Do banks adjust their liquidity to cope with environmental variation? A study of bank deregulation

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Abstract

The effect of bank deregulation on adjustment speed of bank liquidity is the focus of this paper. We find that banks tend to increase their adjustment speed of liquidity in response to bank deregulation. Banks tend to escape their current states and move to states with less deregulation. Those banks that move to less deregulated states reduce their adjustment speed. A strategic movement of headquarters helps banks to fend off competitive pressure. The environmental factors of population and personal income reduce the market-based flexibility of banks. However, higher interest expenses incentivise banks to increase their speed. Surviving banks and acquiring banks react as market-makers whereas target banks respond as market-takers. Failed banks lose their distinct competencies to react properly when environmental variation occurs. Having a larger network and operating in a larger environment, banks affiliated with multi-bank holding companies are able to increase their liquidity adjustment speed. The observable trends of how banks adjust liquidity in response to bank deregulation have important regulatory implications in reducing the environmental challenges faced by banks.

JEL Classification: G20, G21, G38
Keywords: environmental variation; bank liquidity; adjustment speed; bank deregulation; Basel III Net Stable Funding Ratio

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Abstract

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1. Introduction

According to Basel Committee on banking supervision (BCBS) (2014), many banks did not prudently manage their liquidity during the 2007-2009 financial crisis. This study aims to answer four important questions. Why is liquidity management important? Why should we care about banks' attempts to reach a liquidity target? Is there something informative about the speed with which banks reach their target? What is the (theoretical) link between deregulation at the state level and banks' adjustment speed towards liquidity target?

First, why is liquidity management important? The situation that with constrained funding, banks hoard their funding liquidity, leading to the tense liquidity problem in the financial market (Van den End and Tabbae 2012). Consequently, it emphasizes a strong link between banks' funding risk defined as the ability to raise cash to fund asset holding (Drehmann and Nikolaou 2010) and market liquidity (bank's liquidity to convert assets into cash at a short notice). Brunnermeier and Pedersen (2009) argue that market liquidity and funding liquidity are mutually reinforcing, leading to liquidity spirals. Due to this relationship, liquidity risk is likely to cause solvency problems and systemic risk during the economic recession periods (Walther 2016). Considering the great effects of liquidity problems on the financial system, policy makers have suggested that banks should introduce a robust liquidity risk management framework to ensure sufficient liquidity (BCBS 2014).

The main role of regulators and supervisors is to ensure that each bank maintains sufficient liquidity. When a bank is unable to hold enough liquidity during the period with a severe liquidity stress, they take actions to rescue the bank and then to lower its negative impact on the whole economy (BCBS 2008). Launched and implemented by policy makers after the 2007-2009 financial crisis, Basel III Net Stable Funding Ratio (NSFR) act is designed to reduce the probability of disruptions caused by liquidity shortage (Federal Register, 2016) and acts at best to protect depositors and limit the damage to the financial system. This new Basel III liquidity requirements emphasise the importance of liquidity risk management once again.

The second concern is that why we should care about banks' attempts to reach a liquidity target? To comply with capital regulation, banks are forced to set their target capital ratios well above the regulatory requirement (Gropp and Heider 2011, Brewer et al. 2008). Banks find it costly to raise equity on short notice to avoid violating the capital requirement. Hence, banks tend to hold discretionary capital to reduce the probability of facing incurred cost (Berger et al. 2008). Based on bank characteristics, banks have their own liquidity target. Van Den End and

Tabbae (2012) find that banks normally follow a pecking order in their liquidity risk management by making larger adjustment to the most liquid balance sheet items as compared to less liquid items. Target is optimal liquidity ratio for banks to maintain the liquidity risk relatively low while generating profitability. However, during the stressed circumstances, banks have less room for a pecking order in their balance sheet adjustments, hence, are more inclined to adjust their (less liquid) retail lending and deposits than in normal market conditions.

They observe an extreme substitution between demand and fixed-term deposits. In the first stage (August 2007 until the demise of Bear Stearns in March 2008) and second stage (between March 2008 and the failure of Lehman in September 2008) of the crisis, banks tend to hold very large amount of fixed-term retail deposits on balance sheet and decreases in retail demand deposits, whereas this trend was reversed in the third stage of the crisis (October 2008 until March 2009). A key insight from this data observation implies that banks attempt different responses for liquidity targets in different periods. This indicates that banks' response in crisis periods have larger material effects on the economy. In this regard, a particular view on NSFR is drawn on the study of Jobst and Gray (2013) that conditional on the individual bank's funding choice, the likelihood of falling below the boundary of the NSFR could cause a liquidity shortage of the bank during a common funding shock. Hence, it is very important to understand how banks aim to reach liquidity targets in order to make accurate judgement on the liquidity shortage problem and the likelihood of systemic risk.

By using a partial adjustment model, Berger et al. (2008) argue that regulation do not affect bank capital adjustment speeds unless regulatory minimums are violated. DeYoung et al. (2018) find that banks tend to increase their Net Stable Funding Ratio (NSFR) in response to negative shocks to their risk-based regulatory capital ratios, highlighting the importance of liquidity risk positions. The adjustment of bank liquidity reduces systemic risk (Ly et al. 2017), hence, has been attracting a growing debate on Basel III regulatory reform with an objective to stabilise the whole system (Ly and Shimizu 2018, Ly et al. 2017, DeYoung and Jang 2016). The relaxation of geographical expansion could exogenously increase state level competition, therefore, helps us to observe how individual banks react to exogenous competition increase.

On the one hand, banks will lose deposits (liquidity) because new entrants may compete with them by offering higher interests. On the other hand, incumbents may lose customers (borrowers) as new entrants may compete with them by offering lower interest rates. Drawing on Van Den End and Tabbae (2012), banks will face substitution between demand and fixed-

term deposits which affects the ratio of the available amount of stable funding in the formula of NSFR. As a result, the deregulation imposes threat to existing banks from both supply and demand side. Berger et al. (2017) highlight their finding that an increase in competition leads to higher target capital ratios and faster speeds of adjustment in capital, indicating that increased competition improves financial stability. Therefore, a better understanding of bank adjustment behavior toward liquidity target helps the regulators and supervisors to learn about banks' liquidity risk management framework when the market faces increased competition and its implication on the stability in the banking system. Similarly, our study of banks' compliance ability to Basel III NSFR standard in the context of deregulation could generate more guidelines to policy makers in terms of this issue.

The study of Reger et al. (1992) is the first to draw attention on deregulation as an environmental variation in the banking industry. Reger et al. (1992) argue that deregulation as a removal of a competition-constraining regulation creates environmental change, provides unequal strategic choice opportunities and influences bank performance differentially. According to DeYoung and Jang (2016), Basel III is consistent with one of Tirole (2011)'s key areas in bank liquidity that stable or 'sticky' deposit issuance reduces the likelihood of bank runs. Johnson et al. (2003) define that market-focused strategic flexibility as the firm's capabilities to generate firm-specific capacity that comprises resource identification, acquisition and deployment ability. Therefore, resource identification strategy in terms of stable deposits is important for building their liquidity differential. We argue that banks tend to increase their adjustment speed of liquidity in response to environmental variation represented by deregulation.

As the first study of adjustment speed in liquidity, DeYoung and Jang (2016) find that U.S. commercial banks actively manage their liquidity. This paper contributes to the literature by distinguishing from DeYoung and Jang (2016)'s the competition explanation of bank liquidity adjustment speed. Using a yearly data sample of U.S. commercial banks from 1992 to 2012, our main finding shows that banks tend to increase their adjustment speed of liquidity in response to financial deregulation. This evidence is consistent with our hypothesis that banks can manage their liquidity actively by changing strategies in response to environmental variation. Our main findings are robust by analysing the dynamic pattern of bank liquidity adjustments around interstate banking deregulation. Kroszner and Strahan (2009) argue that intrastate banking increases geographic diversification, and then mitigates instability problems. Such intra-state deregulation permit banks to extend their insurance distribution network.

Therefore, it is important for us to count this effect empirically. We follow Kroszner and Strahan (1999) to examine the intra-state deregulation effects on liquidity adjustment speed. We found the results robust to our main findings.

The third question may be raised: is there something informative about the speed with which banks reach their target? Berger et al. (2008) apply a partial adjustment model to separate active capital management from passive capital build-ups. They state that the adjustment speed toward capital target depends on the bank's initial capital adequacy and market pressures the bank is facing. They conclude that regulations do not affect bank capital adjustment speeds unless regulatory minimums are violated. DeYoung et al. (2018) add to the discussion by stating that U.S. banks have treated capital and liquidity as substitutes. In essence, liquidity could act in a similar manner as capital. Banks attempt to adjust their liquidity upon the reason that regulatory liquidity is violated. Such bank behavior could inform the supervisors about bank's liquidity risk management framework and whether bank holds sufficient liquidity.

In terms of market pressures, theory on the timing of liquidity trades emphasizes the importance of the liquidity adjustment speed effect (Ly et al. 2017), where banks could trade at the onset of the liquidity shock or trade at the last resort. The adjustment speed of liquidity reflects the degree of systemic risk (Ly et al. 2017). Adjustment speed is considered timely convergence. In times of stress, banks face the choice between liquidating early before adverse selection problems and riding out the crisis at more depressed prices. Banks adjust fast, and then banks should be safe. Slower liquidity adjustment speed exerts a negative impact on systemic risk.

Berger et al. (2017) highlight the finding that an increase in competition leads to higher target capital ratios and faster speeds of adjustment in capital. It indicates a political implication of increased competition on improving financial stability. In our context, local bank giants may also adjust liquidity faster than other banks based on their economy of scope by lending out excessive liquidity or preserving sufficient liquidity (Claessens and Laeven, 2003; Gorton and Huang, 2004; Carletti et al., 2007). Studying the speed with which banks reach their target is informative in the way that competition forces banks to adjust speed toward their liquidity target, so they are more efficient compared to competitors. A better understanding of bank adjustment behavior helps the regulators and supervisors to learn about banks' liquidity risk management framework when the market faces increased competition.

We extend our paper by a comprehensive set of empirical analysis as follows. Firstly, facing increased competition where the bank is located, an intensified requirement of active liquidity management facilitates the bank's strategic movement. Although DeYoung and Jang (2016) are aware that shocks could push banks away from their liquidity target and cause changes in local economic conditions, but they did not empirically investigate. Therefore, by adding more evidence to DeYoung and Jang (2016), we argue that deregulation tends to heighten the need for banks to escape their current states. It is possible that a strategy that takes no action after the regulation changes. We examine the strategic flexibility of banks' liquidity adjustment speed by analysing the *ex-ante* and *ex-post condition*.[2] We find that overall banks increase their incentive to move because of heightened competition. Banks tend to escape their current states and move to states with less deregulation and then exhibit lower adjustment speed after their movement. The evidence also suggests that banks move their headquarters to fend off competitive pressure.

Secondly, when deregulation is under its way and competition is definitely expected, environmental differentiation will occur (Delmas et al., 2007). Significantly different from DeYoung and Jang (2016), we attempt to enrich our market-focused strategic flexibility analysis by examining five possible environmental elements, including the number of branches, population, average personal income, average interest income and average interest expense. We find that population and personal income reduce the market-based focus flexibility of banks; however, higher interest expenses incentivise banks to increase their speed.

DeYoung and Jang (2016) is concerned that acquisition force a bank away from its desired balance sheet composition, however, no empirical findings are shown. To maintain the spirit of our paper, the third objective is that we focus on four sub-samples of surviving banks, existing acquired banks, failing banks and acquiring banks to examine the concept of competitor orientation (Narver and Slater, 1990). We find that surviving and acquirer banks react as market-makers to increase their adjustment speed rapidly, consistent with the market-driving perspective to induce changes (Jaworski and Sahay, 2000). Target banks show a slower speed, implying their limited capability within the constraint of the existing market (Johnson et al., 2003). Failing banks lose their distinct competencies to react properly when environmental variation occurs, consistent with Vazquez and Federico (2015) that banks with weaker structural liquidity are more exposed to failure.

[2] An *ex-ante* mode attempts to investigate the likelihood of banks' escape behaviour while an *ex-post* condition shows how the liquidity speed changes after banks move to other states.

Fourthly, Deyoung and Jang (2016) find that U.S. banking companies actively manage their balance sheet liquidity positions. However, our interest is different from DeYoung and Jang (2016) that we use the sample of banks affiliated with multi-bank holding companies (MBHCs), i.e. at the subsidiary level, to empirically test network structure and liquidity adjustment relative to environmental changes.[3] Overall, banks affiliated with MBHCs holding a larger network and operating in a larger environment are able to speed up their liquidity adjustment, hence, increasing their strategic flexibility in response to bank deregulation.[4] The strength of strong ties promotes better capability to adapt the environmental changes due to frequent interaction and information sharing (Uzzi, 1996, Krackhardt, 1992, Granovetter, 1982). A bank presenting in different states could solve asymmetric information (Michalski and Ors 2012). Finally, turning to cross-sectional analysis, our evidence shows that banks adjust their liquidity more quickly if their liquidity is below the target. Larger banks and profitable banks are able to increase their liquidity adjustment speed. Safer banks react more actively while risky banks are not capable of adjusting their liquidity.

