period. This result is driven by listed banks, which rely on their cash reserves for their acquisition investments in the after crisis period more than in the pre-crisis period. The analysis shows that the negative effect of cash on competition is concentrated in the post crisis period. The results for unlisted banks in the post-crisis period are consistent with a strategic use of excess cash: cash rich banks have an incentive to employ their reserve to prey on weaker competitors (Bolton and Scharfstein, 1990). Indeed, they acquire more, sacrifice their market power, increase lending and the riskiness of their loan portfolio.

Overall the evidence is again not consistent with excess cash exacerbating agency conflicts even before the financial crisis. In the aftermath of the crisis, precautionary and strategic considerations dominate. These results are in line with a supply shock argument, according to which the sensitivity of investment to the existing cash resources increases when other funding opportunities dry up.

[20] Results for Tobit regressions are not reported for sake of brevity. Results are similar to those shown for logit models.

[Please insert Table 9 about here]

6.3 Regulatory and institutional interventions

We explore whether the changes in the US regulatory and monetary policies affected the amount of reserves held by US banks and therefore the cyclicality of excess cash. The Federal Reserve began paying interest on all reserve balances held by depository institutions (both required and excess balances) in October 2008, and the interest rate paid on these reserves became essentially equal to the target for the federal funds rate in the fourth quarter of 2008 concerns the interest rate paid on bank reserves by the Federal Reserve. Such a significantly reduced costs of holding reserves determined a sharp increase in the level of reserves.

We take a closer look at the effect of the interest rate paid on bank reserves in Table 10. Cash and due from other institutions is decomposed into non interest bearing balances and interest bearing balances, with both required and excess reserves included in the latter.[21] Panel A of Table 10 shows that while non interest bearing balances remain stable over time, interest bearing balances increased in 2008 and, even more, in 2009. We examine the effects of interest and non-interest bearing balances on bank business policies in Panels B to D. Results in these panels show that the effect of excess cash on bank business policies is mostly due to excess interest bearing balances, while the excess non interest bearing balances do not generally impact bank's policies, with the exception of security investments. This result is in line with the prediction of Calomiris *et al.* (2015), which argues that cash held outside provides the incentive to reduces the riskiness of the other assets of the bank.

[Please insert Table 10 about here]

A concern of this analysis is that the results of the post-crisis period, especially acquisitions, may be affected by the cash injections under the CPP program and asset purchase program put in place by the Fed in the last two quartes of 2009 and again the last quarte of 2010, which resulted in a

[21] See the Instructions for preparation of consolidated financial statements for bank holding companies, Reporting Form FR Y–9C, Reissued March 2007, Schedule HC line 1.B.

new wave of increases in bank reserves. To mitigate this concern, even if our proxy for excess cash already accounts for funding received under this program, we re-estimate the models for CPP and non CPP banks in the post-Lehman period. In unreported analysis, we obtain that receiving CPP money cannot explain the results shown in Table 9. Indeed, we find that excess cash is negatively associated to acquisition investments in the sample of CPP banks.

6.4 Alternative definitions of Excess Cash

The existence of potential errors-in-variable bias in the estimation of the excess cash, which is our variable of interest, could affect our results. Observed excess cash is derived from a first-stage statistical procedure. Estimation errors at the first stage might have an impact on the validity of inferences drawn in the second stage. To alleviate this concern, we use different definition of excess cash. The first alternative definition of excess cash we employ is the difference between the actual cash level of the bank and the required reserves (*Excess Cash 2*). Reserve requirements are from the Federal Reserve's website.[22] Since reserve requirements are for depository institutions and not bank holding companies, we estimate the level of required reserve using available data for transaction accounts.[23] Table 11 shows the results using *Excess Cash 2*. Results in Table 11 are remarkably similar to those presented in Tables 5 to 7, suggesting that our findings are robust to the proxy of excess cash used.

[Please insert Table 11 about here]

We also employ a third proxy, *Cash rich*, to identify banks that hoard cash. We use the empirical distribution of *Excess cash* to create this variable. Banks in the top quartile of the distribution of excess cash in a given quarter are considered to be cash rich.[24] Again, in unreported analysis, [25] we

[22] https://www.federalreserve.gov/monetarypolicy/reservereq.htm#table3
[23] Required reserves are calculated on net transaction accounts, which is total transaction accounts less the amounts due from other depository institutions and less cash items in the process of collection.
[24] We also use the top tercile and top quintile of the distribution with similar results.
[25] Results of all unreported analysis are available from the authors.

find results confirming previous tables. Finally, we also use cash holdings instead of excess cash, finding qualitatively similar to those obtained with excess cash, alleviating once again the concern that our findings are driven by an errors-in-variable bias.

6.5 Liquidity Creation

A final robustness check is related to liquidity creation. The liquidity creation measure proposed by Berger and Bouwman (2009) has received considerable attention in the banking literature (see Berger *et al*., 2016 for a recent application). Cash enters the liquidity creation function with a negative coefficient. In an unreported table, we find that excess cash is not another (negative) proxy for liquidity creation. In fact, using the CAT_FAT version of liquidity creation in lieu of excess cash, we cannot replicate the results obtained in Tables 4 to 8. In particular, liquidity creation affects positively acquisition investments for both listed and unlisted banks, increases the Lerner index, credit risk-taking and reduces security investments.

6.6 Large and small banks

Our findings for listed and unlisted banks could capture a size effect, with listed banks being on average larger than unlisted ones (see Table 3). To mitigate this concern, in an unreported analysis we estimate the models in Tables 5 to 7 for the subsamples of large and small banks. We define a bank as large (small) if the bank belongs to the top (bottom) quartile of the empirical distribution of total assets in a given year. The results for large/small banks show a different pattern than the one for listed/unlisted banks. Indeed, for large banks, excess cash is significant with a negative coefficient in the acquisition regressions, while it is not significant in the other models. In the small bank sample, excess cash has a negative and significant relationship with market power, and a positive one with lending growth and increase in credit risk. Overall, these results support the view that our findings for listed and unlisted banks do not merely capture a size effect.

7. Conclusions

In light of the recent regulatory changes and the increase in cash reserves that followed, we aim to investigate how excess cash banking affects bank policies for all US bank holding companies with total assets larger than $500 million over the period 2002-2014. Cash hoarding increased after the great financial crisis of 2007-08 and it never reverted back to the pre-crisis level. This increase is more accentuated for non-listed banks. We find that larger, more profitable, more capitalized, and more diversified banks hold less cash. As for bank's policies, our evidence does not support the hypothesis that excess cash leads bank to take more risks and exacerbates agency costs between managers and shareholders. Precautionary and strategic motives are more suitable explanations for the excess cash reserves that banks decided to hoard.

We also provide evidence that the listing status affect bank's behavior in managing liquidity. Listed banks do not exhibit any behavior consistent with the hypothesis that excess cash increases agency problems. On the other hand, managers of unlisted banks, the least likely to suffer from agency problems (Gao *et al.*, 2013) increase acquisition spending and take on more credit risk when cash is plentiful. This finding is consistent also with a credit supply explanation. Using the listing status as a proxy for the funding supply available to a bank, our results support the view that non-listed banks are more financially-constrained than their listed counter-parts and they hoard more cash for precautionary and strategic. While listed banks have more funding opportunities available, cash is one of the few options that unlisted bank managers have to fund their activities.

