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Two Essays on the Efficiency, Diversification, and Performance of Financial Institutions

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Dissertation

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Dedication

** I would like to dedicate my dissertation to my parents, my wife and my son, without their supports it would not happen.

** I would also like to thank my dissertation Co-chair Dr. Kabir Hassan and Dr. Neal Maroney for their guidance and advice throughout the process. My sincere thanks to my committee members for their feedback.

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Abstract

In the first chapter I investigate the change in operating performance, efficiency and value addition of US bank merger and acquisition after GLBA. I extend the previous research by combining all the previous methodology used in merger literature and added a new methodology namely Expected EVA improvement. I will test whether these performance metrics have similar results or the performance of merger vary depending on the measurements. I will also examine the factors that have significant impact on the change in the banks' performance.

My results show that industry-adjusted operating performance of merged banks increases significantly after a merger. I also find that the acquirer expected EVA improvement increase significantly after the merger. Revenue enhancement opportunity appears to be more profitable if there exist more opportunity for cost cutting such as geographic focus and diversified merger. Product diversification merger increase the industry adjusted performance more than product focused merger. The efficiency or profitability of targets has either positive or no effect change in acquirer performance.

In the second chapter I examine how diversifying away from traditional lending activity into noninterest income has affected banks efficiency and value. Does this activity or product diversification affect the bank's production efficiency and excess value? How does this efficiency translate into excess value for the firm or how excess value increase is related to diversification and efficiency? I find that diversifications significantly reduce the value of banks measured in excess value and vice versa regardless of which measures diversification or excess value I use. Both revenue and asset diversification also significantly reduce all measures of efficiency scores. But the impact of efficiency on diversification is mixed. Only efficiency scores computed based on variable return to scale have negative on revenue diversification and other efficiency scores have no impact on diversifications. I also find that increasing efficiency will increase the excess value of the banks significantly and vice versa. So increasing diversification will reduce the excess value and hence will lower the excess value or BHC with lower diversification will have lower excess value and are more efficient.

JEL Classification : G21, G28, G30, G34

Key Words : Banking Industry, Merger and Acquisitions, Diversification, EVA, Efficiency and performance, DEA

Chapter 01: Efficiency, Value Addition and Performance of US Bank Mergers

1.1. Introduction

Bank mergers and acquisitions (M&A) have been a trend in the US since the mid-1980s. This bank consolidation process was accelerated with the passing of the Riegle-Neal Interstate Banking and Branch Efficiency Act (1994) and the Gramm-Leach-Bliley Act of 1999 (GLBA), or Financial Service Modernization Act. These acts removed the restrictions on interstate banking and the barriers between depository institutions and securities and insurance firms. The GLBA presented US banks the opportunity to shift away from lending activities toward broader financial services and opened the way for full financial integration or universal banking. According to most practitioners and academics, the process of banking integration is far from complete; this trend is expected to continue and become more comprehensive[1]. Berger et al. (1999) argue that M&A are banks' strategic answer to a regulatory environment. This consolidation is largely motivated by the fact that the acquirer can improve performance through economies of scale and scope, revenue enhancement, cost reduction, cost and profit efficiency, increased market power, and reduced earnings volatility. Although the number and size of mergers within the banking industry have steadily increased, there is little consensus regarding the impact of consolidation on industry performance. These mixed findings reflect the different methodologies used in previous studies, but the high incidence of contradictory findings results from the differences in the time period being studied. Much of the extant literature examines M&A data at early stages in the industry consolidation process, mainly from the mid-1980s through the mid-1990s, and consequently may have been observing disequilibrium or pre-equilibrium phenomena (DeYoung, Evanoff, & Molyneux, 2009). This raises the question of whether all bank M&A have a significant impact on bank performance or whether it is possible to differentiate the types of M&A that lead to significant gains from those that do not add value. The goal of this paper is to investigate the change in operating performance, efficiency, and

[1] Source: Mishkin (1998) observes that regulatory and technological changes will allow banks to expand, and in twenty years, the number of banks will be less than half the current number.

value addition of bank M&A after the GLBA. Following prior research, I will examine the operating performance and efficiency of bank mergers. Then I will add a new measure, the Expected Economics Value added (EVA) Improvement, which will interest both academic researchers and practitioners. I will test whether these performance metrics have similar results or the performance of mergers varies depending on the measurements. I will also examine the factors that significantly affect the change in the banks' performance. As there is little consent regarding the overall performance of M&A, I will also extend our analysis to address the impact of activity- and geographically focused mergers versus activity- and geographically diversified mergers.

In this paper, I will take a very simple route and define activity-focused mergers as when the two-digit standard industrial classification code (SIC) codes of the target and the acquirer are the same and if both the target and the acquirer are from the same state. I will call this type of merger a geographically focused merger. There appears to be a significantly different set of goals between a focused and a diversified merger. While cost savings is anticipated from focused mergers, revenue growth is usually the goal of diversified mergers. For example, in the year 2000, when Chase Manhattan Bank, a bank, acquired JP Morgan, a non-bank financial firm, the CEOs of both companies claimed the merger was driven more by *revenue growth potential* than by cost reduction (Cornett, McNutt, & Tehranian, 2006). This merger added diversification to Chase's business in the form of equity underwriting, equity derivatives, and asset management—areas Chase had been trying to build by itself. Less than four years later, JP Morgan Chase acquired Bank ONE for almost twice the deal value of its earlier acquisition and claimed the combined entity was anticipating an annual cost savings of $2.2 billion[2].

The financial gain from M&A can come either from improving market power or operating performance and efficiency. I will directly test the merger-induced operating performance and efficiency by comparing pre- and post-merger levels of financial ratios and non-parametric efficiency measures, namely input-oriented efficiency and output-oriented efficiency. To test if mergers create value for shareholders, I will compare pre- and post-merger expected EVA improvement. In addition, it is not

[2] Source: Maretno, Ha-Chin, & Tosporn, 2010

simple to determine if mergers attract two firms with similar activities; however, I can easily differentiate between banks whose last two-digit SIC code is different. For example, the SIC code is 6000 for depository institutions, 6100 for non-depository credit unions, and 6200 for securities and commodities brokers. Due to financial deregulation, the US banking industry is steadily shifting away from traditional sources of revenue, that is, loan making, toward nontraditional activities that generate fee income, service charges, trading revenue, and other types of noninterest income. Some of the reasons for commercial banks to acquire non-banks are regulatory changes, capital adequacy requirements, an increase in cost efficiency, revenue growth, and managers' personal incentives.

Finally, I will test the relationship between the change in bank-performance and merger-related factors, along with other firm-level control variables that are found to be significant in affecting performance. Our merger data was collected after the GLBA was passed; hence, our entire merger sample will have a similar regulatory effect. I will consider a merger if the target size measured by total assets is greater than $100 million. Most of the literature on the US bank merger study sample periods falls between two regulatory regimes. For example, examining the sample period of mergers from 1996 to 2004 will provide biased results due to the differences in merger motivation before and after the GLBA. Our paper will overcome this issue. To our knowledge, no other study has explored the value addition of bank mergers by the expected EVA improvement methodology. This will be the main contribution of this research.

The rest of the paper is organized as follows. Section Two summarizes the literature review and highlights the main findings in this area. Section Three describes our data and methodology. Section Four analyzes our results, and Section Five concludes the paper.

1.2. Literature Review on Merger and Acquisions

Extensive research has been done on consolidations in the banking industry. Overall, these studies provide mixed evidence, and many fail to show a clear relationship between M&A and

performance. In this section, I review the portion of the literature most relevant to our work. Interestingly, some empirical evidence suggests the impact of M&A operations in the US banking industry have not improved performance (DeLong & DeYoung, 2007; Amel et al., 2004; Berger, Demsetz, & Strahan, 1999). Beccalli and Frantz (2009) investigated the effects of M&A on the performance of banks and explored the sources of merger-induced changes in performance. They used a sample of 714 deals involving European Union (EU) acquirers and targets throughout the world from 1991 to 2005. Their results show that M&A slightly deteriorate performance measured by return on equity, cash flow return, and profit efficiency and improve performance measured by cost efficiency. They attributed these changes in performance directly to M&As' operations and argued that the changes would not have occurred in the absence of M&A. Hagendorff and Keasey (2009) found some evidence for a cost-cutting and revenue-enhancing strategy that entails an increase in both on- and off-balance sheet activities for US mergers during the three years after a merger of European banks. They also discovered that a European merger resulted in an increase of small performance gains for the acquirer during the post-merger period, while a US merger did not result in any performance changes. Considering the impact of M&A on cost X-efficiency (Vander Vennet, 1996, 2002; Altunbas, Molyneux, & Thornton, 1997); the impact on profitability ratios such as ROE and ROA (Vander Vennet, 1996; Altunbas and Ibáñez, 2004); and the impact on profit X-efficiency (Huizinga et al., 2001; Vander Vennet, 2002), a handful of literature on M&As in the EU banking industry also seems to conclude that M&A seldom improve performances. By using a hybrid translog cost function Altunbas, Molyneux, and Thornton (1997) find limited opportunities for cost savings from big-bank mergers. An increase in total costs appears more likely. By using a sample of 492 M&A operations related to EU banks from 1988 to 1993, Vander Vennet (1996) shows that domestic mergers among equal-sized partners significantly increase the accounting profitability of the merged banks, while improvements in cost efficiency are observed only for cross-border acquisitions, not for domestic operations.

Another study by Cornett, McNutt, and Tehranian (2006) finds a contrasting result that shows industry-adjusted operating performance of merged banks increases significantly after a merger. They

used 134 samples of US bank merger from 1990 to 2000 to examine the changes in overall industry-adjusted operating performance and long-run stock returns of commercial bank mergers. They also find large bank mergers produce greater performance gains than small bank mergers, activity-focusing mergers produce greater performance gains than activity-diversifying mergers, and geographically focusing mergers produce greater performance gains than geographically diversifying mergers. The performance gains were even larger after the implementation of full nationwide banking in 1997 via the Riegle-Neal Act. The improved performance results from both revenue enhancement and cost reduction activities.

DeLong (2001) examined the wealth effect of bank mergers by distinguishing between types of mergers according to their focus or diversification along the dimensions of activity and geography rather than differentiating among various organization type. She found diversifying mergers to have a low correlation between the stock return of the bidder and the target at the time of the merger announcements. Her results showed that bank mergers that focus both on geography and activity are value-increasing, whereas diversifying mergers do not create value. Cornett et al. (2006) used the same methodology to test the post-merger performance of diversifying mergers. They found that large bank mergers produce greater performance gains than small bank mergers, activity-focusing mergers produce greater performance gains than activity-diversifying mergers, and geographically focusing mergers produce greater performance gains than geographically diversifying mergers. They also showed that the improved performance comes from revenue enhancement and cost reduction activities. Revenue enhancement opportunities appear to be most profitable in those mergers that offer the greatest opportunity for cost-cutting activities, such as activity-focusing and geographically focusing mergers. Johnston and Madura (2000) examined market valuation at the announcement of the Citicorp-Travelers Insurance Group merger on April 6, 1998, and found favorable share price responses for commercial banks, insurance companies, and brokerage firms. Their evidence supports the argument that mergers between banks and non-bank financial services will facilitate cross-selling and efficiencies. However, their review of market reactions was based on the announcement of one event, the Citicorp and Travelers Insurance Group merger.

Another way banks can achieve potential economies of scale is through geographical diversification, because once the basic infrastructure is in place, organizations can expand the system elsewhere at a potentially reduced cost. Benefits of geographical diversification include better access to capital markets in other regions or countries, which potentially leads to reduced cost of capital (Deng and Elyasiani, 2008), greater market power (Iskandar-Datta and McLaughlin, 2007), and reduced tax liabilities because geographically diversified banks can transfer resources from high-tax to low-tax areas. Gleason et al. (2006) examined market reaction to mergers between banks and non-banks and joint ventures from 1980 to 1998.They discovered that, in both cases, the market responds favorably and product market expansion provides value-enhancing opportunities to US banks.

Maretno , Ha-Chin , and Chotigeat (2010) demonstrated that, when a bank merges with a non-bank, subsequent annualized stock returns are diminished by 2%, but the same choices do not significantly produce abnormal returns during the two days before and two days after the announcement dates. This finding was consistent with those of previous studies (DeLong, 2001; 2003), which found that focusing mergers among banks are more value enhancing to shareholders than diversifying mergers.

Altunbas and Marques (2008) showed improvements in performance after a merger particularly in cross-border M&As; broad similarities between merging partners are also conducive to improved performance. Berger (2000) and Hughes et al. (1999) argue that most of the efficiency gains from mergers are on the revenue side, arising through asset diversification. Value creation from market-related considerations has also been reported in US markets. Kane (2000) found that mergers are likely to generate value when the target bank is a large deposit institution and when both firms are headquartered in the same US state.

Some explanations for this puzzling evidence are the following:

- The absence of best-practices guidelines for planning and executing increasingly large and complex acquisitions (DeLong & DeYoung, 2007),
- Failure to consider the mean-reversion behavior in industry-adjusted performance (Knapp et al., 2006),

- The longer time (up to five years) needed to realize efficiency gains, leading to more favorable prices for consumers (Focarelli & Panetta, 2003),
- The difficulties of integrating broadly dissimilar institutions (Altunbas & Ibáñez, 2004; Vander Vennet, 2002),
- Increased costs associated with changes in post-merger risk profiles, and
- Business strategies (Demsetz & Strahan, 1997; Hughes et al., 1999).