To conclude, *what is the (theoretical) link between deregulation at the state level and banks' adjustment speed towards liquidity targets?* Our findings are consistent with the competition-stability view in the banking literature that more competitive banking systems are more stable (Goetz 2018). Berger et al. (2017) find that competition increases stability by encouraging banks to increase target capital ratios and speeds of adjustment towards these capital targets. We find that after experiencing increased state-level competition due to the relaxation of geographical expansion exogenously, banks tend to increase their speeds of adjustment towards liquidity targets. This, in turn, increases the stability in the banking system (Ly et al. 2017).

Caminal and Matutes (2002) find that lower competition leads to a reduction in credit rationing, resulting in the likelihood of bank failure. Boyd and De Nicoló (2005) claim that banks in greater concentrated banking systems tend to earn more rents in the loan market by charging higher loan rates, which implies higher bankruptcy risk for borrowers. In other words, high volume of non-performing loans increases bank risk of failure. Ly et al. (2017) shows that the Riegle-Neal Act stimulates extensively merger and acquisition waves in the US.

[3] Multi-bank holding companies (MBHCs) have become more organizationally complex over the past two decades in terms of the number of separate legal affiliates and their geographic locations (Avraham et al., 2012).

[4] We find that (i) banks affiliated with MBHCs increase their liquidity adjustment speed; (ii) banks affiliated with MBHCs holding a greater number of subsidiaries are better able to increase their strategic flexibility; and (iii) banks affiliated with MBHCs operating in wider geographical locations could achieve a better reaction to environmental changes.

Specifically, multi-bank holding company acquirers carried about 3,841 merger transactions between 1997 and 2012. A new entrant into bank structure could benefit by raising deposits at lower costs than non-multi-bank holding company structure (Ly and Shimizu 2018). Carletti et al. (2007) agree that merged banks gain benefit for their liquidity management in terms of scope economies, leading to financial cost efficiencies and more precise estimates of liquidity needs. Therefore, banks find their way to adjust towards their own liquidity needs.

Our paper contributes as follows. First, we are the first to shed light on the intersection of bank competition and bank liquidity adjustment speed. Our findings are consistent with the competition-stability view (Goetz 2018, Berger et al. 2017, Schaeck and Ciha1k 2014, Boyd and De Nicolo 2005). Competition could increase stability through encouraging more liquidity adjustment. In this regard, banks that historically operate in a typical regulatory context could start to look beyond their borders when their operating environment varies. Ly et al. (2017) shows that the Interstate Banking and Branching Efficiency Act stimulates extensively merger and acquisition waves in the US between 1997 and 2012. Accordingly, they can build their strategic capabilities to bring their differential advantages to the new competitive area. A new entrant into bank structure could benefit by raising deposits at lower costs than non-multi-bank holding company structure (Ly and Shimizu 2018). Our study complements the literature on deregulation stimulating strategic changes, which has been developed in other fields but not banking, such as railroads (Smith and Grimm, 1987), electricity utilities (Delmas et al., 2007, Russo, 2001), and telecommunications (Bonardi, 1999).

Second, our study deepens the understanding that regulation strongly shapes external environment faced by banks and then forces banks to adjust their strategies to cope with changed external environment. Surviving banks in deregulated states are fully informed about the realisation of idiosyncratic shocks, so they quickly increase their adjustment speed. In contrast, it is difficult for failed banks to respond to environmental variation because they lose their distinct competencies. Third, we complement the theoretical model of Bhattacharya and Gale (1986), who were the first to propose a framework that allows multiple banks to face different liquidity shocks. We shed light on the finance theory with the strategic management literature to prove that when all banks face the same deterioration of stable funding due to environmental variation, different types of banks with their own distinct competencies will react differently.

This paper is organised as follows: Section 2 relates to hypothesis development. Section 3 presents the identification strategy and empirical models. Section 4 provides the data sample and summary statistics. Section 5 reports the empirical findings. Section 6 concludes the paper.

2. Hypothesis development

2.1. Strategic change in response to environmental variation

Carletti et al. (2017) investigate the demand for liquidity in case of M&A. According to Carletti et al. (2007), a bank's demand for liquidity depends on its uncertainty about deposit withdrawals and the relative cost of refinancing. The transition from regulation to deregulation represents dramatic environmental change, resulting in increased environmental uncertainty for the banks' stable funding resources.

The strategic management literature (i.e. Reger et al., 1992, Smith and Grimm, 1987, Porter, 1985) rests on the premise that in a competitive environment, firms have to build an appropriate strategy to align their organisation with critical environmental resources to achieve a competitive advantage. Firms pursue lower cost of financing. The relevant costs are not only the cost of exit but also the cost of entry. By combining the concept of resources with the economic notion of sunk costs, Lieberman et al. (2017) explain that if the resource redeploying is difficult, the manager should be more cautious about entering. In case of change that falls below expectation, the firm should consider to redeploy its resources back into related businesses because relatedness could reduce the sunk costs associated with a new business. In a study of the strategies of 27 railroads prior to and after deregulation, Smith and Grimm (1987) find that most of firms that changed their strategies in response to environmental variation outperformed those that did not. Reger et al. (1992) suggest that deregulation of the U.S. banking industry has direct effects on firms' strategic choices. Thompson (1967) argues that organisations need to utilise distinct competencies and maintain alignment with critical environmental resources. Smith and Grimm (1987) show that strategic changes associated with increased flexibility will be more profitable in uncertain environments than changes associated with decreased flexibility. Therefore, on the one hand, we argue that banks should change in the direction of increased flexibility to increase their strategic capabilities of raising funding in uncertain environments represented by the increasing threat of entry among competitors.

On the other hand, the Basel III liquidity framework is an evaluating regulation considered as an environmental force affecting banks' actions from a strategic management perspective.

BCBS (2014) defines NSFR as a ratio of the amount of available stable funding over the amount of required stable funding. The volume of capital and liabilities that are expected to be reliable over one-year time horizon is called "available stable funding". The "required stable funding" is a function of residual maturities of the various assets according to their liquidity characteristics and an amount in relation to off-balance-sheet commitments.[5] Theoretically, the fact that each bank holds a large liquidity buffer might decrease the likelihood that multiple financial institutions will face liquidity shortfall problems (Jobst, 2014). The rapid adjustment is greatly preferable in a crisis situation (Nsouli et al. 2005). Indeed, Ly et al. (2017) find that banks acquiring immediate-trading equilibrium could adjust the liquidity rapidly in response to the Basel III liquidity standard, thus, reducing systemic risk. Hence, the greater the adjustment effort is, the higher the probability that success of achieving strategic capabilities will be achieved. Taken together, we propose the first hypothesis:

Hypothesis 1: Banks tend to increase their adjustment speed of NSFR in response to environmental variation.

2.2. Market orientation

The prior strategic management literature (Corsi et al., 1991, Corsi and Grimm, 1989, Smith and Grimm, 1987) finds that a majority of firms shift their strategies to fit the environmental conditions that they face. As these conditions change, their strategies must change accordingly if firms want to survive.

With respect to market-focused strategic flexibility, market orientation has been conceptualised as firms' behaviour (Kohli and Jaworski, 1990) of understanding their competitors (Jaworski and Sahay, 2000, Day, 1994). Their central argument rests on the strategy of firms that achieve superior matches will enjoy greater competitive positions. Johnson et al. (2003) argue that firms are able to accumulate either internal or external resources. When confronted with an increasing competitive environmental shift, if banks simply increase the adjustment speed of NSFR, it might not necessarily imply their liquidity advantages. The resource-based capabilities form the foundation to generate another option such as market entry or product introduction (Johnson et al., 2003). The choice of mechanism underlying strategy includes a bundle of options that can be taken at a later time (Kogut and

[5] Appendix A is provided to include details of variables and data sources that were used to calculate NSFR.

Kulatilaka, 2001, Bowman and Hurry, 1993). When the alternative choices are revealed, options allow firms to adjust accordingly (Bowman and Moskowitz, 2001).

Facing increasing competition in the place where the bank is located, option identification capability can be banks' strategic movement that is caused by the intensified requirement of active liquidity management. Therefore, we argue that deregulation tends to heighten the need for banks to escape their current states. However, options identification capability depends on the extent to how great the firms' market-sensing abilities will be. Market sensing involves visualisation of market potential (Ami and Schoemaker, 1993). In other words, the firm's alertness to market signals its ability to read it.

The concept of strategic flexibility is explained by the *ex-ante* mode, that is, advance preparation for future transformation whereas the *ex-post* mode, which describes the consequence after-the-fact adjustments undertaken. On the one hand, if the environment where the bank operates becomes intensely competitive, it contains uncertainty about the available stable funding resources that banks could raise. Banks with lower adjustment speed should realise their inability to compete with others with higher adjustment speed. Hence, they are more likely to exhibit the escape behaviour out of their current states in an effort to 'match' their liquidity needs with changing environmental conditions. On the other hand, one should observe that banks going to less deregulated states significantly reduce their liquidity adjustment speed. Johnson et al. (2003) reason that the market-focused strategic flexibility derives from capabilities in assembling an appropriate resource and maintaining their competitive advantages. If banks are unable to fend off competition pressure to survive, they tend to move to less deregulated states. Therefore, they can seek a resilient form of flexibility that is reflected by lower adjustment speed. Hence, we posit the following:

Hypothesis 2a: Banks with lower adjustment speed of liquidity tend to escape their current states to improve their competitive positions.

Hypothesis 2b: Banks going to less deregulated states tend to reduce their liquidity adjustment speed.

2.3. Competition orientation

When all banks face the same deterioration of stable funding due to environmental variation, the way in which different individual banks treat the risk of selling assets at fire sale prices to repay the liabilities claim on demand is in different ways. The concept of competitor

orientation in market-based strategic flexibility reflects a focus on using information about competitors (Narver and Slater, 1990). The prior management studies (Angwin, 2004, Cannella and Hambrick, 1993) suggest that faster integration leads to less uncertainty and lower competitor's inability to profit from the internal change phase. In this regard, banks should demonstrate their ability to adjust adjustment speed in response to the competitors' move.

Two schools of thought in the competitive orientation are rooted in terms of market-driving versus market-driven perspectives. The first thought of the market-driving perspective suggests that the firm can act to induce changes relative to the behaviours of other players in the market (Jaworski and Sahay, 2000). In striking contrast, with respect to a market-driven perspective, the firm responds within the constraints of the existing market condition (Johnson et al., 2003). The main differences can be considered as innovation in the former versus imitation in the latter. In such circumstances, those with driving strategies will demonstrate rapid reaction speed. When expecting extreme variation in competitive intensity to occur to their own environment, firms will react to guard themselves against damaging consequences (Evans, 1991). However, in a sense of imitation, banks show a delay in their adjustment speed because of the transition from observing to responding. Collectively, the argument is similar to Johnson et al. (2003) that the market-driving player is the market-maker (active) whereas the market-driven player is the market-taker (passive). We propose the following:

Hypothesis 3: Competitor orientation in term of market-driving approaches will lead to higher liquidity adjustment speed than competitor orientation with an emphasis on market-driven approaches.

2.4. Network structure

The strategy flexibility can be linked to the network structure and the likelihood of adaption (Kraatz, 1998). The primary function of the network is to expand the extent that firms could access information from the larger environment and broaden awareness of environmental trends and potential adaptive responses (Burt, 1982, Granovetter, 1973). However, Granovetter (1982) argues that depending on the structure, an organisation's network exacerbates the uncertainty generated by environmental changes, thereby, negatively affecting the ability to successfully adapt. The strength of strong ties promotes better capability to adapt the environmental changes due to frequent interaction and facilitates the exchange of detailed information between organisations (Uzzi, 1996, Krackhardt, 1992, Granovetter, 1982).

Therefore, strong ties are able to provide the members in the network with the implication of external threats. The ties among organisations in the network would enhance valuable information being shared and the information provided being acted upon (Uzzi, 1996). Accordingly, strong network ties help to mitigate environment uncertainty and promote learning of adaptive responses among linked organisations, thus, increasing capability to adapt environmental changes. As a result, we posit the following hypothesis:

Hypothesis 4: Banks with strong network ties are able to more rapidly adjust liquidity than banks with weak or no network ties.