We offer new evidence that mitigates the concern that imposing liquidity ratios (as done in Basel III) could leave too much cash in the hands of managers, who could adopt policies that destroy firm value. Understanding the incentives of cash on bank managers is of paramount importance in the light of the introduction of minimum liquidity ratios, and the substantial increase of cash holdings in the aftermath of the financial crisis. While regulation may have opened the door for managers to

increase their power in the bank they manage, our evidence suggests that this concern is of second-order importance. As predicted by Calomiris *et al.* (2015), high cash reserves reduce the risk-taking incentives of the bank, especially when cash is held outside the bank. Second, we provide compelling evidence about the importance of the listing status for bank holding companies, highlighting that liquidity risk could be a much severe problem for unlisted banks. This is also important at policy level, often too focused on systemic risks and too-big-too-fail banks, and adds to the literature about the cost of ignoring small banks (Croci *et al.*, 2016). Our results also give support to a cash requirement to constrain risk-taking by banks. Finally, we present several results that highlight important differences between banks and non-financial institutions, paving the way for future analysis.

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Tables and Figures

Figure 1. Trend of cash and due from depository institutions

The figure shows the trend of cash and due from depository institutions to total assets (*Cash*) for all bank holding companies (BHCs), i.e. the full sample, and for listed and unlisted BHCs over the period 2002 – 2014. To compute *Cash*, we use US Bank Holding Company (BHC) quarterly data from FRY-9C forms. *Cash* is winsored at the 1 per cent of each tail.

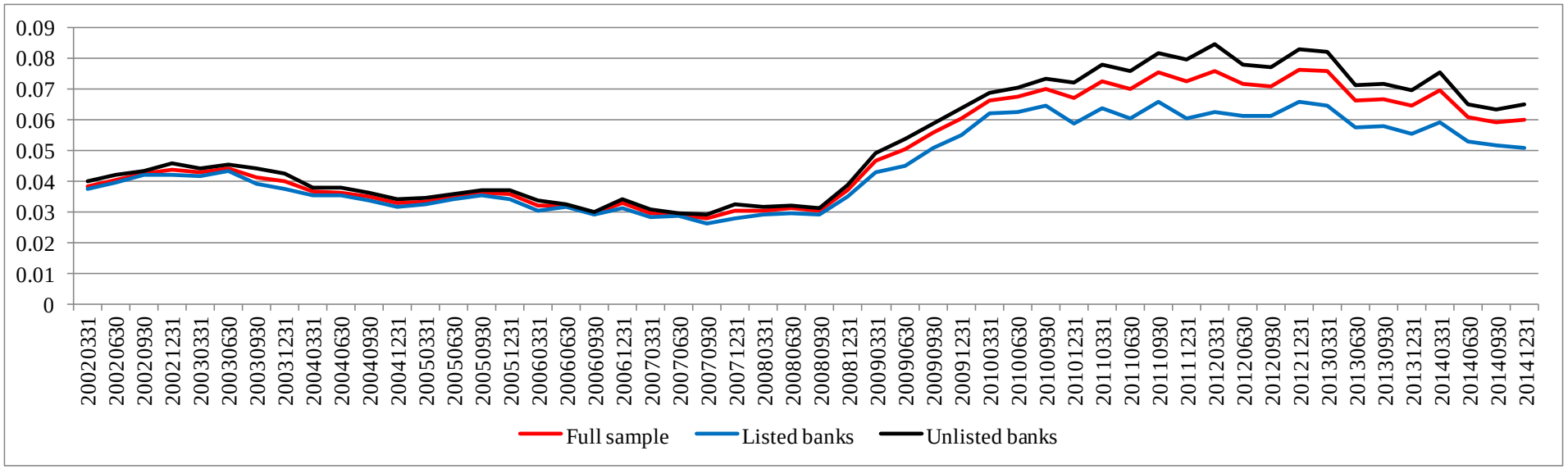

Table 1. Hypothesis Development on Excess Cash and Bank Business Policies

This table reports the predicted sign for the impact of excess cash on the bank business policies under the different hypothesis. The symbol + (-) denotes the expectation of a positive (negative) relationship between *Excess cash* and the bank policy under a given hypothesis.

Policy	Hypothesis		
	Agency Cost	Precautionary	Strategic
Acquisitions	+	-	+
Market power	+ / -	+ / -	-
Loan growth	+	-	+
Riskiness of loan portfolio	+	-	+

Table 2. Summary Statistics of Liquid Assets and Cash.

This table reports summary statistics of liquid assets scaled by total assets (*Liquid assets*) and its component (Panel A) for all BHCs at the end of each year; summary statistics of cash and due from depository institutions to total assets (*Cash*) for all BHCs at the end of each quarter (Panel B); and the samples of listed and unlisted BHCs at the end of the year (Panel C) over the period 2002 – 2014. In Panel A, we report summary statistics of the ratio between liquid assets and total assets (*Liquid assets*) and of the cash to liquid assets (*Cash liquid assets*) as well as of the components of liquid assets: cash and due from other institutions (*Cash*); held-to-maturity securities (*HMT*); available-for-sale securities (*AFS*); trading assets (*Trading assets*); federal funds sold (*Fed funds*); and securities purchased under agreements to resell (*Repo*). All components are scaled by total assets. All these variables are winsorized at the 1 per cent of each tail. The row *Total* reports summary statistics that include also the quarters not shown in the table. The symbols ***, **, and * denote statistical significant at 1%, 5% and 10% levels, respectively, for tests of differences in means and medians between listed and unlisted banks.

Panel A – Liquid assets and Cash

Quarter	Liquid assets	Liquid Assets Component						Cash liquid assets
		Cash	HMT	AFS	Trading assets	Fed funds	Repo	
2002Q4	0.31	0.043	0.029	0.204	0.003	0.017	0.003	0.164
2003Q4	0.306	0.039	0.029	0.212	0.003	0.012	0.003	0.156
2004Q4	0.28	0.032	0.029	0.193	0.003	0.012	0.003	0.143
2005Q4	0.263	0.035	0.026	0.176	0.002	0.013	0.003	0.164
2006Q4	0.245	0.032	0.023	0.164	0.001	0.015	0.002	0.16
2007Q4	0.228	0.03	0.02	0.157	0.002	0.011	0.002	0.161
2008Q4	0.227	0.037	0.018	0.155	0.002	0.008	0.001	0.187
2009Q4	0.256	0.06	0.016	0.164	0.002	0.006	0.001	0.26
2010Q4	0.283	0.066	0.017	0.184	0.002	0.005	0.001	0.259
2011Q4	0.306	0.072	0.019	0.2	0.002	0.004	0.001	0.263
2012Q4	0.308	0.076	0.021	0.197	0.002	0.004	0.001	0.279
2013Q4	0.295	0.064	0.028	0.19	0.001	0.003	0.001	0.245
2014Q4	0.279	0.059	0.029	0.18	0.001	0.002	0.001	0.243
Total	0.277	0.051	0.023	0.183	0.002	0.009	0.002	0.209

Panel B – Cash (All BHCs)