Nevertheless, all the above studies refer to the overall change in performance by comparison in a dynamic analysis (according to the definition by Berger, 1998 and 1999) of the post-M&A performance with the pre-M&A performance. However, some of this difference could be due to a continuation of firm-specific performance before the merger or economy-wide and industry factors, as stated by Healy et al. (1992).

1.3. Data and Methodology

1.3.1. Sample Description

The data set was obtained by combining three sources: Thomson ONE Banker M&A for data on M&A operations, Bankscope for balance sheet and income statement of the banks involved in M&A operations (M&A sample), and the CRSP/Compustat database for market-level data. My sample comprises M&A deals announced between 1/1/1999 and 31/12/2009 in which the acquirer is a US public Bank Holding Companies (BHC) and the target is a bank operating in the US. The initial M&A sample refers to 1,264 mergers. To be included in our sample, M&A must fulfill the following criteria:

1. The merger should not involve any federal government assistance.
2. The target banks must have at least $100 million dollar in asset book value at the time of the merger announcement. That reduces our sample from 1,264 to 555 mergers.
3. The acquirer and target bank can be involved in no other merger in the year before and after the merger in questions, which leaves 311 mergers.
4. I match the acquirer and target acquirer from the Bankscope database; 134 mergers remain.

5. I eliminate those merger samples for those we had missing values either for acquirer or target. Finally, I found 79 mergers.

1.3.2. Performance Measure

One measure I use to evaluate the M&A performance is the operating profitability of an average asset. Healy et al. (1992), Cornett et al. (1998, 2006), and Hagendorff et al. (2009) used similar metrics as pretax operating cash flows divided by the book value of each asset. Conversely, accounting measures relying on return on asset (ROA) and return on equity (ROE) will include general interest expenses, which are influenced by both the method of accounting (pooling vs. purchasing)[3] and takeover finance (cash vs. equity)[4]. Those measures will allow limited inferences about the changes in economic performance[4]. Hence, I use the EVA method that overcomes the suspicious aspect of using operating profitability to estimate performance.

Although accounting ratios are useful performance indicators, they have been criticized for not accurately reflecting real changes of the firm in the long run, especially when they are subject to manipulation (Berger et al., 1994; DeYoung, 1997; Bauer et al., 1998; Berger et al., 1999; and Kohers et al., 2000). The rapid evaluation of both parametric and non-parametric efficiency methodologies made the traditional techniques obsolete in the study of bank performance. Despite the intense research effort, there is no consensus on which method is the best. Regardless of the method used to estimate efficiency scores, they should be consistent in their efficiency levels and ranking. The method should be able to identify the best and worst firms and be consistent over time and with competitive market conditions. Following Al-Sharkas, Hassan, & Lawrence (2008), I chose to use the non-parametric Data Envelopment Analysis (DEA) methodology to estimate input- and output-oriented efficiency.

[3] Source: Healy, Palepu, & Ruback (1992).
[4] Source: Cornett et al. (2006)

1.3.2.1. Accounting Measure

I use operating profitability over average asset to measure accounting performance. The benefit of using this measure is that it excludes the effect of interest on debt used as capital financing by the bank. To measure pre-merger pro forma performance, I combine the operating performance of target and acquirer. Following Cornett et al. (2006), the performance of the combined banks is the weighted average of values for the target and acquirer, where the weights are the relative sizes of the two firms at the end of the year before the merger. Following the same method, I also obtain the industry-adjusted operating performance for both the target and the acquirer. Then I compute the difference between year-end operating profitability of the acquirer one year after the merger and operating profitability of the pre-merger proforma year-end operating performance one year before the merger.

1.3.2.2. Economic Value Added

Sirower and O'Byrne (1998) developed the Economic Value Added equation (EVA) methodology for forecasting and evaluating post-acquisition *operating* performance both for corporate practitioners and researchers. From a performance evaluation perspective, when an acquirer takes over a target, the past essentially becomes irrelevant. Performance should be forward looking. A firm with a stellar past can lose market value if it fails to meet market expectations. Hence, the main challenge would be to develop a post-acquisition benchmark to determine what level of performance the market was expecting before the transaction was announced (Sirower et al., 1998). They separated the known components of the market value from the expectational components. This was the main idea behind their methodology. They broke the total market value of the firm into its known and expected components:

$$MV_0 = Cap_0 + \frac{EVA_0}{c} + \left[\frac{(1+c)}{c}\right] * \sum_{t=1}^{\infty} \Delta \frac{EVA_t}{(1+c)^t}$$

where MV_0 is the market value of the firm (sum of the market value of the equity, book value of preferred stock, minority interest, and interest-bearing debt) at the end of Period 0, Cap_0 is the book capital (total assets minus total non-interest-bearing current liabilities) at the end of Year 0, EVA_0 is the EVA for Year

0, c is the weighted average cost of capital, and ΔEVA_t is the expected EVA improvement in Year t. The EVA_0 is derived as follows:

$$EVA_0 = NOPAT_0 - c * CAP_{t-1}$$

The $NOPAT_0$ is net operating profit after tax at the end of Year 0. Cap_{t-1} is book capital at the beginning of Year 0. The cost of capital is derived as

$$c = w_d * k_d(1 - T) + (w_e * k_e)$$

where w_d is the weight of debt, w_e is the weight of equity, K_d is the cost of debt before tax, T is the tax rate, and k_e is the cost of equity derived from Capital Asset Pricing Model (CAPM).

$$CAPM: k_e = r_f + (r_m - r_f) * \beta_i$$

where r_f is the risk-free interest rate, r_m is market return, and β_i is the beta of the firm.

To measure the future growth value (FGV) that is the capitalized present value of the expected annual EVA improvements in Equation 1, I will rewrite that as:

$$FGV_t = MV_0 - Cap_0 - \frac{EVA_0}{c}$$

The EVA will only provide a cost of capital return on current operation value. Hence, the EVA improvement is required to earn a cost of capital return on the Future Growth Value (FGV) to get a cost of capital return on total market value. The expected EVA improvement must satisfy the following:

$$\Delta EVA_1 + \frac{\Delta EVA_1}{c} + \Delta FGV_1 = c * FGV_0$$

where EVA_1 is actual *EVA* improvement, $\frac{\Delta EVA1}{c}$ is the capitalized actual *EVA* improvement, ΔFGV_1 is the change in *FGV,* and $c*FGV_0$ is the cost of capital return on *FGV*.

To provide a total value of $c*FGV_0$, the substantial ΔEVA is required to satisfy the following:

$$\Delta EVA_1 * \frac{(1+c)}{c} = c * FGV_0$$

or

$$\Delta EVA_1 = \left[\frac{(c * c)}{(1 + c)} * FGV_0\right]$$

Here, $\frac{(c*c)}{(1+c)} * FGV_0$ is the actual expected EVA improvement. The actual improvement is compared to the expected EVA improvement to get the excess EVA improvement for post-merger periods. Positive excess EVA improvement indicates that the return is above what was expected in the operating performance of the firm after the merger and acquisition, whereas negative excess EVA improvement indicates the return is below what was expected.

1.3.2.3. Efficiency Measurement

I use the non-parametric DEA method to compute the efficiency of merged banks. DEA has become very popular in measuring efficiency and is based on the pioneering work of Farrell (1957), proposing the frontier function to measure efficiency. DEA is a non-parametric linear programming technique used to compare the input and output data of decision-making units (DMUs) to measure and evaluate the relative performance of DMUs. Charnes et al. (1978) extended Farrell's model to a multiple input-output pattern and employed mathematical programming to develop an efficient frontier and to estimate the efficiency score (the CCR model). But the CCR model is limited to the constant returns to scale (CRS) and the convexity of the production possibility set. However, the CRS assumption is only appropriate when all DMUs are operating at an optimal scale. When all DMUs are not operating at optimal scale, the use of the CRS specification results in measures of technical efficiency being confounded by scale efficiencies. Banker et al. (1984) suggested an extension of the CRS CCR model to account for variable returns to scale (VRS) situations. In this paper, I will employ VRS technology to compute the two types of efficiency, namely input-oriented efficiency and output-oriented efficiency. The input-oriented technical efficiency measure addresses the question: "How much can input quantities be proportionally reduced without changing output quantities?" Alternatively, "How much can output quantities be proportionally expanded without altering input quantities?" This would be output-oriented efficiency.

The main reasons to choose the DEA method over the parametric stochastic frontier is because, unlike stochastic models that require a large sample size and proper functional form of the frontier to make reliable estimations, the DEA demands relatively less data and does not require knowledge of the proper functional form of the frontier, error, and inefficiency structures (Evanoff & Israilevich, 1991; Grifell-Tatje & Lovell, 1997; Bauer et al., 1998; Wheelock & Wilson, 1999). The DEA is based on the individual firm, so it is easy to analyze efficiency by firm, which is particularly convenient for studying scope economies. The DEA technique measures the performance of each bank in the industry relative to best practice-efficient frontiers consisting of the dominant banks in the industry. Efficiency scores vary between 0 and 1, with fully efficient banks having efficiencies equal to 1 and inefficient firms having efficiencies between 0 and 1. Technical efficiency for a given firm is defined as the ratio of the input usage of a fully efficient firm producing the same output vector as the input usage of the firm under consideration. Technical efficiency can be achieved if the firm operates on the production frontier. I use the following input and output variables to compute efficiency.

Input vectors:

(1) Labor: Measured by staff costs (the number of full-time employees on the payroll),

(2) Fixed capital: Measured by costs of premises and fixed assets, and

(3) Customer and short-term funding: Measured by the sum of deposit (demand and time) and non-deposit funds as of the end of the respective year.

Output vectors:

(1) Total loan: Both short-term and long-term loans,

(2) Other earning assets: Loans to special sectors (directed and specialized loans), inter-bank funds sold, and investment securities (treasury and other securities), and

(3) Off-balance sheet items: Guarantees and warranties (letters of guarantee, bank acceptances, letters of credit, guaranteed pre-financings, endorsements, and others), commitments, foreign exchange and interest rate transactions, as well as other off-balance sheet activities.

1.3.3. Regression Analysis

To analyze the effect of a merger on performance, I will empirically test the following model:

$$\Delta \text{ performance} = \beta_0 * \text{Constant} + \beta_1 * \text{Year} + \beta_2 * \text{Relative size} + \beta_3 * \text{Transaction value} + \beta_4 * \text{Same state (dummy)} + \beta_5 * \text{Same SIC (dummy)} + \beta_6 * \text{Post-merger performance acquirer loan loss reserve over gross loan} + \beta_7 * \text{Post-merger acquirer net interest margin} + \beta_8 * \text{Post-merger acquirer cost-to-income ratio} + \beta_9 * \text{Target performance}$$

- **Relative size:** Relative size is measured as the ratio of target to acquirer assets. For domestic mergers, a positive relation with relative size and change in performance will indicate that relatively larger targets may offer more opportunities to realize post-merger cost efficiencies. But post-merger performance will be weaker in a "merger of equals" because of internal power struggles and conflict in the integration process.
- **Transaction value:** Transaction value is the amount the acquirer paid to acquire the target. If the acquire assumes the target is more valuable and would like to pay a higher price for it, I would expect a change in performance will be positively related to the transaction value. Conversely, post-merger performance may be weaker because of the increased complexity of the higher values of the merger and acquisition (Akhavein, 1997). Here, I use the natural logarithm of transaction value.

- **Same State:** This is a dummy variable to capture the effect of geographic diversification. If both the acquirer and target are from the same state, I assign a value of 1; otherwise, I designate the variable as 0. Banks considering entering a market via acquisition would select the best target banks. Hence, increasing market shares might increase their profitability. However, Berger and DeYoung (2001, 2006) found that the greatly increased geographic footprint of US bank holding companies due to industry consolidation can cause managerial difficulties that will reduce efficiency.
- **Same SIC:** This dummy variable captures the effect of product diversification. If a depository institution/non-depository merges with another depository institution/non-depository, it would like to increase its interest income. I call it product diversification. However, if a depository institution merges with another non-depository institution, I call it product diversification as its income will come from both interest and non-interest income.
- **Acquirer post-merger strategy:** The post-merger performance of the acquirer will mostly depend on the strategy taken by the acquirer. To control for other non-merger-related factors, I use loan loss reserve/gross loan to measure the credit risk of the acquirer, which would be negatively related to the performance. I also use the net interest margin (NIM) as an indicator of acquirer lending efficiency and cost-to-income ratio (CI) as an indicator of operating expenses. I expect NIM would be positively and CI would be negatively related to performance.
- Target performance: Finally, to capture the impact of target performance on acquirer performance, I include return of average asset (ROAA) of target and efficiency of target as a control variable. Acquiring more profitable and more efficient targets may lead to increased operating profit. However, acquiring more efficient targets may increase or decrease the efficiency of the acquirer.

1.4. Results and Main Findings

The descriptive statistics in **Table 1** indicate that, in terms of size as measured by total assets, the acquirer banks on average are five and half times larger than the targets. Operating profits of the acquirer banks on average are 5.36 times, and net income on average is 5.16 times, higher than the target banks. Post-merger acquirer size measured by total assets on average is 1.36 times higher than pre-merger. Also the total profitability on average increases by 1.14 times. The initial results of our descriptive statistics show that mergers increase the size and profitability of the acquirer.

