Elsevier Editorial System(tm) for Journal of Banking and Finance

Manuscript Draft

Manuscript Number: JBF-D-17-00216R1

Title: Competition or manipulation? An empirical evidence of determinants of the earnings persistence of the U.S. banks

Article Type: Full Length Article

Keywords: Competition; Branching Restrictions Index; Earnings persistence; Earnings adjustment speed, Earnings management

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Dear Professor Alexander:

Enclosed please find the paper titled "*Competition or manipulation? An empirical evidence from natural experiments on the earnings persistence of US banks*" that we are re-submitting to *Journal of Banking & Finance*.

In the revised version of the paper, we carefully addressed most of the comments raised by the referees, and also explained those comments that are beyond the scope of the paper. We added a number of new tables in the paper according to the recommendations of the referees. We also re-structured the paper to make sure it reads better. We have strong faith that the paper is significantly improved after the revision process, under the help of you, the editor, and both the referees.

We appreciate your consideration.

Best regards,

Hong Liu (on behalf of the co-authors)

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7 December, 2017

Competition or manipulation? An empirical evidence of determinants of the earnings persistence of the U.S. banks

Our responses to the referees (6 December 2017)

We outline the details that we have addressed each of your comments and suggestions. We reprint your feedback in *italics* for your convenience. Page and table numbers refer to the new draft of the paper. In this response, we only include full references to papers not mentioned in the paper.

Reviewer 1 Comments

Question about contributions

The strategy and the findings of this paper are very very close to what Jiang, Levine and Lin (RFS, 2016) have done for the sample of bank holding companies in the U.S using gravity models. What makes this paper different would be constructing a clean and appealing natural experiment design; examining how these competition laws affect different types of banks and the mechanism of the effects. The authors partly dealt with the third part - mechanism of the effects but have not addressed the first two issues sufficiently.

Our reply:

Thank you very much for your helpful comments. We agree that we adopt a similar method to Jiang, Levine and Lin (2016), however, the main research questions of these two papers are quite different. In Jiang, Levine, and Lin (2016), they examine the impact of bank competition on bank opacity, as measured by ***earnings management***. In our paper, the main research question is to investigate which factor has more impact on bank ***earnings persistence***, bank competition or earnings management. The economic rationale which drives the motivation of our paper is from two different strands of literature, one is from economics and the other is from accounting. The two strands of literature argue that competition and earnings management are the main drivers of earnings persistence, respectively. The details of the arguments are in the second paragraph of the introduction section. Hence, our study is to reconcile the differences between these theories that explain the main driving force of bank *earnings persistence*, as highlighted in the third paragraph of the introduction section.

We thus believe that our paper has its own contribution to the literature and is fundamentally different from the existing literature, including Jiang, Levine and Lin (2016).

In the revised version of the paper, however, we highlighted the difference between *earnings management* and *earnings persistence* to avoid further confusion.

Bank location and treatment effects

In the paper, the authors collect data of all banks across U.S states and evaluate how interstate branching deregulation affects their earnings adjustment speed. Then, it is essential to see how the authors collect and match bank locations. Did the authors only use headquarter office locations? If so, it would be naïve to trust the results as some big banks may have many branches across states, and the identification strategy would be back to what Jiang, Levine and Lin (RFS, 2016) have done in the case of BHCs.

The main effects found in this paper is because banks face with higher entry from rivals from out-of state banks, hence, to have a clean treatment effect, the authors need to either constrain the data sample to single state banks or use branch level data. I also suspect that the main effects in this paper would be driven by small and medium banks as they are the one who are most affected from the branching deregulation. If so, an analysis which focuses on small and medium banks would make the paper more interesting.

Our reply:

Thank you very much for this helpful comment. In contrast to the use of BHCs level data in Jiang, Levine and Lin (RFS, 2016) who use BHC level data, we use data of commercial bank level, many of which are likely to be single-state banks. For your convenience, we highlight some descriptive statistics for comparison. Our sample contains 15,546 distinct banks, which is 17 times the number of banks (911 banks) in the sample of Jiang et al (2016). The median bank size is $92 million in our sample, which is around 12 times less than that ($1,067 million) of Jiang et al (2016).

In the revised version of the paper, we conduct two robust analyses to consider the potential bias by banks operating in multiple states. First, we restrict our sample to those banks with only one branch. Second, we use a sub-sample of banks with size below USD 100 million. We report the results in columns 5 and 6 of Table 5A**.** The results are consistent with our main findings reported in the paper.

IBBEA and its real effects

The authors claim that they follow Rice and Strahan (2010) to construct the interstate

branching restriction index but their index actually seems to be a reversed version of Rice and Strahan (2010) (i.e. in Rice and Strahan 2010, a higher index value implies more restrictions and thus, lower competition). I suggest the authors call their index a "Geographic Expansion Index" or something else to avoid misunderstandings.

Our reply:

Thank you very much for your suggestion. We have changed the name of "interstate branching restriction index" into "Geographic Expansion Index" across the whole paper.

The institutional background for the passage of the IBBEA is poorly described. I suggest the authors appropriately review the current papers on the effect of IBBEA and provide arguments while this can be exogenous with respect to earnings persistence.

Our reply:

Many thanks for your suggestion. We now added more institutional background of IBEEA on pages 7 and 8 of the paper: Quoting the third paragraph on page 7, "The passage of IBBEA mainly involve the relaxation of four restrictions: (1) Age restriction: State could impose a minimum existence year for banks that seeking to enter (max 5 years). Many states set their age requirement at 5 years, while several states set a lower age requirement (eg.3 years) or no minimum age limit at all. (2) De novo interstate branching restriction: State could disallow de novo interstate bank branching. Without de novo interstate bank branching, an out-of-state bank may only open one branch in that state. This makes entry into a particular out-of-state market particularly difficult. (3) Individual branching acquisition restriction: in an interstate merger transaction, States could require an out-of-state bank (Bidder) to acquire all branches of an in-state bank(Asker). Like de novo branching, permitting acquisition of individual branches lowers the cost of entry for interstate banks. (4) Statewide cap on deposits restriction: States could restrict the maximum fraction of deposits that an out-of-state bank could hold. Officially, a cap of 30% is suggested by IBBEA, but each state remains discretion to change it. State could set deposit cap to prevent a large in-state bank from entering into an interstate merge. For example, if a state sets a deposit cap of 20%, a bank in that state with more than 20% statewide deposits fraction could not be acquired."

Natural Experiment and Identification Strategy The use of a natural experiment (NE) requires that in the absence of deregulation, treatment and control groups follow similar

trends. The authors deal with this requirement by showing the insignificant effect of pre-treatment dummies on the dependent variables. This only partly addresses the validity of the NE design. Actually, the NE design does not require the similarity in levels of the outcomes before the treatment but it does require an indistinguishable trend in both outcomes and other pre-determined covariates. The best way to deal with this is plotting parallel trend graphs of the average growth rates/changes of discretionary loan loss provisions, all bank control variables and state level economic variables. One suggestion would be assigning states that require all 4 restriction methods as the control group and other states as treatment to visualize the parallel trends.

Our reply:

Thank you very much for this helpful comment. We fully agree with what you suggested to test the parallel trend of dependent and independent variables. Please allow us to clarify that the dependent variable of our main regression is bank *earnings persistence*, rather than the average growth/change of discretionary loan loss provisions. The partial adjustment model does not allow us to estimate the true value of bank earnings persistence. We have provided further explanations for our partial adjustment model in section 3.4 of the revised version of the paper. In equation (7), the adjustment speed, λ, is a function of bank and macroeconomic characteristics. By substituting equation (7) into equation (2) yields the final estimable specification of the partial adjustment model as in equation (8) with dynamic adjustment speed, λ_{it}. Hence, the adjustment speed, λ, is not observable in the empirical analysis. We do apologize for the confusions caused in our earlier version of the paper.

The use of the interstate bank branching deregulations from 1994 to 1997 as a natural experiment is widely adopted in the bank competition literature (Krishnan, Nandy, and Puri, 2014; Black and Strahan, 2002; Dick and Lehnert, 2010; Beck, Levine and Levkov, 2010, among others). Thus, we follow the extant literature on this practice, and use the Geographic Expansion Index as exogenous variations to bank earnings persistence in this paper.

The sample that authors use may encounter compound treatment effects as there are some other regulations that may affect bank earnings management during this period. One important change, for example, the 1999 Gramm-Leach-Bliley Act, which is also known as the financial service modernization act, would also affect bank information transparency. How would the authors isolate the impact? Further categorizing banks based on holding

company status, size, trading and banking activities would be necessary.

Our reply:

Thank you very much for this comment. We assume what you quoted in the comment "bank *earnings management*" is meant to be "bank *earnings persistence*" since the latter is the focus of our paper. We agree that the GLB Act of 1999 may have significant impact on bank competition (Chronopoulos, Liu, McMillan and Wilson, 2015), and hence on earnings persistence. It is empirically difficult to disentangle the effect of GLB Act from the impact of Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 since the impact of both Acts may have overlapping time periods immediately after 1999. We considered the possibility of categorizing banks based on holding company status (i.e., the commercial bank's parent's organization structure), size, trading and banking activities, as you suggested. We are concerned, however, that these two Acts' impacts on bank competition may have influenced banks of all categories, and thus do not allow us to disentangle the effect of one Act from that of the other. To address this issue, we repeat our main regression analysis using the sub-sample before year 1999 in order to have a clean analysis of the impact of IBBEA of 1994. The results are reported in column 7 of Table 5A of the revised version of the paper and are consistent with our main findings.

The full sample of the paper includes 226,153 bank-year observations over the period of 1986-2013 with the focus on the ten-year around the passage of the IBBEA would be too long and may produce artificially small standard errors as in Bertrand et al. (2004). The authors would need to refer to the solutions in Bertrand et al. (2004) such as collapsing data into a single pre and post period for each bank and report the results in robustness tests (at least).

Our reply:

Thank you very much for this helpful comment. Following your suggestion, we have conducted a robustness test using event difference-in-difference strategy. According to Bertrand and Mullianathan (2003), and Chemmanur, He and Nandy(2009), this method could effectively capture the dynamic variation of difference between treatment and control group around a particular event.

We treat the introduction year of IBBEA for each state as our event year. We use the following model to test the dynamic impact from IBBEA on earnings adjustment speed:

$ROA_{it} - ROA_{it-1} = (\sum Before^t + \sum After^t + \gamma Z_{it-1})\, GAP_{it-1} + \varepsilon_{it}$,

where $GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1}$, $Before^t$ $(After^t)$ is a dummy variable equal to 1 for *t* years before (after) the introduction of deregulation of a state. For example, $Before^5$ equals 1 for year 5 before a particular state's deregulation introduction year, and 0 otherwise. The results are reported in Table 5B of the revised version of the paper. We find that the coefficients on $After^1$, $After^2$, $After^3$, $After^4$ are all positive and statistically significant. This finding shows that after the introduction of deregulation, banks accelerate earnings adjustment speed. This effect is most pronounced 2 and 3 years after the introduction year.

Level of clustering

*The authors cluster standard errors at both bank and year level which is not correct. What happen if the authors cluster standard errors at state level, or at least, state*year level? I suspect that this would make the results less significant.*

Our reply:

Thank you very much for this comment. In the revised version of the paper, we repeat our main regressions by clustering standard errors at different levels. The results are reported in columns 7 to 9 of Table 5A. Consistent with your expectation, we find that the *t*-statistic for testing the coefficient of Geographic Expansion Index is the smallest when we cluster standard errors at the state level (3.80), while the *t*-statistic is the highest when we cluster standard errors at the bank level (12.01). However, our main results are robust with using different levels of clustered standard errors. The coefficients of Geographic Expansion Index across column (7) to column (9) continue to be statistically significant at the 1% level.

Mechanism

The authors provide interesting results that competition affects earnings persistence not through earning management mechanism. Then the authors should back up the results by outlining what mechanism would it be. I do not have a strong suggestion for this but this is the story that the authors need to tell.

