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ABSTRACT

Did regulatory reforms that lowered barriers to competition among U.S. banks increase or decrease the quality of information that banks disclose to the public and regulators? We find that an intensification of competition reduced abnormal accruals of loan loss provisions and the frequency with which banks restate financial statements. The results indicate that competition reduces bank opacity, enhancing the ability of markets and regulators to monitor banks.

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1. Introduction

When banks manipulate their financial statements, this can increase bank opacity and interfere with the private governance and official regulation of banks. In particular, banks manage their financial statements to smooth earnings, circumvent capital requirements, and reduce taxes, as shown by Ahmed et al. (1999) and Beatty et al. (2002). Related research suggests that such manipulations reduce bank stability, the market's valuation of banks, and loan quality, e.g., Beatty and Liao (2011), Bushman and Williams (2012), and Huizinga and Laeven (2012). More generally, the findings by King and Levine (1993), Jayaratne and Strahan (1996) and Beck et al (2000) imply that any factor—including bank opacity—that interferes with the governance of banks can distort capital allocation and slow growth.

Nonetheless, little is known about the impact of bank regulations and competition on bank opacity. While Campbell and Kracaw (1980), Berlin and Loeys (1988), Morgan (2002), and Flannery et al. (2004) examine the comparative opacity of banks and nonfinancial firms, they do not examine the determinants of bank opacity. Barth et al. (2004, 2006, 2009) and Beck et al. (2006) find that banks allocate capital more efficiently in countries that penalize bank executives more for disclosing erroneous information. But, this work does not consider the potential role of competition on bank opacity and unobserved country traits might account for their findings. Given the importance of banks for economic growth, the scarcity of research on the market and regulatory determinants of bank opacity is surprising and potentially consequential.

In this paper, we provide the first assessment of the impact of bank regulatory reforms that spurred competition among banks on bank opacity. Theory offers conflicting perspectives on the effect of competition on information disclosure. Scharfstein (1988) and Darrough and Stoughton (1990) argue that competition can induce incumbent firms to manipulate information to hinder the entry of rivals. Shleifer (2004) maintains that greater competition spurs executives to engage in unethical behavior, including more aggressive accounting practices. Stein (1989) and Kedia and Philippon (2009) show that competition can spur executives to manage financial accounts to extract short-term rents. Other models (e.g.,

Hart, 1983; Schmidt, 1997), however, stress that competition enhances the governance of firms, potentially compelling managers to disclose more reliable information to investors.[1]

To evaluate the impact of competition on measures of bank opacity, we begin by exploiting three sources of variation in the removal of regulatory impediments to bank competition among U.S. banks during the last quarter of the 20th century. First, individual states eliminated restrictions on intrastate branching. For much of the twentieth century, states limited the ability of banks to compete with each other by imposing restrictions on banks establishing branch networks within states. States removed these barriers to competition in different years. Second, interstate bank deregulation eased regulatory impediments to bank holding companies (BHCs) headquartered in one state establishing subsidiaries in other states. As emphasized by Goetz et al. (2013), not only did individual states begin interstate deregulation in different years, these reforms progressed in a state-specific process of bilateral and multilateral agreements over two decades. Thus, we use several time-varying measures of the exposure of a state's banking market to competition from BHCs headquartered in other states. Third, while the Riegle-Neal Act of 1994 eliminated intrastate branch and interstate bank restrictions, states had leeway in the timing of interstate branch deregulation, which is when BHCs in one state can establish branches in other states. Since the costs of establishing branches are lower than those of establishing subsidiaries, interstate branch deregulation further lowered barriers to competition. Jayaratne and Strahan (1998), Stiroh and Strahan (2003), and Johnson and Rice (2008) show that these regulatory reforms spurred competition among banks.

There is, however, an important limitation to these state-time measures of deregulation-induced competition. They are not computed at the bank subsidiary or even the BHC level. Although research finds that these regulatory reforms spurred competition among banks within a state, this does not necessarily imply that they influenced bank opacity by intensifying competition. Perhaps, deregulation produced other changes in a state that

[1] Dichev et al. (2013) find that cross-firm comparisons help investors detect earnings management. If competition facilitates such comparisons, this is an additional mechanism through which competition can enhance transparency.

influenced the quality of bank financial statements, and it is these other changes—not increased competition—that influences bank opacity.

Consequently, we offer a new approach for constructing time-varying, bank-specific measures of competition. Our approach is based on the "gravity model" view that distance matters for investment and hence for the degree of competition faced by bank subsidiaries and BHCs. For example, after state *j* allows BHCs in state *i* to enter and establish subsidiaries in state *j*, two subsidiaries in state *j* may face different competitive pressures from state *i*, depending on their distance to state *i*. That is, when California deregulates with Arizona, the banks in southern California may face greater competitive pressures from Arizona than banks in northern California. Indeed, Goetz et al. (2013, 2014) show that BHCs are more likely to enter geographically close banking markets following deregulation. By integrating the gravity model with interstate bank deregulation, we build time-varying, bank-specific measures of deregulation-induced competition.

To do this, we first construct measures of the competitive environment facing each subsidiary. For each subsidiary in each period, we identify those states whose BHCs can enter the subsidiary's state. We then weight each of those states by the inverse of its distance to the subsidiary. This yields an inverse-distance measure of the regulatory-induced competitive environment facing each subsidiary. Second, we calculate the competitive environment facing a consolidated BHC by weighting these subsidiary level measures of competition by the proportion of each subsidiary's assets in the BHC. We examine the BHC-specific measures, in addition to the subsidiary-level measures, because parent companies may shape the financial disclosure policies of subsidiaries. Our approach also accounts for the fact that a BHC's competitive-environment will change as the states in which it has subsidiaries change their policies. For example, a BHC headquartered in state *j* with subsidiaries in other states will experience changes in competition as those other states deregulate, subjecting the BHC to greater competition even if state *j* does not open-up to additional states. We also examine other BHC-specific measures of regulatory-induced competition that incorporate information on the economic sizes of different states.

We then assess the relationships between various measures of bank opacity and these BHC-specific and subsidiary-specific measures of competition while controlling for state-time fixed effects. In this way, we control for all time-varying state characteristics, including the state-time indicators of bank regulatory reforms. By integrating the gravity model into the process of deregulation, we differentiate the competitive pressures facing banks in the same state and assess whether changes in these competitive pressures influence the quality of their financial statements.

As proxies for bank opacity, we use two strategies for measuring the quality of financial statements. First, we use the frequency with which banks restate their earnings with the Securities and Exchange Commission (SEC). Restatements imply that banks misstated their financial statements. Though imperfect, more frequent restatements provide a negative signal about disclosure quality. Due to data limitations, we can only use financial restatements for a subset of our analyses.

The second strategy focuses on loan loss provisions (LLPs), which are the most important bank accrual through which banks manage earnings and regulatory capital (Beatty and Liao, 2014).[2] As reviewed by Dechow et al. (2010), an extensive literature constructs proxies of the quality of financial statements by estimating a model of LLPs and using the absolute values of the residuals as indicators of the "abnormal" accrual of LLPs, which are also called *discretionary LLPs*. Interpreting such abnormal accruals as reflecting disclosure quality, relies on the efficacy of the underlying LLP model. Since Beatty and Liao (2014) assess the effectiveness of bank LLP models in predicting bank earnings restatements and comment letters from the SEC, we begin our analyses with their preferred model. We then extend this model to address potential concerns arising from our study of bank regulatory reforms. Specifically, if bank deregulation improves the accuracy of the underlying LLP model and we do not account for this, then we may inappropriately interpret the reduction in the estimated errors as a reduction in the manipulation of bank financial accounts. To reduce this concern, we (1) include measures of deregulation in the preferred LLP model to allow for

[2] Provision for loan losses is an expense on a bank's income statement. In contrast, allowances for loan losses enter as an asset on the bank's balance sheet, where these allowances equal the accumulated loan loss provisions from income statements minus write offs from recognized losses on loans.

the possibility that bank deregulation shifts the LLP model, (2) fully interact the bank deregulation indicators with the LLP model regressors to allow for a change in the entire model after deregulation, and (3) use several alternative LLP models. The results are robust across all of these LLP models.

We use a difference-in-differences estimation strategy. The dependent variable is either a measure of discretionary LLPs for each BHC in each period or, for a subset of the analyses, a measure of financial restatements. In our initial assessments, the core independent variables are measures of intrastate branch, interstate bank, and interstate branch deregulation that vary by state and year. In these analyses, we condition on BHC and time fixed effects, as well as an array of time-varying BHC traits. We then examine the BHC-specific and subsidiary-specific, measures of deregulation-induced competition. In these analyses, we not only condition on BHC fixed effects and subsidiary fixed effects, respectively, we also condition on state-time fixed effects. Past research and our assessments support our treatment of these three regulatory reforms as exogenous to disclosure quality. Several studies show that the timing of deregulation does not reflect bank performance (Jayaratne and Strahan, 1998; Goetz et al., 2013) or state economic performance (Jayaratne and Strahan, 1996; Morgan et al., 2004; Demyanyk et al., 2007; Beck et al., 2010). We demonstrate below that discretionary LLPs do not predict the timing of bank deregulation and there are no trends in LLPs prior to deregulation. Given data availability, we conduct the analyses over the period from 1986 through 2006 using quarterly data.

Our initial assessments indicate that regulatory reforms that lowered barriers to bank competition enhanced disclosure quality and reduced the frequency of financial restatements with the SEC. For each of the three different types of regulatory reforms, we find a negative, statistically significant, and economically large impact on discretionary LLPs. For example, consider the traditional measure of the timing of interstate bank deregulation as the year when a state first deregulated with any other state. After this event, discretionary LLPs are half as large as they were before deregulation.

Moreover, we discover that both the BHC-specific and the subsidiary-level measures of regulatory-induced competition are strongly and negatively associated with discretionary

LLPs. In these analyses, identification comes from differentiating between BHCs and subsidiaries within the same state that differ in terms of their distance to other states. These results hold when controlling for state-time fixed effects, as well as an assortment of time-varying BHC and subsidiary traits. Thus, the results are not driven by changes in regulatory policies at the state-time level; rather, they are driven by the differential impact of interstate banking reforms on BHCs and subsidiaries within a state that arise because of their differential distance to competitors. The findings suggest that interstate bank deregulation reduced discretionary LLPs by intensifying competition.

Our work contributes to the debate on the impact of competition on disclosure quality and earnings management, which has focused on nonfinancial firms. Ali et al., (2009) stress that difficulties in finding sound proxies for competition and exogenous sources of variation in competition have hindered research. For example, much of this literature uses cross-industry concentration indicators to proxy for competition differences. But, cross-industry concentrations differences might not reflect differences in competition, confounding the interpretation of such studies. In this paper, we focus on one industry and offer a new strategy for measuring exogenous variation in competition at the BHC and subsidiary levels, so that we can better identify the impact of competition-enhancing reforms on disclosure quality.

The paper proceeds as follows. Section 2 discusses the data and empirical methods. Section 3 presents the main results. Section 4 discusses robustness tests. Section 5 concludes.

2. Data, Methodology, and the Validity of the Identification Strategy

2.1 Data on BHCs and states

The Federal Reserve provides consolidated balance sheets and income statements for BHCs on a quarterly basis starting in June 1986. We examine the ultimate parent BHC that owns, but is not owned by, other banking institutions, where we define ownership as 50% or more of the financial institutions equity. More specifically, we follow Goetz et al. (2013) and use code RSSD9364 in the Y-9C reports to link bank subsidiaries to the parent BHCs and code RSSD9365 to assign a subsidiary bank to the parent BHC if the latter owns at least 50% of the subsidiary's equity stake. In robustness tests, we examine individual commercial banks, rather than parent BHCs, using data from the Reports of Condition and Income ("Call Reports"), and obtain qualitatively similar results. We focus on the parent BHC results both because many commercial banks are not public listed and hence do not have stock price data and because diversification during our sample period occurred primarily through BHC subsidiaries, not through the branch networks of commercial banks.