Table 1: Descriptive Statistics of merger and acquisitions

The descriptive statistics of Table 1, Panel A, refer to acquirer pre- and post-merger and target's pre-merger total asset, total equity, accounting profitability, and expenses. Panel B shows the relative size of the target at the time of announcement and transaction value. Our sample period contains merger data from the years 1999 to 2009.

Descriptive Statistics	N	Mean (thousands)	Std.	Minimum	Maximum
Target					
Total Assets	79	10635080	43456415	108345	326563000
Operating Profit	79	194716	732292	-5257	4390000
Equity	79	1021969	3818731	7855	23419000
Net Income	79	132412	520475	-5410	3535000
Net Interest Income	79	319801	1214825	2857	8149000
Non-Interest Expenses	79	368414	1458107	2574	9777000
Personnel Expenses	79	178843	704234	1224	4765000
Pre-merger Acquirer					
Total Assets	79	59186734	175065568	230215	1110457000
Operating Profit	79	1045195	3163862	-5405	21221000
Equity	79	4871808	14112894	22015	99645000
Net Income	79	681097	2119410	-2703	14143000
Net Interest Income	79	1630496	4592780	6936	28797000
Non-Interest Expenses	79	1696815	4781928	6982	27027000
Personnel Expenses	79	868525	2449545	3646	13473000
Post-merger Acquirer					

Total Assets	79	80924147	249135616	378690	1459737000
Operating Profit	79	1194229	4513879	-2687385	30681374
Equity	79	7596313	22699747	31134	135272000
Net Income	79	789769	3102187	-2113000	21133000
Net Interest Income	79	2047382	5837679	13046	34591000
Non-Interest Expenses	79	2279533	6682827	9862	35549000
Personnel Expenses	79	1137116	3419809	5844	18255000
Relative Size	79	0.33	0.43	0.003	3.244
tran_val	79	2489.87	9481.15	8.53	58663.15

Mean and median profitability and expense and asset quality ratios of the target and acquirer before and after merger are reported in **Table 2**. Profitability measured by return on average asset (ROAA), return on average equity (ROAE), and net interest margin (NIM) indicates that, before a merger, acquirers were on average more profitable than their target. The ROAA and ROAE of the acquirer were significantly higher than the industry average before a merger, while the ROAA and ROAE of the target were about the same as the industry average. The NIM of the target and acquirer before the merger were significantly lower than the industry average. However, the ROAA and ROAE of the acquirer after merger were lower than the pre-merger ROAA and ROAE. They were not significantly different from the industry average. Acquirers were more cost efficient than their targets measured by cost-to-income ratios. Acquirer non-interest expenses were a little higher than their targets'. After a merger, acquirer cost-to-income ratios go up, and non-interest expense-to-average-asset goes down. I can also see that both the acquirer before- and after-merger and target expense ratios were below the industry average.

Table 2: Profitability, Expense, and Asset Quality Ratios

Table 2 shows various profitability expense and asset quality ratios of targets and acquirers from 1998 to 2009. Industry Mean Difference is computed as the difference between merging banks (target and acquirer) performance and the industry. Data are for the years 2000 to 2009. We use a non-parametric Pearson sign test to evaluate the significance of median. indicates significance at 10%, ** indicates significance at 5%, and ***indicates significance at 1%.*

Variables	Median	Mean	Std.	Mean Ind. Difference
Profitability Ratio				
Target Return on Average Assets (ROAA)	0.908	0.883	0.76	-0.03
Target Return on Average Equity (ROAE)	10.653	9.513	8.84	0.60
Target Net Interest Margin	3.612	3.689	0.83	-0.30***
Pre-merger Acquirer (ROAA)	1.153	1.121	0.46	0.21***
Pre-merger Acquirer (ROAE)	12.031	11.594	5.04	2.68***
Pre-merger Acquirer Net Interest Margin	3.716	3.737	0.76	-0.25***
Post-merger (ROAA)	1.014	0.822	0.88	-0.09
Post-merger (ROAE)	9.145	7.894	9.95	-1.02
Post-merger Acquirer Net Interest Margin	3.596	3.681	0.73	-0.31***
Expense Ratio				
Target Cost-to-Income Ratio	63.56	66.892	16.91	-0.35
Target Non-interest Exp./Avg. Asset	2.7	2.888	1.12	-0.38***
Target Non-interest Exp./Gross Rev.	63.56	66.888	16.91	-0.13
Pre-merger Acquirer Cost-to-Income Ratio	62.216	60.603	13.15	-6.64***
Pre-merger Acquirer Non-interest Exp./Avg. Asset	2.84	2.797	0.82	-0.47***
Pre-merger Acquirer Non-interest Exp./Gross Rev.	62.2	60.602	13.15	-6.42
Post-merger Acquirer Cost-to-Income Ratio	63.355	63.075	16.45	-4.16**
Post-merger Acquirer Non-interest Exp./Avg. Asset	2.77	2.767	0.94	-0.50**
Post-merger Acquirer Non-interest Exp./Gross Rev.	63.36	63.075	16.45	-3.95**
Asset Quality				
Target Net Loans/Total Assets	68.919	67.456	12.99	1.83
Target Loans/Customer Deposits	91.06	94.826	25.31	9.20***
Target Net Loans/Customer & ST Funding	86.111	86.319	21.71	6.55***
Target Loan Loss Reserve/Gross Loans	1.173	1.254	0.69	-0.16**
Pre-merger Acquirer Net Loans/Total Assets	67.966	66.404	11.17	0.77
Pre-merger Acquirer Loans/Customer Deposits	96.8	98.664	18.80	13.04***
Pre-merger Acquirer Net Loans/Customer & ST Funding	85.82	87.994	18.82	8.22***
Pre-merger Acquirer Loan Loss Reserve/Gross Loans	1.249	1.246	0.38	-0.17***

Post-merger Acquirer Net Loans/Total Assets	69.049	67.216	10.04	1.59
Post-merger Acquirer Loans/Customer Deposits	98.41	99.989	16.03	14.37***
Post-merger Acquirer Net Loans/Customer & ST Funding	88.632	88.335	14.18	8.56***
Post-merger Acquirer Loan Loss Reserve/Gross Loans	1.204	1.284	0.45	-0.13**

I report the difference between these various profitability, expense, and asset quality ratios in **Table 3**. It shows that, after merger on average, ROAA and ROAE decrease more significantly than pre-merger combined banks' ROAA and ROAE. However, I did not find any evidence that the expense ratio and asset quality of the acquirer bank changes more significantly after a merger than pre-merger combined banks' expense ratios and asset quality. So far, I found that post-merger the profitability of the acquirer, as measured in ROAA and ROAE, decreases more significantly than in a pre-merger combined firm. However, this measure could be manipulated.

Table 3: Acquirer Changes in Pre- and Post-merger Accounting Ratios

*Table 3 shows the average change in various accounting ratios for the acquirer before and after a merger. Data are for the years 2000 to 2009. * indicates significance at 10%,**indicates significance at 5%, and ***indicates significance at 1%.*

Variable	Mean	Std.
Change in ROAA	-0.2633***	.8135
Change in ROAE	-3.6053***	9.4621
Change in Net Interest Margin	-.0246	.4431
Change in Cost-to-Income Ratio	1.5808	13.8587
Change in Non-Interest Expense/Average Assets	-.0221	.5671
Change in Net Loans to Total Assets	.8994	5.8895
Change in Loans to Customer Deposits	1.7937	12.0151
Change in Net Loans to Customer/ST Funding	.9320	10.4721
Change in Non-Interest Expense/Gross Revenues	1.5818	13.8589

Table 4 shows the correlation coefficients between various changes in performance metrics. Interestingly, changes in ROAA, ROAE, and unadjusted operating profit over total average assets are highly positively correlated and significant. When I look at the correlation between changes in industry-

adjusted operating profitability, ROAA, and ROAE, they are significantly negatively correlated. I did not find any significant correlation between change in efficiency and other performance change metrics.

Table 4: Correlation Coefficient of Various Performance Metrics

*Table 4 shows the correlations between various performance metrics. Data are for the years 2000 to 2009. *indicates significance at 10%,**indicates significance at 5%, and ***indicates significant at 1%.*

	Δ in Eff. Input	Δ in Eff. Output	Δin Ind. Adjusted Eff. Input	Δin Ind. Adjusted Eff. output	Δ in Unadj. ROAA	Δ in Unadj. ROAE	Δ in Unadj. in Op. Profit	Δ in Ind. Adjusted Op. Profit
Δin Eff. Input	**1.000**							
Δ in Eff. Output	0.258**	**1.000**						
Δ in Ind. Adjusted Eff. Input	0.960***	0.265**	**1.000**					
Δ in Ind. Adj. Eff. Output	0.148	0.968***	0.206*	**1.000**				
Δ in Unadj. ROAA	-0.043	-0.057	0.032	0.002	**1.000**			
Δ in Unadj. ROAE	-0.035	-0.056	0.036	0.003	0.98***	**1.000**		
Δ in Unadj. Op. Profit	-0.020	-0.071	0.057	-0.004	0.95***	0.9134***	**1.000**	
Δ in Ind. Adj. Op. Profit	0.036	0.053	-0.033	-0.004	-0.97***	-0.999***	-0.889***	**1.000**

The performance of the merged banks was computed one year before and after the merger. I examine the operating profitability, efficiency, and EVA of the target and acquirer before and after the merger as well as the weighted average of combined banks one year before the merger. The operating cash flow measure is deflated by the book value of the average asset to yield the normalized measure of performance. I also compare the performance based on product- and geographically focused versus a diversifying merger. Changes in pre- and post-merger operating profitability and efficiency are examined on both an unadjusted and industry-adjusted basis. Industry-adjusted comparisons will allow us to

examine the performance of merged banks regardless of industry-wide changes that might affect performance. The change in unadjusted performance may reflect some factors other than the bank merger.

Following Cornett et al. (2006), I identify industry banks as all banks that were not involved in a merger in the year before and after the merger in question. But, rather than forming four groups, I form eight groups.

- Group 1 has less than $100 million; as our target filter size is $100 million, I never used this group.
- Group 2 asset size lies between $100 million and $300 million.
- Group 3 asset size is between $300 million and $600 million.
- Group 4 asset size is between $600 million and $1 billion.
- Group 5 asset size encompasses $1billion to $5billion.
- Group 6 asset size comprises $5 billion to $10 billion.
- Group 7 asset size is between $10 billion and $50 billion.
- Group 8 has assets of more than $50 billion.

If the merger bank asset size is $1.5 billion, then industry banks will include all the banks in the group. Matching the merged banks to their respective group will allow us to compare their characteristics with their most similar competitors.

To identify the sources of changes in performance, I also evaluate their other profitability, operating efficiency, and asset quality indicators. There is collinearity between some of the specific ratios, for example, return on asset and return on equity. Hence, change in performance result from common elements. I use t-statistics to test the change in performance by using the following formula:

$$t = \frac{\left(\sum_{t=1}^{n}(P_{post} - P_{pre})\right)}{\left(\frac{\sigma}{\sqrt{N}}\right)}$$

Here, P_{Post-}means the post-merger performance, and P_{Pre-}means the pro-forma, pre-merger performance of the combined banks. N is the number of merged banks, and σ is the standard deviation of the distribution. Finally, I run a regression analysis to the find the impact of mergers on change in performance.

Panel A of **Table 5** represents the unadjusted operating profitability of the target and acquirer before and after the merger as well as the combined banks' pre-merger profitability. On average, the unadjusted operating profitability of the acquirer was 1.63%, compared to target 1.245%. The post-merger operating profitability was 1.178%, compared to pre-merger combined banks' 1.147%. The difference between pre-and post-merger operating profitability is .03%; however, it is not significantly different from zero.

Table 5: Average Change in Pre-and Post-merger Operating Profit

*Table 5, Panel A, shows the average change in pre- and post-merger acquirer unadjusted operating profit/average asset. Panel B shows the average change in pre- and post-merger acquirer industry adjusted operating profit/average asset. Mean industry adjusted difference is calculated as the difference between operating profit/average asset of merging banks and their corresponding peers average operating profit/average asset. Data are for the years 2000 to 2009. I use the non-parametric Pearson sign test to evaluate the significance of the median.*indicates significance at 10%,**indicates significance at 5%, and ***indicates significance at 1%.*

Panel A: Average Change in Pre-and Post-merger Acquirer Unadjusted Operating Profit/Average Asset

	Median	**Mean**	**Std.**
Target Op. Profit/Avg. Asset	1.2300	1.2453	1.0674
Acquirer Pre-merger Op. Profit/Avg. Asset	1.6600	1.6318	0.7043
Unadjusted Pre-merger Pro-forma Op. Profit/Avg. Asset	1.0504	1.1470	0.5952
Acquirer Post-merger Op. Profit/Avg. Asset	1.3500	1.1775	1.1989
Change in Op. Profit/Avg. Asset	0.3123**	0.03042	1.1516

Panel B: Average Change in Pre-and post-merger Acquirer Unadjusted Operating Profit/Average Asset

	Median	**Mean**	**Std.**
Target Industry Adjusted Op. Profit/Avg. Asset	-0.3200***	-0.3698***	0.9600
Pre-merger Acquirer Ind. Adjusted Op. Profit/Avg. Asset	-0.0800	-0.0581	0.6678
Pre-merger Proforma Ind. Adjusted Op. Profit/Avg. Asset	-0.6721	-0.5933***	0.5301
Post-merger Acquirer Ind. Adjusted Op. Profit/Avg. Asset	-0.0300***	-0.0887	0.9417
Change in Ind. Adjusted Operating profit	0.6442***	0.5046***	0.8610

To account for the contemporaneous effect, I also report the industry-adjusted operating performance in Table 5, Panel B. On average, the acquirer industry-adjusted performance is -0.058%,

while the target industry-adjusted operating performance is -0.37%. Both the acquirer and target operating profitability were below their industry-matched performance, but the difference between their performance and the industry did not differ significantly from zero. Moreover, the pre-merger pro-forma performance was also lower than the post-merger performance. On average, a merger increased the industry-adjusted operating performance by 0.50%, an increment not significantly different from zero. So, like Cornett et al. (2006), merged banks perform similar to others in the industry before a merger. However, a merger did not increase the operating profitability of the merged banks.