Our reply:

We do apologize for the confusion caused to the referee. Let's make some clarification here. The main research question of this paper is to examine which factor is the main driving force of bank earnings persistence, competition or earnings management. We find that both factors are important determinants of bank earnings persistence. We suspect, however, that the impact of bank competition on earnings persistence is not direct, but rather indirectly going through the channel of earnings management. We conducted two analyses in Section 5 to investigate this question. First, we show that bank competition has positive impact on bank earnings management as measured by Discretionary loan loss provisions. This result invalidates the indirect channel because otherwise we would have observed a negative impact of bank competition on earnings persistence, which is not what we find in the main regressions. Second, we show that bank competition has no significant impact on earnings management as modelled by realized gains and losses of AFS securities. This result again invalidates the indirect channel. Based on the results in section 5, we then conclude that the impact of bank competition on bank earnings persistence is direct rather than indirect. In the revised version of the paper, we dropped the word "mechanism" to avoid further confusions.

Alternative competition measure

The authors use an adjusted Lerner Index to back up the deregulation index and claim that this is important as it measures bank level competition. I do not agree with this view as deregulation is at the market level, and if something can be used as an alternative, it should be a market level variable. It is up to the authors whether they want to keep the results using the Lerner index, but I believe that another robustness check using HHI is needed to see through the mechanism of the effect. I suggest an IV approach using deregulation index as an instrument for market competition HHI measurement and regress the earning adjustment speed on the predicted HHI to see if competition really decreases earnings persistence.

Our reply:

We do agree with you that Lerner index is a bank level variable while Geographic expansion index is a market level variable. Hence, in the revised version of the paper, we have decided not to include the results of Lerner index.

However, we follow your constructive suggestion and use Geographic Expansion Index as an IV to HHI. Table 1 of this revision letter reports the 2SLS regression results. In the first stage, we use Geographic Expansion Index as an instrument for the HHI measurement of

market-level competition, which reflects deregulation at the market-level, and obtain fitted HHI for each state in each year. We find that Geographic Expansion Index significantly reduces state HHI. In the second stage, we regress the earning adjustment speed on the fitted HHI. We find that the fitted state HHI has a negative and significant impact on earnings adjustment speed. Because a higher fitted HHI indicates a lower level of competition, this result is consistent with our main finding in the paper. This table is however not included in the revised version of the paper to save space, but can be added back if you feel necessary.

Minor comments

GDP growth rate and per capita income can be highly correlated; I am surprised that the authors use both those two variables in one specification.

Our reply:

To address this concern, we compute the correlation matrix and find that the correlation coefficient between *GDP growth rate* and *GDP per capita* is -0.3128, which is rather moderate in magnitude. Nevertheless, we follow your advice and conduct tests based on only using one of the two macro variables and report the results in Table 2 of this response letter. Overall, the results are consistent with what we report in the paper. This table is not included in the revised version of the paper to save space, but can be added back if you feel necessary.

Some typos are in the reference list.

Our reply:

We now have corrected the mistakes in the references.

Reviewer 2 Comments

Main comments:

- *The impact of competition on banks' earnings adjustment speed may be different when the bank is above or below its ROA target (GAP<0 or GAP>0) and the influence of competition on the bank earnings management variables may also differ between these two cases. The authors should consider that in their model.*

Our reply:

We would like to thank you for this valuable comment, which has encouraged us to conduct further analyses to investigate the impact of competition on banks' earnings adjustment speed and bank earnings management when the bank is above or below its ROA target, respectively.

In Table 4 of the revised version of the paper, we further examine the effect of competition on bank *earnings adjustment speed* using sub-samples (GAP>0 and GAP<0). We find that the coefficients on *Geographic Expansion index* remains positive and significant in both sub-samples. It suggests that competition consistently erodes away the economic excessive returns (GAP<0) and expel losses (GAP>0) (Stigler,1961).

In Table 7 of the revised version of the paper, we also examine the effect of competition on bank *earnings management* using sub-samples (GAP>0 and GAP<0). We find that the impact of competition on earnings management is mainly driven by outperforming banks which have higher ROA than their targets (GAP<0). It indicates that outperforming banks have more incentives to manipulate earnings to avoid sudden drops in earnings.

We have updated the discussion of the results on page 14 (Section 4.1) and page 18 (Section 5.1) in the revised version of the paper.

Please also notice that we have followed the suggestion of reviewer 1 and renamed "*the interstate branching restriction index" to "Geographic Expansion Index".*

- *In the data section, the authors explain that they consider the 1986-2013 period but explain just after that in their main analysis they focus on "the ten-year period in which no more than five years are distant from the IBBEA introduction year in each state". This is not clear and information about the date of introduction of the IBBEA in each state should be provided. Are there important differences? Page 14, they state that the introduction of IBBEA lasts from 1994 to 1997 and that they consider "the time period from 1989 to 2002, a ten-year window". This is not a ten-year window. This should be clarified. Besides, can the values of the Branching Restriction index vary after the introduction of IBBEA and is it taken into account when the 1986-2013 period is considered?*

Our reply:

We have re-written the data section (page 13) to make the description clearer in Section 4.1 in the revised version of the paper. In our analysis in Table 4, we use 5 years before and after the introduction of each state to examine the effect of IBBEA on earnings persistence.

Different states adopt the regulation change in different years. For example, Ohio State instantly relieved all restrictions on the 21th May 1997, therefore the data for Ohio spans a ten-year window from 1992 to 2002. On the other hand, Washington State firstly relieved state deposit cap restriction on the 6th June 1996 and then gradually relieved other restrictions in following years. Since we consider a 10 year window around the introduction of IBBEA, the ten-year window for Washington hence spans from 1991 to 2001. The overall time period for all states thus spans from 1989 to 2002.

Next, we use the full sample from 1986-2013 to examine the overall impact of *Geographic Expansion Index* on earnings persistence in column 3 of Table 5A (a new table in the revised version). The results are consistent with those reported earlier.

- *Among the determinants of the adjustment speed, the authors consider competition and earnings management through Discretionary Loan Loss Provisions. As they consider realized gains and losses on Available for Sale Securities as an alternative measure of earnings management, they should also consider this variable among the determinants of the adjustment speed. The interpretation of this variable would be possible if they separate the cases with GAP<0 or >0 as suggested in my first comment.*

Our reply:

We apologize for the confusions on the interpretation of the AFS model. In the model of Barth et al (2017), realized gain and loss of AFS (AFS thereafter) is the dependent variable, while Net Income (NI) is the independent variable. A negative and significant coefficient of NI indicates a negative relation between NI and AFS, which is an evidence that banks use AFS to smooth earnings (see Barth et al (2017), pages 12-13 for detailed explanations). One drawback of this model, however, is that it does not allow us to quantify the degree of earnings management. As a result, we are not able to conduct the regression analyses similar to those we do in Table 4.

Nevertheless, we are able to find significant and negative coefficients of NI in Table 8 of the paper, which suggest that there exists earnings smoothing via AFS in our sample. Further, the negative and significant coefficient of *NI*Competition* suggests that banks engaged more earnings smoothing when competition is high. We then repeat the regressions by using the sub-samples when GAP >0 and GAP<0, respectively. The results reported in Table 8 of the revised version of the paper are consistent with those obtained from using the full sample.

- *The authors test the direct link between competition and earnings persistence taking into account the impact of earnings management and then regress earnings management on competition. To see whether competition affects earnings persistence through earnings management, I think that the authors should rather consider the adjustment model with competition, earnings management and the interaction between the two variables. Besides, I do not understand what is expected when realized gains and losses on Available for Sale Securities are regressed on competition. Indeed, the expected impact depends on whether the bank is above or below the target of ROA.*

Our reply:

Thank you very much for your suggestion. We followed your idea and include the interaction term between earnings management and competition in our baseline regression. Results are shown in Table 3 of this response letter, we found the coefficient on the interaction term of *Geographic Expansion Index*DLLP* is statistically insignificant. This result further suggests that the effect of competition on earnings persistence does not go through the earnings management channel.

We apologize again for the ambiguous interpretation of the AFS model in section 5.2 of the previous version. We have rewritten the section to make it clearer.

- *In the first placebo test, only the variable Before(4,1) should be added, not the early deregulation index that corresponds to the third robustness check.*

Our reply:

Thank you very much for your comment and the analysis of early deregulation index has now been deleted from the revised version of the paper.

Minor comments:

1) *All the equations should be numbered (cf page 9 and 10)*

   We have re-numbered all equations accordingly.

2) *The equation for AFS securities page 10 is not correct, coefficients are missing. Besides, the title of section 3.5 is not good as the measure of earnings management is not available for sale securities (AFS) but realized gains and losses on AFS.*

We do apologize for the typo. The missing coefficients are added. We then dropped section 3.5 and moved the content to section 5.2 to keep a smooth paper flow.

3) *In 3.4, the authors do not explain how the impact of competition on earnings management is taken into account; however, they do so for the other proxy of earnings management in 3.5. This should be harmonized.*

We now have added a paragraph on page 17 in section 5 of the paper to explain the rationale and impact of competition on earnings management. Starting with "In this subsection we examine the direct impact of bank competition on bank earnings management, as measured by discretionary loan loss provisions….conditions……."

4) *In 3.6, details about the way equations are estimated should be given. Do they use Blundell and Bond (1998) estimation techniques?*

We use Fama-Macbech regression for the first stage estimation, and OLS with fixed effects for the second stage estimation. We have rewritten the methodology part of partial adjustment model to make clearer explanations.
Now it is explained on page 11, section 3.4. Starting with "We follow Healy et al, (2014) and Flannery and Rangan (2006) to estimate Equation(8) in two steps. In the first step, we use Fama-Macbeth regression on Equation (5) and obtain an estimate of target ROA (ROA*) (see, also, Fama and French, 2006; Healy et al, 2014)….."

5) *Restrictions put on the sample of banks are not presented. For example, have the authors removed very small banks? Have they kept foreign-owned banks? What is the minimum amount of total assets? In the summary statistics table, the scale for size and other variables is not given.*

We exclude foreign banks and banks with total assets lower than one million US dollars from our sample. It has been updated in the revised version of the paper

(section 3.1 on page 6). For clarity, we also add the accounting figure of total assets in Table 1.

6) *Page 13, the comment on the correlation between Branching Restriction Index and Discretionary Loan Loss Provision is not correct as a higher index indicates higher competition.*

We have now corrected this error.

7) *Page 17, the coefficients of the interaction terms are positive; not negative.*

We have consolidated this analysis into section 4.3 and report the results in Table 6. Earnings adjustment speed is negatively related to these interaction terms, which indicates that banks with larger size, higher level of diversification, higher managerial efficiency and lower level of default risk could persist earnings longer (Page 17 on the revised version).

8) *Only references that are mentioned in the text should be put in the references section.*

The references have been carefully checked and updated.

9) *The authors could provide summary statistics before and after the introduction of the IBBEA.*

In the revised version of the paper we have added the mean value of variables before and after the introduction of IBBEA in Panel B of Table 1.

10) *Details about the computation of the Z-score should be given. For example, how many years are considered to compute the standard deviation?*

In the Appendix (definition of variables), we added the description of Z-score to show that we use 3-year rolling window to estimate standard deviation of ROA.