Our sample contains 27,137 BHC-quarter observations on 911 BHCs headquartered in one of 48 states or the District of Columbia. Consistent with the literature on US bank deregulation, we exclude the states of Delaware and South Dakota from our sample because they changed their laws to encourage the entry and formation of credit card banks.

For stock prices, financial restatements, and state characteristics, we use several additional datasets. Center of Research in Security Prices (CRSP) has information on stock prices and outstanding shares. We construct a dataset on financial restatement information manually from 10-K, 10Q, and 8-K files from EDGAR, which gathers information from the Securities and Exchange Commission (SEC) filings of public firms. The Bureau of Economic Analysis provides state-level data on social and economic demographics.

2.2 The dates of bank deregulation

We use the timing of three types of bank deregulation as exogenous sources of variation in the competitiveness of the banking market in each U.S. state. During the last quarter of the twentieth century, federal and state authorities reduced restrictions on (1)

intrastate bank branching—the ability of banks to establish branches within a state, (2) interstate banking—the ability of banks to establish subsidiary banks across states, and (3) interstate branching—the ability of banks to establish branches across states. These policy changes increased the contestability of banking markets, as a broader array of banks within a state and from different states could compete to sell banking services. Reflecting this competition, deregulation reduced interest rates on loans, increased interest rates on deposits, and did so without boosting loan delinquency rates (Jayaratne and Strahan, 1996, 1998). Johnson and Rice (2008) summarize the history of U.S. deregulation of geographic restrictions on banking.

With respect to intrastate bank branching, most states restricted branching within (and across) state borders for much of the 20th century. From the mid-1970s through the mid-1990s, states relaxed regulatory restrictions on the ability of BHCs to form branch networks within state. This relaxation evolved gradually, with the last states lifting restrictions following the 1994 passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act. Consistent with Jayaratne and Strahan (1996) and others, we choose the date of intrastate branch deregulation as the date on which a state first permitted banks to establish branch networks. Thus, *INTRA* equals one for BHCs headquartered in a state in the periods after that state initiates intrastate branch deregulation and zero otherwise. To be compatible with the quarterly level BHC-characteristic data, we assume that the deregulation happens in the last quarter of the year in which the state deregulated, so that *INTRA* equals one starting from the first quarter of next year. We also make similar assumptions for the other deregulation dummy variables.

States also engaged in a process of interstate bank deregulation, in which a state allowed banks from other states to acquire or establish subsidiary banks in its borders. Over the period from 1978 through 1994, states removed restrictions on interstate banking in a dynamic, state-specific process either by unilaterally opening their state borders and allowing out-of-state banks to enter or by signing reciprocal bilateral and multilateral agreements with other states. The process of interstate bank deregulation ended with the passage of the

Riegle-Neal Act of 1994 that eliminated restrictions on BHCs establishing subsidiary bank networks across state boundaries.

There are several ways to date interstate bank deregulation. Most researchers simply define a state as "deregulated" after it first lowers barriers to interstate banking with at least one other state. In our analyses, *INTER* equals one for BHCs headquartered in a state in the years after that state first allows interstate banking and zero otherwise.

More recently, Goetz et al. (2013) exploit the dynamic process of each state's removal of impediments to out-of-state banks to date interstate bank deregulation. Based on this work, we construct three measures of interstate bank deregulation. $Ln(\#\ of\ States)_{jt}$ equals the natural logarithm of one plus the number of states whose banks can enter state *j* in year *t*. This measure evolves in a state-specific manner as some states unilaterally open their borders and others proceed with a process of bilateral and multilateral reciprocal arrangements. $Ln(\#\ of\ States\text{-}Distance\ Weighted)_{jt}$ equals the natural logarithm of one plus the number of other states whose banks can enter state *j* in year *t*, where each of these other states is weighted by the inverse of their distance from the state. We construct and use $Ln(\#\ of\ States\text{-}Distance\ Weighted)_{jt}$ because BHCs might find it more beneficial and less costly to enter close states rather than distant ones, with corresponding ramifications on the competitiveness of banking markets. The third measure is $Ln(\#\ of\ BHCs\ from\ Other\ States)_{jt}$, and it equals the natural logarithm of one plus the number of BHCs in states that can enter state *j* in year *t*. This measure allows for the possibility that a state's BHCs will face more competition when there is an increase in the number of BHCs from other states that can enter its market.

States also relaxed restrictions on interstate bank branching. While the Riegle-Neal Act of 1994 effectively removed restrictions on interstate banking, it allowed states some discretion on the timing of the lowering of barriers to the establishment of branch networks by BHCs in other states. So, BHCs from state *j* were able to establish a subsidiary in state *i* after 1994, but they were not necessarily able to establish branches in state *i*. The year in which states allowed interstate branching varies between 1994 and 1997. In the analyses below, *INTER-BRANCH* equals one if a BHC is headquartered in a state that allows the

BHCs from other states to establish branch networks and zero otherwise. Appendix Table 3 provides the dates of *INTRA*, *INTER*, and *INTER-BRANCH* for each state.

2.3 Estimating disclosure quality

We use two approaches for measuring the quality of bank financial statements. One approach measures the frequency with which banks restate their financial statements with the SEC. Due to limitation on the time-series availability of financial restatements we can only conduct these for a subset of the data. We define financial restatements more fully and implement this approach below

The second approach examines LLPs, which are the major mechanism through which banks manage both earnings and regulatory capital. This approach measures disclosure quality by estimating a model of LLPs and using the absolute values of the residuals to construct indicators of the "abnormal" accrual of LLPs. Interpreting such abnormal accruals as "disclosure quality" relies on the efficacy of the underlying model of LLPs. Beatty and Liao (2014) assess nine different LLP models proposed by the banking literature. They find that one model performs particularly well in predicting earning restatements and comment letters from the Securities and Exchange Commission. We begin our analyses with Beatty and Liao's (2014) "preferred" model. We then extend this model and use alternative LLP models to assess the robustness of our results.

More specifically, we construct measures of disclosure quality for each BHC in each period using the following two-step procedure. We first run a regression using Beatty and Liao's (2014) preferred LLP model to separate the systemic component of LLPs, i.e., the component of LLPs accounted for by BHC and state determinants, from that part of LLPs unaccounted for by these fundamentals. To account for the impact of deregulation on LLPs, we also include the deregulation measures in this first step. The results are robust to excluding the deregulation measures, as we show in an online annex.

The first-step regression is as follows:

$$LLP_{bjt} = \alpha_1 dNPA_{b,j,t+1} + \alpha_2 dNPA_{bjt} + \alpha_3 dNPA_{b,j,t-1} + \alpha_4 SIZE_{b,j,t-1} + \alpha_5 dLOAN_{bjt} + \alpha_6 CSRET_{jt} + \alpha_7 dGSP_{jt} + \alpha_8 dUNEMP_{jt} + \alpha_9 D_{jt} + \delta_j + \varepsilon_{bjt} \quad (1)$$

In this model, D_{jt} represents the bank deregulation measures that we defined above. $dNPA_{bjt}$ represents the change in non-performing assets between quarter *t* and *t-1* divided by total loans in quarter *t-1* for BHC *b* in state *j*. Following Bushman and Williams (2012), this model includes current period $dNPA_{bjt}$ and next period $dNPA_{b,j,t+1}$ because banks might use current and forward-looking information on non-performing assets in selecting LLPs. The model includes $dNPA_{b,j,t-1}$ since banks might use historical changes in non-performing assets in setting LLPs.[3] $SIZE_{b,j,t-1}$ is the natural logarithm of total assets in quarter *t-1* and is included because official supervisory oversight and private sector monitoring might vary with banks size. $dLOAN_{bjt}$ is the change in total loans over the quarter divided by lagged total loans. This is included to allow for the possibility that an increase in loans is associated with a decrease in loan quality. The model includes measures of three state characteristics that might influence LLP: $CSRET_{jt}$, $dGSP_{jt}$, and $dUNEMP_{jt}$ represent the return on the Case-Shiller Real Estate Index, the change in *GSP*, and the change in the state's unemployment rate, respectively. We also include state fixed effects, δ_j, to account for any time-invariant state characteristics that shape loan loss provisioning.

In the second step, we construct a proxy for the discretionary LLPs of each BHC in each quarter as the logarithm of the absolute values of the errors from estimating equation (1). The errors represent the "abnormal" accrual of LLPs—the component of LLPs unexplained by the regression's fundamental determinants. We use the absolute value of the residuals because both positive and negative residuals may reflect discretionary manipulation of LLPs above and beyond that accounted for by the regressors in equation (1). An extensive literature uses errors from such models to proxy for earnings management, as discussed in Beatty and Liao (2014), Dechow et al. (2010), Yu, (2008), and Jiang et al. (2010). We interpret the results

[3] We do not include the two period lag of *dNPA* as in Beatty and Liao (2014) in the reported analyses because it eliminates many observations. However, including the two period lag of *dNPA* does not affect the results.

reported below under the maintained hypothesis that this proxy reflects the discretionary management of LLPs. As a robustness check, we also conduct the analyses by first averaging the residuals from the quarterly frequency to an annual frequency before taking the logarithm of the absolute value of the residuals and find the results highly robust. For brevity, the results are not presented but are available on request. Appendix Table 1 provides definitions of the variables used in the paper.

To address potential concerns with this approach for constructing measures of the quality of financial statements that are particular to the study of bank deregulation, we extend Beatty and Liao's (2014) preferred model. The concern is as follows: if bank deregulation improves the accuracy of the underlying LLP model, reducing the estimated errors after deregulation, then this might lead us to inappropriately infer that deregulation lowers the manipulation of bank financial accounts. We address this concern in two ways. First, as mentioned above, we include the corresponding indicator of bank deregulation in the first-step LLP model to allow for the possibility that the banking reforms directly shape LLPs. Second, we also conduct the analyses, and report the results below, while fully interacting the bank deregulation indicators with all of the regressors in equation (1) (the LLP model). That is, we modify equation (1) as follows:

$$\begin{aligned} LLP_{bjt} = {} & \alpha_1 dNPA_{b,j,t+1} + \alpha_2 dNPA_{bjt} + \alpha_3 dNPA_{b,j,t-1} + \alpha_4 SIZE_{b,j,t-1} \\ & + \alpha_5 dLOAN_{bjt} + \alpha_6 CSRET_{jt} + \alpha_7 dGSP_{jt} + \alpha_8 dUNEMP_{jt} \\ & + \alpha_9 D_{jt} + \alpha_{10} D_{jt} * dNPA_{b,j,t+1} + \alpha_{11} D_{jt} * dNPA_{bjt} + \alpha_{12} D_{jt} \\ & * dNPA_{b,j,t-1} + \alpha_{13} D_{jt} * SIZE_{b,j,t-1} + \alpha_{14} D_{jt} * dLOAN_{bjt} \\ & + \alpha_{15} D_{jt} * CSRET_{jt} + \alpha_{16} D_{jt} * dGSP_{jt} + \alpha_{17} D_{jt} * dUNEMP_{jt} + \delta_j \\ & + \varepsilon_{bjt}, \end{aligned} \tag{1a}$$

By fully interacting bank deregulation with the explanatory variables in the LLP model, we allow for bank deregulation to change the entire LLP model after deregulation.