3. Identification strategy and research design

3.1. Interstate banking in the U.S.

We use competition as a main source to study how banks adjust liquidity in response to environmental variation. Traditional banking competition proxies such as the Herfindahl-Hirschaman Index and the Lerner index that measured based on bank level characters cannot address the endogeneity issues between competition and liquidity adjustment speed because unobservable cross-sectional heterogeneity could impact competition and liquidity adjustment speed simultaneously. For example, local bank giants can entrench entry barriers for new entrants to reduce competition based on their economy of scales. Meanwhile, local bank giants may also adjust liquidity faster than other banks based on their economy of scope by lending out excessive liquidity or preserving sufficient liquidity (Claessensand Laeven, 2003; Gorton, G. and Huang, L., 2004; Carlettiet al., 2007).

On the other hand, reverse causality may also exist. For instance, better liquidity management can reduce liquidity risk and increase profitability, leading to increased competitiveness of banks. In this vein, liquidity adjustment speed could change banks' ability and ultimately alter competition.

We use the Interstate Banking and Branching Efficiency Act (IBBEA), which relaxed geographical restrictions on bank expansion across state borders, enacted in the U.S. in 1994 and completed in 1997 to document the causality between competition and liquidity adjustment speed. IBBEA is widely applied as an exogenous shock to bank competition studies (Rice and Strahan 2010; Cornaggia et al. 2015; Krishnan et al., 2015 ; Berger et al. 2017). IBBEA relaxes entry restrictions mainly from four dimensions: (i) age restrictions (a minimum age of 3 or more years on the acquiring banks), (ii) *de novo* interstate branching restrictions, (iii) individual

branch acquisition restrictions (not permitting the acquisition of single branch or portions of an institution), and (iv) state-wide cap on deposit restrictions (mandating a deposit cap on branch acquisition less than 30%). IBBEA allows states to have their own discretion to choose the timing of relaxations of each of these four restrictions. Differences in the extent of entry barrier reduction in each state in different years offer a significant environmental variation in the potential exogenous increase in bank competition in each state.[6] IBBEA offers an idea setting to examine how banks manage liquidity adjustment speed in response to different level of exogenous increase in competition across time in different states.

We follow Rice and Strahan (2010) to construct a deregulation index that captures the level of interstate branching restrictions for each state. Specifically, the index in each state equals zero before 1994 whereas after 1994, this index ranges from zero to four. The index takes four values for states that are most open to out-of-state entry. Then, we subtract one from the index when a state has any of the above four barriers. Please note, in our study, the IBBEA index value of four means most deregulated, and the IBBEA index value of zero means least deregulated. After IBBEA is introduced, we observe that 9 states have already fully relaxed all four restrictions by the end of 1997, and 12 states have not relaxed anyone of these restrictions. The average IBBEA index is 1.92 with a standard deviation of 1.57. By the end of 2005, there are 14 states fully deregulated, and 12 states with three of the four restrictions relaxed. 9 states still had not deregulated at all. The average IBBEA index increases to 2.41 with a slight reduction in standard deviation of 1.20.

3.2. Empirical model

We follow DeYoung and Jang (2016) to measure the Basel III NSFR and apply partial adjustment model to model the dynamics of liquidity. The way we constructed NSFR in our study is provided in Appendix A. This model enables us to estimate the following: the target NSFR ratio for each bank; the determinants of target NSFR ratio; how quickly each bank adjusts to its target ratio; and the determinants of these adjustment speeds. Our interest is to determine how bank deregulation would affect the liquidity adjustment speed. In the partial

[6] The study of Reger et al. (1992) is the first to draw attention to the strategic management literature by investigating the effect of bank deregulation on strategic choice and performance in the U.S. banking system. Since then, this line of research has been under-researched. Restrictions on interstate banking are a competition-constraining regulation that was enacted at the state level. Therefore, Reger et al. (1992) argue that deregulation creates environmental change, providing unequal strategic choice opportunities and influencing bank performance differentially.

adjustment model, the bank's current NSFR level is a weighted average of its target and its previous year's NSFR:

$$NSFR_{it} - NSFR_{it-1} = \lambda_i(NSFR^*_{it} - NSFR_{it-1}) + \varepsilon_{it,} \quad (1)$$

Where $NSFR_{it}$ is the liquidity of bank i in year t. $NSFR^*_{it}$ is the target NSFR of bank i in year t. A value of $0< \lambda_i<1$ represents the proportional adjustment speed for bank i. In our context, λ_i captures how bank is operating away from its target NSFR. Alternatively, NSFR is predicted to mean revert to a target level, NSFR*. If the value of λ_i is small(big), the adjustment speed is slow(high), suggesting that banks are passive(active) liquidity managers.

A bank's NSFR* is a function of bank level characteristics:

$$NSFR^*_{it} = \beta X_{it} + \varepsilon_{it,} \quad (2)$$

Where X_{it} is a vector of observable bank level characteristics influencing NSFR. Substituting Equation (2) into Equation (1) and rearranging yields Equation (3) below:

$$NSFR_{it} = \lambda\beta X_{it-1} + (1- \lambda)NSFR_{it-1} + \varepsilon_{it,} \quad (3)$$

In Equation (3), we assume the adjustment speed λ is identical for each bank in each time period. However, we want to relax this constraint, which allows us to estimate dynamic adjustment speeds for the bank. In reality, each bank should adjust liquidity to its target differently because of the individual unique situation and external macro condition. We, therefore, relax this constraint by specifying λ as follows:

$$\lambda_{it} = \gamma Z_{it-1} + \varepsilon_{it} \quad (4)$$

Where λ_{it} is the bank-specific and time-varying adjustment speed towards the target ratio $NSFR^*_{it}$. Z_{it-1} is a vector of the bank and macroeconomic characteristics that affect the adjustment speed. γ is a vector of coefficients that allow us to directly test how banking deregulation influences NSFR adjustment speed. The sign of γ reflects the relationship between Z and the adjustment speed. Substituting Equation (4) into Equation (1) yields the complete model:

$$NSFR_{it} - NSFR_{it-1} = \gamma Z_{it-1}\, GAP_{it-1} + \varepsilon_{it} \quad (5)$$

GAP_{it-1} is calculated as the difference between $NSFR^*_{it}$ and $NSFR_{it-1}$. It is worth noting that our interested variable IBBEA index is placed within Z_{it-1}. We apply OLS on Equation (5) to obtain γ, with the standard errors being clustered on the bank level. Once γ is estimated, we use Equation (4) to calculate the dynamic adjustment speed of NSFR for each bank.

4. Data sample and summary statistics

Because our empirical setting mainly depends on the natural experiment of IBBEA, which starts in 1994, and mostly completes in 2010. To capture the environmental variation for banks in different states, we choose a 20-year sample window that covers the implementation of IBBEA in this study. We obtain yearly data from U.S. commercial banks from 1992 to 2012 from the Call report. We access state-level data from different sources, including the Federal Deposit Insurance Corporation, US Census Bureau and Bureau of Labor Statistics.

The variable definitions are presented in Appendix B. Our deregulation measure is the IBBEA index, which captures the level of interstate branching restrictions for each state, ranging from zero to four. Following Deyoung and Jang (2016), We have a set of control variables, including Zscore, revenue, leverage, total asset, total asset growth, managerial efficiency, diversification and loans. Specifically, a bank should manage its' liquidity ratio based on a set of financial variables, including risk, profitability, diversification, size and efficiency. Under the basic assumption of partial adjustment model, we assume these bank specific characteristics would explain and be able to predict the NSFR target. Hence, we include these controls in our baseline specification. For robustness, we further control for some regional macro factors on state level such as population, GDP growth, personal income that may impact on bank liquidity.

[Insert Table 1 here]

Panel A of Table 1 shows the summary statistics for a sample period of commercial banks during 1992-2012. The mean, standard deviation, and the percentiles of all variables are reported. We winsorise all variables at the 1% and 99% levels to remove outliers. The mean of NSFR is 1.579 while the mean of target NSFR is 1.484, leading to a negative GAP of 0.113. Figure 1 shows the difference between the real NSFR and target NSFR. From the beginning of our observed period, the actual NSFR starts at a lower level than the target; however, it jumped significantly in 1994, which was the beginning year of deregulation in the U.S. Then, the real and target NSFR had been approaching closely until the end of 2012. IBBEA index has a mean value of 2.774, implying a relatively high deregulation magnitude across all states within our sample period. Banks use 89.7% liability of total assets to finance their banking activities. The

mean value of loans is 65.8% of total assets. Total assets are 895.5 million on average. Banks can generate revenue 1.28% of total assets (=11.533/895.5), on average. The mean value of managerial efficiency that is measured by the cost to income ratio is equal to 77.1%. U.S. banks generate approximately 11.2% of total operating revenue from non-interest income.

[Insert Figure 1 here]

As indicated in Panel B of Table 1, we find banks with positive and negative GAPs have differential liquidity adjustment speed. Overall, banks are prone to adjust liquidity faster (0.349 vs 0.241) if their actual NSFRs are below optimal level (GAP>0), compared to those banks with liquidity ratios above the optimal level (GAP<0). However, the former outperforms in their total assets have higher diversification and become safer, but have a lower return on asset (ROA) than the latter. Notably, escaped banks demonstrate their higher market-focused strategic flexibility by 49 times higher in total assets and greater diversification than non-escaped group, yet are riskier. On average, the non-MBHC group gains a higher adjustment speed but a lower NSFR level. Among the four types of banks, surviving banks exhibit the highest estimated NSFR adjustment speed whereas the highest mean value of NSFR lies in acquiring banks, demonstrating that both are market-makers. The failure bank group features the largest asset sizes (38,204.11$ million) and the highest insolvency risk (18.224) due to the extensive expansion strategies with the greatest mean value of diversification (18.276).

Figure 2 illustrates the bank liquidity adjustment speed around deregulation. We mark the introduction year of IBBEA as time 0 and draw a graph of adjustment speed of liquidity around it using a 10-year window. Since different states relax restrictions in different years, then we can observe a staggered and dynamic effect of deregulation on bank liquidity adjustment speed. Before the deregulation period, the mean of the estimated NSFR adjustment speed was between 0.25 and 0.35 and much lower than the one banks achieved after the deregulation. Within the three-year time window, banks reached the highest peak of the adjustment speed of 0.43, indicating that the deregulation has stimulated the incentives for banks to raise their speed to align with environmental variation.

[Insert Figure 2 here]

Appendix C presents the correlation matrix for variables used in the study. In general, there are no high correlations between/among explanatory variables.

5. Empirical results

5.1. Bank deregulation and adjustment speed of NSFR

Table 2 presents the result of Equation (3) for the first stage estimation. We follow recent adjustment speed studies by including OLS, GMM and Fama-Macbeth for first step. Apart from taking OLS as a benchmark (Healy et al, 2014), we use GMM to account for potential reverse causality between bank characteristics and NSFR (De Jonghe and Öztekin, 2015). We also use Fama-Macbeth regression to mitigate analysis bias caused by error term hertergoneity across banks (Flannery and Rangan, 2006; Hung et al., 2018). The results show that the static liquidity adjustment speed for all banks is approximately 0.6. Then, we follow Flannery and Rangan (2006) to use the estimates of Fama-Macbeth regression to gauge our target NSFR.

[Insert Table 2 here]

Table 3 reports the results for the second stage estimation of Equation (5). The coefficients of IBBEA index*GAP are positive and significant; it means that deregulation effectively increases the bank liquidity adjustment. We deflate all financial statement variables using GDP deflator to account for potential bias cause by time. Then we use three estimation strategies; columns (1) and (2) use OLS with fixed effects. In Columns (3), we use the GMM estimator to control potential endogeneity. In Column (4), we follow Berger et al. (2017) to construct a weighted deregulation index to account for variant market share for a bank in each state. The results are consistent across all columns. Column (1) of Table 3 shows a positive coefficient of 0.039, indicating that a one standard deviation increase of the branching restriction index leads to an increase in NSFR adjustment speed by 6.63% (=0.039*1.7). In other words, when deregulation occurs, banks are more likely to increase their adjustment speed of NSFR, consistent with the first hypothesis that firms tend to strategically change to align their organisation with critical environmental resources to achieve a competitive advantage (Reger et al., 1992, Smith and Grimm, 1987, Porter, 1985).

In Column (5) and (6), we perform two more robustness tests. First, banks' strategy towards liquidity management might be highly influenced by the recent financial crisis. In addition to the crisis, the competitive environment would be significantly shaped due to a huge number of failures and M&As recently. We then only use observations before 2007 to clean out mixed effects brought by financial crisis. Second, we control for early Intra-state deregulation by following Kroszner and Strahan (1999) and Berger et al. (2017). All results

are consistent. Furthermore, we reconstruct the index from Rice and Strahan (2010) to randomly assign states into each deregulation year. The randomized index maintains the same distribution as the baseline specification, but it falsifies the proper assignment of deregulation year. If there are unobservable staggered shocks happening during the sample period, the randomized IBBEA may have an opportunity to drive the results. We find the coefficient of *Randomized IBBEA index*GAP* in Column (7) is negative and insignificant. It confirms that our findings are not driven by other unobservable shocks. In Column (8), We further apply trimming rather than winsorising on the sample to control for outliers. In Column (9), we extend our data sample period from 2012 to 2018 to account for recent developments. Results are consistent.