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Table 1
Determinants of Bank Profit Adjustment Speed: IV

This table presents 2SLS regression results. In Column (1), we use *Branching Restriction index* as an instrument for state HHI. In Column (2) and Column (3) we use the fitted value of state HHI as a new competition measure. For second stage partial adjustment model ($ROA_{it} - ROA_{it-1} = (\lambda_i + \gamma Z_{it-1}) GAP_{it-1} + \varepsilon_{it}$,$GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1}$), we assume λ_i to be dynamic, so it varies across banks and over time. Z is a vector of all independent variables. Column (2) presents OLS results of a sub-sample of ten-year window around IBBEA introduction, while Column (3) presents OLS results of full sample. Discretionary Loan Loss Provisions are the proxy for earnings management across all columns. *t*-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	First Stage	Second Stage	
	(1)	(2)	(3)
Branching Restrictions Index	-0.008***		
	(-3.44)		
Fitted state HHI		-1.333***	-0.230***
		(-3.23)	(-7.22)
Discretionary Loan Loss Provisions		-0.016*	-0.016***
		(-1.81)	(-4.62)
Z-score		0.009	-0.055***
		(0.49)	(-16.35)
Leverage Ratio		0.032***	0.007**
		(2.90)	(2.03)
Loan to Total Asset		-0.010	-0.004
		(-1.50)	(-1.04)
Size		-0.062***	-0.027***
		(-4.19)	(-9.68)
Total Assets Growth Rate		0.006	0.000
		(1.07)	(0.09)
Managerial Efficiency		0.033***	0.041***
		(6.37)	(15.20)
Income Diversification		0.004	-0.012***
		(0.95)	(-5.12)
GDP Growth Rate		-0.015***	-0.012***
		(-2.63)	(-5.45)
Inflation		0.035***	0.004
		(3.31)	(1.61)
GDP Per Capita		-0.214***	-0.033***
		(-4.58)	(-5.24)
Constant		1.100***	0.901***
		(29.34)	(158.41)
Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	Yes
State Fixed Effects	Yes	No	No
F-statistics	19.18		
N	226153	77929	226153

Table 2

Determinants of Bank Profit Adjustment Speed: GDP growth rate and GDP per capita

We assume λi to be dynamic, so it varies across banks and over time. Z is a vector of all independent variables. This table presents the OLS results for parameter estimates on Z in the Partial Adjustment Model: $(ROA_{it} - ROA_{it-1} = (\lambda_i + \gamma Z_{it-1}) GAP_{it-1} + \varepsilon_{it}, GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1})$. Column (1) shows the result using a subsample of banks with only one branch, Column(2) shows the result using a subsample of banks with total assets smaller than 100 million USD. Discretionary Loan Loss Provisions are the proxy for earnings management across all columns. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	GDP per capita only	GDP growth only
Branching Restrictions Index	0.092***	0.089***
	(4.54)	(3.76)
Discretionary Loan Loss Provisions	-0.023***	-0.024***
	(-2.62)	(-2.70)
Z-score	-0.025***	-0.025***
	(-3.54)	(-3.48)
Leverage Ratio	0.015**	0.016**
	(2.52)	(2.56)
Loan to Total Asset	-0.017**	-0.017**
	(-2.37)	(-2.31)
Size	-0.075***	-0.074***
	(-7.10)	(-6.96)
Total Assets Growth Rate	0.009*	0.008
	(1.67)	(1.48)
Managerial Efficiency	0.031***	0.030***
	(5.82)	(5.69)
Income Diversification	-0.000	0.000
	(-0.02)	(0.05)
Inflation	-0.002	0.010
	(-0.30)	(0.91)
GDP Growth Rate	-0.014**	
	(-2.27)	
GDP Per Capita		-0.032
		(-0.87)
Constant	-0.001***	-0.001***
	(-33.75)	(-34.05)
Time Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
N	77929	77929
adj. R-sq	0.8252	0.8251

Table 3
Determinants of Bank Profit Adjustment Speed: Interaction between competition and earnings management

We assume λ_i to be dynamic, so it varies across banks and over time. Z is a vector of all independent variables. This table presents the OLS results for parameter estimates on Z in the Partial Adjustment Model: $(ROA_{it} - ROA_{it-1} = (\lambda_i + \gamma Z_{it-1}) GAP_{it-1} + \varepsilon_{it}, GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1})$. Discretionary Loan Loss Provisions are the proxy for earnings management across all columns. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	(1)
Branching Restrictions index*DLLP	0.526
	(0.67)
Branching Restrictions index	0.011***
	(2.76)
Discretionary Loan Loss Provisions	-0.137***
	(-5.34)
Z-score	-0.036***
	(-7.30)
Capital Ratio	0.012***
	(3.70)
Loan to Total Asset	-0.008
	(-1.41)
Size	-0.075***
	(-9.23)
Total Assets Growth Rate	0.006*
	(1.76)
Managerial Efficiency	-0.122**
	(-2.25)
Income Diversification	-0.006
	(-1.51)
GDP Growth Rate	-0.016***
	(-4.77)
Inflation	-0.025***
	(-8.31)
GDP Per Capita	-0.023***
	(-3.21)
Constant	0.892***
	(83.67)
Time Fixed Effects	Yes
Bank Fixed Effects	Yes
N	77929
adj. R-sq	0.8315

*Title Page (with authors and affiliations)

Competition or manipulation? An empirical evidence of determinants of the earnings persistence of the U.S. banks

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This version: December 9, 2017

Abstract

We examine the impact of competition on bank earnings persistence by exploiting a natural experiment following interstate banking deregulation that increased bank competition. We find that bank earnings adjustment speed increases after the state where the bank locates implements the deregulation. This relationship is weakened, however, with the increase of banks' abilities to sustain earnings, as reflected in size, diversification, managerial efficiency and safety. We further find that compeititon directly impacts bank earnings adjustment speed, and does not indirectly go through the channel of earnings management.

Keywords: Competition; Geographic Expansion Index; Earnings persistence; Earnings adjustment speed, Earnings management

JEL Classification: G20, G21, G38

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Competition or manipulation? An empirical evidence of determinants of the earnings persistence of the U.S. banks

Abstract

We examine the impact of competition on bank earnings persistence by exploiting a natural experiment following interstate banking deregulation that increased bank competition. We find that bank earnings adjustment speed increases after their states implement the deregulation. This relationship is weakened, however, with the increase of bank's abilities to sustain earnings, as reflected in size, diversification, managerial efficiency and safety. We further find that the impact of compeititon on bank earnings adjustment speed is direct but not indirectly through the channel of earnings management.

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1. Introduction

Financial crisis raises the recent intense debate on the association between accounting changes and financial crisis. For instance, the accusation of market value accounting after the 2007-2009 financial crisis, along with the economic significance of banks' liquidity and capital provision requirements, reveals the vital economic role of bank accounting (Beatty and Liao, 2014). Bank earnings persistence plays an important role in maintaining the stability of the whole financial system and so has attracted growing debate on the factors that drive such a phenomenon (Cumming et al., 2012; Beaver et al., 2012; Gao and Zhang, 2015; Peterson et al., 2015; Hui et al, 2016; Buchner et al., 2016).

According to economic competition theory, competition contributes to the mean reversion of market profitability (decreased earnings persistence) in the long term (Stigler, 1961; Mueller, 1977, 1986; Berger et al., 2000; Goddard et al., 2011). In other words, competition could erode away all excessive returns by attracting new entrants or all excessive losses by forcing the improvement of operations or exit of the market. Thus, competition could directly reduce earnings persistence. However, accounting studies implicitly suggest that earnings persistence is a result of earnings management (Sloan, 1993; Pope and Wang, 2005; Chen, 2010; Dechow et al., 2010; Skinner and Soltes, 2011; Li, 2010; Healy et al., 2015).

Few studies have attempted to reconcile the differences between theories that explain the main driving force of bank earnings persistence. It is possible that, as an effective external governance mechanism, competition could reduce earnings management via increasing the cost of mispricing (Graham et al., 2005; Dechow et al., 2010; Burks et al., 2016; Jiang et al., 2016). Hence, the resulted reduced earnings persistence is the result of decreased earnings management caused by the increased competition. It is thus the central focus of this paper to determine whether the impact of competition on bank earnings persistence is directly or indirectly from earnings management.

We use a comprehensive data set of the US banking industry for the period between 1986 and 2013 and our final sample includes 15,546 unique commercial banks with 226,153 firm-year observations. The benefits of studying the banking industry are two-fold: First, our focus on a single homogenous industry removes the challenges of defining the market where a firm competes, thereby removing the potential bias in industry identification that is overly broadly or unduly narrowly defined. Second, the focus of

analyzing the banking sector eliminates the concern on conglomerates that operate in different industries and thus face competitions in different markets.

We use a partial adjustment model to capture bank earnings adjustment speed, which allows earnings targets to be bank-specific and to vary over time (see, also, Healy et al., 2014; Flannery and Rangan, 2006; De Jonghe and Öztekin., 2015). Earnings adjustment speed refers to the speed by which banks adjust earnings to their target ROA, and equals one minus earnings persistence. Thus, faster adjustment speeds indicate lower earnings persistence. We estimate heterogeneous adjustment speeds via a two-stage procedure. In the first stage, we obtain a constant adjustment speed λ for each of the banks and estimate the target ROA for each bank-year. In the second stage, we use the gap between the target ROA and the observed realized ROA to obtain a time-varying adjustment speed for each bank in each year.

We exploit the cross-state, time-varying variations in the removal of interstate bank branching prohibitions to identify an exogenous increase in bank competition. The introduction of the Interstate Banking and Branching Efficiency Act (IBBEA) in 1994 by the US authorities relaxed geographical restrictions to bank expansion across state borders. This relaxation enhances competition by enabling banks to enter into new markets in other states, thereby allowing them to compete with those banks in the local market (DeYoung, 2010; Rice and Strahan, 2010, among others).

We start by investigating whether banks adjust their earnings with a faster speed in states that implement the IBBEA and deregulate interstate banking within their borders to a great extent. We find that an increase in the Geographic Expansion Index, which indicates an increase in bank competition, leads to an increase in bank earnings adjustment speed. This finding is in line with the prediction of the economic theory that competition reduces earnings persistence (Stigler, 1961).

We also find that banks with higher earnings management, which is measured as Discretionary Loan Loss Provisions, tend to have slower earnings adjustment speed than their peers. This finding is also in line with arguments in the existing accounting literature.

These findings hold after controlling for state and time fixed effects, a wide array of time-varying bank characteristics, such as size, risk, capital-asset ratio, efficiency, and the macro-economic conditions, such as GDP growth, inflation and GDP per capita in each state. We also conduct a host of robustness tests to ensure that our findings are not driven by potential biases in the sample or alternative explanations. In our additional cross-sectional analysis, we find that the impact of bank competition on earnings adjustment

speed is reduced with the increase of bank's ability to sustain earnings, including size, diversification, managerial efficiency and safety.

Next, we investigate whether the positive impact of competition on bank earnings adjustment speed goes through the earnings management channel. If this is the case, we would expect a negative impact of competition on bank earnings management, because thus a higher level of competition will induce lower earnings management, which will consequently lead to higher earnings adjustment speed. The literature on the relationship between firm competition and earnings management is ambiguous. The negative relationship argues that competition can act as an external governance mechanism to prevent managerial slack and protect the interest of shareholders (Dechow et al., 2010), and that competition increases the cost of misreporting, thereby curbing earnings management incentives (Graham et al., 2005). On the other hand, if the positive impact of competition on bank earnings adjustment speed does not go through the earnings management channel, we would expect a non-negative (positive or insignificant) impact of competition on bank earnings management. This is then consistent with another strand of literature which argues that increased competition could put higher pressure on managers and hence, induces their unethical behavior such as earnings management, giving rise to an empirically observed positive relation between competition and earnings management (Shleifer, 2004; Burgstahler and Dichev, 1997; Milgrom and Roberts, 1992; Bagnoli and Watts, 2010; Tomy, 2016; Dou et al., 2016).

We conduct two analyses to examine whether competition has positive impact on bank earnings management by using two bank earnings management frameworks. First, we use discretionary loan loss provisions, which is widely used to measure earnings management in the banking industry (see, e.g., Beatty et al., 2002; Cohen et al., 2014; Cornett et al., 2009; Cheng and Warfield, 2005; Beatty and Liao, 2014). In our analyses, we find a *positive* relation between competition and discretionary loan loss provisions, which does not support the argument that the impact of competition on bank earnings adjustment speed goes *indirectly* through the channel of earnings management.