Table 6 shows the efficiency scores of the merged banks. Panel A reports the unadjusted efficiency of the target, pre-and post-merger acquirer, and pro-forma combined banks. The median of target input-oriented efficiency was about 13% higher than the acquirer, while the mean of the target input efficiency was 12% higher than acquirer pre-merger efficiency scores. However, the median and mean of the target output efficiency were lower than the acquirer by about 1% and 4% respectively. Post-merger input efficiency of the acquirer significantly decreased by 8%; output efficiency significantly increased by 6.7%. The resulting median change in input-oriented efficiency is about -4.0% and is significant at the 1% level, while the median change in output-oriented efficiency is 0.7% and is insignificant.

Panel B, Table 6, shows the industry-adjusted input- and output-oriented efficiency scores. Both the target and acquirer median and mean input-oriented efficiency scores were significantly below the industry's. While the median output-oriented efficiency scores of the target and acquirer were not different from their industry, mean output-oriented efficiency was significantly higher than the industry. Consistent with unadjusted efficiency scores, I find that, after a merger, the industry-adjusted mean input-oriented efficiency decreased significantly by 2.7%, which was lower than unadjusted input-oriented efficiency. The mean output-oriented efficiency increased significantly by about 9%, which is more than the unadjusted change in output-oriented efficiency. I can conclude that mergers on average increase efficiency if the efficiency of the acquirer is higher than the target, though many studies have concluded that potential efficiency gains from a merger and acquisition are seldom realized. Demoing (1997),

Peristiani (1997), and Berger (1998) find little or no cost-efficiency improvement in mergers. Apparently, managerial inefficiencies of the acquiring banks or integrating system have offset the potential gain from consolidation.

Table 6: Average Change in Acquirer Various Pre-and Post-merger Acquirer Efficiency Scores

*Table 6, Panel A, shows the average change in pre- and post-merger acquirer unadjusted efficiency scores. Panel B shows the average change in pre- and post-merger acquirer industry-adjusted efficiency scores. Mean industry-adjusted difference is calculated as the difference between efficiency of merging banks and their corresponding peers' average efficiency scores. Data are for the years 2000 to 2009. I use a non-parametric Pearson sign test to test the significance of median.*indicates significance at 10%,**indicates significance at 5%, and ***indicates significance at 1%.*

Panel A: Unadjusted Values of Efficiency

Variable Name	Median Eff. Input	Mean Eff. Input	Median Eff. Output	Mean Eff. Output
Target	0.2108	0.2906	0.0274	0.1435
Acquirer Pre-merger	0.0798	0.1743	0.0359	0.1800
Premerger Pro-forma	0.1044	0.1984	-0.0452	0.0861
Acquirer Post-merger	0.0551	0.1171	0.0297	0.1529
Change in Efficiency	-0.0452***	-0.0812***	-0.0072	0.067**

Panel B: Comparison of Industry-Adjusted Values of Efficiency

Variable Name	Median Eff. Input	Mean Eff. Input	Median Eff. Output	Mean Eff. Output
Target Ind. Adjusted	-0.1202**	-0.0338	-0.0159	0.0734***
Acquirer Pre-merger	-0.2353***	-0.1500***	-0.0110	0.1109***
Pre-merger Pro-forma	-0.2002***	-0.1259***	-0.0015	0.0159***
Acquirer Post-merger	-0.2518***	-0.1880	-0.0062	0.1092***
Change in Ind. Adjusted Efficiency	-0.0270***	-0.0620***	-0.0039	0.0933***

Now I examine the product and geographic focus versus product and geographic diversification merger. Theoretically, for a focus merger, improved performance and market value of the combined firm come from economy of scale, and for diversified merger, come from enhancing the income-generating capacity of the combined institution and lowering the operating costs through operational synergies, for example, economies of scope. If a specialized bank is already minimizing its costs, it can also improve its performance by economy of scale, that is, a diversified merger. But a diversified merger can incur agency costs due to the complexity of the conglomerate organization. Therefore, it is unclear whether the potential benefits of activity diversification outweigh the costs.

Moreover, from a theoretical perspective it is uncertain which type of merger reduces the risk—focuses or diversified. Standard portfolio theory predicts that the combined cash flows from non-correlated revenue sources should be more stable than the constituent parts. Securities and insurance activities can decrease conglomerate risk, but the effect largely depends on the type of diversifying activities that bank holding companies undertake (Kwan & Laderman, 1999). Moreover, if the acquirer does not know the true status of the credit risk of the target loan, then after the merger, it might increase the credit risk and the allowance for loan loss ratios.

Apart from the activity focus-diversified motive, bank mergers are also motivated by geographic focus and diversification. Because the financial service industry is highly regulated and different locations have different regulatory environments, a bank's location plays a vital role in the market for corporate control, the activities in which the bank may engage, and the bank loan portfolio. The main goal of this paper is to investigate the impact of bank M&A on performance and find what kind of merger significantly affects firm efficiency, value addition, and long-run performance.

Delong (2003) found that mergers between partners that focus their geography and activity enhance value more than any other type. This study is similar in spirit but differs from Delong (2001) in several aspects. First, Delong (2001) looked at the cumulative abnormal returns (CARs) of the stock market. The main reason to rely on abnormal stock market returns is the efficient capital market hypothesis. If the market efficiency incorporates the expected future gains of the firm, there should be no

abnormal return in the long term. The capital market studies have not been able to identify whether the gains from M&A are due to market inefficiency or real economics gain (Healy, Palepu, & Ruback, 1992). Stock prices that reveal the market's expectations of future cash flows may differ from actual performance.

Table 7: Average Performance Metrics of Geographic and Product Focus Versus Geographic and Product Diversification

*Table 7, Panel A, shows mean performance metrics of geographic and product focus versus geographic and product diversification. If the merging banks' headquarters are in the same state, then the merger is considered a geographically focused merger; otherwise, it is a geographically diversified merger. A product- or activity-focused merger happens when the two-digit SIC code of the merging banks are the same. Mean industry-adjusted difference is calculated as the difference between merging banks and their corresponding peers' average. Data are for the years 2000 to 2009. *indicates significance at Δ10%, **indicates significance at 5%, and ***indicates significance at 1%.*

	Focus		**Diversification**	
Variable Name	**Geographic**	**Product**	**Geographic**	**Product**
Δ in Unadjusted Operating Profit	0.20*	0.04	-0.29	-0.03
Δ in Ind. Adjusted Operating Profit	0.73***	0.49***	0.08	0.64***
Δ in Eff. Input	-0.09***	-0.09***	-0.07**	-0.03**
Δ in Eff. Output	-0.01	0.07**	0.22***	0.06
Δ in Ind. Adjusted Efficiency Input	-0.07***	-0.07***	-0.05	-0.02
Δ in ind. Adjusted Efficiency output	0.01	0.10***	0.25***	0.07

Table 7 reports the results of a focus versus diversification merger. I found significant evidence that a geographically focused merger increases the operating profitability of the banks; there was no significant evidence that a geographically diversified merger has any impact on operating profitability. Compared to the overall industry-adjusted performance, a geographically focused merger increases the operating performance by 0.20%. Both product-focused and a diversification merger increase operating profitability; however, product diversification increases the operating profitability by 0.15% over a product-focused merger. Regardless of product or geographic focus and diversification, mergers overall

lowered the input efficiency and increased the output efficiency of product-focused and geographically diversified mergers.

So far, I have compared post-acquisition with pre-acquisition measures of operating performance and efficiency like most academic studies. Now I will use the EVA methodology developed by Sirower and O'Byrne (1998) for forecasting and evaluating post-acquisition operating performance, which will interest both corporate practitioners and researchers. The EVA method uses the market values of both acquirer and target before the merger and the merger premium to determine the future levels of annual operating performance that are necessary to justify the investment in the merger. When an acquirer takes over a target, the acquirer pays an up-front price that virtually always includes a substantial premium. These premiums should include the expectation of the acquiring bank of making improvements in the target bank's future performance and exploiting other synergies between the two banks. To create value for shareholders, the present value of the performance gains of the merging banks must be higher than the stand-alone expectations to recapture the premium.

M&A are a complex process with unique features. Just by comparing operating performance one year before and after it, I cannot find the true effect of a merger and acquisition. Sirower et al. (1998) identified some benchmark problems, such as:

1. Acquisitions are a capital investment decision that the shareholders of the acquirer can essentially make on their own—just by buying the shares of other companies—without paying either premiums or integration expenses.
2. Unlike any other capital investment decision, an acquisition requires paying all the money up front, including the acquisition premium, before any improvements can begin.
3. Paying the acquisition premium creates an additional business problem—achieving performance gains above those already reflected in the share prices of the two stand-alone firms.

As I have documented in **Table 8,** the sample of our merger shows significant improvement in operating profitability and output-oriented efficiency.. The following table shows that, before the merger,

the acquirer had a negative EVA improvement, and the target had a positive EVA improvement. The pro-forma EVA improvements of the combined firms were also less than zero. However, after the merger, the mean expected EVA improvement of the acquirer was $.76 million, and the acquirer on average improved its expected EVA by $31.09 million, which is significantly different from zero.

Table 8: Changes in Economics Value Added

*Table 8 shows the expected EVA improvement analysis of merging banks. Data are for the years 2000 to 2009. *indicates significance at Δ10%,**indicates significance at 5%, and***indicates significance at 1%.*

	Median	Mean	Std.
Target			
Target EVA	-4555.49	2699.39	248862.33
Target Capitalized EVA	-302528.43	-512099.12	14255298.53
Target Value of Operation	428902.89	13689209.92	44285334.17
Target FGA	254786.39	-1080679.85	13677941.19
Target Expected Return on FGA (FGA*WACC)	3274.15	-25313.23	265266.81
Target $1 EVA Improvement Contributes (1/wacc)	60.84	68.16	47.06
Target EVA Improvement	67.09	-501.43	5247.21
Acquirer Pre-merger			
Acquirer Pre-merger EVA	-15321.50	10578.19	1178333.16
Acquirer Pre-Merger Capitalized EVA	-789619.64	22439055.12	160410187.8
Acquirer Pre-merger Present Value of Operation	8299012.96	93651973.51	270414456.9
Acquirer Pre-merger FGA	-8299012.963	-81157081.22	240579486.8
Acquirer Pre-merger Expected Return on FGA (FGA*WACC)	-100926.27	-889620.60	2366630.46
Acquirer Pre-merger $1 EVA Improvement Contributes (1/wacc)	62.84	66.13	29.94
Acquirer Pre-merger EVA Improvement	-1361.789	-12110.77	30238.19
Acquirer Post-Merger			
Post-merger EVA	-29038.28	-592686.15	2232707.178
Post-merger Capitalized EVA (EVA/WACC)	-1173216.23	-20843341.25	128081665.2

Post-merger Present Value of Operation	3772040.78	81137455.24	243754450.2
Post-merger FGA (Present Value of Expected EVA Improvement)	1776829.63	22178676.18	117092422.3
Post-merger Expected Return on FGA (FGA*WACC)	30159.71	576094.37	2050448.95
Post-merger $1 EVA Improvement Contributes (1/wacc)	55.52	65.00	28.78
Acquirer Post-merger EVA Improvement	698.24	20484.79	76493.32
Change in Performance			
Pre-merger Pro-forma EVA Improvement	-1005.25	-10614.57	27760.04
Change in EVA Improvement	2740.26	31099.36**	91777.07

To identify the factors contributing to the change in performance, I ran a regression analysis. **Panel A, Table 9,** shows the changes in operating profitability as a function of merger-related variables and other firm-level control variables. Consistent with previous findings, I find that geographically focused mergers increase the unadjusted operating profitability significantly (Regression 1a). A product-focused merger does not significantly affect the change in unadjusted operating profit. Consistent with Cornett et al. (2006), I also find that, the bigger the target bank size relative to the acquirer, the greater the improvement in performance around the merger. I also find that a 1% increase in target input-oriented efficiency and output-oriented efficiency will increase the unadjusted operating profitability significantly by 0.9% and 0.83%, respectively. Panel B shows the relationship between the change in industry-adjusted operating profitability around the merger and other variables. Here, only the deal size and Geographically focused merger have a significant, positive relationship with change in industry-adjusted operating profitability. However, when I control for other variables, industry-adjusted performance target efficiency has no significant impact on change in operating profitability. The relative size of the target has significant positive impact on change in operating profitability and has positive but not significant impact on change in unadjusted operating profitability.