Year	Mean	Median	Std. Dev.	N. of obs.
2002Q1	0.038	0.032	0.026	662
2002Q2	0.040	0.034	0.026	685
2002Q3	0.042	0.036	0.027	702
2002Q4	0.043	0.037	0.026	703
2003Q1	0.042	0.036	0.027	720
2003Q2	0.044	0.038	0.027	740
2003Q3	0.041	0.034	0.026	742
2003Q4	0.039	0.034	0.025	748
2004Q1	0.036	0.030	0.024	756
2004Q2	0.036	0.031	0.024	771
2004Q3	0.034	0.031	0.025	777
2004Q4	0.032	0.027	0.025	787
2005Q1	0.033	0.027	0.027	792
2005Q2	0.034	0.029	0.025	819
2005Q3	0.036	0.030	0.026	842
2005Q4	0.035	0.030	0.024	859
2006Q1	0.032	0.027	0.023	833
2006Q2	0.032	0.028	0.020	844
2006Q3	0.029	0.025	0.020	851
2006Q4	0.032	0.027	0.023	858
2007Q1	0.029	0.024	0.022	862
2007Q2	0.029	0.024	0.021	868
2007Q3	0.027	0.023	0.022	865
2007Q4	0.030	0.025	0.021	865
2008Q1	0.030	0.025	0.022	881
2008Q2	0.031	0.026	0.024	882
2008Q3	0.030	0.023	0.026	883
2008Q4	0.037	0.026	0.034	885

2009Q1	0.046	0.032	0.040	948
2009Q2	0.050	0.035	0.041	938
2009Q3	0.055	0.038	0.047	929
2009Q4	0.060	0.044	0.048	921
2010Q1	0.066	0.049	0.051	957
2010Q2	0.067	0.052	0.052	935
2010Q3	0.069	0.054	0.054	920
2010Q4	0.066	0.050	0.054	917
2011Q1	0.072	0.058	0.054	948
2011Q2	0.070	0.055	0.052	941
2011Q3	0.075	0.059	0.056	933
2011Q4	0.072	0.054	0.055	937
2012Q1	0.075	0.061	0.055	1,086
2012Q2	0.071	0.054	0.054	1,080
2012Q3	0.070	0.053	0.055	1,072
2012Q4	0.076	0.059	0.056	1,066
2013Q1	0.075	0.059	0.057	1,097
2013Q2	0.065	0.048	0.053	1,085
2013Q3	0.066	0.045	0.054	1,079
2013Q4	0.064	0.045	0.054	1,070
2014Q1	0.069	0.051	0.054	1,089
2014Q2	0.060	0.043	0.049	1,071
2014Q3	0.058	0.042	0.050	1,068
2014Q4	0.059	0.042	0.049	1,060
Total	0.051	0.034	0.044	46,629

Panel C – Cash (Listed vs Unlisted BHCs)

	Listed BHC				Unlisted BHC				Difference	Difference
Year	Mean	Median	Std. Dev.	N. of obs.	Mean	Median	Std. Dev.	N. of obs.	in means (I) – (II)	in medians (I) – (II)
2002	0.042	0.036	0.027	400	0.045	0.040	0.026	303	-0.003	-0.004**
2003	0.037	0.031	0.026	406	0.042	0.037	0.025	342	-0.004**	-0.006***
2004	0.031	0.026	0.026	410	0.034	0.029	0.023	377	-0.003*	-0.003***
2005	0.034	0.029	0.024	416	0.037	0.032	0.025	443	-0.002	-0.008***
2006	0.031	0.026	0.022	406	0.034	0.029	0.024	452	-0.002*	-0.003***
2007	0.027	0.024	0.021	388	0.032	0.028	0.021	477	-0.004***	-0.004***
2008	0.034	0.023	0.035	374	0.038	0.027	0.033	511	-0.004*	-0.004***
2009	0.055	0.039	0.044	379	0.063	0.048	0.050	542	-0.007**	-0.009*
2010	0.058	0.043	0.049	355	0.071	0.054	0.057	562	-0.015***	-0.011***
2011	0.060	0.046	0.048	344	0.079	0.060	0.057	593	-0.021***	-0.014***
2012	0.065	0.048	0.051	409	0.082	0.065	0.058	657	-0.017***	-0,017***
2013	0.055	0.036	0.050	400	0.069	0.049	0.056	670	-0.016***	-0.013***
2014	0.050	0.035	0.044	376	0.048	0.048	0.051	684	-0.015***	-0.013***
Total	0.044	0.031	0.039	20,453	0.056	0.038	0.048	26,176	-0.011***	-0.007***

Table 3. Summary Statistics

This table reports summary statistics of the dependent and control variables, for the full sample of all BHCs (Panel A) and the samples of listed and unlisted BHCs (Panel B), over the period 2002 – 2014. Variable definitions are provided in the Appendix (see Table A.1). All variables are winsorised at the 1 per cent of each tail. The symbols ***, **, and * denote statistical significant at 1%, 5% and 10% levels, respectively, for tests of differences in means and medians between listed and unlisted BHCs.

Panel A – All BHCs

Variables	Mean	Median	Std. Dev.	N. of obs.
Control variables:				
Ln(size)	10041.62	1047.051	42308.86	46,629
ROA	0.004	0.004	0.006	46,617
CIR	0.378	0.377	0.084	46,616
ETA	0.093	0.090	0.031	46,629
Diversification	0.731	0.731	0.117	46,616
NPL	0.013	0.007	0.017	46,623
ROA volatility	0.004	0.003	0.003	45,516
Core deposits	0.627	0.651	0.134	43,025
Unrealized losses	-0.0002	-0.0001	0.003	44,455
Unused commitments	0.097	0.089	0.055	46,629
Non-interest income	0.187	0.160	0.132	46,613
FED liquidity	0.002	0	0.045	46,629
CPP	0.006	0	0.079	46,629
CPP reimbursement	0.007	0	0.084	46,629
CPP amount	0.021	0.022	0.005	293
CPP amount reimbursed	0.016	0.016	0.008	332
Ln(delta)	546.509	141.251	1012.407	1,220
Ln(vega)	151.300	29.373	306.966	1,238
Relative size	0.185	0.077	0.257	379
Same state	0.588	1	0.492	513
Public	0.331	0	0.471	513
Dependent variables:				
Acquisition dummy	0.018	0	0.135	46,629
Acquisition value	0.003	0	0.118	46,406
Lerner	0.321	0.323	0.096	43,177
Loan growth	0.015	0.012	0.044	44,750
RW loan growth	0.017	0.012	0.047	43,208