Second, we consider the possibility that banks could use securities available for sale to smooth earnings, as suggested by the existing literature (Barth et al., 2015; Dong and Zhang, 2015). Available for Sale (AFS) securities is the largest category of banks' securities that comprise a sizable proportion of bank assets (Nissim and Penman, 2007; Laux and Leuz, 2010). Earnings management through realizing gains and losses on AFS securities is less costly than through managing accruals or involving in real activities

because sales of securities are not subject to ex post scrutiny, such as from auditors. These advantages may enable banks to continuously manage earnings despite the existence of competition. If this is the case, bank's earnings management through AFS will be independent of bank competition. We find evidence to support this argument. Hence, the impact of competition on bank earnings persistence is rather *directly* than *indirectly* through the channel of earnings management.

This paper contributes to the literature in several ways. First, to our best knowledge, we are the first to document the causal relation between competition and earnings persistence by employing Interstate Banking and Branching Efficiency Act as an exogenous shock. Prior studies tend to ignore the endogeneity with respect to the causal relation between competition and earnings persistence (Goddard et al., 2004; Gropp and Kashyap, 2010; Goddard et al., 2011). Recently, Healy et al. (2014) recognize that it is difficult to attribute causality between competition and earnings persistence, given many channels that drive competitive forces, such as government regulation. Therefore, our study fills this gap by employing a government regulation change which could impact bank competition as an exogenous shock.

Second, we examine whether the competition law affects banks with different size, level of diversification, management efficiency, and level of default risk. We find that the stronger a bank is in sustaining earnings, as reflected by large size, better diversification, higher managerial efficiency and lower default risk, the lower is the impact of competition on bank earnings adjustment speed. Third, we provide evidence that the effect of competition on bank earnings persistence is direct, but not indirectly through the channel of earnings management.

The rest of the paper is structured as follows. Section 2 presents conceptual framework. In Section 3, we describe our identification strategy, sample construction, instruments, models and summary statistics. Section 4 presents and discusses our main results and Section 5 conducts two additional analyses. Section 6 concludes.

2. Conceptual framework

Economic scholars argue that competition directly impacts earnings persistence, where competition could erode away all economic excessive returns and losses in the long run and thus, the market profitability level will converge toward a long-term equilibrium (Stigler, 1961; Mueller, 1977, 1986; Berger et al., 2000; Goddard et al., 2011). More

specifically, the excessive profit currently possessed by a firm attracts new competitors to enter the market by offering similar or same product with lower prices, leading to decreases in the profit margin. This process will not stop until firms' profitability reaches the average profit rate of the market. For firms with the profits under the market average will receive precaution from investors to reach the market average level in a short time. Otherwise, investors will withdraw their investment, resulting in the exit of the underperforming firms from the market. Thus, competition directly reduces earnings persistence.

On the other hand, there is a widely accepted consensus that earnings persistence is a result of earnings management choice or earnings manipulation (Sloan, 1993; Pope and Wang, 2005; Chen, 2010; Dechow et al., 2010; Skinner and Soltes, 2011). The underpinning rationale is that, with information asymmetry between managers and investors, firms smooth earnings for purposes like taxes minimization, dividend payouts, target achievements, hiding poor economic performance or avoidance of covenants (Guay et al., 1996; Arya et al., 1998; Burgstahler et al., 2006). Managers are also motivated to smooth reported earnings overtime to obtain relatively constant compensation (Gaver et al., 1995; Holthausen et al., 1995; Healy, 1985; Warfield et al., 1995; Bergstresser and Philippon, 2006). For instance, managers might manipulate earnings downward when bonuses have already reached maximum levels, and might manipulate earnings upward when the actual earnings are not qualified for a bonus plan. Subjecting to regulatory capital requirements, banks with lower regulatory capital are motivated to increase it. Consequently, banks might manipulate earnings to accomplish that objective (Barth et al., 2015).

3. Data and variables

3.1. Data

To explore the impact of competition and earnings management on earnings persistence, we combine data from several sources. From Federal Reserve Report of Condition and Income (Call Reports), we obtain the data of balance sheets and income statements at the commercial bank level, rather than their bank holding company levels. We exclude from our sample foreign banks and banks with total assets less than one million US dollars. Macroeconomic information is from World Bank database. Finally, our

full sample includes 15,546 banks with a total of 226,153 firm-year observations from 51 states over the period of 1986-2013.

3.2. The identification strategy of bank competition

Prior studies use different measures, such as country survey index, the Herfindahl-Hirschman Index, and the Lerner Index, to measure competition at the country, industry, firm or product level (Healy et al., 2014; Goddard et al., 2004; Goddard et al., 2011; Berger et al., 2000). These measures, however, cannot address the endogeneity issues between competition and earnings persistence because unobservable cross-sectional heterogeneity could impact both competition and earnings persistence. On the other hand, reverse causality may also exist. For example, persistent earnings of the industry may indicate better business operations, continuous profits, increasing stock prices and lower debt costs (Lin et al., 2013) and hence, can attract new competitor entrants. Alternatively, persistent earnings of the firm may increase the capability of existing firms in preventing new entrants into the market, resulting in less competition.

We use Interstate Banking and Branching Efficiency Act (IBBEA), which relaxes geographical restrictions on bank expansion crossing state borders enacted by the US authorities in 1994, as an exogenous shock to document the causality between competition and earnings persistence. Interstate Banking and Branching Efficiency Act (IBBEA) was passed in 1994 and completed in 1997. It allows bank holding companies to acquire banks across states (effective in 1995) and to expand across states (effective in 1997) (Rice and Strahan, 2010). Regarded as the watershed event, IBBEA indicates the end of an era of geographic restrictions on bank expansion which could be traced back to the 19th century (Rice and Strahan, 2010).

The passage of IBBEA mainly involves the relaxation of four restrictions: (1) Age restriction: State could impose a minimum existence year for banks that seek to enter. Many states set their age requirement at 5 years, while several states set a lower age requirement (eg.3 years) or no minimum age limit at all. (2) De novo interstate branching restriction: State could disallow de novo interstate bank branching, under which situation, all out-of-state banks could only open one branch in the focal state. This makes entry into certain out-of-state markets particularly difficult, because the potential of fast expansion of an out-of-state bank is significantly constrained. (3) Individual branching acquisition restriction: in an interstate merger transaction, States could require an out-of-state bank (Bidder) to acquire all branches of an in-state bank (Asker). Like de novo branching,

permitting acquisition of individual branches lowers the cost of entry for interstate banks. (4) Statewide cap on deposits restriction: States could restrict the maximum fraction of deposits that an out-of-state bank could hold. Officially, a cap of 30% is suggested by IBBEA, but each state maintains the discretion to change it. State could set a deposit cap to prevent a large in-state bank from entering into an interstate merger. For example, if a state sets a deposit cap of 20%, a bank in that state with more than 20% statewide deposits fraction could not be acquired.

This Act allows states to erect barriers to branch expansion. However, some states make use of this provision by prohibiting out-of-state banks from opening or acquiring branches, by requiring the minimum age of bank branches that could be acquired, or by mandating the maximum amount of deposits that banks could hold. Therefore, IBBEA increases banks' competition in each state while the magnitude of increased competition in each estate is different. Following Rice and Strahan (2010), we create a variable Geographic Expansion Index, which decreases with the extent of interstate branching deregulation restrictions in a state. Hence, an increase in the Geographic Expansion Index indicates an increase in bank competition.

It is important to note that interstate bank deregulation is exogenous to bank earnings persistence. There is no empirical evidence to show that banks' earnings persistence affects the timing of deregulation. Thus, the interstate bank deregulation Act tends to be a disordered act that provides a valuable research laboratory for assessing the influence of competition on banks' earnings persistence. There are also extensive studies applying IBBEA as an exogenous shock to bank competition on topics of firm financing (Rice and Strahan, 2010), firm innovation (Cornaggia et al., 2015; Amore et al., 2013), bank liquidity (Shenoy and Williams, 2015) and market valuation of bank holding companies (Goetz et al., 2013), among others.

3.3. Earnings management measure: Discretionary loan loss provision model

Discretionary loan loss provision becomes the most common vehicle to manipulate bank earnings after the launch of Statements of Financial Accounting Standards No. 133 (short for SFAS 133), which requires firms to measure total assets and liabilities at fair value on the balance sheet (Liu and Ryan, 2006). We hence follow Beatty and Liao (2014), Cohen et al. (2014), Cornett et al. (2009) and Cheng and Warfield (2005) to use the discretionary loan loss provision (DLLP) model to measure bank earnings management. The absolute value of the residual from estimating equation (1) as shown below represents

the degree of each bank's earnings management. The error term represents the unexplained component of the regression and hence, is treated as the Discretionary Loan Loss Provisions (DLLP).

$$\text{Loan Loss Provision}_{it} = \beta_1 \text{Size}_{it} + \beta_2\ \Delta\text{Loan Charge-offs}_{it} + \beta_3 \Delta\text{Loans}_{it}\ + \beta_4 \Delta\text{Non-performing Loans}_{it} + \beta_5 \Delta\text{Non-performing Loans}_{it-1} + \beta_6 \Delta\text{Non-performing Loans}_{it+1} + \varepsilon_{it} \quad (1)$$

where Size_{it} is the natural logarithm of total assets, $\Delta\text{Loan Charge-offs}_{it}$ represents the difference in total loan charge-offs between periods *t* and *t-1*, ΔLoans_{it} represents the difference in total loans between periods *t* and *t-1*, $\Delta\text{Non-performing Loans}_{it}$ reflects the change in non-performing loans between periods *t* and *t-1*, $\Delta\text{Non-performing Loans}_{it-1}$ reflects the change in non-performing loans between periods *t-1* and *t-2*, and $\Delta\text{Non-performing Loans}_{it+1}$ represents the change in non-performing loans between periods *t+1* and *t*. All the variables except Size in Equation (1) are deflated by the book value of total assets of each bank.

3.4. Earnings adjustment speed: The partial adjustment model

A number of studies use a first-order autoregressive model to capture the dynamics of firm's earnings (Mueller, 1990; Jenny and Weber, 1990). This model can only produce a time-invariant persistence level for each entity. However, the persistence level of each entity in every year may not remain unchanged. In order to improve the estimation accuracy, several studies adopt partial adjustment model to obtain time-varying persistence level for each entity (Healey et al., 2014; Gropp and Heider, 2010; Memmel and Raupach, 2010; De Jonghe and Öztehin, 2015). We follow these studies and employ the partial adjustment model to estimate the dynamic persistence level for each bank in each year.

In the partial adjustment model, the bank's current return level (ROA) is a weighted average of its target and its previous year's ROA:

$$\text{ROA}_{it} - \text{ROA}_{it-1} = \lambda_i(\text{ROA}^*_{it} - \text{ROA}_{it-1}) + \varepsilon_{it,} \quad (2)$$

where ROA_{it} is the return on total assets of bank *i* in year *t*. ROA^*_{it} is the target ROA of bank *i* in year *t*. λ_i represents the proportional adjustment for bank *i*. In our context, λ_i captures the exw a bank operates away from its target ROA. Alternatively, ROA is predicted to mean revert to a target level, ROA*. Therefore, bank earnings adjustment

speed refers to the speed at which banks' earnings adjust to their target ROA and equals 1 minus earnings persistence. The ROA* can be determined by a cross-sectional model:

$$ROA^*_{it} = \beta_i X_{it} + \varepsilon_{it,} \quad (3)$$

where X_{it} is a vector of the bank and macroeconomic characteristics influencing ROA. Substituting Equation (3) into Equation (2) and rearranging yields Equation (4) below:

$$ROA_{it} = \lambda_i \beta_i X_{it-1} + (1- \lambda_i) ROA_{it-1} + \varepsilon_{it,} \quad (4)$$

Equation (4) shows that in the partial adjustment model, the bank's current ROA is a weighted average (with λ_i between 0 and 1) of ROA in its previous period, the unobserved fixed effects and random shocks. If the value of λ_i is small, the adjustment speed is slow, suggesting that it takes a long time for a bank to reach its target ROA after a shock to its ROA. On the other hand, known as an inertial fact in the partial adjustment model, (1- λ_i) represents the earnings persistence level. The smaller value of adjustment speed indicates a higher level of earnings persistence. When (1 - λ_i) equals 1, the adjustment speed equals 0, indicating that the earnings level is unchanged. In contrast, when (1 - λ_i) equals 0, the adjustment speed equals 1, suggesting that there is no earnings persistence because the speed of adjustment to the target ROA is instant.