This reduces the possibility that we are simply measuring a change in the accuracy of the LLP model, rather than a change in discretionary LLPs.

Appendix Table 2 reports summary statistics for the sample obtained after dropping observations in which the core explanatory variables have missing values. In our sample, the median BHC has $1.1 billion in total assets (*SIZE*), while the average BHC has $11.0 billion of assets. Given the skewed distribution of bank size, we take the logarithm of total assets (*logSIZE*) in the regression analyses. Both the mean and the median of non-performing assets (*NPA*) in our sample is $10,000 per quarter. The median and mean of total loans (*LOAN*)) are $680 million and $5.9 billion, respectively. In terms of the change in loans scaled by total loans (*dLOAN*), the mean and median are 0.03 and 0.02, respectively.

2.4 Empirical methodology

We examine the relationship between disclosure quality and bank deregulation using a difference-in-differences methodology. This strategy controls for all time-invariant BHC and state characteristics as well as all time effects. Furthermore, we condition on a wide array of time-varying BHC characteristics. Our difference-in-differences methodology employs quarterly data on BHCs, and we confirm the findings when aggregating to an annual frequency. Thus, we evaluate the effect of deregulation on disclosure quality by estimating the following model:

$$Disclosure\ Quality_{bjt} = \beta' \cdot D_{jt} + \gamma' \cdot X_{bjt} + \delta_b + \delta_t + \varepsilon_{ijt} \quad (2)$$

where $Disclosure\ Quality_{bjt}$ is the measure of the manipulation of loan loss provisions by BHC *b*, headquartered in state *j*, in quarter *t*, and equals the logarithm of the absolute value of the residuals from equation (1). D_{jt} is bank deregulation in state *j* and in quarter *t*. For bank deregulation, we use the measures of intrastate, interstate bank, and interstate branch deregulation defined above. To emphasize, the deregulation measures used in each version of equation (2), are also used in the equation (1) estimation of LLPs. We also include time fixed effects (δ_t), BHC fixed effects (δ_b), and a vector, $X_{bjt,}$, of time-varying BHC traits that

might explain the management of LLPs.[4] Specifically, following the literature on the quality of banks earnings statements (e.g., Kanagaretnam et al., 2010), X_{bjt} includes the logarithm of bank assets (*logSIZE*), one year lag of loan loss provision scaled by beginning total loans (*LLP_lag*), negative net income indicator variable (*LOSS*), and bank capital ratio (*CAP*). The results hold when including all of these X_{bjt}variables in the equation (1) model for LLPs. In robustness tests, we control for earnings before tax and provisions (*EBTP*) and obtain the same results. We provide the estimates without EBTP since competition may influence discretionary LLPs through its effect on earnings. Similarly, the results are robust to controlling for the particular features of each BHC's loan portfolio, such as the proportion of real estate, commercial and industrial, agriculture, individual, and foreign loans. Including these loan types does not alter the findings.

2.5 On the validity of our approach

Drawing valid inferences from these regressions requires that the change in discretionary LLPs in deregulated and regulated states would have been the same in the absence of deregulation. If the trend in abnormal accruals of LLPs differed in deregulating versus non-deregulating states—if the treatment group had a different trend in outcomes from the control group, then our estimation strategy could yield erroneous inferences.

To assess the validity of our identification strategy, we conducted two types of analyses. First, we present graphs regarding the relationship between disclosure quality and the timing of interstate bank deregulation that illustrate (1) abnormal accruals of LLPs do not predict the timing of deregulation and (2) the reduction in abnormal accruals occurs immediately after a state started the process of interstate bank deregulation.

Figure 1 illustrates the evolution of disclosure quality before and after interstate bank deregulation. We start by making year zero the year when a state started interstate bank deregulation. Then, time for each state is centered at year zero, such that one quarter before

[4] The term "time" refers to year-quarter effects, so that there is a separate dummy variable for each time period.

deregulation is -1 and one quarter after deregulation is +1. We then run the following regression:

$$Disclosure\ Quality_{bjt} = \beta_1 D_{jt}^{-10} + \beta_2 D_{jt}^{-9} + \cdots + \beta_{20} D_{jt}^{+10} + \delta_b + \delta_t + \varepsilon_{bjt}, \qquad (3)$$

where the deregulation dummy variable D_{jt}^{+n} equals one for banks in the *n*th quarter after deregulation, and the deregulation dummy variable D_{jt}^{-n} equals one for banks in the *n*th quarter before deregulation, and δ_t and δ_b are time and BHC fixed effects, respectively. We consider a 20-quarter window, spanning from ten quarters before until ten quarters after deregulation. We then plot the estimated coefficients on the deregulation dummies and provide 5% confidence intervals.

Figure 1 indicates that there is a distinct break in the time-series of abnormal accruals of LLPs when states start interstate bank deregulation.[5] There is no evidence of trends in discretionary LLPs before interstate bank deregulation. While this figure does not control for time-varying state and BHC specific information, the sharp break in discretionary LLPs is consistent with deregulation changing disclosure quality.

Furthermore, we plot the trend of the median value of disclosure quality scaled by *EBTP* (*D-LLP/EBTP*) of each BHC in a state during the period of interstate deregulation, where *EBTP* equals income before taxes and provisions in million U.S. dollars. Disclosure quality is measured as the natural logarithm of the absolute value of discretionary LLPs estimated from equation (1) multiplied by the value of the lag of total loans, which is also measured in million U.S. dollars. Similarly, we still consider a 20-quarter window, spanning from ten quarters before until ten quarters after deregulation. The median *EBTP* of our sample BHCs is $3.02 million, and the median of discretionary LLPs is $0.43 million. In Figure 2, we find similar trend for the *D-LLP/EBTP* that it has large fluctuations during the pre-deregulation period, with the mean ratio around 30%. In contrast, during the post-deregulation period, this ratio quickly reduced to about 13%, and became much more stable than before. In the meantime, we do not find statistical significant increases in *EBTP*

[5] We find that many BHCs established out-of-state subsidiaries in the first year that it was legally feasible, which is consistent with our finding that the reform impact on disclosure quality occurs quickly.

during the post deregulation period. This is because there is no increase in the overall credit demand, and the reduced costs in banking after deregulation have been passed along to bank customers in the form of lower loan rates (Jayaratne and Strahan, 1996; Rice and Strahan, 2010). This result not only reinforces the findings from Figure 1 that there is a statistically significant drop in abnormal LLPs after interstate deregulation, but also shows that this drop is economically large relative to a BHC's earnings.

For the second type of test of the validity of our approach, we tested whether LLPs in a state predict the timing of bank regulatory reforms. Although we control for BHC, and hence state fixed effects, the management of LLPs by a state's banks might influence the timing of intrastate branch, interstate bank, and interstate branch deregulation. Thus, following the method developed in Kroszner and Strahan (1999), we examine whether the degree of information disclosure by a state's BHCs predicts the timing of each type of bank regulatory reform. For each state and year, we aggregate discretionary LLPs by BHCs operating in the state. Specifically, to compute an index of discretionary LLPs in state *j* during year *t*, we weight each BHC's discretionary LLPs by its proportion of assets in state *j*'s banking system during year *t*. We then incorporate lagged values of this index into the Kroszner and Strahan (1999) econometric model for predicting bank regulatory reforms and assess if discretionary LLPs account for the timing of bank regulatory reforms. The Kroszner and Strahan (1999) framework includes the following control variables: GSP per capita, state level unemployment rate, small bank share of all banking assets, capital ratio of small banks relative to large ones, relative size of insurance in states where banks may sell insurance (zero otherwise), relative size of insurance in states where banks may not sell insurance (zero otherwise), an indicator variable that equal to one if banks may sell insurance (zero otherwise), the small firm (fewer than 20 employees) share of the number of firms in the state, an indicator variable that equals one if the state has a unit banking law (zero otherwise), share of state government controlled by Democrats, and an indicator that takes a value of one if the state is controlled by one party (zero otherwise).

Table 1 presents the results of the determinants of banking deregulations using OLS regressions.[6] The sample consists of state-year observations from 1986 to 2006, and we therefore exclude states that deregulated before 1986. While all states deregulated interstate branching restrictions after 1986, only 22 and 20 states started removing restrictions on interstate banking and intrastate branching in or after 1986, respectively. The dependent variables used in Table 1 are *INTER*, *Ln(# of Out-Of-States)*, *Ln(# of Out-Of-States – Distance Weighted)*, *Ln(# of BHCs from Out-Of-States)*, *INTRA*, and *INTER-BRANCH*.

As shown, disclosure quality does not predict the timing of any of the regulatory reforms. There is no evidence that the degree to which BHCs manipulate the information that they disclose to the public or regulators altered the decision of officials to eliminate restrictions on intrastate branching, eased regulatory impediments to interstate banking, or lowered barriers to interstate branching.

3. Main Results

3.1 Bank regulatory reforms and disclosure quality - basic

Table 2 presents regression results on the relationship between disclosure quality and bank regulatory reforms that lowered barriers to competition. In these baseline regressions, we study the different bank regulatory reform indicators one-at-a-time. That is, we first examine *INTRA*, which measures the relaxation of regulatory impediments to intrastate branching. We then consider the four measures of interstate bank deregulation—*INTER*, *Ln(# States)*, *Ln(#States—Distance Weighted)*, and *Ln(# BHCs from Other States)*. Finally, we examine *INTER-BRANCH*, which measures the removal of barriers to BHCs establishing bank branches across state lines. All six regressions control for time-varying BHC characteristics (*logSIZE*, *LLP_lag*, *LOSS*, and *CAP*), time fixed effects, and BHC fixed effects. In parentheses, we report heteroskedasticity consistent standard errors (as defined in MacKinnon and White (1985)) that are clustered at the state-quarter level. These regressions

[6] We obtain quantitatively similar results when using a probit model. However, due to the zero-variance problem, many observations are automatically dropped with the probit estimator.

assess the impact of bank deregulation on disclosure quality. Appendix Table 4 presents the results from the equation (1) estimation of disclosure quality.

The second stage results presenting the relationship between bank regulatory reforms and disclosure quality indicate that these regulatory reforms reduced bank opacity. Each of the six indicators of regulatory reform enters negatively and statistically significantly at the one percent level. Thus, disclosure quality rose after states eased restrictions on the ability of its banks to establish branch networks across the state (*INTRA*). Similarly, after a state started allowing BHCs from other states to enter its borders and establish subsidiaries (*INTER*), disclosure quality improve (column 1). Furthermore, as reported in columns 2-4 of Table 2, each of three dynamic measures of the evolution of interstate bank deregulation enters negatively and significantly: as states allowed BHCs from more states to enter, discretionary LLPs fell. Finally, as indicated by the results on *INTER-BRANCH*, after states allowed BHCs from other states to enter via the establishment of branches (not just via separately capitalized subsidiaries), the quality of information disclosure improved, too.

The estimated coefficients reported in Table 2 suggest that the economic impact of bank deregulation on the management of LLPs is large. For example, the point estimate for the effect of the start of interstate bank deregulation (*INTER*) on discretionary LLPs is -0.47 (column 1), which implies a 47% decrease in abnormal LLPs after a state starts to remove barriers to interstate banking. Similarly, after a state eliminated restrictions on intrastate branching, discretionary LLPs fell by 83%, as reported in column 5. The results suggest an economically large, negative relationship between removing barriers to competition and the management of LLPs.