[Insert Table 3 here]

5.2. Dynamics of bank adjustment speed around deregulation

Mahon and Murray (1981) argue that in chaotic times surrounding deregulation, the environment changes fluctuate. Our descriptive statistics above exhibit such a pattern. However, banks may anticipate IBBEA deregulation change and proactively manage liquidity, hence, invalidate our difference in difference "parallel trend" assumption (Bertrand and Mullianathan, 2003). It is also important for us to study how quickly banks react deregulation.

We input two series of dummies to capture the dynamic impact of deregulation on bank liquidity adjustment speed. $Before^k$ is a dummy variable that equals to 1 if the state implements IBBEA, and the observation is *k* year prior to the deregulation, where k=1, 2, 3, 4 or 5 years; and $After^j$ is a dummy variable that equals to 1 if the state implements IBBEA, and the observation is j year after the deregulation, where j=1, 2, 3, 4 or 5 years. The above specification corresponds to a difference-in-difference estimation strategy and has been widely applied (Chemmanur et al., 2009). The *Before* and *After* are event-time dummies around deregulation that capture residual changes in the liquidity adjustment speed after controlling for state and year fixed effects, so we drop IBBEA index in the Z matrix to avoid confusion. Please note that states may implement IBBEA gradually; therefore, we pick the first time a state adopted IBBEA as our deregulation event. Therefore, our base year is the year (year 0) of initial effectiveness of IBBEA for a state. We further constrain our sample to a 10-year window

around the year 0. Thus, the coefficients β and λ reflect the deviations of liquidity adjustment speed with respect to the year of deregulation.

Table 4 reports the findings. We use different OLS settings in columns (1) to (3) to analyse the dynamic pattern of the bank liquidity adjustment speed, since states implemented IBBEA differently. For instance, Ohio state instantly relieved all four restrictions (IBBEA index from 0 to 4 on the 21st May 1997. On the other hand, Washington state firstly relieved state deposit cap restriction on the 6th June 1996 (IBBEA index from 0 to 1) and then gradually relieved other restrictions in following years. In column (4), we further restrict our sample by only including those states that progressively relaxed branching restrictions to provide an equalized deregulation environment for treated banks.

All the results across columns (1) to (4) show that banks increase their liquidity adjustment speed. This effect is most pronounced in the first and second years after the first deregulation. These results are consistent with our baseline results. Smith and Grimm (1987) suggest that the transition from a regulated environment to a deregulated environment will lead to environmental uncertainty for the firms. Easing interstate banking provides unequal strategic choice opportunities and affects bank liquidity differently. Reger et al. (1992) suggest that states with a greater number of phasing-in interstate banking will provide banks with more opportunities to adjust strategies. Therefore, banks can manage their liquidity actively by increasing their adjustment speed in response to the progression of the interstate banking and branching efficiency act in the U.S.

[Insert Table 4 here]

5.3. Market orientation

Reger et al. (1992) argue that deregulation has direct effects on firms' strategic choices. In this regard, firms that historically compete in a regulated environment begin to look beyond their borders after environmental changes represented by deregulation. Their central argument rests on the strategy that firms achieve superior matches, thus, enjoy greater competitive positions. Therefore, we argue that deregulation tends to heighten the need for banks to escape their current state. We attempt to test our second hypothesis in this section.

We, therefore, build up a probit model to test whether banks escape from the current state because of deregulation:

$$Bank\ Escape_i = \beta * IBBEAindex_{i,t} + \gamma Controls_{i,t} + Time\ Fixed\ Effects + State\ Fixed\ Effects + \varepsilon_{i,t} \quad (6a)$$

$$Bank\ Escape_i = \beta_1 * IBBEAindex_{i,t} * More + \beta_1 * IBBEAindex_{i,t} * Less + \gamma Controls_{i,t} + Time\ Fixed\ Effects + State\ Fixed\ Effects + \varepsilon_{i,t} \quad (6b)$$

$$Bank\ Escape_i = \beta_1 * IBBEAindex_{i,t} * High + \beta_1 * IBBEAindex_{i,t} * Low + \gamma Controls_{i,t} + Time\ Fixed\ Effects + State\ Fixed\ Effects + \varepsilon_{i,t} \quad (6c)$$

Where the dependent variable $Bank\ Escape_i$ is a dummy that equals one if a bank has changed headquarter address within the sample period. If the exogenous deregulation variation forces banks' strategic movement, we would expect a positive coefficient on *IBBEAindex* in Equation (6a). For Equations (6b) and (6c), we interact *IBBEAindex* with two sets of dummies to observe the impact from deregulation in two separate aspects, where *More* equals 1 if a bank has moved to more deregulated state, and otherwise 0; if deregulation indeed triggers a bank's escape, we shall observe a pattern about escaping phenomenon. *Less* equals to 1 - *More*; *High* equals to 1 if a bank's NSFR adjustment speed is above the median, and otherwise 0; *Low* equals to 1- *High*.

Table 5A reports our findings. In column (1), a positive and significant coefficient of IBBEAindex suggests that overall banks are forced to move because of competition, consistent with hypothesis 2a. Market sensing involves visualisation of market potential (Ami and Schoemaker, 1993). Banks with a lower adjustment speed should read their inability to compete with others with a higher adjustment speed. Hence, they are more likely to exhibit the escape behaviour out of their current statse in an effort to 'match' their liquidity need with changing environmental conditions.

As presented in column (2), a positive and significant coefficient of IBBEAindex*Move to less or similar deregulated states indicates that banks tend to escape their current states and move to states with less deregulation. Evans (1991) describes it as a defensive form of flexibility in an *ex-ante* sense. It provides banks with the capability to withstand the consequences of increasing competitive environment and be insured against their competitors. Interestingly, regarding the findings in column (3), when we compare the magnitude of coefficients between the interaction of IBBEAindex*High adjustment speed of NSFR (0.065)

and that of IBBEAindex*Low adjustment speed of NSFR (0.105), we find that those banks with a low adjustment speed are more willing to move. In face of increasing competition in the place where the bank is located, those with constrained ability prefer strategic movement to enhance their resource identification capability and active liquidity management.

[Insert Table 5A here]

Since we believe that banks' strategic movement is caused by the intensified requirement of active liquidity management, one should observe that banks going to less deregulated states significantly reduce their liquidity adjustment speed. Therefore, we then further examine how is the ex-post liquidity management of escaped banks. We introduce an index named Escape in our baseline model. Escaped bank is a different index that equals to 1 after the movement. For example, a bank has moved from New York to California in 2000; this index equals to 1 starting from 2001 and thereafter, and 0 otherwise. This index allows us to capture the ex-post liquidity level for moved banks. *More (Less*) is an index that equals to 1 after banks have moved to more (less or similar) deregulated states.

Table 5B reports our results. A positive and significant coefficient of Move to more deregulated state*GAP shows that if banks have moved to more deregulated states, they must increase their liquidity adjustment speed in order to survive. However, a negative and significant coefficient of Move to less or similar deregulated states*GAP implies that those move to less deregulated states will decrease the adjustment speed because of a low level of competition, consistent with hypothesis 2b. This is in line with Evans (1991) for a resilient form of flexibility that reflects the recuperative capability to return to the previously viable condition. Johnson et al. (2003) reason that market-focused strategic flexibility derives from capabilities in assembling an appropriate resource and maintaining their competitive advantages.

[Insert Table 5B here]

We have conducted two additional analyses in table 5 of Panel C to test whether banks have successfully fended off competitive pressure. In this table, we shift our interest in those banks that have escaped to less deregulated states. We create a dummy variable "Move to less deregulated states" that equals to 1 if a bank has moved to less deregulated and 0 otherwise. We investigate this empirical analysis by using NSFR, Market power (Lerner index) and Deposit share as dependent variables. The coefficients of Move to less deregulated states are

all positive and significant in the column (1), (2) and (3) of Table 5C. Our findings show that after relocation of headquarters to less competitive states, banks have gained higher liquidity (NSFR), market power (Lerner index) and state-level deposit share. Again, our evidence suggests a strategic movement of headquarters by banks in order to fend off competitive pressure.

[Insert Table 5C here]

To sum up, all the findings in this section have painted an overall picture that deregulation tends to heighten the need for banks to escape their current states. Banks achieving superior matches will enjoy greater competitive positions to 'match' their liquidity need with changing environmental conditions.

5.4. Environmental factors

Regarding market-focused strategic flexibility, while institutional change shifts the competitive landscape, a firm can make the strategic shift necessary to meet the environmental differentiation by shifting its investment to reflect the new strategic imperative (Delmas et al., 2007). When deregulation is under way and competition is definitely expected, environmental differentiation will occur (Delmas et al., 2007). Therefore, our argument differentiation is based on two conditions. First, bank deregulation needs to be in place to allow for differentiation strategies to emerge. Second, demand for environmental quality should be present in the state. When the two conditions occur, banks will have the incentive to pursue environmental differentiation strategies. Following the previous section, this section generates a next interesting question: Where might such environmental differentiation strategies emerge?

We suggest that there are five possible elements, including the environmental sensitivity of the number of branches, population, average personal income, average interest income and average interest expense. We, hence, input a set of state-level variables to interact with deregulation to testify whether outside environmental sensitivity is the driver of the bank's strategic decision.

Table 6 reports our results. As indicated in columns (1) and (4), we find that the branch number does not play a vital role in adjusting liquidity when banks face environmental changes. The interaction terms of population and personal income are negative and significant at the 1% level. The results indicate that after the deregulation, banks in any state with higher population

and personal income tend to lower the NSFR speed. According to Carletti et al. (2007), a bank's demand for liquidity depends on its uncertainty about deposit withdrawals and the relative cost of refinancing. Smith and Grimm (1987) show that strategic changes associated with increased flexibility will be more profitable in uncertain environments than change associated with decreased flexibility. Our results are consistent in the way that larger population will provide more customers to offer deposits; therefore, the active liquidity management target can be relieved. In a similar vein, environmental sensitivity of higher personal income is also a driver of banks' strategic decisions. We have shown that the market factors of population and personal income reduce the market-based focus flexibility of banks.

However, a positive coefficient of IBBEA index*Interest expense*GAP in column (5) suggests that banks in states with higher interest expenses increase speed. The strategic management literature (Reger et al., 1992, Smith and Grimm, 1987, Porter, 1985) argues that in a competitive environment, firms have to build an appropriate strategy to align their organisation with critical environmental resources to achieve competitive advantages. Firms pursue lower cost. Therefore, the states with higher interest expenses incentivise banks to increase their adjustment speed of liquidity.

[Insert Table 6 here]

5.5. Competition orientation

The concept of competitor orientation in market-based strategic flexibility reflects a focus on using information about competitors (Narver and Slater, 1990). Banks should demonstrate their ability to adjust the adjustment speed in response to the competitors' move. The key question has been raised in this section as to whether different groups of banks have different NSFR adjustment speeds in competitive equilibrium. In this section, to test the third hypothesis, we categorise banks into four types: (i) surviving banks, i.e., those banks that existed before deregulation and continue to survive after deregulation; (ii) existing acquired banks, i.e., those banks that existed prior to deregulation but exited the sample through merger or acquisition; (iii) failing banks, i.e., those banks that existed prior to deregulation but exited or closed after deregulation; and (iv) acquiring banks, i.e., those banks from another state that acquired banks in the deregulated states. Surviving banks and acquirer banks are those with market-driving perspectives whereas target and failed banks are those with market-driven perspectives.

We re-run the main regression with these four sub-samples. Table 7 reports the findings. In model (1) of Table 7, we find a positive and significant coefficient of 0.029 for surviving banks, indicating that surviving banks in the current states increase the adjustment speed of their liquidity. Surviving banks show protective approaches in response to competitors' move. When expecting extreme variation in competitive intensity to occur to their own environment, firms will react to guard themselves against damaging consequences and exploit the markets before their competitors enter (Evans, 1991).

A negative and significant coefficient of -0.025, as shown in the model (2), implies that existing acquired banks are less likely to increase their liquidity speed. The less a bank depends on its exchange partners, the less it has to adjust to fit environmental fluctuation. Reger et al. (1992) argue that if a firm has the necessary ability to demonstrate its competitive advantage but does not intend to act accordingly, market-focused strategic flexibility cannot emerge. Existing acquired banks show a sense of imitation, i.e., a delay in their adjustment speed because of the transition from observing to responding. Consequently, we observe that target banks are less likely to adjust their liquidity. They act as market-takers.