Panel B – Listed vs Unlisted Banks

Variables	Listed banks (I)				Unlisted banks (II)				Difference in means (I) – (II)	Difference in median (I) – (II)
	Mean	Median	Std. Dev.	N. of obs.	Mean	Median	Std. Dev.	N. of obs.		
Control variables:										
Ln(size)	16079.970	1733.353	53543.36	20,453	5323.471	838.479	29965.84	26,176	10756.5***	894.874***
ROA	0.004	0.004	0.006	20,453	0.004	0.004	0.006	26,164	-0.0004***	0
CIR	0.366	0.365	0.080	20,453	0.387	0.388	0.086	26,163	-0.021***	-0.023***
ETA	0.096	0.092	0.029	20,453	0.091	0.088	0.032	26,176	0.005***	0.004***
Diversification	0.727	0.727	0.118	20,453	0.735	0.735	0.115	26,163	-0.010***	-0.015***
NPL	0.012	0.007	0.016	20,451	0.013	0.007	0.017	26,172	-0.001***	0***
ROA volatility	0.004	0.003	0.003	20,130	0.004	0.003	0.003	25,386	0.0002***	0***
Core deposits	0.610	0.631	0.135	19,067	0.641	0.665	0.130	23,958	-0.031***	-0.034***
Unrealized losses	0.00005	0.00001	0.003	19,458	-0.0004	-0.0002	0.003	24,997	0.0004***	0.00021***
Unused commitments	0.101	0.093	0.057	20,453	0.093	0.085	0.053	26,176	0.008***	0.008***
Non-interest income	0.193	0.164	0.135	20,452	0.183	0.158	0.130	26,161	0.012***	0.006***
FED liquidity	0.003	0	0.058	20,453	0.0009	0	0.031	26,176	0.002***	0***
CPP	0.010	0	0.099	20,453	0.003	0	0.031	26,176	0.006***	0***
CPP reimbursement	0.011	0	0.104	20,453	0.003	0	0.057	26,176	0.007***	0***
CPP amount	0.021	0.022	0.002	205	0.021	0.022	0.001	88	-0.0007	0
CPP amount reimbursed	0.016	0.016	0.001	228	0.017	0.016	0.001	104	-0.002*	0
Dependent variables:										
Acquisition dummy	0.030	0	0.171	20,453	0.009	0	0.097	26,176	0.021***	0***
Acquisition value	0.005	0	0.071	20,302	0.001	0	0.145	26,104	0.004***	0***
Lerner	0.328	0.333	0.094	19,097	0.314	0.316	0.097	24,080	0.015***	0.017***
Loan growth	0.018	0.013	0.046	19,718	0.013	0.011	0.042	25,032	0.004***	0.002***
RW loan growth	0.020	0.014	0.047	19,159	0.015	0.011	0.044	24,049	0.005***	0.003***

Table 4. Determinants of Cash Holdings

This table presents in Panel A descriptive statistics the target cash level obtained from Equation 1 (end-of-the-year), for the full sample of BHCs, listed and unlisted BHCs, over the period 2002 - 2014. The row *Total* reports summary statistics that include also the quarters not shown in the table. Panel B reports estimates of bank fixed-effect (FE) regressions for the full sample and for the listed and unlisted BHCs filing FRY-9C forms with total assets above $500 million for the period 2002 -2014. The dependent variable is cash and due from depository institutions, scaled by total assets (*Cash*). Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Quarter dummy variables are also included in the models. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Summary statistics of target cash level

	All BHCs					Listed BHCs				Unlisted BHCs			
	Mean	Median	Std. Dev.	N. of obs.	N. of obs. Excess cash>0 (Excess cash<=0)	Mean	Median	Std. Dev.	N. of obs.	Mean	Median	Std. Dev.	N. of obs.
2002	0.042	0.041	0.008	646	254 (392)	0.041	0.041	0.008	383	0.044	0.043	0.009	263
2003	0.039	0.039	0.007	685	249 (436)	0.037	0.036	0.006	392	0.042	0.042	0.007	293
2004	0.032	0.031	0.008	724	273 (451)	0.031	0.029	0.008	395	0.034	0.033	0.008	329
2005	0.035	0.035	0.009	797	305 (492)	0.034	0.033	0.009	407	0.036	0.036	0.008	390
2006	0.032	0.032	0.007	836	295 (541)	0.031	0.031	0.007	398	0.033	0.033	0.006	438
2007	0.030	0.029	0.008	848	322 (526)	0.027	0.027	0.008	386	0.032	0.032	0.008	462
2008	0.037	0.035	0.012	868	295 (573)	0.035	0.032	0.014	371	0.038	0.038	0.010	497
2009	0.060	0.059	0.016	915	346 (569)	0.056	0.055	0.017	378	0.063	0.061	0.014	537
2010	0.066	0.064	0.020	904	356 (548)	0.058	0.053	0.020	352	0.071	0.068	0.018	552
2011	0.072	0.072	0.018	850	323 (527)	0.058	0.056	0.016	304	0.079	0.077	0.014	546
2012	0.077	0.077	0.018	829	325 (504)	0.066	0.065	0.018	290	0.083	0.082	0.015	539
2013	0.065	0.065	0.016	593	218 (375)	0.057	0.055	0.016	206	0.070	0.069	0.014	387
2014	0.060	0.061	0.015	597	222 (375)	0.049	0.047	0.014	193	0.066	0.065	0.011	404
Total	0.049	0.044	0.021	40,240	15,107 (25,133)	0.043	0.039	0.018	17,981	0.054	0.052	0.023	22,259

Panel B – Full sample, listed and unlisted BHCs

	All BHCs			Listed BHCs			Unlisted BHCs		
Variables	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
Ln(size)	-0.005*	-0.005*	-0.005*	-0.004	-0.004	-0.004	-0.003	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
ROA	-0.165**	-0.160**	-0.161**	-0.134	-0.128	-0.129	-0.193*	-0.193*	-0.193*
	(0.071)	(0.071)	(0.071)	(0.095)	(0.095)	(0.095)	(0.108)	(0.108)	(0.108)
CIR	0.038***	0.038***	0.038***	0.053***	0.053***	0.053***	0.028**	0.028**	0.028**
	(0.009)	(0.009)	(0.009)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
ETA	-0.108***	-0.110***	-0.109***	-0.120***	-0.122***	-0.121***	-0.042	-0.042	-0.042
	(0.040)	(0.040)	(0.040)	(0.040)	(0.041)	(0.040)	(0.072)	(0.072)	(0.072)
Diversification	-0.015	-0.015	-0.015	-0.031***	-0.031***	-0.031***	0.003	0.003	0.003
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)
NPL	0.047	0.046	0.046	0.067	0.067	0.066	0.041	0.041	0.041
	(0.050)	(0.050)	(0.051)	(0.074)	(0.074)	(0.074)	(0.066)	(0.066)	(0.066)
ROA volatility	1.002***	1.003***	1.004***	1.042***	1.044***	1.045***	1.279***	1.278***	1.278***
	(0.229)	(0.228)	(0.228)	(0.241)	(0.241)	(0.241)	(0.409)	(0.409)	(0.409)
Core deposits	0.041***	0.041***	0.041***	0.031**	0.031**	0.031**	0.063***	0.063***	0.063***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.019)	(0.019)	(0.019)
Unrealized losses	0.380**	0.380**	0.381**	0.105	0.106	0.108	0.640***	0.640***	0.641***
	(0.171)	(0.171)	(0.171)	(0.281)	(0.281)	(0.281)	(0.220)	(0.220)	(0.220)
Unused commitments	-0.084***	-0.085***	-0.084***	-0.076***	-0.076***	-0.076***	-0.080***	-0.080***	-0.080***
	(0.019)	(0.019)	(0.019)	(0.024)	(0.024)	(0.024)	(0.026)	(0.026)	(0.026)
FED liquidity		-0.000	-0.000		-0.004	-0.004		0.002	0.002
		(0.002)	(0.002)		(0.003)	(0.003)		(0.004)	(0.004)
CPP		0.004**			0.004**			0.000	
		(0.002)			(0.002)			(0.004)	
CPP reimbursement		-0.005**			-0.003			-0.002	
		(0.002)			(0.002)			(0.004)	
CPP amount			0.129*			0.117			-0.014
			(0.075)			(0.085)			(0.151)
CPP amount reimbursed			-0.235**			-0.185*			-0.078
			(0.098)			(0.105)			(0.189)
Listed	-0.006**	-0.006**	-0.006**						
	(0.003)	(0.003)	(0.003)						
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	40,240	40,240	40,240	17,981	17,981	17,981	22,259	22,259	22,259
R-squared	0.278	0.278	0.278	0.259	0.259	0.259	0.307	0.307	0.307