With respect to the control variables, Table 2 indicates the following. Large BHCs tend to engage in more LLP management. This is consistent with the findings in Huizinga and Laeven (2012) who showed that larger banks have more discretion over asset valuation because they tend to have a larger fraction of hard-to-value assets; therefore, these banks tend to benefit more from the enhanced capability to do asset revaluation. We also find that discretionary LLPs are positively related to *LOSS* (i.e. an indicator variable takes the value of one if net income is negative and zero otherwise). These results suggest that when the bank

makes a loss, there is an uptick in the management of LLPs. This result is consistent with findings in the earnings smoothing literature that banks manage income by either delaying or accelerating provisions for losses (Liu and Ryan, 2006).

3.2 Bank regulatory reforms and disclosure quality – fully interacted model

Table 3 presents results using fully interacted deregulation terms to predict the LLPs in equation (1). In other words, D_{jt} in equation (1) represents one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA,* and *INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table plus each corresponding deregulation measures fully interacted with all the other independent variables used in equation (1). The first stage results using equation (1) on estimating disclosure quality are presented in Appendix Table 5.

The second stage results presenting the relationship between bank regulatory reforms and bank opacity are similar both in terms of coefficient estimates and in terms of statistical significance disregarding whether we use fully interacted deregulation terms to estimate disclosure quality.

3.3 BHC-specific regulatory environment and disclosure quality

There is a potentially important limitation to these state-time regulatory reform measures: They are not computed at the BHC-time level. Although considerable research finds that these regulatory reforms spurred competition among banks, this does not necessarily imply that these reforms improved disclosure quality by intensifying competition. Perhaps, deregulation produced other changes that reduced bank opacity, and it is these other changes—not increased competition—that accounts for the improvement in disclosure quality.

In light of this concern, we develop a new strategy for more precisely identifying the impact of competition on bank behavior. This strategy builds on the "gravity model," which predicts that the costs to a business of opening a new site are positively associated with the distance between the business's headquarters and the site. For example, after state *j* allows

BHCs in state *i* to enter and establish subsidiaries in state *j*, two subsidiaries in state *j* may face different competitive pressures from state *i*, depending on their distance to state *i*. More concretely, when California deregulates with Arizona, the banks in southern California may face greater competitive pressures from BHCs in Arizona than banks in northern California. A large body of evidence validates the "gravity model" by showing that distance influences such investment decisions, including the decision of BHCs to open subsidiaries in other states (Goetz et al., 2013, 2014). We build a BHC-specific-time measure of deregulation-induced competition by integrating this gravity model into the process of interstate bank deregulation.

More formally, we first construct measures of the competitive environment associated with interstate banking facing each subsidiary. For each subsidiary in each period, we identify those states whose BHCs can enter the subsidiary's state. We then weight each of those states by the inverse of its distance to the subsidiary. That is, we calculate the interstate bank competitive pressures facing a subsidiary, *s*, located in state *j* in period *t* as:

$$\boldsymbol{C}_{\boldsymbol{s,j,t}}^{\boldsymbol{SUB}} = \sum_{i} [\boldsymbol{I}_{\boldsymbol{j,i,t}} / \boldsymbol{DIS}_{\boldsymbol{s,i}}] \tag{4}$$

where $\boldsymbol{I}_{j,i,t}$ equals one if BHCs from state *i* are allowed to establish subsidiaries in state *j* in period *t*, and zero otherwise; and, $\boldsymbol{DIS}_{s,i}$ equals the distance between subsidiary s and state *i*.

Second, we aggregate this to the BHC level and calculate the interstate bank competitive pressures facing BHC, *b*, located in state *k* in period *t*. We do this by identifying all of the subsidiaries in each BHC, i.e., all *s* within each *b*, and performing the following calculation:

$$\boldsymbol{BHC\_DIS}_{\boldsymbol{b,k,t}} = \sum_{s \in b} Ln\left[\boldsymbol{C}_{\boldsymbol{s,j,t}}^{\boldsymbol{SUB}}\right] * \boldsymbol{P}_{\boldsymbol{s,b,t}}, \tag{5}$$

where $\boldsymbol{P}_{s,b,t}$ is the proportion of assets of each subsidiary, *s*, within BHC, *b*, in period *t*, relative to the total assets of all of BHC *b*'s subsidiaries.[7] Thus, for each BHC in each period:

[7] In those cases where $C_{s,j,t}^{SUB} = 0$, we include the value as 0.000001.

$$1 = \sum_{s \in b} \boldsymbol{P}_{s,b,t}, \tag{6}$$

We also create two additional BHC-specific-time measures where we also weight by the economic sizes of different states (Gross State Product) and the number of BHCs in states. We call these *BHC_DIS_GSP* and *BHC_DIS_NUM*, respectively. To illustrate the construction we *BHC_DIS_GSP*, we modify the computation of the regulatory-induced competitive pressures facing each subsidiary in each period:

$$\boldsymbol{C}_{\boldsymbol{s,j,t}}^{\boldsymbol{SUB}} = \sum_{i} GSP_j * \boldsymbol{I}_{\boldsymbol{j,i,t}} \Big/ \boldsymbol{DIS}_{\boldsymbol{s,j}} \tag{7}$$

We then proceed as above to construct *BHC_DIS_GSP*.

A novel component of this approach is that it measures the changing competitive environment facing a BHC as the BHC's subsidiaries in other states facing different competitive pressures. For example, a BHC headquartered in state *i* with subsidiaries in other states will experience changes in competition as those other states deregulate, subjecting the BHC to greater competition. In computing these BHC-specific-time competition measures based on regulations and distance, we also calculate and examine other measures that incorporate information on the economic sizes of different states.

With these BHC specific measures, we reexamine the regulatory determinants of bank opacity. In particular, we modify equation (2), so that it now includes these new BHC-specific-time measures of the competitive environment facing BHCs and state-time fixed effects:

$$Disclosure\ Quality_{bjt} = \beta' \cdot BHC\_DIS_{bjt} + \gamma' \cdot X_{bjt} + \delta_{jt} + \delta_b + \varepsilon_{bjt}, \tag{8}$$

where δ_{jt} and δ_b represents state-time and BHC fixed effects, respectively. If (a) the earlier results were driven by competition and (b) the distance of a potential competitor to a market influences the competitiveness of that market, then β should enter negatively and significantly. If, however, the earlier results were driven by a change in some state-time factor occurring when two states lower barriers to interstate banking, then the

BHC-specific-time measure of competition should not provide additional explanatory power in the discretionary LLP analyses.

The results reported in Table 4 indicate that interstate bank deregulation reduced discretionary LLP by intensifying the competitive pressures facing BHCs. In columns 1-3 of Table 4, we first include three BHC-specific deregulation measures (*BHC_DIS*, *BHC_DIS_GSP*, and *BHC_DIS_NUM*) separately into the regression. As shown, they each enter negatively and significantly. In columns 4-6, we use fully interacted deregulation terms to predict disclosure. Consistent with the competition channel, we still find that each of the three BHC-specific deregulation measures enters negatively and significantly. The evidence is consistent with the view that regulatory reforms that intensify the competition faced by a BHC tend to reduce bank opacity.

3.4 Bank regulatory reforms and disclosure quality at the subsidiary level

We also examined disclosure quality at the subsidiary bank level. There are material disadvantages to conducting the analyses at the subsidiary level. First, a BHC's subsidiaries are probably subject to the same accounting policies as the parent organization. Second, subsidiaries are typically not publicly listed, so that market capitalization and other data are typically unavailable for subsidiary banks. However, an advantage of conducting the analyses at the subsidiary level is that we can identify exactly which bank subsidiary is influenced by the interstate banking deregulation.

With these subsidiary specific measures, we reexamine the regulatory determinants of bank opacity. In particular, we modify equation (2), so that it now simultaneously includes (a) the original state-time indicators of interstate banking reforms and (b) these new subsidiary-specific-time measures of the competitive environment facing each subsidiary.

$$Disclosure\ Quality_{sjt} = \beta' \cdot SUBSIDIARY\_DIS_{sjt} + \gamma' \cdot X_{sjt} + \delta_{jt} + \delta_s + \varepsilon_{sjt}, \quad (9)$$

where δ_{jt} and δ_s represents state-time and subsidiary bank fixed effects, respectively.

To do the subsidiary-level analyses, we use the commercial bank dataset published on the Federal Reserve Bank of Chicago website to merge these subsidiary banks with BHCs in our main sample. We exclude those stand-alone banks or banks that do not belong to any BHCs. We end up with a sample of 68,320 bank-quarter observations. However, because some of the banks are lack of capitalization information, our final subsidiary bank data contains 55,015 observations, with 2,879 subsidiary banks spanning from the third quarter of 1986 until 2006. Again, we have excluded the state of Delaware and South Dakota from the sample. These subsidiary banks belong to 881 BHCs (out of 911 BHCs) in our main sample. The results using the BHC subsidiaries are presented in Table 5, and are virtually identical to those using the consolidated BHC.

4. Extensions and Robustness Tests

4.1 Alternative measures of discretionary loan loss provisions

We considered alternative measures of the degree to which banks manipulate information disclosed to the public and regulators. In this subsection, we use different models of loan loss provisioning, collect the residuals from these models, and compute the logarithm of the absolute value of the residuals as alternative proxies of discretionary LLPs. Specifically, we use four additional models described in Beatty and Liao (2014). The first two models are simple modifications of their preferred model of LLPs:

Model (a) in Beatty and Liao (2014):

$$\begin{aligned} LLP_{bjt} = {} & \alpha_1 dNPA_{b,j,t+1} + \alpha_2 dNPA_{bjt} + \alpha_3 dNPA_{b,j,t-1} + \alpha_4 dNPA_{b,j,t-2} \\ & + \alpha_5 SIZE_{b,j,t-1} + \alpha_6 dLOAN_{bjt} + \alpha_7 CSRET_{jt} + \alpha_8 dGSP_{jt} \\ & + \alpha_9 dUNEMP_{jt} + \alpha_{10} D_{jt} + \delta_j + \varepsilon_{bjt}, \end{aligned} \tag{10}$$

Model (b) in Beatty and Liao (2014):

$$LLP_{bjt} = \alpha_1 dNPA_{b,j,t+1} + \alpha_2 dNPA_{bjt} + \alpha_3 dNPA_{b,j,t-1} + \alpha_4 dNPA_{b,j,t-2} + \alpha_5 SIZE_{b,j,t-1} + \alpha_6 dLOAN_{bjt} + \alpha_7 CSRET_{jt} + \alpha_8 dGSP_{jt} + \alpha_9 dUNEMP_{jt} + \alpha_{10} ALW_{b,j,t-1} + +\alpha_{11} D_{jt} + \delta_j + \varepsilon_{bjt}, \quad (11)$$

The next model is from Kanagaretnam et al. (2010):

$$LLP_{bjt} = \alpha_1 ALW_{b,j,t-1} + \alpha_2 NPA_{b,j,t-1} + \alpha_3 CO_{bjt} + \alpha_4 dLOAN_{bjt} + \alpha_5 LOAN_{bjt} + \alpha_6 CSRET_{jt} + \alpha_7 dGSP_{jt} + \alpha_8 dUNEMP_{jt} + \alpha_9 D_{jt} + \delta_j + \varepsilon_{bjt}, \quad (12)$$

and, the final model is from Bushman and Williams et al. (2012):

$$LLP_{bjt} = \alpha_1 dNPA_{b,j,t+1} + \alpha_2 dNPA_{bjt} + \alpha_3 dNPA_{b,j,t-1} + \alpha_4 dNPA_{b,j,t-2} + \alpha_5 SIZE_{b,j,t-1} + \alpha_6 dGSP_{jt} + +\alpha_7 D_{jt} + \delta_j + \varepsilon_{bjt}. \quad (13)$$

All of these models also include deregulation measures and state fixed effects in predicting abnormal LLPs. As shown in Appendix Table 6, these alternative measures of discretionary LLPs yield the same conclusions: Regulatory reforms that spurred competition among banks tended to reduce the management of LLPs.[8] Our main results in general still hold. Using various model specifications, we find that the point estimate for the effect of interstate bank deregulation ranges from -0.2013 to -0.3613 (columns 1-4), which implies about 20-36% decrease in abnormal accrual compared to its sample average for treated BHCs relative to their control group. Thus, the economic sizes of the relationship between regulatory reforms and the reduction in discretionary LLPs are comparable to our main results based on the preferred measure of abnormal accruals of LLPs.