We do not find a significant result for failed banks. The likelihood of falling below the boundary of the NSFR conditions is bound on the individual funding choice and the bank's experiencing a liquidity shortage due to a common funding shock (Jobst and Gray, 2013). Kane (1996) states that bank failures, which occurred in separate waves in different regions due to different economic shocks, were important triggers of interregional financial deregulation. In the study of bank funding structure and failure by using NSFR, Vazquez and Federico (2015) find that banks with weaker structural liquidity were more exposed to failure. Thompson (1967) argues that organisations need to utilise distinct competencies and maintain alignment with critical environmental resources. In this regard, we conclude that failed banks lose their distinct competencies to react properly when environmental variation occurs.

The result shows that acquiring banks tend to rapidly adjust NSFR. This movement positions acquirers in the exploitive mode of strategic flexibility. Banks devote their capabilities in being strategically flexible to react to the environment changes. To determine exploitative approaches, Johnson et al. (2003) suggest that the firm would develop market-sensing and identification capabilities that go beyond existing competitive structures. Those acquiring banks employing acquisition strategies are able to look beyond their borders when their operating environment varies.

Overall, the findings on surviving and acquirer banks are consistent with the market-driving perspective that the firm can act to induce changes relative to the behaviours of other players in the market (Jaworski and Sahay, 2000). Surviving banks and acquirer banks react as market-makers in an innovative way. Target and failed banks responded as market-takers. The reason is that they have limited response capability within the constraint of the existing market (Johnson et al., 2003).

[Insert Table 7 here]

5.6. Network structure

To achieve a comprehensive analysis, this section raises the next question as to how the network structure affects banks' capacity for liquidity adjustment speed in response to environmental change. MBHCs have become more organisationally complex over the past two decades in terms of the number of separate legal affiliates and their geographic locations (Avraham et al., 2012). It suggests that MBHCs enhance the involvement of bank members in the network structure. Therefore, this section aims to test the fourth hypothesis by interacting the MBHC dummy variable into the main model. We use full sample to test whether MBHC subsidiaries adjust liquidity faster than other banks under deregulation, where M*BHC* is a dummy variable that equals to 1 if the bank belongs to an MBHC, and 0 otherwise.

The primary function of the network is to examine the extent that firms could access information from the larger environment and broaden awareness of environmental trends and potential adaptive responses (Burt, 1982, Granovetter, 1973). However, Granovetter (1982) argues that depending on the structure, an organisation's network exacerbates the uncertainty generated by environmental changes, thereby, negatively affecting the ability to successfully adapt. Therefore, next, we want to extend our analysis by examining the question of whether MBHC affiliates holding a larger network and operating in a larger environment could achieve faster adjustment speed.

We use a subsample of bank holding company (BHC) subsidiary observations to test whether banks affiliated to a BHC manage liquidity differently. The sample of BHC subsidiary observations includes all subsidiary observations belonging to single-bank holding companies (SBHCs) and MBHCs. First, the variable *Number of subsidiaries of parent BHC* that counts the total number of subsidiaries of parent BHC represents the larger network. If the number of

subsidiaries equals to 1, this is an SBHC structure. Otherwise, they are an MBHC structure. Second, the variable *Number of states operated of parent BHC* that counts the total number of distinct states the parent BHC operates represents the larger environment.

The result in column 1 of Table 8 shows that banks affiliated with MBHCs increase their liquidity adjustment speed, consistent with the fourth hypothesis. The strength of strong ties promotes better capability to adapt the environmental changes due to frequent interaction and facilitates the exchange of detailed information between organisations (Uzzi, 1996, Krackhardt, 1992, Granovetter, 1982). Therefore, strong ties are able to provide the members in the network with the implication of external threats. The ties among organisations in the network would enhance valuable information being shared, and the information provided will be acted upon (Uzzi, 1996).

Interestingly, as indicated in columns 2 and 3 of Table 8, banks affiliated with the larger network and larger environment are able to speed up their liquidity adjustment. These findings suggest that stronger network ties relative to the bigger structure of BHCs help to mitigate environment uncertainty and promote learning of adaptive responses among linked organisations, therefore, increasing the capability to adapt greater environmental changes. Similar to the loan processing costs channel in Michalski and Ors (2012), MBHC-member banks may benefit from the deposit expense channel to raise their liabilities to meet their NSFR targets. Hence, multi-regional banks having the advantage of information have implications for liquidity across regions because they gather it through their network based on their cross-regional presence and share it among affiliated institutions.

[Insert Table 8 here]

5.7. Cross-sectional analysis

According to Smith and Grimm (1987), change takes the form of action, indicating that firms taking action will outperform those that do not in an uncertain environment. It would be interesting to extend cross-sectional analysis by focusing on different financial factors. This section re-examines the main model by categorising into two subsamples above and below median of GAP, size, ROA, loan loss provision, loan charge-offs and Zscore. Table 9 reports the results.

Columns (1) to (2) of Table 9 shows the evidence of GAP larger than 0, indicating that the real liquidity is lower than the target one. A positive and significant coefficient of IBBEA index*GAP suggests that banks become more sensitive when they hold less than the target liquidity, so they increase their adjustment speed. Columns (3) to (4) indicate that larger banks are able to increase their speed. Turning to profitability, banks with higher profits tend to adjust liquidity quicker. However, low profitability banks are struggling to cope with the outside environment; therefore, the results are just significant at the 10% level. Smith and Grimm (1987) show that strategic changes associated with increased flexibility will be more profitable in uncertain environments than changes associated with decreased flexibility. We find that safer banks react more actively while risky banks are not capable to adjust their liquidity.

[Insert Table 9 here]

5.8. Robust tests using alternative liquidity measures

DeYoung and Jang (2016) highlight the fact that U.S. commercial banks actively managed their positions before the Basel III NSFR rule is implemented. They suggest that NSFR might be described as the regulatory analogue to the loan-to-core deposit (LTCD) ratio. In their study, they examine how banks might respond to an NSFR-like liquidity standard by observing how U.S. commercial banks manage LTCD ratios. By construction, the NSFR increases with balance sheet liquidity while high LTCD shows low liquidity. Therefore, we reversed the LTCD ratio to the core deposit to loan (CDTL) ratio to make this paper more consistent in the result explanation. In this section, we employ this measure and core deposit to total asset (CDTA) as a robustness check.

Table 10 reports our findings. Both the first stage and second stage analysis are reported in Table 10. The results in the second stage analysis show that banks actively increase their liquidity adjustment speed with the progression of IBBEA implementation. Again, our findings are robust across different methodologies and various liquidity measures.

[Insert Table 10 here]

6. Conclusion

This study provide evidence on the effect of bank deregulation on adjustment speed of bank liquidity. We find that banks tend to increase their adjustment speed of NSFR in response to financial deregulation. Banks can manage their liquidity actively by maintaining strategies in response to bank deregulation. Our evidence is consistent with the view of the strategic management literature that organisations need to utilise distinct competencies and maintain alignment with critical environmental resources. Our main findings are robust by analysing the dynamic pattern of bank liquidity adjustments around interstate banking deregulation, considering the financial crisis and intra-state deregulation.

We find that banks tend to escape their current state and move to states with less deregulation. When environment variation occurs, banks tend to strategically move to the place that provides a better ability for them to raise stable funding. More specifically, those banks with low adjustment speed are more willing to move. Those banks that move to less deregulated states decrease their adjustment speed. Our evidence suggests that banks employ a strategic movement of headquarters to fend off competitive pressure. In our study of market-focused strategic flexibility enhanced by environmental elements, we find that the environmental sensitivity of a larger population and higher personal income could relieve the active liquidity management target. However, the states with higher interest expenses incentivise banks to increase their adjustment speed of liquidity.

We shed light on the finance theory with the strategic management literature to prove that when all banks face the same deterioration of stable funding due to environmental variation, different types of banks with their own distinct competencies will react differently. Surviving banks and acquiring banks increase their adjustment speed while acquired banks reduce their speed of reacting to financial deregulation. Failed banks show no effect because they lose their distinct competencies. Banks affiliated with MBHCs operating with wider networks and in larger environments are more likely to increase their liquidity adjustment speed.

This paper is written at a time of significant Basel III reform of liquidity; hence, the observable trends of how banks adjust liquidity in response to bank deregulation have important regulatory implications for reducing environmental challenges faced by banks after the first implementation of Basel III in the U.S. in 2021. Banks should prepare their strategy to adapt with the changes of stable funding resources in order to align with the new requirement of Basel III liquidity standard. This paper suggests the regulators to control the strategic

flexibility of liquidity adjustment speed, especially in the state where the competition is high. The failed banks should be merged with the surviving banks to strengthen their capability; therefore, the regulators could stabilize the banking system. The regulators could encourage weak banks to join MBHCs that offer a larger operating environment, thus, promote information sharing to cope with the liquidity shocks and improve their access to stable funding.

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Table 1
Summary Statistics

Panel A

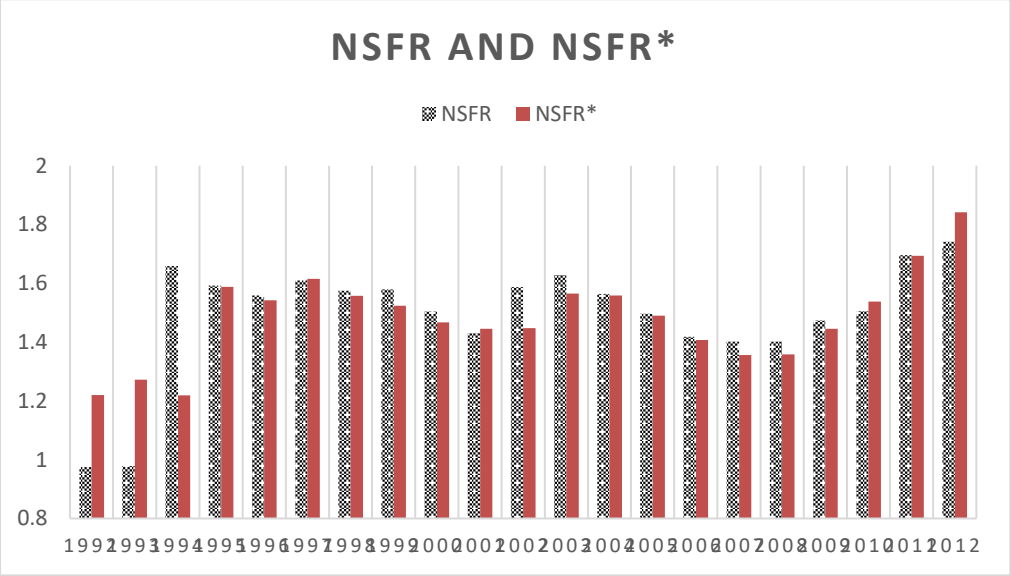
Variable	Mean	Standard Deviation	1st	25th	50th	75th	99th
NSFR	1.579	0.679	0.548	1.324	1.598	1.997	2.569
NSFR*(Target)	1.484	0.465	0.631	1.221	1.437	1.720	2.138
NSFR Adjustment Speed	0.310	0.218	0.060	0.150	0.337	0.488	0.844
GAP	-0.113	0.553	-1.311	-0.349	-0.137	0.591	1.207
IBBEAindex	2.774	1.700	0.000	1.000	3.000	4.000	4.000
Zscore	24.446	17.192	2.758	11.108	20.260	33.368	83.816
Revenue($ Million)	11.533	184.246	-2.778	4.500	1.172	2.779	139.241
Leverage%	0.897	0.036	0.765	0.886	0.906	0.919	0.942
Loans%	0.658	0.208	0.168	0.530	0.656	0.775	1.304
Total Assets ($ Million)	895.500	17953.500	8.800	43.000	89.500	203.700	8818.400
Loan loss Provisions%	0.311	0.860	-0.151	0.051	0.152	0.324	3.401
Diversification %	0.112	0.080	0.012	0.063	0.093	0.136	0.533
Managerial Efficiency %	0.771	0.087	0.541	0.717	0.771	0.826	0.973
Growth Rate of Total Assets %	9.459	16.680	-14.887	1.238	5.969	12.482	88.791