Finally, **Table 10** shows that, the larger the deal, the higher the improvement in efficiency. Geographically focused mergers decrease output-oriented efficiency. This result is consistent with our previous findings and economy of scale hypothesis.

Table 9: Results of the Regression Analysis-Accounting Performance

*Table 9 shows the results of the regression analysis. The dependent variable in Panel A is the change in operating profit/average asset. Model A includes Target ROAA as an independent variable while Model B and C include the target's input- and output-oriented efficiency scores. In Panel B, the dependent variable is the change in industry-adjusted operating performance. Data are for the years 2000 to 2009. *indicates significance at 10%,**indicates significance at 5%, and***indicates significance at 1%.*

	Panel A: Dependent Variable: Change Unadjusted in Operating Profit		
	A	**B**	**C**
Constant	197.098**	143.104	138.286
Merger Year	-0.098**	-0.071	-0.069
Relative Size	0.369*	0.409**	0.358*
Log (Transaction Value)	0.028	0.092*	0.029
Same-state Dummy	0.356*	0.312	0.326
Same-SIC Dummy	0.006	-0.168	-0.131
Post-Merger Acquirer Loan Loss Reserve/Gross Loans	-0.985***	-1.085***	-1.158***
Post-merger Acquirer Net Interest Margin	0.369***	0.4***	0.408***
Post-merger Acquirer Cost-to-Income Ratio	-0.022***	-0.023***	-0.022***
Target ROAA	0.067	N/A	N/A
Target Efficiency Input	N/A	0.904***	N/A
Target Efficiency Output	N/A	N/A	0.828**
R square	0.651	0.683	0.676
Adj. R-square	0.605	0.641	0.634

	Panel B: Dependent Variable: Change in Ind. Adjusted Operating Profit		
	A	**B**	**C**
Variables	**Coefficients**	**Coefficients**	**Coefficients**
(Constant)	-195.464**	-196.988**	-192.368**
Merger Year	0.098**	0.098**	0.096**
Relative Size	0.231	0.246	0.231
Log (Transaction Value)	0.046	0.086*	0.065
Same-state Dummy	0.511***	0.459**	0.463**
Same SIC Dummy	0.077	-0.008	0.018
Post-Merger Acquirer Loan Loss Reserve/Gross Loans	-0.428**	-0.459**	-0.462**
Post-merger Acquirer Net Interest Margin	0.344***	0.354***	0.351***
Post-merger Acquirer Cost-to-Income Ratio	-0.023***	-0.023***	-0.023***
Target ROAA	0.141	N/A	N/A
Target Ind. Adjusted Eff. Input	N/A	0.302	N/A
Target Ind. Adjusted Eff. Output	N/A	N/A	0.181
R-Square	0.539	0.534	0.53
Adjusted R-Square	0.479	0.473	0.469

Table 10: Results of the Regression Analysis-Efficiency Scores

*Table 10 shows the results of the regression analysis. The dependent variable is the change in industry-adjusted and unadjusted efficiency scores. The change in industry-adjusted efficiency scores are calculated as the difference between efficiency scores of merging banks and their corresponding peers' average efficiency scores. Data are for the years 2000 to 2009.*indicates significance at 10%,**indicates significance at 5%, and ***indicates significance at 1%.*

Dependent Variables	Change in Eff. Input	Change in Ind. Adjusted Eff. Input	Change in Eff. Output	Change in Ind. Adjusted Eff. Output
Variables	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
Constant	-47.106**	-35.361**	-46.135**	-11.955
Merger Year	0.023**	0.018**	0.023**	0.006
Relative Size	0.032	0.026	-0.071	-0.081*
Log (Transaction Value)	0.018*	0.021**	0.087***	0.087***
Same-state Dummy	-0.024	-0.016	-0.099**	-0.083*

Same-SIC Dummy	-0.014	-0.014	0.074	0.083
Post-merger Acquirer Loan Loss Reserve/Gross Loans	0.026	0.03	0.062	0.074
Post-merger Acquirer Net Interest Margin	-0.014	-0.021	-0.018	-0.023
Post-Merger Acquirer Loans/Customer Deposits	-0.001	-0.001	0.001	0.001
Post-merger Acquirer Operating Profit/Average Total Assets	0.024	0.03	0.044	0.046*
Target Eff. Input	-0.107	N/A	N/A	N/A
Target Ind. Adjusted Eff. Input	N/A	-0.063	N/A	N/A
Target Eff. Output	N/A	N/A	-0.145**	N/A
Target Ind. Adjusted Eff. Output	N/A	N/A	N/A	-0.12
R-square	0.234	0.217	0.663	0.682
Adjusted R-Square	0.121	0.102	0.614	0.635

1.5. Conclusion

In this paper, I examine bank performance around mergers after the passage of the GLBA. While previous research in this area has examined the performance of banks around a merger and changes in short-term and long-term operating performance. This paper extends the previous research by combining all the previous methodology used in merger and acquisition studies and adding a new methodology, namely Expected EVA improvement. My empirical results conclude that industry-adjusted operating performance of merged banks increases significantly after a merger. This finding is consistent with the recent findings of Cornett et al. (2006). I also find that the acquirer-expected EVA improvement increases significantly after the merger. The revenue enhancement opportunity appears more profitable if there exists more opportunity for cost-cutting such as geographic focus and diversified merger. A product diversification merger increases the industry-adjusted performance more than a product-focused merger.

Finally, in the United States, regulation has constrained the ability of banks to expand geographically and various product lines. Our paper shows that eliminating these constraints through the adoption of intrastate and interstate banking laws has helped US banks improve their operating performance and efficiency through merger and acquisition.

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Chapter 2: Efficiency, Diversification, and Performance of Financial Institutions

2.1. Introduction

An important issue in the financial service industry is whether it is better for commercial banks to specialize in traditional banking activities, that is, pure lending, or to offer a variety of financial products such as underwriting and brokerage and insurance services. Are financial institutions prone to make the same mistakes that many non-financial firms made during the conglomeration wave of the sixties and nineties in the last century? One might argue that the financial industry is truly special in the sense[4] that a broadening of business scope increases the banks efficiency thereby creates the value for bank shareholders (Elsas et al., 2010). Increase in efficiency might come from either bank-specific economies of scope or technological progress. Unlike most firms from other industries, banks are highly regulated and operate with high operational leverage (i.e., a high ratio of fixed costs to variable costs). Diversifying into related businesses awards them with a cost advantage over specialized competitors. For example, selling securities or life insurance through the existing retail bank branch network might result in cost economies of scope. Rajan (1994) points out that the involvement of commercial banks into underwriting, brokerage, and insurance depends on the efficiency of commercial banking organizations in providing these services, the effects on the stability of the financial system and the proper role of the government. In this paper I focus on the first issue- the efficiency and performance of commercial banks in providing these diversified financial services. The objective of this paper is to investigate the relationship among diversification; efficiency and market value of all public banks in the world. We examine how diversifying away from traditional financial intermediation activity into noninterest income business has affected banks efficiency and value.

[4] Banks are special because banks have proprietary information acquirers of the borrowers (Fama, 1980, 1985; James, 1987; Sharpe, 1990; Rajan, 1992), and banks, by their very nature, are designed to diversify (Winton, 1999; Acharya et al., 2006).

Our motivation came from the fact that between 2000 to 2003, assets of securities underwriting and dealing subsidiaries of FHCs grew by two-third, assets of their insurance underwriting and dealing subsidiaries tripled. (Report to Congress of FHCs under the GLBA, 2003). If this activity or product diversification is beneficial to the banks, it should be reflected on the value of the banks. Does this diversification affect the bank's production efficiency and excess value? How does this efficiency translate into excess value for the firm or how excess value increase is related to diversification and efficiency. Existing banking literature shows mixed results. By exploring whether activity diversification changes production efficiency and excess value I offer an alternative way to test the differences between diversified versus focused banks. Our results will help to explain the possible value difference of diversified banks. Our study will contribute to the vast literature on corporate diversification discount, which still remains a puzzle. Our paper will provide further evidence for bank managers, investors in bank stocks, and bank regulators about banks' diversification vs. focus strategy. Specifically, is diversification or focus the way to improve efficiency and value? As far as I know, this is the first paper to examine the interrelationships among diversification, efficiency, and excess value.

Our research is based on two competing hypotheses, namely the conglomeration hypothesis and strategic focus hypothesis. Conglomeration hypothesis holds when a firm can add value by exploiting cost and revenue scope economies by operating in a diversity of businesses whereas strategic focus hypothesis states a firm can add value by focusing on core businesses and core competencies.

The proponents of **conglomeration hypothesis** argue that scope economies can originate from cost complementarities, including the sharing of inputs such as customer lists and managerial expertise (Berger et al., 2000, Teece, 1980) or take advantage of revenue scope economies in providing "one-stop shopping" to consumers who are willing to pay for the extra convenience of financial supermarkets (Berger et al. 1996, Herring and Santomero 1990, Gallo, Apilado, and Kolari 1996, Calomiris 1998). Conglomeration may also improve financial efficiency and add value by creating internal capital markets that may be less prone than external markets to imperfections such as information asymmetries (e.g., Williamson, 1970; Gertner, Scharfstein, & Stein, 1994). Furthermore, conglomeration may diversify risk

by diversifying its earnings, reducing the expected costs of financial distress or bankruptcy, allowing greater financial leverage and/or permitting firms to earn higher revenues from risk-sensitive customers who are willing to pay more or accept reduced services in return for lower default risk (e.g., Lewellen 1971). The proponents of the **strategic focus hypothesis** argue that firms can maximize its value by focusing on core businesses and core competencies (John & Ofek, 1995). According to this hypothesis, conglomeration is likely to destroy firm value by introducing cost and/or revenue scope diseconomies. Conglomeration may reflect agency problems in which managers may add businesses to protect the value of their human capital (Amihud & Lev, 1981), exacerbate principal-agent conflicts (Jensen, 1986; Meyer, Milgrom, & Roberts, 1992) and create cross-subsidization among subsidiaries due to inefficient internal capital markets (Scharfstein & Stein, 2000).

The inconclusive findings in the literature, the empirical evidence documented on banking diversification to date are primarily based on either US or European market (Laeven and Levine (2007) may be one of the few exceptions).

By employing nonparametric data envelopment analysis (DEA), I estimate input- and output-oriented technical efficiency scores using both constant return to scale (CRS) and variance return to scale (VRS). Input-oriented and output-oriented efficiency scores under CRS technology are the same, so I report one of them. The diversification literature mainly focuses on either geographic diversification or activity/product diversification. Here, I are more interested in activity diversification, rather than geographic diversification. To capture the degree of activity diversification of banks, I follow Laeven and Levine (2007) and compute two measures of diversification, namely asset diversity and income diversity. Corresponding to asset and income diversity, I calculate asset-based excess value and income-based excess value by using a modified version of the "chop-shop" method (LeBaron & Speidell, 1987; Lang & Stulz, 1994). So I have two measures of diversification (asset-based and income-based), two measures of excess value (asset-based and income-based), and three measures of efficiency (input-oriented efficiency based on CRS and VRS technology, output-oriented efficiency based on VRS technology). To check the robustness of our finding, I compute the income-based measure of diversification, excess value, and

output-oriented efficiency. Finally, I investigate the relationships among diversification, efficiency, and excess value. To estimate these interrelationships, our main challenge is to control for both endogeniety and heterogeneity.

Our results show that diversifications significantly reduce the value of banks measured in excess value and vice versa regardless of which measures diversification or excess value I use. Both revenue and asset diversification also significantly reduce all measures of efficiency scores. But the impact of efficiency on diversification is mixed. Only efficiency scores computed based on variable return to scale have negative on revenue diversification and other efficiency scores have no impact on diversifications. Finally I find that increasing efficiency will increase the excess value of the banks significantly and vice versa. This finding is consistent with our previous two findings. So increasing diversification will reduce the excess value and hence will lower the excess value or BHC with lower diversification will have lower excess value and are more efficient.

2.2. Literature Review

The existing banking literature does not provide a clear consensus as to the question "should banks diversify or should they specialize" (Berger, Hassan, & Zhou 2010). There is evidence supporting both arguments. Traditional arguments support the conglomerate hypothesis and suggest that banks should be as diversified as possible, as banks are typically highly leveraged, and diversification reduces their chance of costly financial distress/bankruptcy. Diversification also makes it cheaper for institutions to achieve reliability in their role as screeners or monitors of borrowers (Diamond, 1984; Ramakrishnan & Thakor, 1984; Boyd & Prescott, 1986). On the other hand, some studies (Jensen, 1986; Berger & Ofek, 1996; Servaes, 1996; Denis et al., 1997) support the strategic focus hypothesis and argue that financial institutions should focus on a single line of business to take greatest advantage of management's expertise and reduce agency problems, leaving investors to diversify on their own.

The empirical literature on the merits of a bank expanding into a diversified business has largely focused on the question of whether the repeal of the Glass–Steagall Act allowed US commercial banks to reduce business risk by diversifying into non-traditional financial services. The general conclusion of these findings is that bank expansion into less traditional financial activities is associated with increased risk and lower returns. Rose (1989) suggested that banks moving into non-bank product lines could reduce cash flow risk. However, Allen and Jagtiani (1999) generated synthetic banks to simulate the impact of both insurance and securities activities and found that these non-bank activities reduced the firm's total risk but served to increase systematic market risk. Estrella (2001) did not find the potential to reduce earnings volatility for the combination of earnings streams from interest-based banking activities and fee-based securities activities. Templeton and Severiens (1992) examined 54 BHCs from 1979 to 1986 and found that banks' diversifying into other financial services would reduce unsystematic risk, but there was no effect on systematic risk. Berger et al. (1999) found that consolidation in the financial services industry has been consistent with greater diversification of risks on average but with little or no cost efficiency improvements.