In the partial adjustment model, the target ROA (ROA*) is unobservable and is not necessarily constant over periods. Therefore, we employ the cross-sectional model proposed by Fama and French (2006) to estimate the target ROA[1].

$$\begin{aligned} ROA^*_{it} = {} & \beta_0 + \beta_1 \text{Income Diversification}_{it} + \beta_2 \text{Non-Performing Loans}_{it} \\ & + \beta_3 \text{Revenue}_{it} + \beta_4 \text{Capital Ratio}_{it} + \beta_5 \text{Size}_{it} \\ & + \beta_6 \text{Management Efficiency}_{it} + \beta_7 \text{Loans}_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

where Income Diversification is the non-interest income to total revenue ratio, the variable of Non-performing Loans is the non-performing loans to total asset ratio, Revenue is total revenue to total asset ratio and the Capital Ratio is total equity to total assets ratio, Size is the natural logarithm of total assets. Management Efficiency is calculated via total costs divided by total revenues, and Loans is the total net loans over total assets. We employee Fama-Macbeth estimation in this first stage estimation (see, also, Fama and French, 2006; Healy et al, 2014).

The above model for estimating the target ROA uses contemporaneous variables, for which Healy et al. (2014) demonstrate to be sufficient to predict the target ROA. The

[1] The variables used in equation (5) are different from those used in Fama and French (2006) because our focus is on the banking industry that they do not analyze.

adjustments are meaningful if there is a difference between the target ROA and the actual ROA. The GAP is applied to define the difference between these two variables:

$$GAP_{it} = ROA^{*}_{it} - ROA_{it} \quad (6)$$

To test what determines the dynamic of bank earnings adjustment speed. We modify the empirical setup described in Equation (2) and adjust the model such that the adjustment speed, λ, can vary over time and banks:

$$\lambda_{it} = \lambda_i + \gamma Z_{it-1} \quad (7)$$

We assume that λ_{it} is dynamic and varies across banks and over time. γ is a vector of coefficients for the adjustment speed function and Z_{it-1} is a vector of the bank and macroeconomic characteristics that could affect adjustment speed. Substituting Equation (7) into Equation (2) yields the specification for a partial adjustment model with dynamic adjustment speed λ_{it}, that is heterogeneous:

$$ROA_{it} - ROA_{it-1} = (\lambda_i + \gamma Z_{it-1})\, GAP_{it-1} + \varepsilon_{it} \quad (8)$$

We follow Healy et al, (2014) and Flannery and Rangan (2006) to estimate Equation (8) in two steps. In the first step, we use Fama-Macbeth regression for Equation (5) and obtain an estimate of target ROA (i.e., ROA_{it}*) (see, also, Fama and French, 2006; Healy et al, 2014). Then, we use Equation (6) to calculate the earnings GAP for each bank in each year. In the second stage analysis, we follow De Jonghe and Öztekin (2015) and use OLS with bank and year fixed effects. Heterogeneity robust standard errors are clustered at bank level (for robustness, we also conducted several alternative clustering methods and our conclusions are not changed). Having running regression as in Equation (8), we obtain a set of coefficients γ. These coefficients allow us to directly test how bank's competition and earnings management influence earnings adjustment speed. The sign of γ reflects the relationship between *Z* and the adjustment speed.

3.5. Summary statistics

Table 1 displays the summary statistics of variables. Appendix I shows the definitions of the variables. We winsorize all variables except Size at the 1st and 99th percentiles to mitigate the influence of outliers. The mean value of target ROA is 1.048% and the mean value of realized ROA is 0.974%, resulting in a positive GAP of 0.09%. These figures are consistent with studies that use Call Reports database (Beatty et al., 2002; Ellul and Yerramilli, 2013). Geographic Expansion Index ranges from zero to four and the mean value of this index is 2.06, indicating that the US states overall apply IBBEA

but create on average two barriers for interstate branching. The absolute mean value of Discretionary Loan Loss Provisions (i.e., earnings management) is 0.44, which accounts for 0.278% of total assets (= 0.44 multiplied by the mean value of Loan to asset). The mean value of realized gains and losses of AFS is 0.004.

The average Z-score of US banks is around 24. On average, US banks lend 63% of their assets as loans and hold 9.8% equity to assets ratio. The average total assets of US banks is 705 million dollars, and the median bank size is $92 million. The average asset growth is equal to 8.7%. The average value of one minus costs to income ratio, a proxy for banks' managerial efficiency, is equal to 20.8%. The US banks, on average, generate around 10% of total revenue from non-interest income. Both the GDP growth and Inflation range from 2% to 3%. In addition, we found discretionary loan loss provisions have a slight increase after the introduction of IBBEA. Z-score increased from 24 to 25, on average. The mean of capital ratio leveled up from 9.3% to 10.2%, showing that banks in general reserved more equity after deregulation. The average lending and diversification have grown as well. Meanwhile, banks improved their cost-efficiency by 2.7%, on average.

<Insert Table 1 here>

Table 2 reports the correlations between the variables used in this study. Geographic Expansion Index and Discretionary Loan Loss Provisions are positively correlated, showing that banks that operate in those states with lower regulatory restrictions use more earnings management. Most of the correlations are modest and the multicollinearity problem should be limited.

<Insert Table 2 here>

4. Empirical results

4.1. The impact of Interstate banking deregulation on earnings adjustment speed

Table 3 presents the regression results of Equation (4) for the first stage Fama-MecBeth (1973) estimation. Most of the lagged variables that explain the target ROA have significant coefficients with expected signs, except the insignificant coefficient on Capital $ratio_{t-1}$. The coefficient estimate on the lagged ROA indicates that the constant adjustment speed of earnings persistence in the first-stage specification is 0.488 per year (= 1- 0.512).

<Insert Table 3 here>

Table 4 reports the regression results for the second-stage estimation of Equation (7). We consider a ten-year window of the introduction of IBBEA which lasts for three years from 1994 to 1997. Specifically, we use 5 years before and after the introduction of IBBEA Act for each state to examine the effect of IBBEA. Because different states adopt the regulation changes in different years, therefore our ten-year window vary across different states. For example, Ohio State instantly relieved all four restrictions on the 21th May 1997, therefore the data for Ohio spans a ten-year window from 1992 to 2002. On the other hand, Washington State firstly relieved state deposit cap restriction on the 6th June 1996 and then gradually relieved other restrictions in following years. Since we consider a ten-year window around the first introduction of IBBEA, the data for Washington hence spans from 1991 to 2001. Thus, the overall time period for all states spans from 1989 to 2002. This allows us to capture the effect of dramatic changes of deregulation across states and time.

We standardize all the explanatory variables in the regression, except for Geographic Expansion Index because this index is an ordinal variable rather than a continuous variable. The coefficient of Geographic Expansion Index is positive and significant. Since a higher Geographic Expansion Index value indicates higher competition, a positive regression coefficient of Geographic Expansion Index indicates that banks in more competitive markets tend to adjust their earnings at a higher speed. As shown in Column (1) of Table 4, a one inter-quartile increase of Geographic Expansion Index leads to an increase of earnings adjustment speed by 0.094%. This result is in accordance with economic competition theory that competition impacts earnings persistence by eroding away economic excessive returns and losses in the long run (Stigler, 1961).

In Column (2) of Table 4, the coefficient of Discretionary Loan Loss Provisions is negative and significant, suggesting that banks with higher earnings management tend to have a slow earnings adjustment speed. Earnings adjustment speed will decrease by 4.8% (0.178*0.27) if Discretionary Loan Loss Provisions rises by one standard deviation. This result also supports the widely documented opinion that the principle purpose of earnings management is to smooth earnings (Healy and Wahlen, 1999; Dechow et al., 2010; Gaver et al., 1995; Holthausen et al., 1995). In addition, we find that the coefficients of Capital Ratio are significant and positive, indicating that banks with higher capital ratio adjust earnings faster. Size shows a significantly negative impact on the adjustment speed, suggesting that larger banks tend to have more persistent earnings than their smaller

counterparts. A one standard deviation increase in Size decreases the adjustment speed by 0.324% (0.054*0.06). Managerial Efficiency is also significantly and positively related to earnings adjustment speed.

We conduct further analysis to examine whether the positive impact of bank competition on earnings adjustment speed is driven by those banks with earnings below their target (positive GAP), because these banks tend to have more incentives to adjust their earnings to their target levels than their better performed peer banks. We re-run the regressions on the subsample of banks with positive and negative GAP, respectively. The results are reported in Column (4) and (5) of Table 4. We find that the coefficients on *Geographic Expansion index* remain positive and significant in both specifications. It suggests that our main results are not driven by those banks with earnings below their target (positive GAP), and competition consistently erodes away the economic excessive returns (GAP<0) and expel losses (GAP>0) (Stigler, 1961).

<Insert Table 4 here>

4.2. Robustness checks

We also conduct additional tests to ensure that our results presented in Table 4 are not driven by potential biases in the sample or due to alternative explanations. Table 5 reports the results.

First, there exists a potential concern that our results may be driven by states that time their interstate bank branching deregulations to coincide with a higher level of bank earnings persistence. Thus, the positive coefficient estimates on Geographic Expansion Index in the previous regressions may simply reflect a trend of rising adjustment speed after the IBBEA deregulation. To address this concern, we conduct two empirical analyses. First, we follow Krishnan et al. (2014), and introduce the *Before (4,1)* dummy variable, which equals one for the years *t*-4 to *t*-1 preceding the deregulation year *t*. This variable captures the difference in earnings adjustment speed of banks in each state between the four-year period *t*-4 to *t*-1 prior to the deregulation year *t* and the years prior to the four-year period, *t*-5 and earlier, before the deregulation. If the deregulations are due to states trying to time earnings persistence or if our results above represent a secular trend in earnings persistence, the coefficient estimate on *Before (4,1)* dummy should be positive and statistically significant. We do not find such evidence. In Column (1) of Table 5, the coefficient estimate of the *Before (4,1)* dummy is statistically insignificant.

Second, if our results reflect a treatment effect of interstate bank branching deregulations by states, our results should disappear if we falsely assume that our treatment occurs one year prior to the actual deregulation year (Roberts and Whitted, 2011; Krishnan et al., 2014). For these tests, we repeat our main regressions of Equation (8) under such false definitions of Geographic Expansion Index, which takes the index value one year before the actual deregulation year. Column (2) of Table 5 reports that the coefficient estimate on the falsified Geographic Expansion Index is statistically insignificant. This result confirms that interstate bank branching law were not enacted under certain circumstances that coincide with other unobservable characteristics that also lifted bank earnings persistence. Furthermore, these results also indicate that reverse causality does not drive our results.

Third, in order to examine the influence of deregulation over a long time horizon, we expand our sample for the main regression of Equation (8) to the time period of 1986 to 2013. As shown in Column (3) of Table 5, the coefficient is significantly positive, which is the same as and consistent with those reported in Table 4. Fourth, we consider the potential bias by banks operating in multiple states. Thus, we restrict our sample to those banks with only one branch and banks with size below USD 100 million, respectively. The results reported in column (4) and (5) are consistent with our main findings.