Panel B

Mean Value of Sub-group	GAP>0	GAP<0	Escaped Banks	Non-Escaped Banks	MBHC	Non-MBHC	Surviving Banks	Failure Banks	Target Banks	Acquiring Banks
NSFR Adjustment Speed	0.349	0.241	0.217	0.311	0.304	0.340	0.315	0.220	0.155	0.273
NSFR	1.280	2.008	1.457	1.543	1.813	1.478	1.540	1.434	1.217	1.561
ROA	0.010	0.011	0.011	0.010	0.010	0.010	0.010	0.011	0.011	0.009
Zscore	25.638	22.330	18.396	24.500	24.449	24.432	24.289	18.224	24.233	23.418
Diversification	12.124	10.798	18.417	11.587	11.873	10.533	11.761	18.276	14.925	11.671
Total Assets ($ Million)	1544.893	422.565	39144.420	801.967	1323.208	244.008	1092.569	38204.110	15342.920	1016.900

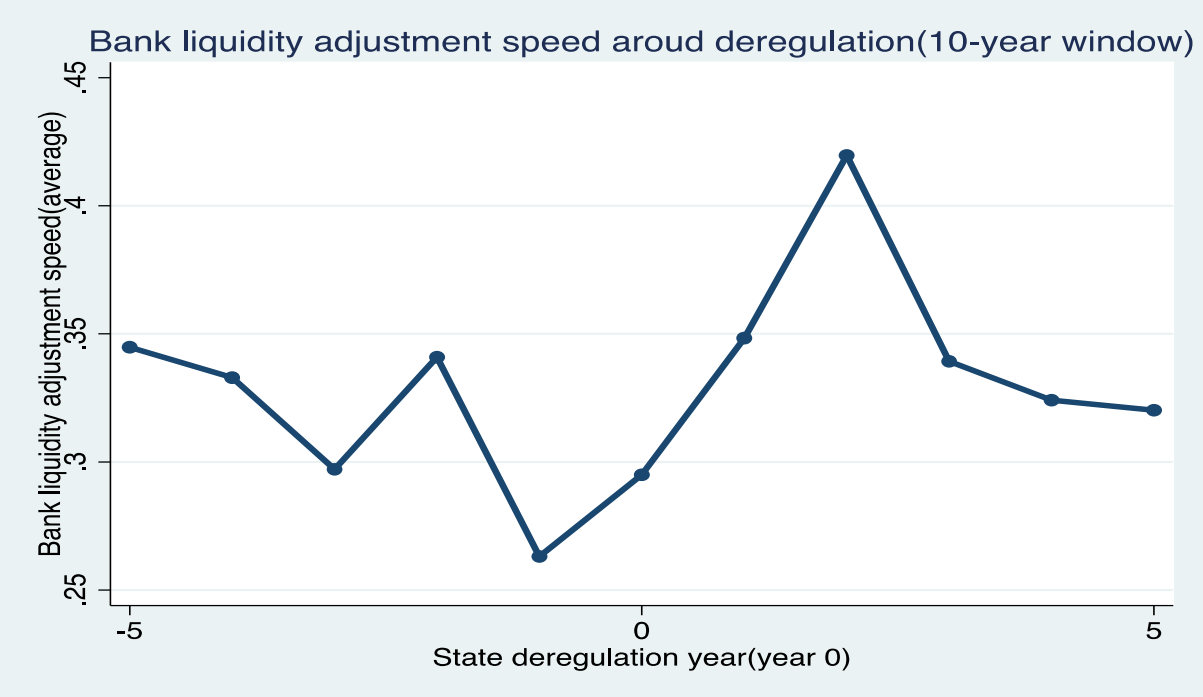
Note: This table reports the summary statistics for a sample period of commercial banks during 1992-2012. Appendix B presents the definitions of variables.

Figure 1: NSFR and NSFR target



Note: This figure shows the value of NSFR and NSFR*(target) across sample-period.

Figure 2: Bank liquidity adjustment speed around deregulation



Note: This figure shows the dynamic bank liquidity adjustment speed around the introduction year of IBBEA of each state. 0 is the introduction year of IBBEA. We chose a ten-year window around the state deregulation year to see the trend of bank liquidity adjustment speed.

Table 2
First stage Partial Adjustment Model

Dependent Variable	OLS	GMM	Fama-Macbeth
$NSFR_{t-1}$	0.395***	0.354***	0.601***
	(9.28)	(23.25)	(27.65)
$Revenue_{t-1}$	-0.382	-0.143***	0.041
	(-1.31)	(-4.11)	(1.58)
$Leverage_{t-1}$	-9.470***	-0.401	-0.701***
	(-2.71)	(-1.05)	(-6.16)
$Loans_{t-1}$	-4.338***	-2.038***	-2.344***
	(-7.45)	(-21.33)	(-8.42)
Total $Assets_{t-1}$	0.561*	0.136***	0.043*
	(1.95)	(4.36)	(1.72)
Loan loss $Provisions_{t-1}$	-15.818*	5.247***	0.698
	(-1.83)	(5.82)	(1.09)
$Diversification_{t-1}$	-0.001**	0.001	-0.008***
	(-2.27)	(0.89)	(-3.94)
Managerial $Efficiency_{t-1}$	0.014*	-0.004***	-0.003***
	(1.75)	(-4.45)	(-4.97)
Growth Rate of Total $Assets_{t-1}$	0.025***	0.012***	0.014***
	(4.08)	(16.95)	(8.73)
$Constant_{t-1}$		0.944***	1.008***
		(7.24)	(8.29)
Hansen(df=143)		160.70	
AR(1)		-13.52***	
AR(2)		-1.44	
N	195581	182250	195581
Adj.R-sq	0.3685		

Note: This table reports the results of first stage partial adjustment model assuming a static NSFR adjustment speed. $NSFR_{it} = \lambda_i \beta_i X_{it-1} + (1- \lambda_i) NSFR_{it-1} + \varepsilon_{it}$, λ_i is the adjustment speed of NSFR. We follow Flannery and Rangan (2006) to use Fama-Macbeth regression to estimate NSFR. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Table 3
Bank NSFR Adjustment speed and Bank deregulation: Baseline results

Strategy	OLS With State FE	OLS With Bank FE	GMM	Weighted IBBEA index	Before Financial Crisis	Control for Early Intra-state deregulation	Random State assignment to IBBEAindex	Using trimming values of controls	Extend data-sample to 2018
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IBBEA index*GAP	0.039***	0.022***	0.117**		0.021**	0.038***		0.019***	0.039***
	(4.01)	(3.24)	(2.14)		(2.11)	(4.25)		(3.25)	(5.09)
Weighted IBBEA index*GAP				0.004***					
				(3.36)					
Early Intra-state deregulation index*GAP						0.033			
						(1.07)			
Randomized IBBEA index*GAP							-0.198		
							(-0.96)		
Zscore*GAP	-0.035***	-0.022**	-1.301*	-0.019**	-0.041**	-0.120**	-0.018***	-0.030**	-0.044***
	(-4.15)	(-2.34)	(-1.76)	(-2.33)	(-2.35)	(-2.51)	(-3.08)	(-2.05)	(-3.96)
Leverage*GAP	0.002	0.001	-0.179	0.028	0.018	0.005	0.018	0.109	0.006
	(0.58)	(0.04)	(-0.93)	(0.33)	(1.31)	(0.88)	(0.32)	(0.31)	(1.01)
Loan*GAP	-0.067***	-0.070***	0.439	-0.121***	-0.141***	-0.127***	-0.205***	-0.200***	-0.097***
	(-7.35)	(-6.29)	(0.88)	(-9.47)	(-7.44)	(-10.98)	(-7.00)	(-7.66)	(-5.99)
Log Total Assets*GAP	0.005	-0.040	-0.881	-0.031	-0.018	-0.021	-0.019	-0.012	0.010
	(0.32)	(-1.03)	(-1.33)	(-0.20)	(-0.97)	(-1.58)	(-1.18)	(-0.98)	(0.41)
Loan loss provisions*GAP	0.019**	-0.004	-0.311*	0.023**	0.031***	0.033***	0.033***	0.035***	-0.001
	(2.21)	(-0.23)	(-1.75)	(2.17)	(3.88)	(3.99)	(3.18)	(2.97)	(-0.04)
Managerial Efficiency*GAP	0.041***	0.048***	0.429**	0.037***	0.049**	0.031***	0.044**	0.049***	0.076***
	(3.94)	(3.22)	(1.96)	(3.48)	(2.38)	(3.37)	(2.03)	(4.44)	(4.11)
Diversification*GAP	-0.018**	0.003	0.228	-0.014	-0.006	-0.010	-0.002	0.002	0.001
	(-2.04)	(0.27)	(1.01)	(-1.28)	(-0.51)	(-0.88)	(-0.19)	(0.42)	(0.01)
GAP	0.310***	0.472***	1.589**	0.496***	0.530***	0.411***	0.622***	0.490***	0.410***
	(25.84)	(27.37)	(2.13)	(31.23)	(27.01)	(10.57)	(28.56)	(29.75)	(33.01)
Constant	-0.325***	-0.475***		-0.423***	-0.522***	-0.475***	-0.315***	-0.406***	-0.446***
	(-10.47)	(-12.85)		(-15.46)	(-12.80)	(-7.56)	(-11.77)	(-13.03)	(-13.91)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	No	No	No	No	No	No	No	No
Bank FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen(df=108)			132.50						
AR(1)			-8.08***						
AR(2)			1.25						

N	160039	160039	147327	160039	88883	160039	160039	155838	230182
Adj. R-sq	0.170	0.236		0.276	0.306	0.240	0.297	0.240	0.221

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model:[$NSFR_{it}$-$NSFR_{it-1}$=(λ_i+γ_{it-1}Z) GAP_{it-1}+ ε_{it}, GAP_{it-1}= $NSFR_{it}$*-$NSFR_{it-1}$], Z is a vector of all independent variables. We use three estimation strategies, column (1) and (2) use OLS with fixed effects while Column (3) uses GMM estimator. We rerun the baseline specification using Weighted IBBEA index in Column (4). Column (5) shows findings in years before financial crisis. Column (6) indicates the effect of intra-state deregulation on liquidity adjustment speed. Column (7) uses the randomized IBBEA index on liquidity adjustment speed. Column (8) uses deflated values of controls with trimming instead of winsorising. *t*-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Table 4
The Dynamics of Bank NSFR Adjustment speed and Bank deregulation

	Bank FE	State FE	State*Year FE	Only for States (IBBEAindex change from 0 to 1)
	(1)	(2)	(3)	(4)
$Before^{5}$*GAP	-0.0069	-0.0691	-0.0035	0.0337
	(-0.08)	(-0.74)	(-0.07)	(0.49)
$Before^{4}$*GAP	0.0119	-0.0627	0.0603	0.0252
	(0.18)	(-1.03)	(0.72)	(0.87)
$Before^{3}$*GAP	0.0848	-0.0547	0.0165	0.0019
	(0.50)	(-0.39)	(0.16)	(0.05)
$Before^{2}$*GAP	0.0091	-0.0375	-0.0036	0.0673
	(0.20)	(-0.77)	(-0.03)	(1.59)
$Before^{1}$*GAP	0.0848	-0.0547	0.1555	0.0797
	(0.50)	(-0.39)	(0.56)	(1.56)
$After^{1}$*GAP	0.1133***	0.1431**	0.1019**	0.0508***
	(2.78)	(2.36)	(2.28)	(5.40)
$After^{2}$*GAP	0.1310**	0.1386**	0.0749**	0.4298***
	(2.29)	(2.01)	(1.97)	(7.00)
$After^{3}$*GAP	0.1153**	0.0144**	0.0993**	0.3427***
	(2.17)	(2.34)	(2.48)	(4.05)
$After^{4}$*GAP	0.0368**	0.0197*	0.1113**	0.3545***
	(2.10)	(1.81)	(2.46)	(5.74)
$After^{5}$*GAP	0.0962**	0.0718*	0.1624***	0.3995**
	(2.45)	(1.70)	(3.55)	(2.31)
Time FE	Yes	Yes	No	Yes
Control	Yes	Yes	Yes	Yes
State FE	Yes	No	No	No
Bank FE	No	Yes	No	Yes
State*Year FE	No	No	Yes	No
N	75866	75866	75866	43750
adj.R-sq	0.152	0.227	0.159	0.201

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: [$NSFRit\text{-}NSFR_{it-1}=(\sum Before^{t}+\sum After^{t}+\gamma i_{t-1}Z)\ GAP_{it-1}+\varepsilon_{it}$, $GAP_{it-1}= NSFR_{it}\text{*-}NSFR_{it-1}$], Z is a vector of all independent variables. All columns apply OLS regression, $Before^{t}(After^{t})$ is a dummy variable equal to 1 for *t* years before(after) the very first time of deregulation of a state. For example, $Before^{5}$ equals 1 for year 5 before a state's first time deregulation, and 0 otherwise. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Table 5 Panel A
Bank Escape and Bank deregulation