[8] For brevity, we only include the analyses with two measures of interstate bank deregulation, *INTER and Ln(# of states)*. The results are similarly robust to using the other two measures. Also, the number of observations is slightly lower in Appendix Table 6 relative to Tables 2 because one of the new models uses $NPA_{i,j,t-2}$.With the two-period lag, there is a loss of observations and we keep the number of observations constant across the Appendix Table 6 specifications.

4.2 A different measure of information manipulation

Rather than inferring the degree to which banks manipulate information disclosed to the public by using the residuals of an empirical model of LLPs, we also examined the frequency with which banks restate their earnings. When a bank restates earnings, it means that the bank either intentionally or unintentionally misstated earnings in the past. Such restatements could simply reflect a change in accounting standards or a mistake, and few restatements are criminally fraudulent. Nevertheless, restatements do represent a violation of appropriate accounting practices by managers and represent an alternative proxy of the management of information disclosed to the public.

Following Beatty and Liao (2014), we manually search restatement information in 8-K, 10-K, and 10-Q files from EDGAR directly.[9] We create an indicator variable (*RESTATEMENT*) that equals one if a BHC restated its earnings in a year and zero otherwise. Consequently, we conduct these analyses using annual data. Even though EDGAR's electronic files start in year 1996, our search through EDGAR's paper records go back to 1988. However, the comprehensiveness and quality of the data increased markedly since 1993. We therefore start our sample period from 1993 through 2006 in conducting the restatement analysis, though the results are robust to choosing alternative sample periods. These data limitations prevent us from conducting the analyses on intrastate branch or interstate deregulation. In this section, we therefore only examine the relationship between interstate branch deregulation and bank restatements. Given the binary distribution of the

[9] We primarily follow Audit Analytics in classifying both fraud and some technical and nonsubstantive restatements as financial restatement cases in our hand-collection procedure. These technical or nonsubstantive restatements are related to company reorganizations and restructurings. In addition, we also consider issues related to accounting rules change or reclassification as earnings restatement. More specifically, we count the following non-fraud cases as financial restatement reported in EDGAR: adjustment due to mergers and acquisitions; adjustment due to new accounting principles; adjustment in income statement, balance sheet, or cash flow statement; adjustment due to reclassification or characterization; adjustment due to internal management policies, methodology change, segment revision, allocation between lines of business, measurement change; adjustment due to tax impacts; Adjustment due to error / correction; adjustment due to operation combination / operation closed / operation sales; adjustment due to loans, assets, credit changes, investment; adjustment due to warrants, securities, equity changes; adjustment in cash dividends; adjustment in share outstanding, stock value, stock dividends, or stock distribution; earnings per share or dividends adjustment because of stock split; earnings per share adjustment or other adjustment because of dividends payment.

dependent variable, we use a probit regression model and report the marginal effects. We confirm the results using OLS. In the analyses, we control for year and BHC fixed effects.

As reported in Table 6, interstate branch deregulation reduced the odds of banks restating their earnings. The coefficient estimates in columns 1 indicate that the passage of the IBBEA deregulation reduces the odds of banks' earnings restatement by 10%, holding everything else constant. A drawback of using the probit model with fixed effects is the potential incidental parameters problem (Neyman and Scott, 1948). The fixed effects model draws inferences about common parameters and places very little structure on the distribution of unobserved heterogeneity. However, using a nonlinear model, such as probit model, noise in the estimation of individual level effects will contaminate estimates of the common parameters when the time dimension is short. In addition, in our case, many observations are automatically dropped from the regression due to the zero within-variance problem. We therefore also run a set of OLS regressions using similar specifications to check the robustness of our results and report the OLS estimates in column 2 of Table 6. We find that the marginal effects of interstate branch deregulation on reducing the odds of earnings restatement is about 6%. These results are not only statistically significant, but also similar in terms of magnitude compared to those estimates from the probit model.

In columns 3-4 of Table 6, we also present the dynamic effects of the interstate branch deregulation on the odds of financial restatement, where financial restatement is modeled by leads and lags from two years before to eight years or more after the interstate branch deregulation. The reference group is the interstate branch deregulation year.

These analyses show that (1) changes in financial restatements do not occur before deregulation, (2) deregulation triggers a reduction in financial restatements, and (3) the impact of deregulation on restatement grows over time. The post-deregulation coefficients starting from the second year are negative and statistically significant at the 5% level.

4.3 Other robustness tests

Besides the robustness tests discussed above, we conducted a series of sensitivity analyses. To save space, we describe these robustness tests but do not present the regression results, which are available upon request.

First, we were concerned that the management of information might have changed after the 2004 Basel II Accord because it required more stringent risk-based capital requirements. Thus, we re-did the analyses restricting the sample to before 2004. The results hold for this restricted sample period and the coefficient estimates are very similar.

Second, the ability of banks to manage earnings might vary with the particular mixture of loans. Consequently, we include additional loan type control variables, such as loans secured by real estate, commercial and industrial loans, loans to finance agricultural production, individual loans, and loans to foreign governments, where all of the loan type variables are scaled by the size of total loans. Controlling for the nature of the different loans yields very similar results, both in terms of significance and in terms of the economic sizes of the coefficient estimates.

Third, there is considerable exit and entry over this period of active merger and acquisition activity this deregulatory period. To assess whether selection on particular traits drives our findings, we conduct the analyses only for BHCs that exist for the entire period. All of the results hold.

Fourth, we examined whether the intensification of competition reduced actual loan charge-offs. If the regulatory-induced intensification of competition only influenced the manipulation of BHC financial accounts but did not alter the actual quality of loan portfolios, then we should find no relationship between bank deregulation and subsequent charge-offs. This is what we find. When we conduct a similar analysis using net loan charge-offs as the dependent variable and controlling for standard control variables in the literature on loan charge-offs (e.g. Kanagaretnam, Lim, Lobo, 2014), we find that deregulation does not have a significant effect on charge-offs.

5. Conclusion

In this paper, we find that bank regulatory reforms that eased impediments to competition among U.S. BHCs reduced bank opacity. This paper contributes to our understanding of how regulations influence the private governance and regulatory oversight of banks. Theory provides conflicting predictions about the impact of regulatory reforms that intensify competition on bank opacity. Some models predict that competition will induce the executives of banks to manipulate information either to hinder the entry of potential competitors or to extract as many private rents as possible in the short-run because competition makes the long-run viability of the bank uncertain. Other models stress that competition will enhance efficiency, reduce managerial slack, and force banks to disclose more accurate information. We provide the first evaluation of the net impact of competition on disclosure quality.

The evidence suggests that bank deregulations that removed barriers to the geographic expansion of banks boosted disclosure quality by intensifying competition among banks. There is no evidence that intensifying competition makes it more difficult for private investors to discipline banks or regulators to supervise them. The findings are consistent with the view that exposing BHCs to greater competition will facilitate the monitoring of banks, with potentially beneficial repercussion on the governance and regulation of banks.

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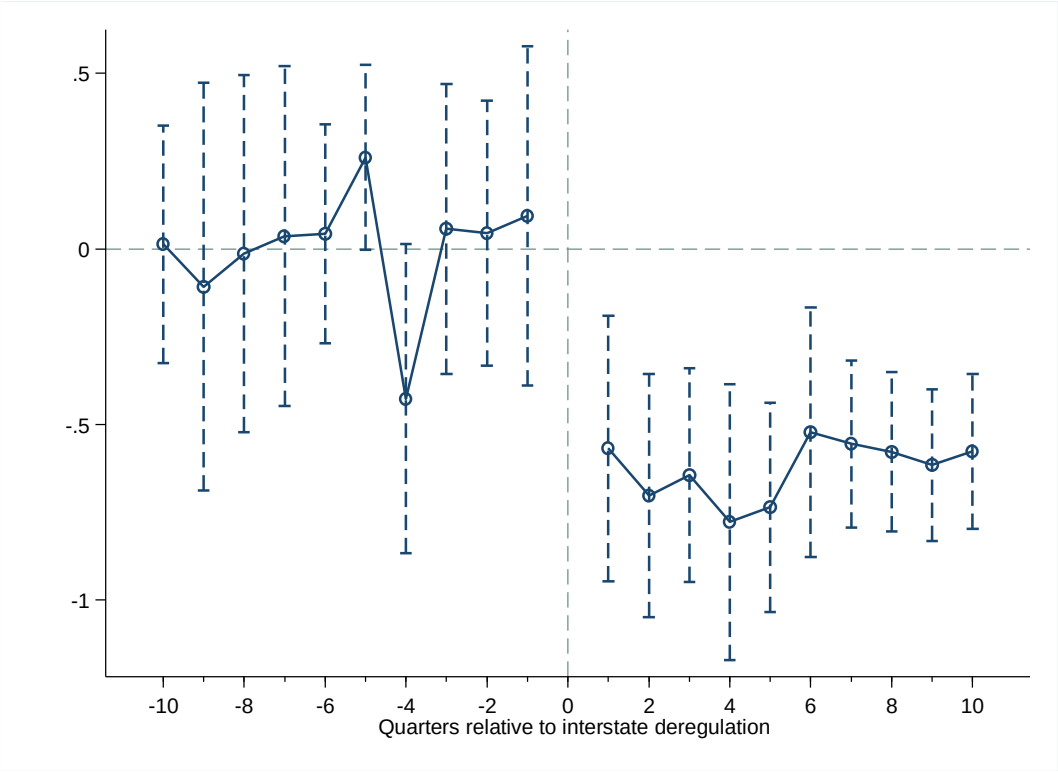
Figure 1: Evolution of Disclosure Quality around Interstate Bank Deregulation



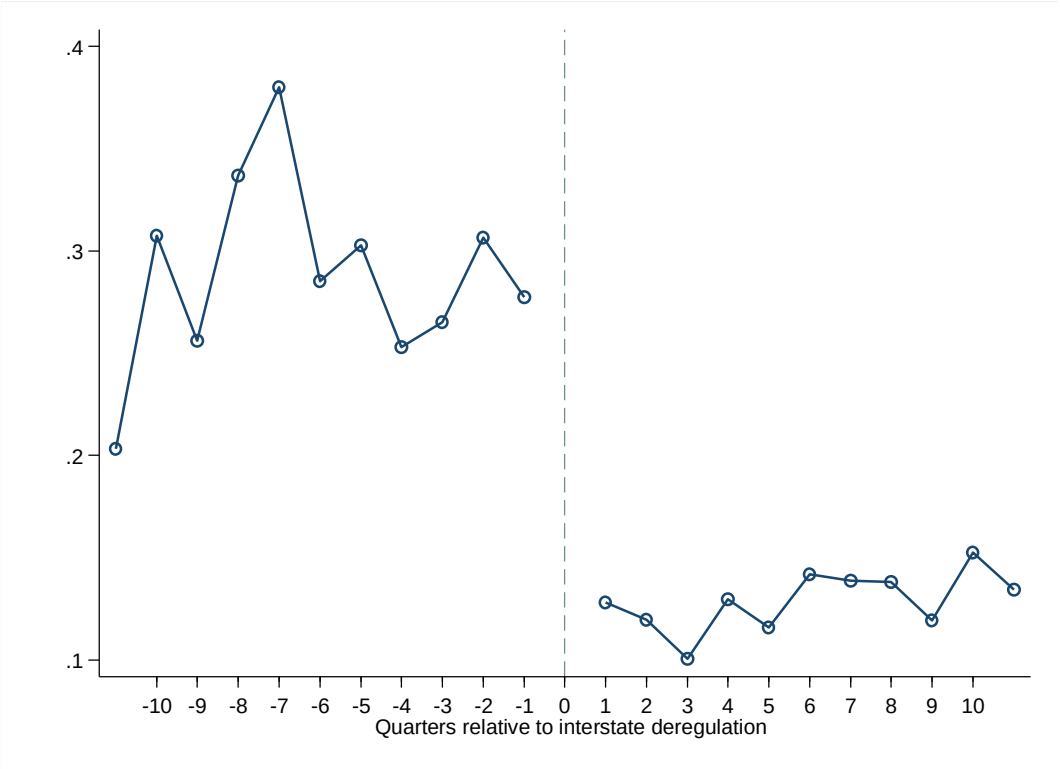
Note: This figure plots the impact of interstate bank deregulation on disclosure quality by banks in a state. Disclosure quality is measured as the natural logarithm of the absolute value of residuals predicted from equation (1). The deregulation term D_{jt} represents the interstate deregulation *INTER* in the equation, which is defined as a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. For the definitions of the other variables in the equation, please see Appendix Table 1.