Fifth, we are concerned with the confounding effect of the Gramm-Leach-Bliley Act of 1999, which allows banks to diversify into various businesses. The literature suggests that the GLB Act of 1999 impacts on market competition (Chronopoulos, Liu, McMillan and Wilson, 2015) and hence may also affect bank earnings adjustment speed. However, it is empirically difficult to disentangle the effect of GLB Act from the impact of Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 since the impact of both Acts may have overlapping time periods immediately after 1999. In order to find a clean effect from IBBEA 1994, we repeat our main regression analysis using the sub-sample before year 1999 and find consistent results reported in Column (6). Sixth, we use standard errors that are clustered at the bank, state and state-year level. The coefficients of Geographic Expansion Index across column (7) to column (9) continue to be statistically significant at 1% level.

Finally, in Table 5B, we conduct a robustness test using event difference-in-difference strategy following Bertrand and Mullianathan (2003), and Chemmanur, He and Nandy (2010) to further test whether our main results are sensitive to different methods. This method captures the dynamic variation of difference between treatment and control

group around a particular event. It could also prevent us from producing underestimated small standard errors by including a too long sample period in a difference-in-difference estimation (*Bertrand et al. 200)*). We treat the introduction year of IBBEA for each state as our event year. We use the following model to test the dynamic impact from IBBEA on earnings adjustment speed:

$$ROA_{it} - ROA_{it-1} = (\sum Before^{t} + \sum After^{t} + \gamma Z_{it-1})\, GAP_{it-1} + \varepsilon_{it}, \qquad (9)$$

where $GAP_{it-1} = ROA^{*}_{it-1} - ROA_{it-1}$, $Before^{t}$ $(After^{t})$ is a dummy variable equal to 1 for t years before (after) the introduction of deregulation of a state. For example, $Before^{5}$ equals 1 for year 5 before a particular state's deregulation introduction year, and 0 otherwise. We find that the coefficients on $After^{1}$, $After^{2}$, $After^{3}$, $After^{4}$ are all positive and statistically significant. This result shows that after the introduction of deregulation, banks accelerate earnings adjustment speed. This effect is most pronounced 2 and 3 years after the introduction year. These results are consistent with our main results.

<Insert Table 5A here>

<Insert Table 5B here>

4.3. The impact of banks' heterogeneous ability to sustain earnings on earnings persistence

In the previous sections we have established causality between competition and bank earnings adjustment speed. In this subsection, we attempt to strengthen the interpretation of this relation by exploring the impact of banks' heterogenous abilities in sustaining earnings, which affects their earnings adjustment speed. The hypothesis is that the impact of competition on bank earnings adjustment speed should be less strong for banks with higher level of ability to sustain their previous years' earnings.

Specifically, we expect that banks with larger size, higher level of diversification, more efficient in management and lower level of default risk have stronger ability to sustain earnings. A large bank size usually indicates comprehensive strength, which may help banks increase their earnings persistence. Product diversification reflects banks' business expansion, which increases banks' attractiveness to customers (De Young and Rice (2004) and Stiroh and Rumble (2006)). Further, income diversification effectively reduces earnings volatility caused by a particular external event. Banks' safety and soundness could reduce banks' default risk induced by external shocks. Efficient bank management not only reduces operation costs but also makes timely and effective

strategies to mitigate loss caused by external changes or is even able to find opportunities in external crises (Lin and Zhang, 2010; Shehzad et al., 2010).

In the empirical analysis, we introduce four variables, *size*, *diversification*, *managerial efficiency*, and *Z-score,* and their interaction terms with the Geographic Expansion Index. Table 6 presents the regression results. The relations between the interaction terms of *size, diversification, managerial efficiency and Z-score* and earnings adjustment speed, respectively, are negative and significant. These results indicate that banks with larger size, higher level of diversification, higher managerial efficiency and lower level of default risk could persist earnings longer and hence, the impact of competition of earnings adjustment speed is less stronger.

<Insert Table 6 here>

5. The impact of competition on earnings management

In the previous sections we document a positive impact of bank competition and a negative impact of bank earnings management on bank earnings adjustment speed. Our findings emphasize that the impact of bank competition on earnings adjustment speed is direct and causal. However, the accounting literature emphasizes the role of earnings management in shaping the relation between competition and earnings persistence (Li, 2010; Healy et al., 2014). This argument implicitly suggests that competition may *indirectly* impact earnings persistence through the channel of earnings management because an increased competition could lead to lower level of earnings management. The reasoning is that competition increases the cost of misreporting, thereby curbing the incentives of earnings management. With more competitive rivals, firms are more likely to lose their shareholders, customers and suppliers due to the damage of reputation caused by misreporting (Graham et al., 2005). Consequently, it is possible that competition reduces earnings management and that such a reduced earnings management results in a lower level of earnings persistence, or equivalently speaking, a higher speed of earnings adjustment, as we found in. We investigate whether this indirect channel may exist and drive our main results by using two earnings management models in this section.

5.1. The impact of competition on Discretionary Loan Loss Provisions (DLLP)

In this subsection we examine the direct impact of bank competition on bank earnings management, as measured by discretionary loan loss provisions. If it is indeed that bank competition impact on earnings persistence *indirectly* through the earnings management channel, we would expect a *negative* relationship between the Geographic Expansion Index and our bank earnings management measure, otherwise the impact of competition on earnings adjustment speed would not be positive.

Table 7 presents the results. The coefficient of Geographic Expansion Index is significantly positive, indicating the positive impact of bank competition on earnings management. In Column (1), a one inter-quartile increase in the Geographic Expansion Index leads to an increase of 0.008% in Discretionary Loan Loss Provisions. These results support the recent growing studies that find that bank competition encourages bank earnings management. For instance, Tomy et al. (2016) argue that banks would inflate loss provisions, which reduces reported earnings and hence discourages the entry of new banks. Dou, Ryan, and Zou (2016) argue that banks would suppress loan provisions, which creates the impression of high underwriting quality and hence helps deter the entry of new banks. Our evidence does not support the notion that competition reduces earnings management (see, e.g., Graham et al., 2005; Lin et al., 2016; Burks et al., 2016; Jiang et al., 2016).

We further examine whether the impact of bank competition on earnings management is driven by banks with earnings above their targets (GAP<0), because these outperforming banks have more incentives to manipulate earnings to avoid sudden drops in earnings. We thus re-run the regressions with two sub-samples of banks with earnings below (GAP>0) and above (GAP<0) their target, respectively. Column (2) and (3) of Table 7 report the results. We find that the coefficient of Geographic Expansion Index is significantly positive only in the GAP<0 regression but not in the GAP>0 regression. These results indicate that the impact of bank competition on earnings management is driven by banks that have higher ROA than their targets (GAP<0).

<Insert Table 7 here>

5.2. The impact of competition on bank earnings management through Available for Sale Securities (AFS securities)

Prior research documents that banks tend to use the item of available for sale (AFS) securities to smooth earnings (Barth et al., 2017; Dong and Zhang, 2015). AFS securities is

the largest category of banks' securities and contains a sizable proportion of bank assets (Nissim and Penman, 2007; Laux and Leuz, 2010). Standards Codification (ASC) Topic 320 specifies that AFS securities should be measured as fair value in the statement of financial position, with changes in fair value recognized in other comprehensive income. Hence, the accounting treatment for gains and losses from AFS securities provides banks a chance to engage in earnings management by selling these securities and realizing selected gains and losses. After the announcement of Accounting Standard Codification (ASC) 320, it is increasingly popular that banks use AFS securities to manage earnings due to large size of this item and lower cost of managing this item (Nissim and Penman, 2007; Laux and Leuz, 2010).

In this Section, we examine whether competition induce earnings smoothing via utilizing the AFS securities. Following Barth et al. (2017) and Dong and Zhang (2015), we use realized gains and losses of AFS securities model to capture bank earnings management. We estimate the following model:

$$\begin{aligned}\text{AFS securities}_{it} = {} & \beta_1 \text{Net Income}_{it} + \beta_2 \text{ Competition}_{it} \\ & + \beta_3 \text{ Net Income}_{it} \text{ x Competition}_{it} \\ & + \beta_4 \text{Discretionary Loan Loss Provisions}_{it} + \beta_5 \text{Z-score}_{it} \\ & + \beta_6 \text{Capital Ratio}_{it} + \beta_7 \text{ Loan to Total Asset}_{it} + \beta_8 \text{Size}_{it} \\ & + \beta_9 \text{Total Assets Growth Rate}_{it} + \beta_{10} \text{Managerial Efficiency}_{it} \\ & + \beta_{11} \text{Income Diversification}_{it} + \beta_{12} \text{GDP Growth Rate}_{it} \\ & + \beta_{13} \text{Inflation}_{it} + \beta_{14} \text{GDP Per Capita}_{it} + \varepsilon_{it} \qquad (10)\end{aligned}$$

where $\text{AFS securities}_{it}$ is realized gains and losses on AFS securities and Net Income_{it} is net income before taxes and gains and losses on AFS securities, both deflated by beginning-of-year total assets. Competition_{it} is the Geographic Expansion Index. If banks employ AFS securities to maintain persistent earnings, the coefficient on Net Income_{it}, β_1, should be negative, and if banks under more competition realize more gains from AFS securities, the coefficient on Competition_{it}, β_2, should be positive. Our interested coefficient is β_3, the interaction term between Net Income_{it} and Competition_{it}. It tests whether earnings smoothing is more pronounced for banks under higher competition. A negative β_3 implies that competition would directly intensify banks earnings smoothing behavior. [2]

The results are reported in Table 8. In column (1), net income before tax is negatively related to realized gains and losses of AFS securities. This finding suggests that

[2] It is worth to note that the model of Barth et al., (2017) only allows us to check whether banks use AFS securities to smooth earnings, but not the magnitude of this earnings management.

banks use AFS securities to smooth earnings, which is consistent with Barth et al. (2017). The interaction term of Geographic Expansion Index and Net Income is insignificant, indicating that bank competition does not induce more earnings smoothing by utilizing AFS securities. Column (2) and (3) consistently show insignificant coefficients on the interaction term of Geographic Expansion Index and Net Income when we consider the sub-samples when GAP >0 and GAP<0, respectively. These results further confirm our main findings that bank competition has a direct rather than indirect impact on bank earnings persistence through the channel of earnings management.

<Insert Table 8 here>

6. Conclusions

This study investigates whether the effect of competition on bank earnings persistence is direct or indirect through the channel of earnings management. We employ a sample of commercial banks in the U.S. from 1986 to 2013. We use the introduction of the Interstate Banking and Branching Efficiency Act (IBBEA) as a natural experiment of competition, which could effectively mitigate endogeneity issues in prior research. By applying a two-stage partial adjustment model, we find a negative impact of competition on earnings persistence, consistent with economic competition theory that competition could directly impact earnings persistence. Further, we fail to find a negative relation between competition and earnings management, although we find a positive relation between earnings management and persistence. Therefore, our evidence rules out the possibility that competition could indirectly decrease earnings persistence through the channel of earnings management.

Our findings are useful for scholars and practitioners, who seek to understand bank earnings persistence. The implication for policy makers is to pay attention to form a healthy competition environment for existing banks while at the same time encourage information disclosure quality. As a result, investors could obtain more valuable information regarding banks performance and the banking industry could become more stable, contributing to the stability of the financial system.

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Table 1

Panel A Summary Statistics

This table reports the summary statistics for banks during the period of five years before and five years after the year when the IBBEA act was introduced in each state. ROA* is estimated using the first stage of the partial adjustment model, $ROA_{it} = \lambda_i \beta_i X_{it-1} + (1- \lambda_i) ROA_{it-1} + \varepsilon_{it}$, $GAP_{it} = ROA^*_{it-1} - ROA_{it-1}$. $\Delta ROA = ROA_{it} - ROA_{it-1}$. We use Fama-Macbeth regression to estimate the ROA* in the first stage. Appendix presents the definitions of variables.