Dependent Variable	Bank Escape		
	(1)	(2)	(3)
IBBEAindex	0.067***		
	(5.75)		
IBBEAindex*Move to more deregulated states		0.011	
		(0.10)	
IBBEAindex*Move to less or similar deregulated states		0.070***	
		(7.74)	
IBBEAindex*High adjustment speed of NSFR			0.085***
			(4.79)
IBBEAindex*Low adjustment speed of NSFR			0.105***
			(3.00)
Revenue	0.461***	0.483***	0.463***
	(10.15)	(9.42)	(10.27)
Leverage	0.044	-0.158	0.031
	(0.42)	(-1.21)	(0.09)
Loans	-0.071	0.019	-0.049
	(-0.91)	(0.23)	(-0.64)
Total Assets	-0.215***	-0.315***	-0.297***
	(-6.10)	(-6.18)	(-6.43)
Loan loss Provisions	4.994**	5.943***	4.931**
	(2.14)	(2.88)	(2.51)
Diversification	0.002	0.001	0.001
	(0.48)	(0.23)	(0.45)
Managerial Efficiency	0.006***	0.007***	0.008***
	(6.15)	(4.82)	(6.17)
Growth Rate of Total Assets	0.005***	0.004***	0.005***
	(6.18)	(5.45)	(6.59)
Constant	-4.221***	-3.721***	-4.220***
	(-14.51)	(-12.51)	(-14.53)
Time FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
N	160039	160039	160039
pseudo.R-sq	0.069	0.072	0.062

Note: We use probit regression to examine Bank Escape behaviour under banking deregulation. Bank Escape is a dummy variable that equals 1 if a bank has changed its headquarter location within the sample period. In column (2) and (3), we interact IBBEAindex with two set of dummies to observe the impact of deregulation in two separate aspects. Where Move to more deregulated states equals 1 if a bank has moved to more deregulated state, otherwise 0; Move to less or similar deregulated states equals (1- Move to more deregulated states); High adjustment speed of NSFR equals 1 if a bank's NSFR adjustment speed is above median, otherwise 0; Low adjustment speed of NSFR equals (1- High Adjustment speed of NSFR). t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, all the variables are standardised. Appendix B presents the definitions of variables.

Table 5 Panel B
After Bank Escape and NSFR Adjustment speed

	(1)	(2)	(3)
Moved Banks*GAP	0.101		
	(1.46)		
Move to more deregulated state*GAP		0.763**	
		(2.18)	
Move to less or similar deregulated states*GAP			-0.433**
			(-2.45)
Zscore*GAP	-0.022	-0.021	-0.021
	(-1.51)	(-1.47)	(-1.57)
Leverage*GAP	0.001	0.001	0.001
	(0.13)	(0.13)	(0.13)
Loan*GAP	-0.109***	-0.113***	-0.135***
	(-6.87)	(-5.91)	(-6.21)
Log Total Assets*GAP	-0.021	-0.023	-0.024
	(-1.24)	(-1.49)	(-1.59)
Loan loss provisions*GAP	0.014	0.013	0.014
	(0.97)	(0.83)	(0.73)
Managerial Efficiency*GAP	0.037***	0.037***	0.029***
	(2.86)	(2.82)	(3.82)
Diversification*GAP	-0.010	-0.009	-0.009
	(-0.89)	(-0.77)	(-0.76)
GAP	0.500***	0.501***	1.264***
	(23.05)	(22.60)	(3.38)
Constant	-0.278***	-0.277***	-0.277***
	(-15.99)	(-16.04)	(-16.00)
Time FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
N	160039	160039	160039
adj. R-sq	0.212	0.210	0.221

Note: In this table, we insert three new dummies into the second stage partial adjustment model: $[NSFR_{it}\text{-}NSFR_{it-1}=\gamma_{it-1}Z_{it-1}*GAP_{it-1}+\varepsilon_{it}, GAP_{it-1}= NSFR_{it}*\text{-}NSFR_{it-1}]$, where Moved banks equals 1 after a bank has changed its headquarter, otherwise 0; Move to more deregulated states equals 1 after a bank has moved to more deregulated state, otherwise 0; Move to less or similar deregulated states equals 1 after a bank has moved to less or similar deregulated state, otherwise 0; t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, all the variables are standardized. Appendix B presents the definitions of variables.

Table 5 Panel C
Competitiveness of banks After Escape

Dependent Variable	NSFR	Lerner index	Deposit share
	(1)	(2)	(3)
Move to less deregulated states	0.241***	0.001***	0.041*
	(4.28)	(4.93)	(1.93)
Zscore	-0.004***	0.101***	0.000
	(-11.17)	(12.51)	(1.11)
Leverage	-0.117***	0.012***	-0.191***
	(-12.31)	(31.29)	(-4.11)
Loan	-0.821***	0.001***	-0.017***
	(-13.39)	(5.10)	(-7.10)
Log Total Assets	0.714***	0.020***	0.016***
	(36.21)	(15.47)	(12.35)
Loan loss provisions	-1.313***	-0.247***	-0.918***
	(-14.22)	(-51.22)	(-3.32)
Managerial Efficiency	0.022***	0.002***	0.012***
	(17.14)	(9.04)	(6.31)
Diversification	-0.017***	-0.020***	0.002
	(-13.49)	(-5.29)	(0.13)
Consatnt	0.428***	1.021***	-0.561***
	(32.82)	(24.93)	(-12.31)
Time FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
N	146552	146425	146552
adj. R-sq	0.284	0.097	0.021

Note: We examine post bank escape competitiveness by using NSFR, Market power (Lerner index) and Deposit share as dependent variables. Where Move to less deregulated states equals 1 if a bank has moved to less deregulated states, otherwise 0; We estimate Lerner index by following Maudos and Guevara (2007), Deposit share is calculated as the total deposit of a bank in a particular state scaled by total deposit of that state. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Table 6
Bank NSFR Adjustment speed and Bank deregulation: Environmental Sensitivity Test

State-level Sensitivity Measure	Number of branches	Population	Average Personal income	Average interest income	Average interest expense
	(1)	(2)	(3)	(4)	(5)
IBBEA index*GAP	0.048***	0.044***	0.051***	0.043***	0.046***
	(7.16)	(7.00)	(6.93)	(6.92)	(6.51)
IBBEA index *No.Branches*GAP	-0.001				
	(-0.25)				
No.Branches*GAP	-0.019				
	(-1.24)				
IBBEA index*Population*GAP		-0.017***			
		(-3.01)			
Population*GAP		0.072***			
		(3.03)			
IBBEA index*Personal income*GAP			-0.021***		
			(-3.03)		
Personal income*GAP			0.091***		
			(2.74)		
IBBEA index*Interest income*GAP				0.002	
				(0.38)	
Interest income*GAP				0.004	
				(0.01)	
IBBEA index*Interest expense*GAP					0.022*
					(1.74)
Interest expense*GAP					-0.017
					(-1.31)
Time FE	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
N	160039	160039	160039	160039	160039
adj. R-sq	0.278	0.288	0.276	0.274	0.280

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: $[NSFR_{it}-NSFR_{it-1}=\gamma_{it-1}Z_{it-1}*GAP_{it-1}+\varepsilon_{it}$, $GAP_{it-1}= NSFR_{it}*-NSFR_{it-1}]$, Z is a vector of all independent variables. We use six different state macro indicators to test how bank liquidity adjustment speed reacts to different environmental variations. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, all the variables are standardized. Appendix B presents the definitions of variables.

Table 7
Bank NSFR Adjustment speed and Bank deregulation: Different type of banks

Sub-sample	Surviving Banks	Target Banks	Failure Banks	Acquiring Banks
	(1)	(2)	(3)	(4)
IBBEA index*GAP	0.039***	-0.015**	0.062	0.273**
	(5.12)	(-2.10)	(1.30)	(2.23)
Zscore*GAP	-0.017	0.039	-0.098***	0.179
	(-1.47)	(0.72)	(-3.94)	(1.19)
Leverage*GAP	0.007	0.057***	-0.028	-0.003
	(1.53)	(3.01)	(-1.00)	(-0.01)
Loan*GAP	-0.101***	-0.151***	-0.063**	-0.179***
	(-9.34)	(-5.15)	(-2.84)	(-3.37)
Log Total Assets*GAP	-0.014	-0.047*	-0.051	-0.097**
	(-1.25)	(-1.99)	(-1.02)	(-2.29)
Loan loss provisions*GAP	0.024*	0.029	0.012	0.067**
	(1.27)	(1.21)	(0.07)	(2.09)
Managerial Efficiency*GAP	0.033***	0.060**	0.023	-0.089
	(3.28)	(2.81)	(1.07)	(-1.23)
Diversification*GAP	-0.109	0.017	0.019	-0.087***
	(-0.95)	(0.86)	(0.69)	(-3.13)
GAP	0.477***	0.601***	0.258***	0.559***
	(34.35)	(12.81)	(6.14)	(3.71)
Constant	-0.544***	-0.422***	-0.426***	0.316***
	(-28.79)	(-16.64)	(-2.87)	(3.39)
Time FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
N	136868	32574	13803	7203
adj. R-sq	0.268	0.335	0.121	0.378

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: $[NSFR_{it}\text{-}NSFR_{it-1}=\gamma_{it-1}Z_{it-1}*GAP_{it-1}+\varepsilon_{it}$, $GAP_{it-1}= NSFR_{it}*\text{-}NSFR_{it-1}]$, Z is a vector of all independent variables. We examine how banks react differently subject to different status: column (1){(2);(3)} shows impact of interstate banking deregulation on surviving banks {Target banks; Failure banks} within the local state. Specifically, for column (2), (3) and (4), we only include a two-year window of observations prior to M&A or failure event. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Table 8
Bank NSFR Adjustment speed and Bank deregulation: how BHC react to deregulation?

Bank Structure	Belong to a MBHC?	Number of subsidiaries of parent BHC	Number of states operated of parent BHC
	(1)	(2)	(3)
IBBEA index*GAP	0.036***	0.027**	0.025**
	(3.34)	(2.23)	(2.07)
IBBEA index*MBHC*GAP	0.057**		
	(2.26)		
MBHC*GAP	-0.210**		
	(2.15)		
IBBEA index *No of subsidiaries*GAP		0.018**	
		(2.46)	
No of subsidiaries *GAP		-0.025**	
		(-2.04)	
IBBEA index *No of states operated*GAP			0.011**
			(2.30)
No of states operated*GAP			-0.028**
			(-2.18)
Time FE	Yes	Yes	Yes
Control	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
N	160039	101331	101331
adj.R-sq	0.229	0.232	0.232

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: [$NSFR_{it}$-$NSFR_{it-1}$=$\gamma_{it-1}Z_{it-1}$*GAP_{it-1}+ ε_{it}, GAP_{it-1}= $NSFR_{it}$*-$NSFR_{it-1}$], Z is a vector of all independent variables. Column (1) uses full sample to test whether BHC subsidiary adjusts liquidity faster than other banks under deregulation. Where *MBHC* is a dummy variable equals one if the bank belongs to a MBHC, and zero otherwise. Column (2) and (3) use a subsample of BHC subsidiary observations to test whether bigger structure of MBHC parent can lead subsidiary to a faster adjustment speed. Variable *Number of subsidiaries of parent BHC* counts the total number of subsidiaries of parent BHC. Variable *Number of states operated of parent BHC* counts the total number of distinct states the parent BHC operates. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, all the variables are standardized. Appendix B presents the definitions of variables.

Table 9

Bank adjustment speed and Bank deregulation: Cross-section analysis

	GAP		Size		Profitability	
Strategy	GAP>0	GAP<0	TA>median	TA<median	ROA>median	ROA<median
	(1)	(2)	(3)	(4)	(5)	(6)
IBBEA index*GAP	0.0886***	0.0047	0.0486***	0.0012	0.0376***	0.0331*
	(3.61)	(0.43)	(4.75)	(0.06)	(3.19)	(1.74)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N	80020	80019	80020	80019	80020	80019
adj.	0.0702	0.1937	0.2331	0.2684	0.2513	0.2355
	Loan loss Provision		Loan Charge-offs		Zscore	
Strategy	LLP/TA>Median	LLP/TA<Median	LCO/TA>Median	LCO/TA<Median	Zscore>median	Zscore<median
	(7)	(8)	(9)	(10)	(11)	(12)
IBBEA index*GAP	0.0191	0.0496***	0.0484	0.0370***	0.0395***	0.0441*
	(1.11)	(4.20)	(1.44)	(3.61)	(3.81)	(1.91)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
N	80020	80019	80020	80019	80020	80019
adj.	0.2232	0.2557	0.1504	0.2554	0.2270	0.2595

Note: This table reports the results of second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: [$NSFR_{it}$-$NSFR_{it-1}$=$\gamma_{it-1}Z_{it-1}$*GAP_{it-1}+ ε_{it}, GAP_{it-1}= $NSFR_{it}$*-$NSFR_{it-1}$], Z is a vector of all independent variables. We analyze how bank reacts to deregulation in different subsamples. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, all the variables are standardized. Appendix B presents the definitions of variables.