More recent papers suggest that costs may outweigh benefits when banks choose to diversify their products. DeYoung and Roland (2001) found that a shift toward fee-based activities from traditional banking activities is associated with increased revenue volatility and a higher degree of total leverage, both of which imply greater earnings volatility for commercial banks in the US. Stiroh (2004) concluded that a greater reliance on non-interest income, particularly trading revenue, is associated with higher risk and lower risk-adjusted profits across commercial banks. Stiroh (2005) showed that greater exposure to non-interest income increases the volatility of equity market returns, but not the mean. Stiroh and Rumble (2006) demonstrated that revenue diversification toward fee income reduced risk-adjusted returns. Over their observation period, fee-based activities were more volatile but not necessarily more profitable than traditional interest-earning activities. Apart from this traditional view, there are some papers that focus on the effects of diversifications on firm value and efficiency. Lamont and Polk (2001) suggested that diversified firms are faced with required future asset returns that are higher than those of specialized

firms. The range of possible explanations for differential expected returns are due to risk, taxes, and liquidity; in a financial conglomerate setting, it is often attributed to mispricing by irrational investors. Mansi and Reeb (2002) valued firms based on contingent claim framework. Shareholders' value is the call option on the value of the firm, and it is exercised when the value of asset is greater than debt. Corporate diversification leads to risk reduction and a lower default premium, which decreases the value of the call option and increases debt holder value. So, in effect, value is transferred from shareholders to debt holders.

A completely different view from the above arguments supporting the conglomerate hypothesis is that it is not corporate diversification that causes the discount but that already discounted firms tend to diversify away from industries experiencing difficulties into more promising industries (reverse causality). Using various econometric techniques, Campa and Kedia (2002), Villalonga (2004b), Whited (2001), Fluck and Lynch (1999), and Lamont and Polk (2001) all discovered that the discount can be at least partly explained by selection bias, endogeneity problems, and measurement error. Maksimovic and Phillips (2002) also made the similar argument that less productive firms tend to diversify, but diversity is not causing the discount.

Recently, Laeven and Levine (2007), Schmid and Walter (2009), and Baele et al. (2007) found strong evidence of a conglomerate discount. Laeven and Levine attributed the destruction of value to agency problems associated with the conglomerate structure. They also concluded that the size of the discount is such that it would almost certainly wipe out any economies of scope these firms might have. Schmid and Walter (2009) found a substantial and persistent discount. The authors argued that it is driven by diversification, not by troubled firms diversifying away into more promising areas. For the very largest of the firms in their sample, Schmid and Walter find a substantial premium, pointing to the existence of ‘‘too big to fail" guarantees.

To our knowledge, not too much research has directly addressed the issues of efficiency and diversification. However, some prior research has come close to these issues. For example, some studies found that banks in BHCs are more efficient than independent banks (e.g., Spong, Sullivan, & DeYoung

1995; Mester 1996). Vander Vennet (1996, 2002) found that financial conglomerates outperform small banks when it comes to cost/profit efficiency, which supports the economies of scale and X-efficiency for universal banks over specialized banks. In contrast, other research suggested that branch banking organizations are more efficient than multibank BHCs (e.g., Grabowski, Rangan, & Rezvanian, 1993), and that for a given organization size, a greater number of separate bank charters reduces the market value of the organization (Klein & Saidenberg, 2000). A few studies in the banking literature examine revenue and profit economies. For example, Berger, Hancock, and Humphrey (1993) analyzed profit scope economies using the standard profit function. Berger, Humphrey, and Pulley (1996) analyzed revenue scope economies using the alternative revenue function, and Clark and Siems (1997) used the alternative profit function to evaluate expansion-path scale economies. They did not find consistent benefits of either joint production or specialization within the banking industry.

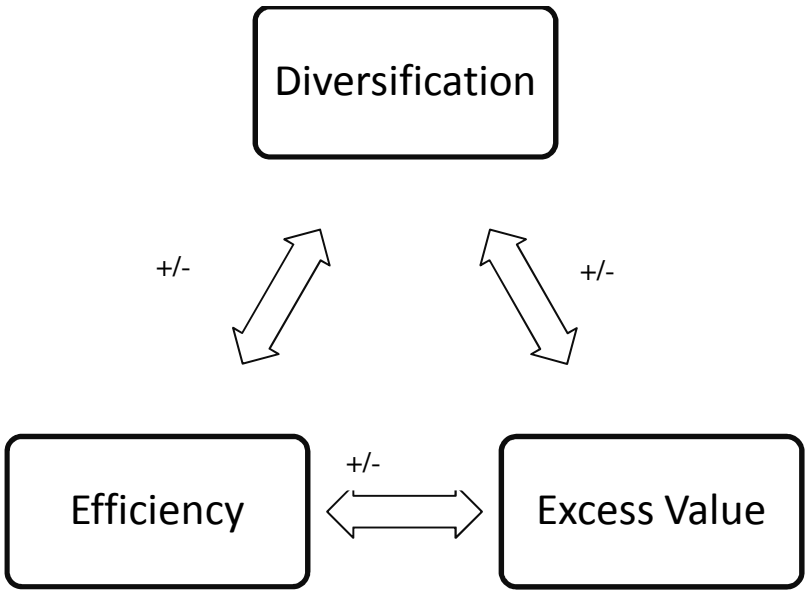
2.3. Hypothesis

At the end of the twentieth century, the financial industry across the globe went through major deregulation. That allowed commercial banks to engage in various financial activities, that is, security underwriting. Hence, some commercial banks have chosen to diversify across products while others choose to specialize. The co-existence of diversifying and specializing firms provides a natural experiment in the relative efficiency and performance of these alternative operating strategies. Hence, I ask the question, "Are banks with lower diversification discounts more efficient?" and attempt to determine if increased efficiency translates into value creation. To find the answer, I need to find the relationship among diversification, excess value, and efficiency. I empirically test the following hypothesis:

- ***H1:*** How does diversification influence efficiency and excess value?
- ***H2:*** How does efficiency impact excess value?

The graphical representation of my hypothesis:

Figure: 2.1.



2.4. Model

To test our hypothesis, I will estimate the following equations simultaneously:

Diversification = *f* (efficiency, excess value, other bank-level variables)

Efficiency = *f* (diversification, excess value, other bank-level variables)

Excess Value = *f* (efficiency, diversification, other bank level variables)

The main objective of doing this simultaneous equation is to control for endogeneity. I will also control for the individual firm effect or heterogeneity while estimating these equations. To control for heterogeneity, I will first demean my data and then apply three-stage least-square techniques. The following are the various efficiency, diversification, and excess value measures I will use to estimate our hypotheses.

Efficiency	Diversification	Excess value
Input-Oriented Efficiency Using CRS Technology (Crsi)	Asset-based Diversity (Diva)	Excess Value Computed Using Asset-based Diversity (EVA)
Output-Oriented Efficiency Using VRS Technology (Vrsi)	Revenue-based Diversity (Divr)	Excess Value Computed Revenue-based Diversity (Evr)
Output-Oriented efficiency Using VRS Technology (Vrso)		

Empirically, I will estimate the following equations simultaneously:

Diversification = year dummy + ln(Asset) + ln(asset^2) + equity/total assets + ln(Other earning Assets) + Excess value + Efficiency Scores **eq-2.1.**

Efficiency = year dummy + ln(Asset) + ln(asset^2) + equity/total assets + ln(Personnel Expenses) + Market share + Diversification + Excess value **eq-2.2.**

Excess Value = year dummy + ln(Asset) + ln(asset^2) + equity/total assets + Deposit/Total Liability + Diversification + Efficiency **eq-2.3.**

The table below shows the tentative sign of our regression results.

Dependent Variable	Efficiency	Excess Value	Diversification
Ln(Asset)	-	+	+
Ln(Asset^2)	+	-	-
EQ_TA	+	-	+
Ln(Emp)	-	N/A	N/A
MSHR	+	N/A	N/A
DEP_LIB	N/A	+	N/A

LN(OEA)	N/A	N/A	+
Efficiency	N/A	+ or -	+ or -
Diversification	+ or -	-	N/A
Excess Value	+ or -	N/A	-

2.5. Data and Methodology

I collected all our data from Bankscope, which contains considerably more data on financial information on all publicly traded banks around the world than alternative data sources. Our sample contains data from the years 2002 to 2010. Our initial data set contained 3,697 banks. Following Laeven and Levine (2007), I excluded small banks, defined as banks with less than US $100 million in total assets. I also excluded insurance companies and Islamic banks because their accounting information does not match the rest of the sample. Furthermore, I excluded banks with missing data on basic accounting variables, including assets, loans, deposits, equity, interest income, and non-interest income. My final data set contains 1,940 banks and 8,093 bank-year observations.

2.5.1. Measures of Activities

The diversification of a bank will depend on the degree to which each bank underwrites securities, provides brokerage services, operates mutual funds, securitizes assets, underwrites insurance, etc. For example, if a specialized bank is focused on commercial banking, then most of its revenue will come from interest revenue, or it will primarily engage in lending activities. If a bank focuses on trading activities, then it will have more fee income and have less lending activity. However, financial conglomerates provide a broad array of financial services; they make loans, underwrite securities, underwrite insurance policies, securitize assets, and sell a wide array of financial services. I construct our

diversification measure based on the diversity of bank activities and asset-based and income-based measures of diversity. These measures show the degree to which banks specialize in lending or non-lending services, or whether they perform a diversity of activities. Our diversification measures will primarily focus on the distinction between interest-generating and fee-generating activities. Lower values of these diversity indexes mean more specialization, and higher values signify that the bank engages in a mixture of lending and non-lending activities or is well diversified. Financial conglomerates who offer a broad array of services will have higher indexes than a specialized bank and a bank that only makes loans; theoretically, it will have zero diversity. As I am interested in the impact of diversification on efficiency and firm value, our diversity indexes will measure diversity per se.

2.5.2. Measures of Diversity

I follow the idea of Laeven and Levine (2007) to construct our diversity measure. Our first measure of diversity is asset-based diversity. I first construct an asset-based measure that equals loans relative to total earning assets to identify where along the range each bank falls, from pure commercial banking to specialized investment banking. Total-earning assets include loans, securities, and investments. Very high values signal that the bank specializes in loan making or specialized commercial banking. And very low values of these ratios signal that the bank specializes in non-loan-making activities. For any bank, if this asset-based measure is greater than 0.90 or lower than 0.10, then this bank is considered a specialized bank. If asset-based measures for any bank fall between the ranges of .10 to .90, then it is considered a diversified bank or a conglomerate. I calculate asset-based diversity as

$$\text{Asset diversity } = 1 - 2 * \left| 5. - \frac{Net\ Loan}{\text{Total Earning Assets}} \right|,$$

where other earning assets include earnings from investments and other securities, total earning assets is the sum of net loans and other earning assets, and |.| denotes the absolute value indicator. Revenue diversity takes values between 0 and 1 and is increasing in the degree of diversification. Although our measures are different from Laeven and Levine (2007), I got similar results.

Our second measure of diversity is revenue-based diversity. I first construct a revenue-based indicator that equals the ratio of net interest income-to-total operating income. This indicator identifies where each bank falls along the range from pure lending to pure fee/trading-based activities. Total operating income includes net interest income, net fee income, net trading income, and net commission income. A specialized loan-making bank will have a larger ratio of net interest income-to-total operating income. A specialized investment bank is expected to have a larger share of other operating income (fees, commissions, and trading income), meaning a lower ratio of net interest income to total operating income. For any bank, if this revenue-based indicator is greater than 0.90 or lower than 0.10, then this bank is considered a specialized bank. If the indicator for any bank falls between the ranges of .10 to .90, then it is considered revenue, income-diversified, or conglomerate. The revenue-based diversity is measured as

$$Income\ diversity\ = 1 - 2 * \left| .5 - \frac{Net\ interest\ revenue}{Total\ operating\ income} \right|.$$

Here, net interest income is interest income minus interest expenses; other operating income includes net fee income, net commission income, and net trading income. Revenue diversity takes values between 0 and 1 and increases the degree of diversification.

The asset-based measure suffers from fewer measurement problems than revenue-based measure, but I include both for robustness. In particular, since loans may yield fee income, the income-based measure may overestimate the degree to which some lending institutions engage in non-lending activities. Thus, while presenting both sets of results, I place greater weight on the analyses using the asset-based measure.

2.5.3. Bank-Level Performance: Tobin's Q, Activity-Adjusted q, and Excess Value

To measure the performance of a bank, I will also follow Laeven and Levine (2007).

Tobin's Q*:* I use Tobin's Q as a measure of bank valuation. Tobin's q is calculated as the sum of the market value of common equity plus the book value of preferred shares plus the book value of total debt divided by the book value of total assets. Tobin's Q will capture the present value of future cash flows

divided by the replacement cost of tangible assets (Lang & Stulz, 1994). One of the advantages of using Tobin's Q is that, theoretically, I don't have to adjust for risk or leverage to compare firms. Moreover, as banks are extremely highly leveraged and banks' tangible assets are primarily financial assets, so market values and replacement costs are identical for most assets (Brook et al., 1998). In this case, I will have Tobin's Q close to 1.