Table 5. Acquisition analysis

This table reports in Panel A the estimations of logit (columns I, II, and III) and tobit (columns IV, V, and VI) regressions for the period 2002 - 2014. Models I and IV show estimates for the full sample of BHC filing FRY-9C forms with total assets above $500 million; models II and V show estimates for the sample of listed banks; and models III and VI present the estimates for the sample of unlisted banks. The dependent variable in models (I) to (III) is *Acquisition dummy*, a binary variable that takes the value of 1 if the bank completes at least an acquisition in the following quarter; 0 otherwise. The dependent variable models (IV) to (VI) is *Acquisition value*, which is computed as the sum of total assets of the target banks acquired in the following quarter, scaled by the total assets of the acquiring bank. In addition, this table reports the summary statistics of the cumulative abnormal returns (*CAR*) around acquisition announcements (Panel B) and the estimations of ordinary least squared (OLS) regressions of abnormal returns on excess cash and other control variables in the period 2002 – 2014 (Panel C). Cumulative abnormal returns are computed in the event window (-2, 2) and (-1, 1) centered around the acquisition date. Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Propensity to Acquire

	Logit			Tobit		
Variables	All	Listed	Unlisted	All	Listed	Unlisted
	(I)	(II)	(III)	(IV)	(V)	(VI)
Constant	-8.103***	-7.817***	-6.376***	-2.009***	-2.132***	-0.926***
	(0.792)	(0.965)	(1.605)	(0.221)	(0.298)	(0.223)
Excess cash	-1.868	-4.956**	2.653*	-0.203	-1.246**	0.476**
	(1.360)	(2.128)	(1.541)	(0.283)	(0.505)	(0.190)
Ln(size)	0.241***	0.246***	0.226***	0.048***	0.049***	0.028***
	(0.030)	(0.034)	(0.080)	(0.007)	(0.009)	(0.010)
ROA	21.158	38.620**	-1.618	4.682*	8.717**	0.738
	(13.370)	(18.134)	(18.198)	(2.694)	(4.155)	(2.104)
CIR	0.440	0.511	0.236	0.092	0.086	0.042
	(0.674)	(0.863)	(1.046)	(0.148)	(0.229)	(0.117)
ETA	6.894***	8.312***	2.905	1.756***	2.762***	0.267
	(1.528)	(1.743)	(2.415)	(0.416)	(0.615)	(0.279)
Diversification	-0.509	-0.068	-1.797**	-0.080	-0.058	-0.142
	(0.443)	(0.522)	(0.814)	(0.100)	(0.144)	(0.093)
NPL	-6.402	-5.758	-9.632	-1.523	-2.132	-0.942
	(5.959)	(8.589)	(7.687)	(1.215)	(1.981)	(0.836)
ROA volatility	-48.940**	-92.739***	21.905	-8.249*	-16.534**	1.247
	(23.054)	(29.758)	(31.177)	(4.431)	(7.187)	(3.319)
Listed	0.874***			0.179***		
	(0.108)			(0.025)		
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No
N. of obs.	40,240	17,603	21,182	40,059	17,853	22,206
Pseudo R-squared	0.077	0.065	0.047	0.091	0.082	0.086

Panel B – Summary Statistics of the Abnormal Returns around Acquisition Announcements

	Mean (%)	Median (%)	N. of obs.
CAR (-2, 2)	0.101	0.036	609
CAR (-1, 1)	0.156	0.140	609

Panel C – Abnormal Returns Regressions

Variables	CAR (-2, 2)		CAR (-1, 1)	
	(I)	(II)	(III)	(IV)
Constant	0.057	0.058	0.039	0.097
	(0.055)	(0.111)	(0.031)	(0.066)
Excess cash	-0.020	0.078	0.013	0.007
	(0.054)	(0.108)	(0.043)	(0.099)
Ln(size)	-0.002	-0.007	-0.002*	-0.007**
	(0.002)	(0.005)	(0.001)	(0.003)
ROA	-0.123	0.423	0.473	0.387
	(0.690)	(0.922)	(0.421)	(0.566)
CIR	-0.070	-0.012	-0.026	-0.009
	(0.045)	(0.072)	(0.028)	(0.040)
ETA	0.082	0.169	-0.002	-0.007
	(0.071)	(0.130)	(0.049)	(0.094)
Diversification	-0.003	0.025	0.005	0.007
	(0.027)	(0.044)	(0.019)	(0.030)
NPL	0.291	0.577	0.030	0.294
	(0.228)	(0.412)	(0.210)	(0.275)
ROA volatility	-1.049	-1.392	-1.370	-1.578
	(1.270)	(2.209)	(1.002)	(1.819)
Relative size	0.000	-0.011	0.014	-0.001
	(0.009)	(0.012)	(0.013)	(0.009)
Same state	-0.001	-0.001	0.001	-0.000
	(0.004)	(0.007)	(0.003)	(0.005)
Public	0.009**	0.013*	0.011***	0.011**
	(0.005)	(0.007)	(0.003)	(0.005)
Ln(delta)		0.001		0.001
		(0.003)		(0.002)
Ln(vega)		0.006**		0.004
		(0.003)		(0.003)
D_quarter	No	No	No	No
Bank FE	No	No	No	No
N. of obs.	334	146	334	146
R-squared	0.041	0.112	0.075	0.149

Table 6. Effects on Competition

This table reports estimates of bank fixed-effect (FE) regressions for the period 2002 -2014. Model I shows estimates for the full sample of BHCs filing FRY-9C forms with total assets above $500 million; model II (model III) shows estimates for the sample of listed (unlisted) BHCs. The dependent variable is the Lerner index (*Lerner*) in quarter *t+1*. Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	$Lerner_{t+1}$		
Variables	All	Listed	Unlisted
	(I)	(II)	(III)
Excess cash	-0.110***	-0.149***	-0.112***
	(0.026)	(0.041)	(0.027)
Excess cash*Listed	-0.026		
	(0.049)		
Listed	0.010		
	(0.006)		
Ln(size)	0.015***	0.003	0.039***
	(0.005)	(0.006)	(0.007)
ROA	1.747***	1.534***	1.875***
	(0.130)	(0.183)	(0.185)
CIR	-0.714***	-0.786***	-0.651***
	(0.019)	(0.026)	(0.025)
ETA	0.412***	0.409***	0.484***
	(0.048)	(0.065)	(0.077)
NPL	-1.099***	-1.112***	-1.052***
	(0.067)	(0.102)	(0.089)
Non-interest Income	-0.060***	-0.036**	-0.076***
	(0.015)	(0.018)	(0.022)
FED liquidity	0.004	0.004	0.008
	(0.005)	(0.006)	(0.011)
CPP	0.004	0.006	-0.001
	(0.004)	(0.005)	(0.005)
CPP reimbursement	-0.001	0.000	-0.005
	(0.003)	(0.004)	(0.005)
D_quarter	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
N. of obs.	38,028	17,113	20,915
R-squared	0.529	0.558	0.512