	(1)	(2)	(3)	(4)	(5)
Variable Name	Observations	Mean	Standard Deviation	Minimum	Maximum
Target ROA(ROA*)	77929	1.048	0.530	-2.834	2.424
ROA	77929	0.974	0.723	-4.440	2.961
GAP	77929	0.091	0.766	-2.908	4.520
ΔROA	77929	0.030	0.682	-7.401	7.401
Discretionary Loan Loss Provisions	77929	0.435	0.270	0.011	1.319
Realized gains and losses of AFS	77929	0.004	0.052	-6.433	8.044
Geographic Expansion Index	77929	2.060	1.907	0.000	4.000
Z-score	77929	24.132	17.069	0.428	83.816
Capital Ratio	77929	9.799	3.460	3.992	36.872
Loan to Total Asset	77929	63.118	20.751	13.274	148.805
Total Assets (million)	77929	705.256	15091.220	0.723	1746242.000
Size (Log total Asset)	77929	11.339	1.296	8.679	15.734
Total Assets Growth	77929	8.686	15.879	-18.691	125.575
Managerial Efficiency	77929	20.808	8.741	-4.076	45.923
Income Diversification	77929	10.131	7.519	0.492	53.253
Inflation	27	2.463	0.763	0.879	3.793
GDP Growth	27	2.746	1.585	-3.109	4.869
GDP Per Capita	27	10.307	0.304	9.822	10.819

Panel B Summary statistics around IBBEA introduction

This table presents summary of interested variables before and after the introduction of IBBEA in each state for a 10 year window.*, **, *** denote the 10%, 5% and 1% significance levels, respectively.

	Before Deregulation			After Deregulation			Difference in Mean
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation	After-Before
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Discretionary Loan Loss Provisions	0.003	0.003	0.002	0.004	0.004	0.002	0.001***
Z-score	24.403	20.883	16.868	25.167	21.120	17.292	0.764***
Capital Ratio	9.340	8.629	3.118	10.242	9.355	3.591	0.009***
Loan to Total Asset	58.978	59.180	19.226	66.213	66.083	19.950	0.072**
Total Assets (million)	318566	55412	2864378	581112	77803	6957687	262545***
Total Assets Growth Rate	7.806	5.004	15.205	10.424	6.812	16.924	2.61762***
Managerial Efficiency	22.148	22.195	7.687	19.387	19.216	7.601	-2.761***
Income Diversification	9.198	7.667	6.498	10.082	8.404	7.313	0.884***

Table 2

Correlation Matrix

This table reports the correlation covariance. * denotes the 5% significance level. Appendix presents the definitions of variables.

	Geographic Expansion Index	Discretionary Loan Loss Provisions	Z-score	Capital ratio	Loan to total asset	Size	Total Assets Growth	Managerial efficiency	Income diversification	Inflation	GDP growth	GDP per capita
Geographic Expansion Index	1											
Discretionary Loan Loss Provisions	0.0728*	1										
Z-score	0.0267*	-0.2257*	1									
Capital ratio	0.1970*	-0.2168*	0.3399*	1								
Loan to total asset	0.2542*	0.4709*	-0.2191*	-0.1983*	1							
Size	0.3104*	0.1196*	-0.0026	-0.1127*	0.3062*	1						
Total Assets Growth	0.0390*	0.1413*	-0.1349*	-0.0899*	0.5593*	0.1602*	1					
Managerial efficiency	-0.2891*	-0.1342*	0.1934*	0.2947*	0.1186*	0.2862*	0.0205*	1				
Income diversification	0.1889*	0.0039	-0.1554*	0.0560*	0.0389*	0.2982*	0.0499*	-0.1032*	1			
Inflation	-0.4282*	-0.0004	-0.0239*	-0.1188*	-0.0893*	-0.1314*	-0.0162*	0.2305*	-0.1297*	1		
GDP growth	-0.1653*	-0.2515*	0.0101*	-0.0389*	-0.0445*	-0.1141*	0.0231*	-0.0117*	-0.0621*	-0.0031	1	
GDP per capita	0.3786*	-0.2058*	0.0115*	0.2171*	0.2440*	0.3250*	0.0155*	-0.3318*	0.2311*	-0.3904*	-0.3128*	1

Table 3
First Stage Partial Adjustment Model

This table reports the results of the first-stage partial adjustment model assuming a static earnings adjustment speed. $ROA_{it} = \lambda_i \beta_i X_{it-1} + (1- \lambda_i) ROA_{it-1} + \varepsilon_{it}$, where $(1- \lambda_i)$ is the level of persistence of ROA. In column (1), we follow Fama and French (2006) and Healy et al. (2014) to use Fama-Macbeth regression for estimating ROA. *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 presents the definitions of variables.

Dependent Variable	ROA_t
ROA_{t-1}	0.512***
	(22.06)
$Revenue_{t-1}$	0.005*
	(1.74)
$Capital\ ratio_{t-1}$	0.066
	(0.37)
$Loans_{t-1}$	-0.027***
	(-4.54)
$Total\ Assets_{t-1}$	-0.004**
	(-2.21)
$Diversification_{t-1}$	0.004***
	(3.42)
$Managerial\ Efficiency_{t-1}$	0.129***
	(13.97)
$Growth\ of\ Total\ Assets_{t-1}$	0.002***
	(6.11)
Constant	-0.456**
	(-2.02)
N	77929

Table 4
Determinants of Bank Profit Adjustment Speed: a ten-year window of IBBEA

We assume λ_i to be dynamic, so it varies across banks and over time. *Z* is a vector of all independent variables. This table presents the OLS results for parameter estimates on Z in the Partial Adjustment Model: (ROA_{it} - ROA_{it-1} = (λ_i + γZ_{it-1}) GAP_{it-1} + ε_{it} ,GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1}) over the ten-year period in which no more than five years are distant from the IBBEA introduction year. Discretionary Loan Loss Provisions are the proxy for earnings management across all columns. *t*-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	(1)	(2)	(3)	(4)	(5)
				Below target GAP>0	Above target GAP<0
Geographic Expansion Index	0.094***		0.090***	0.057***	0.042***
	(7.38)		(8.70)	(11.09)	(7.11)
Discretionary Loan Loss Provisions		-0.178***	-0.176***	0.041***	-0.069***
		(-4.25)	(-4.22)	(9.66)	(-10.21)
Z-score	-0.012	-0.009	-0.009	-0.004	-0.116***
	(-1.63)	(-1.21)	(-1.21)	(-0.68)	(-12.46)
Capital Ratio	0.021***	0.022***	0.022***	-0.005	0.007
	(3.14)	(3.21)	(3.21)	(-1.13)	(1.27)
Loan to Total Asset	-0.004	-0.010	-0.010	0.062***	-0.003
	(-0.60)	(-0.96)	(-0.96)	(9.13)	(-0.39)
Size	-0.053***	-0.054***	-0.054***	-0.051***	-0.074***
	(-5.03)	(-5.04)	(-5.04)	(-5.34)	(-9.65)
Total Assets Growth	0.006	0.008	0.008	-0.023***	0.021***
	(1.28)	(1.43)	(1.43)	(-5.52)	(3.84)
Managerial Efficiency	-0.026***	-0.027***	-0.027***	-0.004	-0.072***
	(-4.11)	(-4.22)	(-4.22)	(-1.09)	(-11.99)
Income Diversification	-0.005	-0.006	-0.006	0.018***	-0.039***
	(-1.03)	(-1.11)	(-1.11)	(5.45)	(-6.43)
Inflation	0.017	0.019	0.019	-0.049***	-0.068***
	(1.12)	(1.34)	(1.34)	(-8.49)	(-11.91)
GDP Growth	0.013	0.014	0.014	-0.119***	0.019***
	(1.39)	(1.50)	(1.50)	(-21.74)	(3.38)
GDP Per Capita	-0.001	-0.001	-0.001	-0.383***	-0.197***
	(-0.06)	(-0.09)	(-0.09)	(-25.28)	(-14.22)
Constant	0.091***	0.091***	0.097***	0.850***	0.738***
	(9.66)	(9.70)	(9.70)	(54.33)	(51.39)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	77929	77929	77929	128584	97513
adj. R-sq	0.792	0.793	0.793	0.659	0.613

Table 5A

Determinants of Bank Profit Adjustment Speed: Robust Analysis

We assume λ_i to be dynamic, so it varies across banks and over time. *Z* is a vector of all independent variables. This table presents the placebo tests of the OLS results for parameter estimates on *Z* in the Partial Adjustment Model: ($ROA_{it} - ROA_{it-1} = (\lambda_i + \gamma Z_{it-1})GAP_{it-1} + \varepsilon_{it}$, $GAP_{it-1} = ROA^*_{it-1} - ROA_{it-1}$). Column (1) shows the results controlling for the four years prior to the deregulation year. Before (4, 1) is a dummy variable equals one for year -4 to -1 relative to the deregulation year. Columns (2) displays the results under which Geographic Expansion Index variable is the actual index for one year prior to the actual deregulation. Column (3) displays the regression results for both large banks and their smaller counterparts. Column (4) presents the regression results using the full sample. Column (5) to (7) present the regression results using the sub samples, while (8) to (10) show regression results using different standard errors clustering method. *t*-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	Before(4,1) dummy	Falsified one-year before Geographic Expansion Index	Full sample	Banks with only one branch	Banks with total assets smaller than 100million	Before GLB Act	Bank-level clustering	State-level clustering	State-year-level clustering
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Geographic Expansion Index	0.088***	-0.007	0.071***	0.016***	0.082***	0.029***	0.091***	0.091***	0.091***
	(18.85)	(-1.36)	(18.33)	(3.55)	(6.35)	(6.16)	(12.01)	(3.80)	(4.74)
Before (4,1)	0.011								
	(0.05)								
Geographic Expansion Index*Large Banks									
Geographic Expansion Index*(1-Large Banks)									
Discretionary Loan Loss Provisions	-0.017***	-0.018***	-0.025***	-0.021***	-0.082***	-0.021**	-0.126**	-0.126*	-0.126***
	(-3.27)	(-2.58)	(-5.87)	(-3.14)	(-5.51)	(-2.19)	(-2.32)	(-1.89)	(-2.63)
Early Deregulation Index		0.019**	0.017**						
		(2.31)	(2.21)						
Z-score	-0.013***	-0.032***	-0.058***	-0.090***	-0.050***	-0.061***	-0.069***	-0.069***	-0.069***
	(-12.11)	(-5.68)	(-12.25)	(-9.12)	(-7.36)	(-6.49)	(-7.79)	(-8.46)	(-10.72)
Leverage Ratio	0.017***	0.017***	-0.201***	-0.001	0.004	0.019***	0.014**	0.014**	0.014**
	(3.64)	(3.79)	(-3.27)	(-0.17)	(0.76)	(4.42)	(2.26)	(2.41)	(2.49)
Loan to Total Asset	0.058***	0.000	0.049***	0.033**	0.001	-0.007	-0.026***	-0.026**	-0.026***
	(13.33)	(0.02)	(11.66)	(2.62)	(0.13)	(-0.83)	(-2.86)	(-2.44)	(-2.86)
Size	-0.049***	-0.076***	-0.062***	-0.092***	-0.077***	-0.106***	-0.124***	-0.124***	-0.124***
	(-5.62)	(-8.93)	(-11.57)	(-6.92)	(-6.83)	(-9.71)	(-11.90)	(-13.42)	(-19.08)
Total Assets Growth	0.004	0.004	-0.011***	-0.002	0.017***	-0.002	0.017***	0.017***	0.017***
	(0.85)	(1.14)	(-3.25)	(-0.26)	(3.37)	(-0.38)	(2.82)	(3.43)	(3.01)
Managerial Efficiency	-0.023***	-0.038***	-0.025***	-0.043***	-0.042***	-0.043***	-0.093***	-0.093***	-0.093***
	(-4.34)	(-9.60)	(-7.61)	(-3.97)	(-9.56)	(-4.93)	(-14.06)	(-13.61)	(-16.58)