For each state, year zero is the year the state started interstate bank deregulation, such that one quarter before deregulation is -1 and one quarter after deregulation is +1. We consider a 20-quarter window, spanning from ten quarters before until ten quarters after deregulation. The figure reports estimated coefficients from the following regression:

$$Disclosure\ Quality_{bjt} = \beta_1 D_{jt}^{-10} + \beta_2 D_{jt}^{-9} + \cdots + \beta_{20} D_{jt}^{+10} + \delta_b + \delta_t + \varepsilon_{bjt},$$

where the deregulation dummy variable D_{jt}^{+n} equals one for banks in the *n*th quarter after deregulation, and the deregulation dummy variable D_{jt}^{-n} equals one for banks in the *n*th quarter before deregulation, and δ_t and δ_b are time and BHC fixed effects, respectively. The solid line denotes the estimated coefficients ($\beta_1, \beta_2, \ldots$), while the dashed lines represent 95% confidence intervals. The graph is normalized by the pre-deregulation (period -10 through -1) mean.

Figure 2: Disclosure Quality over EBTP around Interstate Bank Deregulation



Note: This figure plots the impact of interstate bank deregulation on disclosure quality (scaled by EBTP) by BHCs in a state. For each state, year zero is the year the state started interstate bank deregulation, such that one quarter before deregulation is -1 and one quarter after deregulation is +1. We consider a 20-quarter window, spanning from ten quarters before until ten quarters after deregulation. The figure reports the median of the absolute value of disclosure quality measures divided by EBTP. EBTP is defined as income before taxes, provisions recognized in income (in million $), and disclosure quality is measured as the natural logarithm of the absolute value of residuals predicted from equation (1) (with D_{jt} represents the interstate deregulation dummy *INTER* in the equation) multiplied by the value of the lag of total loans (in million $).

Table 1. Banking Deregulations and Lagged Disclosure Quality

This table presents OLS regressions of bank regulatory reforms on lagged values of disclosure quality and other potential predictors of regulatory reforms. Panel A presents five regressions, where the dependent variables are as follows. *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. *Ln (# of States-Distance Weighted)* is the natural logarithm of one plus the number of other states whose can enter the home state in period t, where each of those other states is weighted by the inverse of its distance to the home state. *Ln (# of BHCs from Other States)* is the natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*. In the first two columns of Panel B, the dependent variable is *INTRA*, which is a dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise. In columns 3 and 4 of Panel B, the dependent variable is *INTER-BRANCH*, which is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. Since the sample consists of state-year observations from 1986 to 2006 and these analyses assess whether discretionary loan loss provisions predict future deregulations, this table only includes states that deregulated after1986: 22 states started interstate bank deregulation, 20 states deregulated intrastate branching, and all states completed interstate branch deregulation after 1986. The variable *state weighted residuals* is calculated by the natural logarithm of the absolute value of residuals predicted from equation (1), aggregated to the state level and weighted by the proportion of the BHC's total assets held by its subsidiaries and branches in that state. Following Kroszner and Strahan (1999), the following controls variables are included: GSP per capita, state level unemployment rate, small bank share of all banking assets, and capital ratio of small banks relative to large ones, relative size of insurance in states where banks may sell insurance (zero otherwise), relative size of insurance in states where banks may not sell insurance (zero otherwise), an indicator variable that equal to one if banks may sell insurance (zero otherwise), small firm (fewer than 20 employees) share of the number of firms in the state, unit banking law, share of state government controlled by Democrats, and an indicator that takes a value of one if the state is controlled by one party. We also include state dummy variables. Standard errors are adjusted for state-level clustering and appear in parentheses. *, **, and *** indicate significant at 1%, 5%, and 10%.

Panel A. Interstate Deregulation

	(1)	(2)	(3)	(4)	(5)
Dep Var	*INTER*		*Ln(# of States)*	*Ln(# of States – Distance Weighted)*	*Ln(# of BHCs from Other States)*
State Weighted Residuals one year before interstate deregulation	0.0094	0.0105	0.0820	0.0734	0.0955
	(0.0081)	(0.0104)	(0.0580)	(0.0507)	(0.0675)
State Weighted Residuals two years before interstate deregulation		0.0022	0.0976	0.0848	0.1163
		(0.0077)	(0.0773)	(0.0658)	(0.0914)
State Weighted Residuals three years before interstate deregulation		0.0020	0.0365	0.0346	0.0423
		(0.0072)	(0.0256)	(0.0235)	(0.0298)
Controls	Yes	Yes	Yes	Yes	Yes

N. of observations	310	275	275	275	275

Panel B. Intrastate and Interstate Branch Deregulation

	(1)	(2)		(3)	(4)
Dep Var	*INTRA*		Dep Var	*INTER-BRANCH*	
State Weighted Residuals one year before Intrastate deregulation	0.0145	0.0153	State Weighted Residuals one year before Branching deregulation	-0.0049	-0.0030
	(0.0118)	(0.0097)		(0.0087)	(0.0094)
State Weighted Residuals two years before Intrastate deregulation		0.0069	State Weighted Residuals two years before Branching deregulation		-0.0119
		(0.0048)			(0.0109)
State Weighted Residuals three years before Intrastate deregulation		-0.0006	State Weighted Residuals three years before Branching deregulation		-0.0066
		(0.0055)			(0.0075)
Controls	Yes	Yes	Controls	Yes	Yes
N. of observations	328	291	N. of observations	773	682

Table 2. Disclosure Quality and Deregulation: Basic

This table presents results of the effects of banking deregulations on disclosure quality. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals from equation (1). The deregulation term D_{jt} represents one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA, and INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table. *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. *Ln (# of States-Distance Weighted)* is the natural logarithm of one plus the number of other states whose can enter the home state in period t, where each of those other states is weighted by the inverse of its distance to the home state. *Ln (# of BHCs from Other States)* is the natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*. *INTRA* is a dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise. *INTER-BRANCH* is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. Appendix Table 1 defines the other regressors, where *other BHC traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
INTER	-0.4716***					
	(0.0796)					
Ln(# of States)		-0.0418***				
		(0.0056)				
Ln(# of States – Distance Weighted)			-0.0509***			
			(0.0074)			
Ln(# of BHCs from Other States)				-0.0374***		
				(0.0046)		
INTRA					-0.8341***	
					(0.0589)	
INTER-BRANCH						-0.6271***
						(0.0517)
logSIZE	0.0719***	0.0589**	0.0587**	0.0575**	0.0791***	0.0534*
	(0.0269)	(0.0259)	(0.0261)	(0.0261)	(0.0261)	(0.0281)
CAP	2.1018***	1.9032***	1.9942***	1.9287***	1.8303***	1.6243***
	(0.4914)	(0.4884)	(0.4940)	(0.4874)	(0.4907)	(0.5144)
Other BHC traits	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes
BHC fixed effects	yes	yes	yes	yes	yes	yes
N	27137	27137	27137	27137	27137	27137
R-sq	0.3079	0.3121	0.3110	0.3128	0.3123	0.3162

Table 3. Disclosure Quality and Deregulation: Fully Interacted

This table presents results of the effects of banking deregulations on disclosure quality. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from equation (1a). The deregulation term D_{jt} is one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA,* and *INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table plus each corresponding deregulation measures fully interacted with all the other independent variables used in equation (1a). *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. *Ln (# of States-Distance Weighted)* is the natural logarithm of one plus the number of other states whose can enter the home state in period t, where each of those other states is weighted by the inverse of its distance to the home state. *Ln (# of BHCs from Other States)* is the natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*. *INTRA* is a dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise. *INTER-BRANCH* is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. We take the natural logarithm of the sum of the weighted distance measures. Appendix Table 1 defines the other regressors, where *other BHC traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
INTER	-0.5123***					
	(0.0833)					
Ln(# of States)		-0.0452***				
		(0.0055)				
Ln(# of States – Distance Weighted)			-0.0532***			
			(0.0067)			
Ln(# of BHCs from Other States)				-0.0368***		
				(0.0048)		
INTRA					-0.7954***	
					(0.0639)	
INTER-BRANCH						-0.5604***
						(0.0532)
logSIZE	0.0554**	0.0649**	0.0602**	0.0665**	0.0770***	0.0278
	(0.0260)	(0.0260)	(0.0260)	(0.0263)	(0.0260)	(0.0265)
CAP	1.7315***	1.6491***	1.6274***	1.5950***	1.6794***	1.3900***
	(0.4832)	(0.4925)	(0.4989)	(0.4913)	(0.4841)	(0.4886)
Other BHC traits	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes
BHC fixed effects	yes	yes	yes	yes	yes	yes
N	27137	27137	27137	27137	27137	27137
R-sq	0.3078	0.3112	0.3116	0.3116	0.3094	0.3233

Table 4. Disclosure Quality and BHC-Specific Deregulation Measures

This table presents results of the effects of interstate bank deregulation on disclosure quality, where the interstate bank deregulation measures include information on the regulatory environment facing each subsidiary in a BHC. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from equation (8). For columns 1-3, the deregulation term BHC_DIS_{bjt} used in equation (1a) is one of the deregulation measures (*BHC_DIS*, *BHC_DIS_NUM*, *BHC_DIS_GDP*) corresponding to the deregulation measures used in columns 1-3 of this table. For columns 4-6, the deregulation term D_{bjt} includes one of the deregulation measures corresponding to each of the deregulation measures used in columns 4-6 of this table plus each corresponding deregulation measures fully interacted with all the other independent variables used in equation (8). *BHC_DIS* is computed as follows: For each BHC in each period, weight its assets across all subsidiaries by the regulatory environment facing each subsidiary (including the subsidiaries in the state of the BHC's headquarters). To calculate the regulatory environment facing each subsidiary in each year, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k* (*k* = *j* if headquarter state), weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. We use *BHC_DIS* to represent this bank-specific regulatory environment index. We further weight this regulatory environment index by (a) the number of BHCs in the other state (*BHC_DIS_NUM)* or (b) the economic size (GSP per capita in $10,000) of the other state (*BHC_DIS_GSP*). We take the natural logarithm of the sum of the weighted distance measures. Appendix Table 1 defines all the other regressors, where *other BHC traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state- quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
BHC_DIS	-0.0499***			-0.0524***		
	(0.0117)			(0.0116)		
BHC_DIS_NUM		-0.0419***			-0.0470***	
		(0.0093)			(0.0086)	
BHC_DIS_GSP			-0.0513***			-0.0540***
			(0.0100)			(0.0100)
logSIZE	0.0058	0.0003	0.0030	0.0108	0.0096	0.0072
	(0.0333)	(0.0332)	(0.0329)	(0.0339)	(0.0337)	(0.0335)
CAP	2.1866***	2.2468***	2.1771***	1.9631***	1.9796***	1.9897***
	(0.5903)	(0.5957)	(0.5878)	(0.6082)	(0.6014)	(0.5936)
Other BHC traits	yes	yes	yes	yes	yes	yes
BHC fixed effects	yes	yes	yes	yes	yes	yes
State-quarter fixed effects	yes	yes	yes	yes	yes	yes
First-stage using deregulation interactive terms	no	no	no	yes	yes	yes
N	25803	25803	25803	25803	25803	25803
R-sq	0.2856	0.2862	0.2847	0.2848	0.2864	0.2856