Table 7. Loan growth rate and risk-taking multivariate analysis

This table reports estimates of bank fixed-effect (FE) regressions for the period 2002 -2014. Models I, and IV show estimates for the full sample of BHCs filing FRY-9C forms with total assets above $500 million; models II, and V (models III and VI) show estimates for the sample of listed (unlisted) BHCs. The dependent variables are: (i) the growth rate in gross loan (*Loan growth*) in quarter *t+1* in models I to III; and (ii) the growth rate in risk weighted loans and leases (RW loan growth) in models IV to VI. Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

	Loan growth$_{t+1}$			RW loan growth$_{t+1}$		
Variables	All	Listed	Unlisted	All	Listed	Unlisted
	(I)	(II)	(III)	(IV)	(V)	(VI)
Excess cash	0.008	-0.040**	0.009	-0.003	-0.025	-0.002
	(0.015)	(0.019)	(0.016)	(0.016)	(0.020)	(0.017)
Excess cash*Listed	-0.044*			-0.017		
	(0.024)			(0.026)		
Listed	0.000			0.001		
	(0.003)			(0.003)		
Ln(size)	-0.024***	-0.023***	-0.027***	-0.025***	-0.024***	-0.027***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
ROA	0.336***	0.452***	0.221**	0.362***	0.504***	0.207**
	(0.068)	(0.094)	(0.099)	(0.072)	(0.103)	(0.101)
CIR	0.029***	0.009	0.041***	0.028***	0.010	0.038***
	(0.008)	(0.012)	(0.010)	(0.008)	(0.013)	(0.010)
ETA	0.138***	0.103***	0.152***	0.125***	0.085**	0.145***
	(0.028)	(0.036)	(0.046)	(0.029)	(0.037)	(0.049)
Diversification	-0.018***	-0.013	-0.024***	-0.017**	-0.017*	-0.019*
	(0.006)	(0.009)	(0.009)	(0.007)	(0.010)	(0.010)
NPL	-0.808***	-0.784***	-0.837***	-0.815***	-0.765***	-0.865***
	(0.041)	(0.057)	(0.056)	(0.045)	(0.063)	(0.062)
ROA volatility	-0.791***	-0.963***	-0.669***	-0.803***	-1.034***	-0.599**
	(0.129)	(0.161)	(0.218)	(0.145)	(0.179)	(0.249)
Core deposits	0.002	-0.007	0.009	-0.002	-0.006	-0.002
	(0.007)	(0.010)	(0.011)	(0.008)	(0.011)	(0.012)
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	39,024	17,500	21,524	38,789	17,418	21,371
R-squared	0.202	0.193	0.219	0.198	0.189	0.213

Table 8. IV approach

This table reports estimates of the coefficient for the instrumented *Excess cash* from IV regression models on acquisitions (Panel A); Lerner index (Panel B); loan growth rate and risk taking (Panel C). In the first stage we employ as instrument the house price index (see Section 6.1) and the log of 1 plus the number of business bankruptcy cases filed in the bank state. Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Quarter dummy variables are also included in all models. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Propensity to acquire

Variables	Logit			Tobit		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Excess cash	1.085	-14.063*	6.745*	1.152	-7.783	2.337**
	(4.056)	(8.532)	(3.933)	(1.902)	(5.538)	(1.179)

Panel B – Market power

Variables	$Lerner_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)
Excess cash	-1.943***	-1.676***	-0.422
	(0.453)	(0.334)	(0.470)

Panel C – Growth rate and risk taking

Variables	$Loan\ growth_{t+1}$			$RW\ loan\ growth_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Excess cash	-0.657*	-0.359	-0.602	-0.598*	0.072	-1.018*
	(0.345)	(0.280)	(0.466)	(0.358)	(0.293)	(0.563)

Table 9. Pre-crisis, crisis and post crisis

This table reports estimates for models on acquisitions (Panel A); Lerner index (Panel B); loan growth rate (Panel C); and and risk taking (Panel D) on the pre-crisis, crisis and post-crisis period, respectively. The pre-crisis period spans from 2002Q1 to 2007Q2, the crisis period extends from 2007Q3 to 2009Q2, while the post-crisis period spans from 2009Q3 to 2014Q4. Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Quarter dummy variables are also included in all models. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Propensity to acquire

Variables	Logit								
	All (I)			Listed (II)			Unlisted (III)		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Excess cash	-9.167***	-1.728	0.396	-9.211***	-4.278	-2.783	-5.743	1.778	3.825**
	(2.710)	(3.148)	(1.543)	(2.800)	(4.439)	(2.895)	(6.225)	(4.968)	(1.627)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No	No	No	No
N. of obs.	16,064	6,970	17,206	8,657	3,037	5,909	6,865	3,933	10,384
Pseudo R-squared	0.079	0.056	0.082	0.057	0.062	0.073	0.045	0.063	0.052

Panel B – Market power

Variables	$Lerner_{t+1}$								
	All (I)			Listed (II)			Unlisted (III)		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Excess cash	-0.046	-0.050	-0.165***	-0.106*	-0.141	-0.164***	-0.035	-0.057	-0.155***
	(0.056)	(0.043)	(0.029)	(0.056)	(0.094)	(0.042)	(0.063)	(0.045)	(0.030)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	15,696	6,699	15,633	8,472	2,928	5,713	7,224	3,771	9,920
Pseudo R-squared	0.536	0.325	0.267	0.562	0.332	0.276	0.513	0.333	0.267

Panel C – Loan growth

Variables	Loan growth$_{t+1}$								
	All (I)			Listed (II)			Unlisted (III)		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Excess cash	0.046	0.019	0.045**	0.007	0.041	-0.018	0.047	0.014	0.044**
	(0.071)	(0.043)	(0.019)	(0.051)	(0.061)	(0.029)	(0.074)	(0.046)	(0.018)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	15,827	6,857	16,340	8,529	2,982	5,989	7,298	3,875	10,351
Pseudo R-squared	0.083	0.244	0.146	0.086	0.255	0.133	0.092	0.241	0.159

Panel D – RW loan growth

Variables	RW loan growth$_{t+1}$								
	All (I)			Listed (II)			Unlisted (III)		
	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis	Pre-crisis	Crisis	Post-crisis
Excess cash	-0.025	0.010	0.038**	0.018	0.043	-0.013	-0.021	0.012	0.035*
	(0.080)	(0.038)	(0.019)	(0.058)	(0.066)	(0.030)	(0.085)	(0.041)	(0.019)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	15,686	6,852	16,251	8,487	2,981	5,950	7,199	3,871	10,301
Pseudo R-squared	0.074	0.232	0.134	0.077	0.248	0.124	0.078	0.222	0.148

Table 10. A closer look at cash and due from other institutions

Panel A reports summary statistics of interest bearing balances to total assets (*Interest bearing cash*) and non interest bearing balances and currency and coin to total assets (*Non interest bearing cash*) for all BHCs at the end of each quarter over the period 2002 – 2014. Panels B to D of the table reports estimates of *Interest bearing cash* and *Non interest bearing cash* for models on acquisitions (Panel B); Lerner index (Panel C); loan growth rate and risk taking (Panel D). Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Quarter dummy variables are also included in all models. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Summary Statistics