Income Diversification	-0.010**	-0.007*	0.000	-0.012*	-0.013**	-0.034***	-0.013**	-0.013	-0.013***
	(-2.28)	(-1.90)	(0.03)	(-2.00)	(-2.01)	(-4.77)	(-2.10)	(-1.64)	(-2.60)
GDP Growth	0.015	0.001	-0.075***	-0.054***	-0.114***	-0.005	-0.007	-0.007	-0.007
	(1.62)	(0.29)	(-25.29)	(-5.86)	(-15.15)	(-0.76)	(-0.93)	(-0.95)	(-0.88)
Inflation	0.006	-0.019***	-0.056***	-0.029***	0.048***	0.009	0.001	0.001	0.001
	(0.47)	(-3.51)	(-16.63)	(-3.33)	(2.97)	(1.21)	(0.11)	(0.14)	(0.08)
GDP Per Capita	-0.321***	-0.121***	-0.354***	-0.192***	-0.592***	0.114***	0.047	0.047	0.047
	(-45.30)	(-37.27)	(-43.49)	(-8.84)	(-19.46)	(5.75)	(1.09)	(1.24)	(0.94)
Constant	0.896***	0.857***	0.823***	0.659***	1.124***	0.750***	0.702***	0.702***	0.702***
	(80.29)	(85.79)	(88.14)	(26.71)	(24.80)	(43.23)	(19.55)	(21.07)	(16.69)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	226153	77929	226153	42942	102551	140572	77929	77929	77929
adj. R-sq	0.826	0.808	0.701	0.777	0.614	0.826	0.697	0.697	0.697

Table 5B

Determinants of Bank Profit Adjustment Speed: Robustness checks

We assume λ_i to be dynamic, so it varies across banks and over time. Z is a vector of all independent variables. This table presents the OLS results for parameter estimates on Z in the Partial Adjustment Model. We use the event DID results. [$ROA_{it} - ROA_{it-1}=(\sum Before^t+\sum After^t+ \gamma Z_{it-1}) GAP_{it-1}+ \varepsilon_{it}$, GAPit-1 = $ROA^*_{it-1} - ROA_{it-1}$], $Before^t(After^t)$ is a dummy variable equal to 1 for *t* years before(after) the introduction of deregulation of a state. For example, $Before^5$ equals 1 for year 5 before a state's first time deregulation, and 0 otherwise. We apply OLS regression. t-statistics are in parentheses. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	(1)
Before 5	-0.037**
	(-2.57)
Before 4	-0.031*
	(-1.82)
Before 3	0.006
	(0.37)
Before 2	-0.020
	(-1.21)
Before 1	0.011
	(0.90)
After 1	0.034***
	(2.59)
After 2	0.258***
	(4.02)
After 3	0.1190*
	(1.78)
After 4	0.032**
	(2.56)
After 5	0.008
	(0.61)
Discretionary Loan Loss provisions	-0.113*
	(-1.89)
Constant	0.7585***
	(112.92)
Bank Controls	Yes
Time Fixed Effects	Yes
Bank Fixed Effects	Yes
N	77929
adj. R-sq	0.687

Table 6
Determinants of Bank Profit Adjustment Speed: Heterogeneity

This table investigates the potential mechanisms between earnings adjustment speed and bank competition. The Geographic Expansion measure is a state level competition measure. Following Rice and Strahan (2010), Geographic Expansion is an index that captures the level of interstate Geographic Expansion for each state. All other variables are defined in the appendix. *, **, *** represents the significance level of 10%, 5% and 1% respectively.

	(1)	(2)	(3)	(4)
Geographic Expansion Index *Size	-0.034***			
	(-6.28)			
Geographic Expansion Index *Income Diversification		-0.011***		
		(-2.93)		
Geographic Expansion Index *Managerial Efficiency			-0.037***	
			(-5.83)	
Geographic Expansion Index *Z-score				-0.007***
				(-3.45)
Geographic Expansion Index	0.056***	0.042***	0.057***	0.088***
	(4.27)	(6.68)	(5.96)	(7.43)
Discretionary Loan Loss provisions	-0.019***	-0.021***	-0.016***	-0.021***
	(-4.75)	(-5.17)	(-3.84)	(-5.13)
Z-score	-0.086***	-0.084***	-0.090***	-0.114***
	(-17.28)	(-16.69)	(-18.56)	(-11.45)
Capital Ratio	-0.003	-0.003	-0.004	-0.003
	(-0.42)	(-0.38)	(-0.56)	(-0.43)
Loan to Total Asset	0.072***	0.071***	0.056***	0.070***
	(13.62)	(13.12)	(10.11)	(13.31)
Size	-0.033***	-0.065***	-0.070***	-0.064***
	(-4.02)	(-12.13)	(-12.95)	(-12.09)
Total Assets Growth Rate	-0.018***	-0.017***	-0.010***	-0.017***
	(-4.75)	(-4.39)	(-2.63)	(-4.37)
Managerial Efficiency	-0.107***	-0.042***	-0.012***	-0.036***
	(-5.14)	(-8.38)	(-2.89)	(-7.52)
Income Diversification	0.005*	-0.018***	0.004	-0.000
	(1.80)	(-2.84)	(1.26)	(-0.06)
GDP Growth Rate	-0.077***	-0.077***	-0.077***	-0.078***
	(-23.47)	(-23.67)	(-23.87)	(-23.88)
Inflation	-0.071***	-0.073***	-0.070***	-0.074***
	(-21.85)	(-22.31)	(-22.03)	(-22.60)
GDP Per Capita	-0.261***	-0.254***	-0.249***	-0.256***
	(-41.61)	(-41.39)	(-40.17)	(-41.87)
Constant	0.980***	0.634***	0.691***	0.618***
	(18.76)	(70.01)	(103.31)	(48.61)
Time Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
N	226153	226153	226153	226153
adj. R-sq	0.707	0.707	0.708	0.7073

Table 7
The Impact of Competition on Bank Earnings Management

This table presents the OLS results between competition and earnings management with the full sample, and when the bank is above or below its ROA target (GAP<0 or GAP>0). The dependent variable, earnings management, is measured by Discretionary Loan Loss Provisions. As to independent variable, competition is measured by Geographic Expansion Index. *, **, *** denote the 10%, 5% and 1% significance levels, respectively. Appendix presents the definitions of variables.

	(1)	(2)	(3)
	Full Sample	Below target GAP>0	Above target GAP<0
Geographic Expansion Index	0.00008**	0.00000	0.00002**
	(1.97)	(0.77)	(2.32)
Z-score	-0.000***	-0.000	-0.000***
	(-10.20)	(-1.52)	(-14.93)
Leverage Ratio	-0.001	0.002**	-0.003***
	(-1.14)	(1.98)	(-3.29)
Loan to Total Asset	0.008***	0.008***	0.009***
	(131.77)	(108.44)	(94.53)
Size	0.000***	0.000***	0.000***
	(8.56)	(3.41)	(7.71)
Total Assets Growth Rate	-0.000***	-0.000***	-0.000***
	(-70.73)	(-49.13)	(-53.47)
Managerial Efficiency	-0.000***	-0.000	-0.000***
	(-13.86)	(-0.89)	(-3.81)
Income Diversification	0.000***	0.000***	0.000***
	(4.99)	(6.23)	(4.07)
GDP Growth Rate	-0.000***	-0.000***	-0.000***
	(-89.79)	(-49.22)	(-49.38)
Inflation	-0.003***	-0.003***	-0.003***
	(-185.22)	(-177.35)	(-95.00)
GDP Per Capita	0.043***	0.037***	0.044***
	(52.89)	(30.66)	(34.03)
Constant	-0.456***	-0.388***	-0.457***
	(-52.25)	(-29.25)	(-31.92)
Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
N	214403	128584	97513
adj. R-sq	0.776	0.778	0.771

Table 8
The Impact of Competition on Bank Realized gains/losses of AFS

This table investigates whether competition induces banks earnings management using realized gains/losses of available for sale securities, when the bank is above or below its ROA target (GAP<0 or GAP>0). The dependent variable is Realized gains/losses of AFS scaled by total assets. NI is net income before tax and realized gains/losses of AFS scaled by total assets. The Geographic Expansion Index measure is a state level competition measure. All other variables are defined in the appendix. *, **, *** represents the significance level of 10%, 5% and 1% respectively. Appendix presents the definitions of variables.

	(1)	(2)	(3)
	Full Sample	Below target GAP>0	Above target GAP<0
NI	-0.048***	-0.012***	-0.008***
	(-26.62)	(-24.04)	(-18.07)
Geographic Expansion Index	0.000	0.000001*	0.000
	(0.16)	(1.69)	(1.04)
NI*Geographic Expansion Index	-0.000	0.000	0.000
	(-0.83)	(0.53)	(1.46)
Discretionary Loan Loss Provisions	0.035***	0.001	0.009***
	(10.01)	(1.19)	(6.36)
Z-score	-0.000***	-0.000*	0.000
	(-2.91)	(-1.87)	(1.39)
Leverage Ratio	0.000	-0.000	0.000***
	(0.22)	(-0.47)	(3.20)
Loan to Total Asset	-0.002***	-0.000***	-0.000***
	(-6.34)	(-7.51)	(-8.48)
Size	0.005***	0.000***	0.000***
	(2.73)	(9.52)	(6.42)
Total Assets Growth Rate	0.000***	0.000***	0.000
	(3.43)	(4.59)	(1.43)
Managerial Efficiency	-0.003***	-0.000***	-0.000***
	(-23.05)	(-22.31)	(-14.51)
Income Diversification	-0.000***	-0.000***	-0.000***
	(-7.84)	(-5.38)	(-3.89)
GDP Growth Rate	0.003***	0.000	0.000***
	(8.72)	(1.19)	(3.91)
Inflation	-0.008***	-0.000***	-0.000***
	(-8.00)	(-6.73)	(-3.55)
GDP Per Capita	-0.003***	0.000***	0.000**
	(-6.67)	(5.48)	(1.98)
Constant	0.001	-0.001***	-0.001***
	(1.51)	(-9.50)	(-5.42)
Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
N	146338	78491	47324
adj. R-sq	0.112	0.079	0.081

Appendix
Definition of Variables

Variable Name	Definition
Earnings Management measure	
Discretionary Loan Loss Provisions	The Earnings Management measures the discretionary loan loss provisions manipulated by each bank. It is obtained from the discretionary loan loss provision model (Cohen et al., 2014). We treat the absolute value of the error term as the earnings management indicator. The Higher the absolute residual value, the more earnings management the bank applied.
Competition Measures	
Geographic Expansion Index	The Interstate Banking and Branching Efficiency Act (IBBEA) is an exogenous shock of competition. Followed by Rice and Strahan (2010), Geographic Expansion Index captures the level of interstate branching restrictions for each state. Before 1994, the index in each state equals to zero, while, after 1994, 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 highest competition and 0 means lowest competition
Bank-controls	
Z-score	The Z-score 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. We use 3-year rolling window to estimate standard deviation of ROA. Higher Z-score indicates greater financial stability.
Capital Ratio	The ratio of total equity to total assets
Bank Size	The natural logarithm of total assets
Total Assets Growth	The yearly total assets growth rate
Managerial Efficiency	One minus the ratio of total cost to total income
Income Diversification	The ratio of non-interest income to total operating income
Loans to total assets.	The ratio of total loans to total assets
Early Deregulation Index	Early Deregulation Index represents the wave of deregulation before IBBEA. This index equals zero prior to the earlier of the year of intra- or inter-state deregulations, one if the state deregulates either full intra-state branching through acquisition and de novo branching or inter-state banking, and two if the state deregulates both types of branching expansions. The years of these deregulations are gained from Kroszner and Strahan (1999).
Macro-controls	
GDP Growth	Annual GDP growth rate
Inflation	Annual inflation growth rate
GDP per capita	GDP divided by the number of the people in the country