Table 5. Disclosure Quality and Subsidiary-Level Deregulation Measures

This table presents results of the effects of interstate banking deregulations on disclosure quality at the subsidiary bank level. The sample consists of subsidiary-bank-quarter observations from the third quarter of 1986 to 2006. These banks are subsidiary commercial banks of BHCs examined in our main regression. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from equation (9). The deregulation term D_{sjt} includes one of the deregulation measures corresponding to each of the deregulation measures used in columns 1-6 of this table plus each corresponding deregulation measures fully interacted with all the other independent variables used in equation (1). To calculate the regulatory environment facing each subsidiary in each year, we first compute *SUBSIDIARY_DIS* by measuring the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k* (*k* = *j* if headquarter state), weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. We further weight this regulatory environment index by (a) the number of banks in the other state (*SUBSIDIARY_DIS_NUM)* or (b) the economic size (GSP per capita in $10,000) of the other state (*SUBSIDIARY_DIS_GSP*). We take the natural logarithm of the sum of the weighted distance measures. Appendix Table 1 defines all the other regressors, where *other subsidiary bank traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
SUBSIDIARY_DIS	-0.0569***			-0.0562***		
	(0.0102)			(0.0051)		
SUBSIDIARY _DIS_NUM		-0.0585***			-0.0540***	
		(0.0082)			(0.0042)	
SUBSIDIARY _DIS_GSP			-0.0692***			-0.0644***
			(0.0092)			(0.0050)
logSIZE	0.0307	0.0335	0.0245	-0.0767***	-0.0759***	-0.0773***
	(0.0235)	(0.0234)	(0.0236)	(0.0064)	(0.0065)	(0.0064)
CAP	-0.2825	-0.2491	-0.2723	0.5421***	0.5695***	0.5501***
	(0.2679)	(0.2667)	(0.2671)	(0.1769)	(0.1770)	(0.1834)
Other subsidiary bank traits	yes	yes	yes	yes	yes	yes
Sate-quarter fixed effects	yes	yes	yes	yes	yes	yes
Subsidiary bank fixed effects	yes	yes	yes	no	no	no
BHC fixed effects	no	no	no	yes	yes	yes
First stage using deregulation interactive terms	yes	yes	yes	yes	yes	yes
N	55015	55015	55015	55015	55015	55015
R-sq	0.1466	0.1479	0.1472	0.1646	0.1662	0.1655

Table 6. Financial Restatement After the Banking Deregulation

This table presents regression results of the (dynamic) effects of interstate branching deregulation on the incidence of financial restatements. The sample consists of BHC-year observations from year 1993 through 2006.The dependent variable, the incidence of financial restatement (*RESTATEMENT*), equals one if the BHC restates its financial restatements in year t and zero otherwise *INTER-BRANCH* is defined as a dummy variable takes the value of one if the BHC is headquartered in a state that has the State Interstate Branching Laws takes effective by the beginning of year t, and zero otherwise. Columns 1 and 3 use probit regression models, and present estimated marginal effects (dy/dx). The marginal effect of a dummy variable is calculated as the discrete change in the expected value of the dependent variable from 0 to 1. Columns 2 and 4 use OLS. *INTER-BRANCH* is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. Columns 3-4 present results of the dynamic effects, where financial restatement is modeled by leads and lags from one year before to five years or more after the interstate branch deregulation. The reference group is the interstate branch deregulation year. Appendix Table 1 defines the other regressors, where *other BHC traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state-year level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
MODEL	Probit	OLS	Probit	OLS
INTER-BRANCH	-0.0951*	-0.0571*		
	(0.0522)	(0.0329)		
Years 1 before INTER-BRANCH			0.0084	0.0053
			(0.0477)	(0.0269)
Year 1 after INTER-BRANCH			-0.0727	-0.0489
			(0.454)	(0.0375)
Year 2 after INTER-BRANCH			-0.1450***	-0.1087***
			(0.0339)	(0.0397)
Year 3 after INTER-BRANCH			-0.1550***	-0.1176**
			(0.0438)	(0.0534)
Year 4 after INTER-BRANCH			-0.2050***	-0.1749***
			(0.0324)	(0.0581)
Year 5+ after INTER-BRANCH			-0.2550**	-0.1578**
			(0.0909)	(0.0667)
logSIZE	-0.0014	0.0037	-0.0057	0.0030
	(0.0337)	(0.0225)	(0.0333)	(0.0223)
CAP	1.2270**	0.4452	1.2350*	0.4488
	(0.5860)	(0.3063)	(0.5860)	(0.3082)
Other BHC traits	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
BHC fixed effects	yes	yes	yes	yes
N	2875	5520	2875	5520
R-sq	0.1587	0.3050	0.1620	0.3065

Appendix Table 1. Variable Definition

Panel A. Definitions of Variables Used in Disclosure Quality Regressions

Variable Name	Definition
Deregulation Measures	
INTER	A dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise.
INTRA	A dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise.
INTER-BRANCH	A dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches.
Ln(# of States)	The natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*.
Ln(# of States – Distance Weighted)	The natural logarithm of one plus the number of other states whose can enter the home state in period *t*, where each of those other states is weighted by the inverse of its distance to the home state.
Ln(# of BHCs from Other States)	The natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*.
BHC_DIS	Computed as follows: For each BHC in each period, weight its assets across all subsidiaries by the regulatory environment facing each subsidiary (including the subsidiaries in the state of the BHC's headquarters). To calculate the regulatory environment facing each subsidiary in each year, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k*, weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. As before, we take the natural logarithm of the sum of the weighted distance.
BHC _DIS_NUM	Computed as follows: For each BHC in each period, weight its assets across all subsidiaries by the regulatory environment facing each subsidiary (including the subsidiaries in the state of the BHC's headquarters). To calculate the regulatory environment facing each subsidiary in each year, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k*, weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state, and further weight by the number of BHCs in the other state. As before, we take the natural logarithm of the sum of the BHC-weighted distance.
BHC_DIS_GSP	Computed as follows: For each BHC in each period, weight its assets across all subsidiaries by the regulatory environment facing each subsidiary (including the subsidiaries in the state of the BHC's headquarters). To calculate the regulatory environment facing each subsidiary in each year, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k*, weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state, and further weight by the economic size (GSP per capita in $10,000) of each of the other state. As before, we take the natural logarithm of the sum of the GSP-weighted distance.

Panel A. Definitions of Variables Used in Disclosure Quality Regressions (cont'd)

Variable Name	Definition
SUBSIDIARY _DIS	To calculate the regulatory environment facing each subsidiary in each period, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k* (*k* = *j* if headquarter state), weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. We take the natural logarithm of the sum of the weighted distance measures.
SUBSIDIARY _DIS_NUM	To calculate the regulatory environment facing each subsidiary in each period, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k* (*k* = *j* if headquarter state), weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. We further weight this regulatory environment index by the number of banks in the other state. We take the natural logarithm of the sum of the weighted distance measures.
SUBSIDIARY _DIS_GSP	To calculate the regulatory environment facing each subsidiary in each period, we measure the distance from each subsidiary bank to the capital of every other state, and for each subsidiary in a state *k* (*k* = *j* if headquarter state), weight the interstate deregulation between state *k* and every other state in period *t* by that subsidiary's distance to the other state. We further weight this regulatory environment index by the economic size (GSP per capita in $10,000) of the other state. We take the natural logarithm of the sum of the weighted distance measures.
Firm Level Variables	
logSIZE	The natural logarithm of total assets in million $
LLP_lag	One year lag of loan loss provision scaled by beginning total loans
LOSS	A dummy variable that equals one if net income is negative, and zero
CAP	Book value of equity over total assets
EBTP	Income before taxes, provisions recognized in income in million U.S.

Panel B. Definitions of Variables Used to Estimate Disclosure Quality

Variable Name	Definition
LLP	Loan loss provision over the quarter scaled by beginning total loans
NPA	Non-performing assets over the quarter scaled by beginning total loans
dNPA	Change in NPA over the quarter divided by beginning total loans
LOAN	Total loans over the quarter in million $
dLOAN	Change in total loans over the quarter divided by beginning total loans
LOAN_ASSETS	Total loans over the quarter divided by total assets
CO	Net charge offs over the quarter divided by beginning total loans
ALW	Loan loss allowance over the quarter divided by total loans
CSRET	The return on the Case-Shiller Real Estate Index over the quarter
dUNEMP	Change in unemployment rates over the quarter
dGSP	Change in GSP (gross state product) per capita over the quarter/100

Appendix Table 2. Summary Statistics

This table presents summary statistics on the main variables used in the paper. The sample consists of BHC-quarter observations from the third quarter of 1986 to 2006. See Table 1 for variable definitions.

Variable	N	Mean	Std	P25	Median	P75
INTER	27137	0.98	0.14	1	1	1
INTRA	27137	0.96	0.18	1	1	1
INTER-BRANCH	27137	0.56	0.50	0	1	1
Ln(# of States)	27137	3.43	1.80	3.5	3.91	3.91
Ln(# of States – Distance	27137	0.8	1.55	0.85	1.25	1.26
Ln(# of BHCs from Other States)	27137	6.76	2.16	6.93	7.32	7.36
BHC_DIS	25803	0.70	1.76	0.85	1.25	1.26
BHC_DIS_NUM	25803	4.08	2.19	4.25	4.74	4.81
BHC_DIS_GSP	25803	1.99	1.92	2.01	2.57	2.66
SUBSIDIARY _DIS	55015	0.61	1.79	0.65	1.23	1.26
SUBSIDIARY _DIS_NUM	55015	3.96	2.23	3.92	4.71	4.81
SUBSIDIARY _DIS_GSP	55015	1.87	1.95	1.82	2.53	2.65
SIZE	27137	11,014	64318	477	1,067	3,569
logSIZE	27137	7.34	1.59	6.17	6.97	8.18
LLP_lag (%)	27137	0.14	0.27	0.04	0.08	0.15
LOSS	27137	0.04	0.21	0	0	0
CAP	27137	0.09	0.04	0.07	0.08	0.1
LLP (%)	27137	0.14	0.27	0.04	0.08	0.15
NPA	27137	0.01	0.02	0	0.01	0.02
dNPA (%)	27137	-0.01	1.18	-0.15	-0.02	0.11
LOAN	27137	5880	28,660	300	680	2180
dLOAN	27137	0.03	0.09	0	0.02	0.05
LOAN_ASSETS	27137	0.64	0.12	0.58	0.65	0.72
CO (%)	27137	0.15	0.24	0.03	0.08	0.16
ALW	27137	0.02	0.01	0.01	0.01	0.02
CSRET	27137	0.01	0.01	0.01	0.02	0.02
dUNEMP	27137	-0.02	0.03	-0.2	-0.1	0.1
dGSP	27137	1.72	2.00	0.57	1.63	2.78
EBTP	27137	31.89	171.54	1.18	3.02	9.89