Quarter	Interest bearing cash	Non interest bearing cash	N. of obs.
2002Q4	0.008	0.034	687
2003Q4	0.007	0.031	747
2004Q4	0.007	0.025	787
2005Q4	0.006	0.028	859
2006Q4	0.006	0.025	858
2007Q4	0.005	0.024	865
2008Q4	0.014	0.022	885
2009Q4	0.040	0.018	921
2010Q4	0.051	0.015	917
2011Q4	0.053	0.018	937
2012Q4	0.055	0.020	1,066
2013Q4	0.046	0.017	1,070
2014Q4	0.042	0.016	1,060
Total	0.027	0.022	46,532

Panel B – Propensity to acquire

Variables	Logit			Tobit		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Interest bearing cash	-1.265	-4.910**	2.513	0.018	-1.184**	0.530***
	(1.453)	(2.349)	(1.656)	(0.291)	(0.541)	(0.196)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No
N. of obs.	40,218	17,595	21,168	40,037	17,845	22,192
Pseudo R-squared	0.077	0.064	0.047	0.091	0.082	0.087

Variables	Logit			Tobit		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Non interest bearing cash	-0.492	-6.818	7.761	-0.680	-2.050	0.176
	(3.833)	(5.123)	(5.033)	(0.846)	(1.316)	(0.624)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No
N. of obs.	40,240	17,603	21,182	40,059	17,853	22,206
Pseudo R-squared	0.077	0.063	0.047	0.091	0.081	0.082

Panel C – Market power

Variables	Lerner$_{t+1}$					
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Interest bearing cash	-0.116***	-0.156***	-0.131***			
	(0.026)	(0.042)	(0.027)			
Non interest bearing cash				0.101	0.065	0.146*
				(0.070)	(0.083)	(0.075)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter/Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	38,019	17,108	20,911	38,028	17,113	20,915
R-squared	0.529	0.559	0.513	0.527	0.556	0.510

Panel D – Growth rate and risk taking

Variables	Loan growth$_{t+1}$			RW loan growth$_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Interest bearing cash	0.006	-0.037*	0.011	-0.009	-0.023	-0.002
	(0.015)	(0.020)	(0.016)	(0.016)	(0.021)	(0.017)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter/Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	39,002	17,492	21,510	38,774	17,411	21,363
R-squared	0.203	0.194	0.218	0.198	0.189	0.213

Variables	Loan growth$_{t+1}$			RW loan growth$_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Non interest bearing cash	-0.003	-0.033	-0.004	0.016	-0.043	0.016
	(0.038)	(0.059)	(0.039)	(0.040)	(0.067)	(0.041)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter/Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	39,024	17,500	21,524	38,789	17,418	21,371
R-squared	0.202	0.193	0.219	0.198	0.188	0.213

Table 11. Cash in excess of required reserves

This table reports estimates for models on acquisitions (Panel A); Lerner index (Panel B); loan growth rate and risk taking (Panel C). The variable of interest is the cash in excess of required reserves divided by total assets (*Excess cash 2*). Variable definitions are provided in the Appendix (see Table A.1). All non-binary variables are winsorized at the 1% of each tail. Quarter dummy variables are also included in all models. Bank clustered standard errors are reported in parentheses. The superscripts ***, **, and * denote coefficients statistically different from zero at the 1%, 5%, and 10% levels, respectively, in two-tailed tests.

Panel A – Propensity to acquire

Variables	Logit			Tobit		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Excess cash 2	-4.505***	-8.923***	1.472	-0.669**	-2.226***	0.412*
	(1.491)	(2.324)	(1.585)	(0.291)	(0.528)	(0.215)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	No	No
N. of obs.	45,509	19,750	25,109	45,290	19,980	25,31
Pseudo R-squared	0.075	0.063	0.053	0.088	0.079	0.075

Panel B – Market power

Variables	$Lerner_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)
Excess cash 2	-0.109***	-0.183***	-0.114***
	(0.026)	(0.037)	(0.027)
Control variables	Yes	Yes	Yes
D_quarter/Bank FE	Yes	Yes	Yes
N. of obs.	41,436	18,415	23,021
R-squared	0.521	0.551	0.503

Panel C – Growth rate and risk taking

Variables	Loan $growth_{t+1}$			RW loan $growth_{t+1}$		
	All (I)	Listed (II)	Unlisted (III)	All (I)	Listed (II)	Unlisted (III)
Excess cash 2	-0.017	-0.042**	-0.002	-0.029**	-0.033*	-0.015
	(0.014)	(0.018)	(0.015)	(0.014)	(0.019)	(0.016)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
D_quarter/Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	40,559	18,177	22,382	38,851	17,464	21,387
R-squared	0.196	0.190	0.208	0.198	0.188	0.214

Appendix

Table A.1 Variable Definitions

This table reports the description of the variables used in our analysis, their construction and the source of data used to collect them. The symbol *l1.* in the Construction column denotes a lagged value for the variable. Data code are from FRY 9-C filings if not specified otherwise.

Variable	Definition	Construction
Dependent variable:		
Cash	The ratio of cash and due from depository institutions to total assets.	BHCK0010/BHCK2170
Acquisition dummy	Binary variable that takes the value of 1 if the bank completes at least an acquisition in the following quarter; 0 otherwise. Mergers & Acquisition data are from Federal Reserve Bank of Chicago (BHC Merger Bank file).	
Acquisition value	The sum of total assets of the target banks acquired in the following quarter, scaled by the total assets of the acquiring bank. Mergers & Acquisition data are from Federal Reserve Bank of Chicago (BHC Merger Bank file)	
CAR (-2, 2) [(-1, 1)]	Cumulative Abnormal Returns in the event window (-2, 2) or (-1, 1) centered around the acquisition date. Abnormal returns are obtained using a market model with CRSP value-weighted portfolio returns.	
Lerner	The index is defined as the difference between price (P_{it}) and marginal cost (MC_{it}), divided by price (P_{it}), where P_{it} is the price of banking outputs for bank i at time t and MC_{it} is marginal costs for bank *i* at time *t*. The variable P_{it} is calculated as the ratio of total bank revenues (interest plus non-interest income) to total assets. The term MC_{it} is estimated on the basis of a trans-log cost function with one output, that is, total assets, and three input prices, that is, the prices of labour, physical capital, and borrowed funds.	BHCK4135: salaries and employee benefits; BHCK4092: other operating expenses; BHCK4073: total interest exp.
Loan growth	The natural logarithm of the ratio of gross loans in quarter t to gross loans in quarter t-1.	LN(BHCK2122/l1.BHCK2122)
RW loan growth	The growth rate in risk-weighted (RW) loans and leases.	[(BHC0B528*0)+(BHC2B528*0.20)+(BHC5B528*0.5)+BHC9B528]-l1.[(BHC0B528*0)+(BHC2B528*0.20)+(BHC5B528*0.5)+BHC9B528]/l1.[(BHC0B528*0)+(BHC2B528*0.20)+(BHC5B528*0.5)+BHC9B528]
Target variable:		
Excess Cash	Residuals of the regression model in Eq. 1	
Bank-specific factors:		
Ln(size)	The natural logarithm of total assets.	LN (BHCK2170)
ROA	The ratio of net income to quarterly average of total assets.	BHCK4340/ BHCK3368
CIR	The ratio of overheads to the sum of net interest income and other operating income.	(BHCK4135+BHCK4150)/(BHCK4074+BHCK4079)
ETA	The ratio of equity to total assets.	BHCK3210/BHCK2170
Diversification	The sum of the squared of the ratio of interest income to the sum of interest income and total non-interest income and the squared of the ratio of total non-interest income to the sum of interest income and total non-interest income.	(BHCK4107/(BHCK4107+BHCK4079))^2 +(BHCK4079/(BHCK4107+BHCK4079))^2