Activity-adjusted *Q:* Different banking activities may be valued differently. For example, if investment banking is valued differently from commercial banking, then I need to control for the extent to which the bank is engaged in either activity to isolate the relationship between valuation and diversity per se. Revenue-adjusted q is our estimate of the q that would prevail if the bank were divided into activity-specific financial institutions and then priced according to the q's associated with each of those activity-specific activities. At a general level, if I consider a bank that engages in two activities such as lending operation and non-lending operations, let α_i equal the share of the *i*th activity in the total activity of bank and $\sum_{i=1}^{2} \alpha_i = 1$. Let q_i equal the Tobin's q of financial institutions that specialize in activity i (pure-activity q). $Activity\ adjusted\ q = \sum_{i=1}^{2} \alpha_i q^i$.To compute the activity-adjusted Tobin's Q (q^1 and q^2), I find the average Tobin's Q of the specialized financial institution with the same size.

Excess Value: We use a modified version of the "chop-shop" method introduced by LeBaron and Speidell (1987) and Lang and Stulz (1994) to compute the excess values of banks. To compare the Tobin's Q of each bank with the Q that would exist if the bank were "chopped" into separate financial "shops" (pure-activity banks) that each specializes in a financial activity (e.g., lending or fee/revenue generation). Hence, excess value equals the difference between a bank's actual q and the activity-adjusted q, so that the excess value for a bank is $Excess\ Value = q - (\alpha_1 q^1 - \alpha_2 q^2) = q - (\alpha_1 q^1 - (1 - \alpha_1) q^2)$. Here, q = the actual Tobin's q, and q^1 and q^2 are activity-adjusted Tobin's q.

2.5.4. Efficiency Measures

Following Berg et al. (1992), Elyasiani and Mehdian (1992), Fare et al. (1994), Leightner and Lovell (1998), Wheelock and Wilson (1999), and Cooper et al. (2004), this study will utilize the DEA method to calculate various efficiency measures, that is, input-oriented and output-oriented technical efficiency. Unlike stochastic models that require a large sample size and proper functional form of the frontier to make reliable estimations, the DEA is relatively less data demanding and does not require knowledge of the proper functional form of the frontier, error, and inefficiency structures (Evanoff & Israilevich, 1991; Grifell-Tatje & Lovell, 1997; Bauer et al., 1998; Wheelock & Wilson, 1999). DEA is individual-firm based, making it easy to decompose efficiency by firm, which is particularly convenient for studying scope economies. The DEA technique measures the performance of each bank in the industry relative to ‘‘best practice” efficient frontiers consisting of the dominant banks in the industry. Efficiency scores vary between 0 and 1, with fully efficient banks having efficiencies equal to 1 and inefficient firms having efficiencies between 0 and 1.

Technical efficiency for a given firm is defined as the ratio of the input usage of a fully efficient firm producing the same output vector as to the input usage of the firm under consideration. Technical efficiency can be achieved if the firm operates on the production frontier. I decompose technical efficiency into the proportional reduction in input usage if inputs were not wasted (pure technical efficiency) and that reduction if there existed constant returns to scale (scale efficiency). Hence, pure technical efficiency (PTE) measures efficiency relative to a variable returns-to-scale (VRS) frontier, and scale efficiency (SE), the distance between the VRS frontier and the CRS frontier. Pure technical inefficiency reflects excess input levels for a given level of output. This inefficiency is caused by and is correctable by management. From a societal point of view, firms that operate at constant returns to scale represent the socially efficient level of operation. Therefore, choosing a VRS of operation also constitutes inefficiency.

To determine the input and output variables for banks, first I need to understand the nature of bank technology. In banking literature, there are two main competing approaches, that is, production and

intermediation or asset (Sealey & Lindley, 1977). Like many studies on banking efficiency, for example, Ishik and Hassan (2002), I adopt the intermediation approach in this paper. Accordingly, I model US commercial banks as multi-product *firms,* producing three outputs employing three inputs. I normalize our input and output variables by total assets. I use the following input and output variables to compute our efficiency scores.

Input vectors

1. Labor: Measured by staff costs (the number of full-time employees on the payroll),
2. Fixed capital: measured by costs on premises and fixed assets, and
3. Customer and short-term funding funds: measured by the sum of deposit (demand and time) and non-deposit funds as of the end of the respective year.

Output vectors

1. Total loan: both short-term and long-term loans,
2. Other earning assets: loans to special sectors (directed and specialized loans), inter-bank funds sold, and investment securities (treasury and other securities), and
3. Off-balance sheet items: Guarantees and warranties (letters of guarantee, bank acceptance, letters of credit, guaranteed pre-financing, endorsements, and others), commitments, foreign exchange and interest rate transactions, as well as other off-balance sheet activities.

2.5.6. Other Bank-Level Variables

The other explanatory variables are: bank asset size, market share, the loan-to-asset ratio, and bank's capitalization. These explanatory variables are commonly used in the literature.

Size: I use logarithm of total assets to measure the bank size. The main reason to include this variable is that it will capture the possible cost advantages associated with size (i.e., economies of scale). Size may lead to positive effects on bank efficiency if there are significant economies of scale. In that case, I expect the effect of growing size on efficiency to be positive. However, the effect of size could be negative due

to agency problems and other reasons. Hence, the size-efficiency relationship may be expected to be non-linear. Following Delis and Papanikolaou (2009), I use the banks' assets (logarithm) and the square of asset size to capture this possible non-linear relationship. So if there exists any non-linear relationship, then the sign of the size and size^2 variable would be opposite. And this is also true for the size-excess value relationship.

Equity to total asset: To capture the risk, I use equity to total assets (EQ/TA), a measure of capitalization that reflects a bank's attitude toward risk. Banks with large capitalization are less likely to become insolvent and will engage in low-risk investment. Theoretically, well-capitalized banks enjoy a higher level of efficiency due to their ability to attract more customers than their poorly capitalized counterparts. So I expect that EQ/TA has a positive effect on efficiency. It is also possible that efficient banks generate higher profits, which in turn strengthen their capitalization status. These results are in line with the results of Isik and Hassan (2002), Turkey, Case, and Giradone (2004), and Italy, Kwan, and Eisenbeis (1997) for the US. One possible explanation for these findings is that, when EQ/TA is high, shareholders are more likely to monitor banks to ensure that they operate efficiently. Hence, these results are in favor of conventional wisdom that capital plays the role of implicit deposit insurance, which in turn encourages more deposits. On the other hand, a well-capitalized bank may have fewer incentives to engage in risk-taking. So they might pass a risky but positive NPV project. If this were the case, I would expect a negative correlation between the ratio of book value of equity to total assets (Equity/Assets) and our excess valuation measure. In other words, increasing EQ/TA will lower the risk, which will lower the value. In the same line I expect EQ/TA be positively related to diversification.

Market Share: Following Miller and Noulas (1996), I use the ratio of bank deposits to aggregate banks' total assets to reflect market share. It appears that banks with a larger market share are likely to be more efficient than those with a smaller share. This might reflect gains from scale economies or superiority. The efficient structure paradigm links concentration to high profitability through efficiency (Demsetz,1973), where efficient banks compete more aggressively for market shares.

Personnel Expenses: To capture the cost, I use the log (personnel expenses) to control for employee expenses. Increasing personnel expense will decrease efficiency.

Deposit to Liability*:* A higher deposits/liabilities ratio implies that the bank has access to low-cost, subsidized funding as deposits are generally an inexpensive source of funding and enjoy government-subsidized insurance. In that case, I expect a higher deposits/liabilities ratio than the excess value.

Other Earning Asset: I expect a logarithm of other-earning assets higher than diversification.

2.6. Empirical Results

Table 11, Panel A, shows the descriptive statistics of diversifications, excess value, various efficiency measures, and other exogenous variables from pooled data. I also report the standard deviation of the fixed-effect models. I found that, after controlling for bank-level effects, the variation in our variables was reduced at least by 66%, and maximum reduction was almost 98%. So most of the variations I observed in the data were due to bank-level effects. Our sample mean of both asset-based and revenue-based excess value are positive and significantly different from zero. This finding is different from other studies. Laeven and Levine (2007) found 6%, and Lang and Stulz (1994) found 32% diversification discount as a percentage of average q. Our results indicates a diversification premium, which is consistent with Elsas et al. (2010). Our Panel B of Table 11 shows the correlation coefficients of our demeaned endogenous variables. All the efficiency measures are positively correlated. However, CRSI and VRSI are strongly correlated, whereas CRSI and VRSI are weakly correlated. Excess values are weakly negatively related to all efficiency scores and positively related to diversification variables. Diversification and efficiency scores are also weakly correlated.

Table 12 shows the individual and time effects OLS estimates of each endogenous variable against all exogenous variables (i.e., the reduced form). There exists a non-linear relationship between input-oriented efficiency and bank size. Size has no effect on asset-based excess value and revenue-based

excess value; however, decrease as the banks became bigger. Mshr has a positive, significant effect on efficiency and negative and significant effect on excess value.

Our main objective is to assess the relationship among efficiency, diversity per se, and excess value. First, I estimate the fixed-effect regression to control for firm-level variation. As the same bank-level characteristics that guide a bank's decision to diversify or not may affect the market's valuation of the bank (Campa & Kedia, 2002; Chevalier, 2000; Graham, Lemmon, & Wolf, 2002; Lamont & Polk, 2001; Maksimovic & Phillips, 2002; Villalonga, 2004a, b; Whited, 2001). So, if I don't control for the firm-level traits that drive the diversification decision, it may create misleading econometric results and incorrectly attribute the diversification discount to diversification per se rather than to the underlying traits that induce firms to diversify. "A proper evaluation of the effect of diversification on firm value should take into account the firm-specific characteristics that bear both on firm value and on the decision to diversify" (Campa & Kedia, 2002, p. 1731).

I first control for individual bank-specific traits and bank-level heterogeneity, and later I control for endogeneity concerns. First, I include the major firm characteristics identified by various authors to have significant impact on firm value, diversification, and efficiency, including the year dummy. Table 13 presents six individual and time effects-OLS systems estimations with alternative efficiency metrics and asset-based measures in Panel A and revenue-based measures in Panel B. Each panel presents three (1), (2), (3), equation systems using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. Here, I omit the exogenous variables from each equation to identify the system. Our OLS results show that excess value is negatively and significantly related to efficiency and asset-based excess value has no significant effect on asset diversity. Revenue-based excess value has a positive, significant effect on revenue diversity. Increasing diversity has no effect on efficiency and positive and significant effect on excess value. Size has either no effect or a negative effect on efficiency, and $size^2$ has a positive effect on efficiency. There exists a non-linear relationship with efficiency and size. Size also has no effect on excess value, except one instance when it is measured with output efficiency. In that case, asset size has a positive and significant effect on excess

value. Equity/total asset has negative effect on excess value. These findings could be because a well-capitalized bank may have fewer incentives to engage in risk taking, so it might pass a risky but positive NPV project. If this were the case, I would expect a negative correlation between the ratio of book value of equity to total assets (Equity/Assets) and our excess valuation measure. In other words, increasing EQ/TA will lower the risk, which will lower the value. Accordingly, I expect EQ/TA be positively related to diversification. I also find deposit/liability has either no effect or a negative effect on excess value.

In Table 14, I present six individual and time effects-2SLS systems estimation with alternative efficiency metrics. Panel A reports asset-based measures, and revenue-based measures are reported in Panel B. In each panel, columns (1), (2), and (3) represent three equation systems using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. I do not report year-level time effects estimates for clarity purposes. Our 2SLS results show that increasing diversity will increase the excess value significantly and decrease the input-oriented efficiency significantly. However, diversity has either a positive or no effect on output-oriented efficiency. The effects of diversity on excess value are similar to our OLS results, and the coefficient estimates are higher than OLS estimates. All efficiency metrics have negative and significant effect on excess value. Asset-based efficiency metrics have no effect on asset-based diversification, and revenue-based efficiency metrics have a negative and significant effect on diversity. Asset-based excess value has a positive and significant effect on input-oriented efficiency metrics and no effect on output-oriented efficiency. Revenue-based excess value has a negative impact on all efficiency metrics. Revenue-based excess value has either a positive or no effect on diversity while asset-based excess value has a negative and significant effect on diversity. I found a linear relationship between bank size and excess value and diversity and non-linear or no relationship between size and efficiency. Increasing equity/total assets will lower the efficiency, excess value, and diversity, except it will increase the input-oriented constant return-to-scale (crsi) efficiency in an asset-based model and revenue diversity in an output-oriented variable return to scale model.