Appendix Table 3. Years of Deregulation By State

State	Interstate banking permitted	Intrastate branching through M&A	Interstate Banking and Branching Efficiency Act
AL	1987	1981	1997
AK	1982	before 1970	1994
AZ	1986	before 1970	1996
AR	1989	1994	1997
CA	1987	before 1970	1995
CO	1988	1991	1997
CT	1983	1980	1995
DE	1988	before 1970	1995
DC	1985	before 1970	1996
FL	1985	1988	1997
GA	1985	1983	1997
HI	-	1986	1997
ID	1985	before 1970	1995
IL	1986	1988	1997
IN	1986	1989	1996
IA	1991	-	1996
KS	1992	1987	1997
KY	1984	1990	1997
LA	1987	1988	1997
ME	1978	1975	1997
MD	1985	before 1970	1995
MA	1983	1984	1996
MI	1986	1987	1995
MN	1986	1993	1997
MS	1988	1986	1997
MO	1986	1990	1997
MT	1993	1990	1997
NE	1990	1985	1997
NV	1985	before 1970	1995
NH	1987	1987	1997
NJ	1986	1977	1996
NM	1989	1991	1996
NY	1982	1976	1996
NC	1985	before 1970	1995
ND	1991	1987	1997
OH	1985	1979	1997
OK	1987	1988	1997
OR	1986	1985	1995
PA	1986	1982	1995
RI	1984	before 1970	1995
SC	1986	before 1970	1996
SD	1988	before 1970	1996
TN	1985	1985	1997
TX	1987	1988	1995
UT	1984	1981	1995
VT	1988	1970	1996
VA	1985	1978	1995

WA	1987	1985	1996
WV	1988	1987	1997
WI	1987	1990	1997
WY	1987	1988	1997

Appendix Table 4. First Stage Estimates of the LLP Results Based On Table 2

This table presents the first-stage results using equation (1) on estimating disclosure quality. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from equation (1). The deregulation term D_{jt} represents one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA, and INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table. *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. *Ln (# of States-Distance Weighted)* is the natural logarithm of one plus the number of other states whose can enter the home state in period t, where each of those other states is weighted by the inverse of its distance to the home state. *Ln (# of BHCs from Other States)* is the natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*. *INTRA* is a dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise. *INTER-BRANCH* is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. δ_j represents state dummy variables. Appendix Table 1 defines the other regressors. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
INTER	-0.0012***					
	(0.0002)					
Ln(# of States)		-0.0001***				
		(0.0000)				
Ln(# of States – Distance Weighted)			-0.0001***			
			(0.0000)			
Ln(# of BHCs from Other States)				-0.0001***		
				(0.0000)		
INTRA					-0.0015***	
					(0.0001)	
INTER-BRANCH						-0.0008***
						(0.0001)
$dNPA_{t-1}$	0.0245**	0.0245**	0.0245**	0.0245**	0.0246**	0.0246**
	(0.0114)	(0.0114)	(0.0114)	(0.0114)	(0.0115)	(0.0115)
dNPA	0.0268***	0.0267***	0.0267***	0.0267***	0.0269***	0.0269***
	(0.0088)	(0.0087)	(0.0087)	(0.0087)	(0.0088)	(0.0087)
$dNPA_{t+1}$	0.0140*	0.0139*	0.0139*	0.0138*	0.0141*	0.0141*
	(0.0084)	(0.0083)	(0.0083)	(0.0083)	(0.0084)	(0.0083)
$logSIZE_{t-1}$	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
dLOAN	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
dUNEMP	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)

dGSP	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
CSRET	-0.0217***	-0.0205***	-0.0202***	-0.0205***	-0.0215***	-0.0028
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0023)
N	27137	27137	27137	27137	27137	27137
R-sq	0.0837	0.0851	0.0858	0.0855	0.0871	0.0944

Appendix Table 5. First Stage Estimates of the LLP Results Based On Table 3

This table presents the first-stage results using equation (1) on estimating disclosure quality. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from equation (1a). The deregulation term D_{jt} represents one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA, and INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table, plus each corresponding deregulation measures full interacted with all the other independent variables used in equation (1). For presentation purpose, we also use $\boldsymbol{DEREG_{jt}}$ to represent one of the six deregulation measures (*INTER, Ln (# of States), Ln (# of States-Distance Weighted), Ln (# of BHCs from Other States), INTRA, and INTER-BRANCH)* corresponding to each of the deregulation measures used in columns 1-6 of this table. *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. *Ln (# of States-Distance Weighted)* is the natural logarithm of one plus the number of other states whose can enter the home state in period t, where each of those other states is weighted by the inverse of its distance to the home state. *Ln (# of BHCs from Other States)* is the natural logarithm of one plus the number of BHCs from other states that can enter the home state in period *t*. *INTRA* is a dummy variable that equals one if a BHC is headquartered in a state that has removed restrictions on intrastate branching through mergers and acquisitions, and zero otherwise. *INTER-BRANCH* is a dummy variable that equals one if the BHC is headquartered in a state that has liberalized restrictions on BHCs in others from establishing bank branches. δ_j represents state dummy variables. Appendix Table 1 defines the other regressors. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	DEREG *=INTER*	***DEREG*** *=Ln (# of States)*	***DEREG****= Ln(# of States – Distance Weighted)*	***DEREG****= Ln(# of BHCs from Other States)*	***DEREG*** *=INTRA*	***DEREG*** *=INTER -BRANCH*
INTER	0.0038*					
	(0.0020)					
Ln(# of States)		0.0004***				
		(0.0001)				
Ln(# of States – Distance Weighted)			0.0005***			
			(0.0002)			
Ln(# of BHCs from Other States)				0.0004***		
				(0.0001)		
INTRA					0.0009	
					(0.0011)	
INTER-BRANCH						-0.0004
						(0.0003)
$DEREG_{it}$ x $dNPA_{t-1}$	-0.0653**	-0.0109**	-0.0142**	-0.0102**	-0.0604**	-0.0586***
	(0.0294)	(0.0047)	(0.0058)	(0.0045)	(0.0302)	(0.0121)

$DEREG_{it}$ x dNPA	-0.0094	-0.0081**	-0.0104**	-0.0070**	-0.0370	-0.0503***
	(0.0356)	(0.0039)	(0.0047)	(0.0033)	(0.0306)	(0.0128)
$DEREG_{it}$ x $dNPA_{t+1}$	0.0093	-0.0010	-0.0012	-0.0006	0.0709***	-0.0137
	(0.0254)	(0.0031)	(0.0038)	(0.0026)	(0.0228)	(0.0093)
$DEREG_{it}$ x $logSIZE_{t-1}$	-0.0004*	-0.0001***	-0.0001***	-0.0001***	-0.0002	-0.0001***
	(0.0003)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)
$DEREG_{it}$ x dLOAN	-0.0000	0.0001	0.0001	0.0001	0.0034	0.0033***
	(0.0022)	(0.0002)	(0.0002)	(0.0002)	(0.0021)	(0.0010)
$DEREG_{it}$ x dUNEMP	0.0017**	0.0000	0.0000	0.0000	0.0008	-0.0002
	(0.0007)	(0.0001)	(0.0001)	(0.0001)	(0.0005)	(0.0002)
$DEREG_{it}$ x dGSP	-0.0002***	-0.0000	-0.0000	-0.0000	-0.0000	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)
$DEREG_{it}$ x CSRET	-0.0782***	-0.0050***	-0.0057***	-0.0043***	-0.0396***	-0.0071
	(0.0170)	(0.0016)	(0.0020)	(0.0015)	(0.0108)	(0.0070)
$dNPA_{t-1}$	0.0891***	0.0649***	0.0394***	0.0962***	0.0843***	0.0662***
	(0.0272)	(0.0168)	(0.0099)	(0.0311)	(0.0279)	(0.0111)
dNPA	0.0360	0.0563***	0.0371***	0.0759***	0.0634**	0.0593***
	(0.0345)	(0.0150)	(0.0086)	(0.0233)	(0.0293)	(0.0119)
$dNPA_{t+1}$	0.0047	0.0169*	0.0145**	0.0176	-0.0564***	0.0189**
	(0.0240)	(0.0101)	(0.0066)	(0.0159)	(0.0211)	(0.0082)
$logSIZE_{t-1}$	0.0006**	0.0004***	0.0002***	0.0005***	0.0004**	0.0002***
	(0.0003)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)
dLOAN	0.0001	-0.0002	-0.0000	-0.0004	-0.0032	-0.0018*
	(0.0022)	(0.0008)	(0.0005)	(0.0012)	(0.0020)	(0.0009)
dUNEMP	-0.0014**	0.0002	0.0003**	0.0000	-0.0005	0.0005***
	(0.0007)	(0.0003)	(0.0001)	(0.0004)	(0.0005)	(0.0002)
dGSP	-0.0000	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)
CSRET	0.0557***	-0.0020	-0.0143***	0.0099	0.0170	0.0065
	(0.0169)	(0.0064)	(0.0030)	(0.0109)	(0.0106)	(0.0067)
N	27137	27137	27137	27137	27137	27137
R-sq	0.0872	0.0887	0.0901	0.0903	0.0901	0.1197

Appendix Table 6. Robustness Checks - Using Alternative Disclosure Quality Measures

This table presents results of the effects of banking deregulations on alternative measures of disclosure quality. The sample consists of BHC-quarter observations from the third quarter of 1986 through 2006. The dependent variable, disclosure quality, is measured as the natural logarithm of the absolute value of residuals predicted from model (10)-(13), respectively. The deregulation term D_{jt} represents one of the two deregulation measures (*INTER* or *Ln (# of States)* corresponding to each of the deregulation measures used in columns 1-8 of this table. *INTER* is a dummy variable equal to one if a BHC is headquartered in a state that has passed an interstate bank deregulation, and zero otherwise. *Ln (# of States)* is the natural logarithm of one plus the number of states whose BHCs can enter into the home state in period *t*. Appendix Table 1 defines the other regressors, where *other BHC traits* include *Loss* and *LLP_lag*. Standard errors are heteroskedasticity-consistent, clustered at the state-quarter level, and reported in parentheses. *, **, and *** indicate significant at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INTER	-0.2716***	-0.2381**	-0.2013**	-0.3613***				
	(0.0945)	(0.0946)	(0.0802)	(0.0914)				
Ln(# of States)					-0.0369***	-0.0380***	-0.0131**	-0.0516***
					(0.0057)	(0.0063)	(0.0063)	(0.0065)
logSIZE	0.0059	-0.0963***	-0.0824***	0.0097	0.0388	-0.0796***	-0.0626**	0.0496*
	(0.0283)	(0.0288)	(0.0302)	(0.0273)	(0.0278)	(0.0304)	(0.0310)	(0.0273)
CAP	1.3294**	1.7347***	0.5949	0.9634*	1.5825***	1.7816***	0.6087	1.4684***
	(0.5314)	(0.5338)	(0.5268)	(0.5055)	(0.5186)	(0.5544)	(0.5358)	(0.5102)
Other BHC traits	yes	yes	yes	yes	yes	yes	yes	yes
Quarter fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
BHC fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
N. of observations	26149	26149	26149	26149	26149	26149	26149	26149
R-sq	0.3027	0.3024	0.3189	0.2914	0.3051	0.2978	0.3173	0.2905