NPL	The ratio of non-performing loans to total assets.	(BHCK5525+BHCK5526)/BHCK2170
ROA volatility	The standard deviation of ROAA computed over 10 quarters.	STD. DEV. (BHCK4340/ BHCK3368)
Core deposits	The sum of deposits under $100,000 plus all transactions deposits all divided to total assets.	(BHCB2210+BHCB3187+BHCB2389+ BHCB6648+BHOD3189+BHOD3187+ BHOD2389+BHOD6648)/BHCK2170
Unrealized losses	The ratio of unrealized losses in securities holdings to total assets.	(-BHCK8434+BHCKA221-BHCK4336)/BHCK2170
Unused commitments	The ratio of unused commitments to unused commitments plus total assets.	(BHCK3814+BHCKJ455+BHCKJ456+ BHCK3816+BHCK6550+BHCK3817+ BHCKJ457+ BHCKJ458+BHCKJ459+ BHCK6566+BHCK3411+BHCK3430)/(BHCK3814+BHCKJ455+BHCKJ456+ BHCK3816+BHCK6550+BHCK3817+ BHCKJ457+ BHCKJ458+BHCKJ459+ BHCK6566+BHCK3411+BHCK3430+ BHCK2170)
Non-interest income	The ratio of non-interest income to net operating revenue.	BHCK4079/(BHCK4107+BHCK4079)
Excess cash 2	Cash minus required reserves	BHCK0010-[3%*min (Low reserve tranche amount- Exemption amount; BHCB2210+ BHCB 3187-Exemption amount)+ 10%* max (BHCB 2210+ BHCB 3187- low reserve tranche amount; 0)]
Cash rich	Binary variable that takes value 1 if	
HMT	The ratio of held-to-maturity securities to total assets.	BHCK1754/ BHCK2170
AFS	The ratio of available-for-sale securities to total assets.	BHCK1773/ BHCK2170
Trading assets	The ratio of trading assets to total assets.	BHCK3545/ BHCK2170
Fed funds	The ratio of federal funds sold in domestic offices to total assets.	BHDMB987/ BHCK2170
Repo	The ratio of securities purchased under agreements to resell to total assets.	BHCKB98/BHCK2170
Liquid assets	The ratio of liquid assets to total assets.	(BHCK0010+BHCK1754+BHCK1773+ BHCK3545+BHDMB987+BHCKB98)/ BHCK2170
Cash liquid assets	The ratio of cash and due from depository institutions to liquid assets.	BHCK0010/(BHCK0010+BHCK1754+ BHCK1773+BHCK3545+BHDMB987+ BHCKB98)
Interest bearing cash	The ratio of interest bearing balances to total assets.	(BHCK0395+BHCK0397)/BHCK2170
Non interest bearing cash	The ratio of non interest bearing balances to total assets.	BHCK0081/BHCK2170
FED and CPP variables:		
FED liquidity	Binary variable that takes the value of 1 if the bank participated in one or more of these FED liquidity program (TAF, AMLF, TALF, PDCF, TSLF) in quarter *t*, 0 otherwise.	
CPP	Binary variable that takes the value of 1 if the bank received cash injections from the US Treasury under the CPP in quarter *t*, 0 otherwise.	
CPP reimbursement	Binary variable that takes the value of 1 if the bank repaid the Treasury of the capital injection under the CPP in quarter *t*, 0 otherwise	
CPP amount	The original investment amount received by the bank from the US Treasury under the CPP in quarter *t*, scaled by total assets.	
CPP amount reimbursed	The capital repayment amount repaid by the bank to the US Treasury in quarter *t*, scaled by total assets.	

Variables specific to listed banks:	
Ln(delta)	The natural logarithm of the (1+ delta). Delta is the change in the dollar value of the CEO wealth for a one percentage point change in stock price at the end of the fiscal year.
Ln(vega)	The natural logarithm of the (1+ vega). Vega is the change in the dollar value of the CEO wealth for a one percentage change in the annualized standard deviation of stock returns at the end of the fiscal year.
Relative size	Ratio of the target bank's total assets to the bidding bank's total assets.
Same state	Binary variable that takes value 1 if target and bidder are from the same state; 0 otherwise.
Public	Binary variable that takes value 1 if the target bank is listed; 0 otherwise.
Listed	Binary variable that takes the value of 1 if the bank is listed, 0 otherwise.

Table A.2 – Correlations matrix

This table shows the correlation matrix for the variables used in the empirical analysis over the period 2002 - 2014. Variable definitions are provided in the Appendix (see Table A.1). Bold indicates statistically significance at the 5 per cent level.

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Cash	1															
2	Acquisition value	-0.01	1														
3	Lerner	**-0.07**	**0.02**	1													
4	Loan growth	**-0.19**	0.01	**0.13**	1												
5	RW loan growth	**-0.16**	0.00	**0.12**	**0.89**	1											
6	Ln(size)	0.01	**0.01**	**0.21**	**0.05**	**0.03**	1										
7	ROA	**-0.11**	**0.02**	**0.52**	**0.25**	**0.27**	**0.05**	1									
8	CIR	**0.12**	**-0.02**	**-0.71**	**-0.07**	**-0.09**	**-0.25**	**-0.39**	1								
9	ETA	**0.04**	**0.03**	**0.26**	**0.04**	**0.05**	**0.10**	**0.27**	**-0.15**	1							
10	Diversification	**-0.13**	0.01	**-0.12**	**-0.02**	-0.01	**-0.30**	**-0.19**	**-0.06**	**-0.05**	1						
11	NPL	**0.20**	**-0.01**	**-0.25**	**-0.33**	**-0.33**	**-0.02**	**-0.48**	**0.10**	**-0.12**	**0.12**	1					
12	ROA volatility	**0.18**	**0.02**	**-0.01**	**-0.19**	**-0.19**	**0.06**	**-0.22**	**-0.03**	**0.05**	**0.05**	**0.42**	1				
13	Core deposits	**0.08**	**-0.02**	**0.05**	**-0.07**	**-0.05**	**-0.39**	**-0.01**	**0.17**	**-0.10**	**-0.05**	0.00	**-0.07**	1			
14	Unrealized losses	**-0.03**	0.00	**-0.16**	**0.03**	**0.02**	**0.08**	**-0.11**	**0.07**	**-0.16**	0.00	**0.01**	**0.03**	**-0.11**	1		
15	Unused commitments	**0.06**	0.00	**0.14**	**0.08**	**0.10**	**0.26**	**0.07**	**-0.01**	**0.05**	**-0.19**	**-0.09**	**-0.10**	**0.11**	**0.04**	1	
16	Non-interest income	**0.25**	**0.02**	**0.05**	**0.02**	0.00	**0.35**	**0.22**	**0.02**	**0.17**	**-0.77**	**-0.09**	**0.12**	**-0.17**	**0.01**	**0.10**	1