Table 10
Robust test using alternative liquidity estimates

First Stage			Second Stage		
Dependent Variable	CDTL	CDTA		$CDTL_t$-$CDTL_{t-1}$	$CDTA_t$-$CDTA_{t-1}$
	(1)	(2)		(3)	(4)
CDTL	0.906***		IBBEA index*LGAP	0.027***	
	(84.08)			(3.04)	
CDTA		0.855***	IBBEA index*AGAP		0.052**
		(83.90)			(2.05)
Revenue	0.004	0.004**	Zscore*GAPs	-0.003*	-0.024***
	(1.73)	(2.37)		(-1.65)	(-3.06)
Leverage	0.009	0.203***	Leverage*GAPs	-0.002	-0.027***
	(1.11)	(17.60)		(-0.85)	(-2.83)
Loans	-0.009***	-0.013***	Loan*GAPs	0.006***	-0.000
	(-3.45)	(-4.28)		(2.85)	(-0.01)
Total Assets	-0.004*	-0.008***	Log Total Assets*GAPs	-0.005***	-0.020***
	(-1.97)	(-4.57)		(-3.31)	(-2.77)
Loan loss Provisions	-0.087	0.283***	Loan loss provisions*GAPs	-0.001	0.024***
	(-1.12)	(3.82)		(-0.08)	(2.95)
Diversification	-0.000***	-0.000***	Managerial Efficiency*GAPs	0.003*	-0.023***
	(-3.61)	(-4.41)		(1.91)	(-3.97)
Managerial Efficiency	-0.000***	-0.000	Diversification*GAPs	-0.002	-0.002
	(-3.77)	(-0.36)		(-1.57)	(-0.37)
Growth Rate of Total Assets	0.000***	0.000	GAPs	-0.013***	0.118***
	(6.98)	(0.48)		(-3.19)	(3.31)
Constant	0.028**	0.007	Constant	-0.109***	-0.760***
	(2.45)	(0.71)		(-6.60)	(-4.78)
N	195581	195581		160039	160039
adj.R-sq				0.215	0.340

Note: This table reports the results of both first and second stage partial adjustment model assuming a dynamic NSFR adjustment speed across banks and over time. In the second stage partial adjustment model: [$NSFR_{it}$-$NSFR_{it-1}$=$\gamma_{it-1}Z_{it1}$*GAP_{it-1}+ ε_{it}, GAP_{it-1}= $NSFR_{it}$*-$NSFR_{it-1}$], Z is a vector of all independent variables. In Column (1) and (2), we use Fama-Macbeth regression to obtain the target liquidity ratio(First stage). Column (3) and (4) apply OLS regressions with fixed effects(Second stage). t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. In this regression, we use the original values of these ratios instead of percentages. Appendix B presents the definitions of variables.

Appendix A

ASF factor (%)	2012 Components of ASF category	2012 CALL report items	1991 Components of ASF category	1991 CALL report items
100	Total equity capital	RCFDG105	Total equity capital	RCFD3210
	Subordinated notes and debentures	RCFD3200	Subordinated notes and debentures	RCFD3200
	Time deposits of less than $100,000 with remaining maturity one year or more	RCON6648-RCONA241 RCONJ473-RCONK221		
	Time deposits of $100,000 through $250,000 with remaining maturity one year or more	RCONJ474-RCONK222 RCFDF055+RCFDF056+RCFDF057+RCFDF058-RCFD2651		
	Time deposits of more than $250,000 with remaining maturity one year or more	RCFDF060+RCFDF061+RCFDF062+RCFDF063-RCFDB571		
	Federal Home Loan Bank advances with remaining maturity more than a year			
	Other borrowings with remaining maturity more than a year			
95	Transaction deposits of individuals, partnerships, and corporations non-MMDA savings deposits	RCONB549 RCON0352	Total transaction deposits	RCON2215
	Non-brokered time deposits of less than $100,000 with remaining maturity less than a year	RCONA241-RCONA243 RCONK221-RCONK219		
	Non-brokered time deposits of $100,000 to $250,000 with remaining maturity less than a year			
90	MMDAs	RCON6810	Non-transaction savings deposits	RCON0352
	Non-brokered time deposits of more than $250,000 with remaining maturity less than a year	RCONK222-RCONK220	MMDAs	RCON6810
			Time deposits of less than $100,000	RCON6648
50	Non-retail transaction deposits	RCON2202+RCON2203+RCONB551+RCON2213+RCON2216	Time deposits of more than or equal to $100,000	RCON2604
	Brokered time deposits with remaining maturity less than a year	RCONA243+RCONK219+RCONK220	Other borrowed money	RCFD2850
	Federal Home Loan Bank advances with a remaining maturity of one year or less	RCFD2651		
	Other borrowings with remaining maturity one year or less	RCFDB571		
0	Other liabilities	RCFD2930	Other liabilities	RCFD2930
	Trading liabilities	RCFD3548	Trading liabilities	RCON2840
	Fed funds purchased in domestic offices	RCONB993	Fed funds purchased in domestic offices	RCFD0278
	Securities sold under agreements to repurchase	RCFDB995	Securities sold under agreements to repurchase	RCFD0279
100	Loans to depository institutions and acceptances of other banks	RCFDB532+RCFDB533+RCFDB534+RCFDB536+RCFDB537	Loans to depository institutions	RCFD1506+RCFD1507+RCFD1517+RCFD1513+RCFD1516
	Loans to nondepository financial institutions and other loans	RCFD1563	Trading assets	RCFD2146
	Trading assets	RCFD3545	Premises and fixed assets	RCFD2145
	Premises and fixed assets	RCFD2145	Other real estate owned	RCFD2150
	Other real estate owned	RCFD2150	Investments in unconsolidated subsidiaries and associated	RCFD2130
	Investments in unconsolidated subsidiaries and associated companies	RCFD2130	companies	RCFD2155
	Direct and indirect investments in real estate ventures	RCFD3656	Customers' liability to the bank on acceptances outstanding	RCFD2143
	Intangible assets	RCFD0426+RCFD3163	Intangible assets	RCFD1756+RCFD1757
	Nonperforming loans	sum of ''past due 90 days or more" and ''nonaccrual" items from schedule RC-N	Nonperforming loans	sum of ''past due 90 days or more" and ''nonaccrual" items from Schedule RC-N
	Other assets	RCFD2160	Other assets	RCFD2160
85	1–4 family mortgages	RCON1797+RCON536 +RCON5368	1–4 family mortgages	RCON1797+RCON5367+RCON5368
	Loans secured by real estate excluding 1–4 family mortgages	RCON1415+RCON1420+RCON1460+RCON1480	Loans secured by real estate excluding 1–4 family mortgages	RCON1415+RCON1420+RCON1460+RCON1480
	Agricultural loans	RCFD1590	Agricultural loans	RCFD1590
	Commercial and industrial loans	RCON1766	Commercial and industrial loans	RCON1766
	Loans to individuals	RCON1975	Loans to individuals	RCON1975
	Lease financing receivables	RCFD2165	Lease financing receivables	RCFD2165
65	Loans to foreign governments and official institutions	RCFD2081	Loans to foreign governments and official institutions	RCFD2081
	Obligations of states and political subdivisions in the U.S.	RCFD2107	Obligations of states and political subdivisions in the U.S.	RCFD2107
50	Mortgage-backed securities	RCFDG300+RCFDG303+RCFDG304+RCFDG307+RCFDG308	Fed funds sold and securities purchased under agreements to resell	RCFD1350

	2012		1991	
ASF factor (%)	Components of ASF category	CALL report items	Components of ASF category	CALL report items
	Asset-backed securities and structured financial products	+RCFDG311+RCFDG312	All securities excluding pledged securities	RCFD0390-RCFD0416
	Other debt securities	+RCFDG315+RCFDG316+RCFDG319+RCFDG320+RCFDG323		
	Mutual funds and equity shares with readily determinable fair values	+RCFDK142+RCFDK145		
	Fed funds sold in domestic offices	+RCFDK146+RCFDK149+RCFDK150+RCFDK153+RCFDK154		
	Securities purchased under agreements to resell	+ RCFDK157		
		RCFDC026+RCFDC027+RCFDG336+RCFDG339+RCFDG340		
		+RCFDG343		
		+RCFDG344+RCFDG347		
		RCFD1737+RCFD1741+RCFD1742+RCFD1746		
		RCFDA511		
		RCONB987		
		RCFDB989		
15	U.S. Government agency obligations	RCFD1289+RCFD1293+RCFD1294+RCFD1298	U.S. Government agency obligations	RCFD1289+RCFD1293+RCFD1294+RCFD1298
	Securities issued by states and political subdivisions in the U.S.	RCFD8496+RCFD8499	Securities issued by states and political subdivisions in the U.S.	RCFD1676+RCFD1679+RCFD1681+RCFD1691 +RCFD1694+ RCFD1697
5	U.S. Treasury securities	RCFD0211+RCFD1287	U.S. Treasury securities	RCFD0211+RCFD1287
	Unused commitments	RCFD3814+RCFD3815+RCFDF164+RCFDF165+RCFD6550+ RCFD3817+RCFD3818	Unused loan commitments	RCFD3814+RCFD3815+RCFD3816+RCFD6550 +RCFD3817+RCFD3818
	Financial standby letters of credit	RCFD3819	Financial standby letters of credit	RCFD3819
	Performance standby letters of credit	RCFD3821	Performance standby letters of credit	RCFD3821
	Commercial and similar letters of credit	RCFD3411	Commercial and similar letters of credit	RCFD3411
0	Cash and balances due from depository institutions	RCFD0071 + RCFD0081	Cash and balances due from depository institutions	RCFD0071+RCFD0081

Note: This table describes construction of the variable Net Stable Funding Ratio (NSFR) by following the definition of NSFR in Basel Committee on Banking Supervision (2014) and DeYoung and Jang (2016). Basel III NSFR can be mapped into more detailed 2012 call report categories and less detailed 1991 call report categories. The weights are associated with each of components in the NSFR and the appropriate items numbers in call reports.

Appendix B
Definition of Variables

Variable Name	Definition
Deregulation	
IBBEA index	The Interstate Banking and Branching Efficiency Act (IBBEA) is an exogenous variation of state-level deregulation started from 1994. Followed by Rice and Strahan (2010), IBBEA index captures the level of interstate branching restrictions for each state. This index ranges from zero to four. The index equals to four for states that are most open to out-of-state entry. Then, we minus one to the index when a state has any of the four barriers: requiring a minimum age of 3 or more years on the acquiring banks; not allowing de novo interstate branching; not permitting the acquisition of single branch or portions of an institution; mandating a deposit cap on branch acquisitions less than 30%. Thus, 4 means most deregulated and 0 means least deregulated.
Bank-controls	
Zscore	The Zscore is an accounting-based bank-level indicator of financial stability. It is measured by the sum of return of total assets and capital ratio over the standard deviation of return of total assets. Higher Zscore indicates greater financial stability.
Revenue	The natural logarithm of total income
Leverage	The ratio of total liability to total assets
Total Assets	The natural logarithm of total assets
Total Assets Growth	The yearly total assets growth rate
Managerial Efficiency	One minus the ratio of total cost over total income. Keeping total revenue unchanged: higher managerial efficiency ratio indicates lower total expense.
Diversification	The ratio of non-interest income to total operating income
Loans	The ratio of total loans to total assets

Appendix C
Correlation Matrix

	IBBEA index	Zscore	Revenue	Leverage	Loans	Total Assets	Loan loss Provisions	Diversification	Managerial Efficiency	Growth Rate of Total Assets
IBBEA index	1									
Zscore	0.0150*	1								
Revenue	0.1778*	-0.0535*	1							
Leverage	-0.1053*	-0.3431*	0.1298*	1						
Loans	0.1995*	-0.2474*	0.2751*	0.2382*	1					
Total Assets	0.2467*	-0.0269*	0.9741*	0.1470*	0.2667*	1				
Loan loss Provisions	0.0590*	-0.1987*	0.2071*	0.0132*	0.1840*	0.1748*	1			
Diversification	0.0730*	-0.1432*	0.3515*	-0.0550*	-0.0342*	0.2829*	0.1278*	1		
Managerial Efficiency	-0.0678*	-0.1690*	-0.2467*	0.2063*	-0.0585*	-0.2487*	-0.0148*	-0.0504*	1	
Growth Rate of Total Assets	0.0309*	-0.1679*	0.1533*	0.1069*	0.5764*	0.1676*	-0.0187*	0.0418*	0.0007	1

Note: This table presents correlation matrix. * denotes a significance of 1% level.