From the above discussion, I can see that our variables of interest, namely excess value, efficiency metrics, and diversity show different type of relationships among themselves when estimated by OLS or 2SLS. Now I would check what kind of relationship really exists among those variables of our interest. Should they be exogenously or endogenously determined? In **Table 5,** I report six individual and time effects-OLS and 2SLS systems estimates of each system's endogenous variables, appearing on the right-hand side of the equations from tables 13 and 14. I also report a Wu test p-value for endogeneity of its own appearance on the right-hand side in the system, a Wu endogeniety test p-value of prospective endogenous variables as a group in each equation, and an overall Wu endogeneity test p-value for each three-equation system. Panels A and B of Table 15 contain estimates and tests from three (1), (2), and (3), three-equation system using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. Individual Wu tests (for each endogenous variable separately) is a t-test of prediction errors (made from Table 12 first-stage projections) that are included in the equation where the endogenous variable appears on the right-hand side. The null hypothesis is that the candidate variable is not endogenous. The significance of prediction errors is evidence that right-hand side variable is correlated with the error term of that equation; therefore, the tested candidate variable is endogenous. The equation Wu test is a Wald with two degrees of freedom, testing whether the prediction errors of both included prospective endogenous variables are exogenous. For the individual and equation Wu test, each equation is run separately for the test, in typical 2SLS fashion. The System Wu tests set up 2SLS estimates as a three-equation system in GMM, making sure each equation uses its appropriate instruments and forming a Wald test with six degrees of freedom of all six coefficients' projection errors. Our test shows that asset-based excess value has a positive impact on input-oriented efficiency and no effect on output-oriented efficiency, while revenue-based excess value has a negative impact on efficiency and no effect on input-oriented variable return-to-scale efficiency (Vrsi). Excess value is endogenously related to efficiency. Excess value has either no significant effect or a positive effect on diversity. Excess value is exogenously related to diversity in asset-based measures and endogenously related to revenue-based measures.

Diversity is positively and significantly related to excess value. It is exogenously related to excess value in asset-based measures and endogenously related in revenue-based measures. Asset-based diversity has a negative and significant effect on input-oriented efficiency and no effect on output efficiency, and it is endogenously related to efficiency metrics. Revenue-based diversity has no effect on input-oriented efficiency and a positive and significant effect on output efficiency. Revenue diversity is exogenously related to input-oriented efficiency and endogenously related to output efficiency. Efficiency metrics have no significant effect on diversity measures, except output efficiency has a positive and significant effect on revenue diversity. Output efficiency is endogenously related to diversity, and input efficiency metrics are endogenously related to asset diversity and exogenously related to revenue diversity. Finally, efficiency metrics are significantly and negatively related to excess value, and they are endogenously related to excess value. I were surprised at this finding, as I expected a positive relationship between efficiency and excess value. I used the contemporaneous effect of efficiency on excess value. Efficiency might have a lagging effect on excess value, or I can attribute this finding to adjustment cost. As I see, the mean excess value of our sample banks is positive, and they are not optimally capitalized to reach that level, as the banks might deem it very costly.

2.7. Conclusion

Because of the role that banks play in the economy, the performance of financial institutions is crucial for the well-being of the economy as a whole. This has led to many studies on efficiency, diversification, and excess value in the banking sectors of many countries. To my knowledge, this is the first paper that incorporated all these three issues and their relationship. I find that the excess value of financial conglomerates that engage in multiple activities are higher than if those financial conglomerates were broken into financial intermediaries that specialize in individual activities. This findings support the conglomerate hypothesis. To identify the independent impact of diversity on valuation and efficiency, I employ a number of econometric procedures that control for the individual bank effect and endogeniety

effect, as the same characteristics that induce financial institutions to diversify also affect market valuations. Asset diversification may have a negative or no effect on efficiency and a positive effect on excess value. Revenue diversification is positively related to efficiency and excess value, as I do not directly measure agency problems and therefore cannot directly link the results to a single causal factor. The results, however, do show that there exist both economies and diseconomies of scope in financial intermediation. The economies of scopes are sufficiently large to compensate for countervailing forces associated with diversification since I consistently find a diversification premium, never a diversification discount, and both an increase and reduction in efficiency due to diversification. Diversification exogenously affects the excess value and both exogenously and endogenously affects efficiency.

Efficiency and excess value has no effect on diversification. However, efficiency is negatively related to excess value. I attribute this finding to adjustment costs or efficiency having a lagging effect on performance. This is also consistent with the strategic focus hypothesis. The paper shed lights on three interrelated areas: efficiency, diversification, and excess value. First, while some policymakers, practitioners, and researchers argue economies of scope for financial conglomerations, others point out the intensified agency problems associated with complex financial conglomerates. I find that financial institutions that engage in diverse activities have higher excess market value but may also enjoy higher efficiency.

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Table 11: Sample characteristics of Bank Holding Companies

Crsi is an input-oriented efficiency measure using constant return-to-scale technology. Vrsi is input-oriented efficiency, and Vrso is output-oriented efficiency measuring variable return-to-scale technology. EVA is the excess value measure based on asset diversity, whereas Evr is the excess value measured based on revenue diversity. Diva is an asset-based diversity measure and is calculated as 1-2(|.5 – (net loans/Total earning assets)|). Asset diversity takes values between 0 and 1 and is increasing in the degree of diversification. Revenue diversity measures diversification across different sources of income and is calculated as 1-2*(|.5- (net interest income/total operating income)|). Revenue diversity takes values between 0 and 1 and is increasing in the degree of diversification. Net interest income is calculated as interest income minus interest expense. Ln(size) is a logarithm of total asset. Ln(size^2) is a logarithm of total asset times total asset. E/A equals equity/total asset. ln(emp) equals logarithm of employee expenses. Mshr is the ratio of bank deposits to aggregate banks' total assets. Dep/Lib equals deposits/liabilities, and lnoea equals a logarithm of other-earning assets. I exclude observations without basic accounting information (i.e., missing values for total assets, earning assets, operating income, equity, and market value). Data are for the years 2002 to 2010. Variance reduction is the percentage reduction in variance when going from pooled data to within or fixed effects.*

Panel A. Descriptives Statistics

var	*mean*	*median*	*std*	*min*	*max*	*Std within*	*variance reduction*
crsi	0.241	0.195	0.161	0.002	1.000	0.081	-74.6%
vrsi	0.262	0.205	0.181	0.014	1.000	0.090	-75.1%
vrso	0.865	0.892	0.107	0.084	1.000	0.062	-66.3%
nrsi	0.253	0.197	0.181	0.002	1.000	0.091	-74.6%
nrso	0.864	0.892	0.107	0.084	1.000	0.062	-66.7%
eva	0.047	0.060	0.087	-0.682	0.555	0.029	-88.6%
diva	0.519	0.508	0.249	0.000	1.000	0.098	-84.6%
evr	0.075***	0.091	0.085	-0.702	0.592	0.032	-85.3%
divr	0.729***	0.769	0.204	0.000	1.000	0.090	-80.7%
lnSize	14.98	14.50	2.08	11.51	22.06	0.220	-98.9%
lnSize^2	228.59	210.29	66.03	132.58	486.66	6.762	-99.0%
E / A	0.110	0.089	0.092	0.000	0.946	0.026	-91.9%
lnEmp	10.62	10.25	1.92	4.89	17.38	0.224	-98.6%
MShr	0.001	0.000	0.004	0.000	0.201	0.003	-50.8%
dep/lib	0.792	0.853	0.196	0.000	0.999	0.055	-92.1%
lnOea	13.48	13.06	2.42	1.79	21.62	0.364	-97.7%

Panel B. Correlation of demeaned dependent variables

	crsi	*vrsi*	*vrso*	*nrsi*	*nrso*	*eva*	*diva*	*evr*	*divr*
crsi	1.00								
vrsi	0.90	1.00							
vrso	0.13	0.12	1.00						
nrsi	0.90	0.99	0.19	1.00					
nrso	0.13	0.11	1.00	0.19	1.00				
eva	-0.13	-0.13	-0.15	-0.14	-0.15	1.00			
diva	0.03	0.01	-0.07	0.00	-0.08	0.13	1.00		
evr	-0.19	-0.20	-0.21	-0.22	-0.21	0.87	0.01	1.00	
divr	0.02	0.05	-0.12	0.04	-0.12	0.09	0.08	0.17	1.00

Table 12: Reduced form individual and time effects OLS

*Table 12 Notes: This table contains individual and time effect ols estimates of each endogenous variable against all exogenous variables (i.e., the reduced form). Panel robust standard errors are in ( ), and the 10, 5, and 1% significance levels are denoted by *,**, and *** respectively. Projections constructed from these estimates constitute the first stage in two-stage least squares estimation of a system. Ln(size) is the logarithm of a total asset. Ln(size^2) is a logarithm of total asset times total asset. E/A equals equity/total asset. ln(emp) equals logarithm of employee expenses. Mshr is the ratio of bank deposits to aggregate banks' total assets. Dep/Lib equals deposits/liabilities, and lnoea equals the logarithm of other earning assets. I exclude observations without basic accounting information (i.e., missing values for total assets, earning assets, operating income, equity, and market value). Data are for the years 2002 to 2010.*

	$crsi$	$vrsi$	$vrso$	Eva	$diva$	evi	$divi$
$lnSize$	-0.1188**	-0.1067*	-0.0154	0.0124	-0.2005**	0.0193*	-0.0232
	(0.0557)	(0.061)	(0.0368)	(0.0088)	(0.0857)	(0.0107)	(0.0566)
$lnSize^2$	0.0049***	0.0048**	-0.0004	-0.0003	0.0003	-0.0006*	-0.0016
	(0.0018)	(0.0019)	(0.0011)	(0.0003)	(0.0026)	(0.0003)	(0.0018)
E/A	0.0989	0.0786	-0.0177	-0.9271***	-0.1485	-0.9386***	-0.3883***
	(0.0711)	(0.0753)	(0.069)	(0.014)	(0.1168)	(0.0179)	(0.0835)
$lnEmp$	-0.1679***	-0.1735***	-0.0294***	0.0028**	-0.0007	0.0175***	0.0566***
	(0.0135)	(0.0146)	(0.0077)	(0.0014)	(0.016)	(0.0031)	(0.0124)
$MShr$	3.4315***	3.2512***	0.6802***	-0.439***	0.5475**	-0.4597***	-0.2264
	(0.4765)	(0.6327)	(0.1497)	(0.0655)	(0.2698)	(0.1296)	(0.2811)
dep/lib	-0.2012***	-0.1915***	0.0175	-0.0079	0.0531	0.0031	0.1099**
	(0.032)	(0.0349)	(0.0273)	(0.005)	(0.0383)	(0.0068)	(0.0445)
$lnOea$	0.0033	-0.0074	0.0208***	0.0136***	0.1947***	-0.0005	0.0093*
	(0.004)	(0.0048)	(0.0043)	(0.0014)	(0.0174)	(0.001)	(0.0052)
$Y03$	-0.0884***	0.0337	0.0619***	-0.0305***	0.023*	-0.0858***	0.0117
	(0.0164)	(0.0222)	(0.0052)	(0.0022)	(0.0136)	(0.0023)	(0.0094)
$Y04$	0.0057	0.0929***	0.0824***	0.0229***	0.0089	-0.0169***	0.0257***
	(0.0154)	(0.0194)	(0.0057)	(0.0029)	(0.0117)	(0.0023)	(0.0094)
$Y05$	-0.0724***	-0.0673***	0.0814***	0.0046***	-0.0041	0.0027	-0.013**
	(0.009)	(0.0093)	(0.0039)	(0.0013)	(0.0085)	(0.0017)	(0.0063)
$Y06$	-0.0759***	-0.0745***	0.0874***	0.0146***	-0.0123*	0.0063***	-0.0419***
	(0.0073)	(0.0075)	(0.0035)	(0.0011)	(0.0071)	(0.0014)	(0.0058)
$Y07$	-0.0828***	-0.0849***	0.0883***	0.0103***	-0.0208***	0.0163***	-0.055***
	(0.0052)	(0.0054)	(0.0029)	(0.0009)	(0.0055)	(0.0011)	(0.0047)
$Y08$	-0.069***	-0.0779***	0.0901***	-0.0047***	-0.032***	-0.0144***	-0.0558***
	(0.0044)	(0.0047)	(0.0027)	(0.0008)	(0.0047)	(0.001)	(0.0049)
$Y09$	-0.0057*	-0.0053	-0.0051***	0.0091***	-0.0135***	0.0115***	-0.0124***
	(0.0031)	(0.0032)	(0.0015)	(0.0004)	(0.0027)	(0.0006)	(0.0029)
R^2	0.82	0.82	0.82	0.98	0.91	0.97	0.83

Table 13:Individual and time effects-OLS systems estimation with alternative efficiency metrics and asset-based measures

Table 13 Notes: *The table presents six individual and time effects-OLS systems estimation with alternative efficiency metrics and asset-based measures in Panel A and revenue-based measures in Panel B. Each panel presents three (1), (2), and (3), equation systems using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. Exogenous variables omitted from each equation are used to identify the system. For identification of the system, the number of excluded exogenous must be equal to or greater than the number of included endogenous in each equation. Year-level time effects estimates are omitted for clarity. Panel robust standard errors are in ( ), and the 10, 5, and 1% significance levels are denoted with *, **, and *** respectively. Crsi is input-oriented efficiency measured using constant return to scale technology. Vrsi is input-oriented efficiency and Vrso is output-oriented efficiency measuring variable return-to-scale technology. Eva is excess value measured based on asset diversity. Evr is excess value measured based on revenue diversity. Diva is an asset-based diversity measure and is calculated as 1-2*(|.5 – (net loans/total earning assets)|). Asset diversity takes values between 0 and 1 and is increasing in the degree of diversification. Revenue diversity measures diversification across different sources of income and is calculated as 1-2*(|.5- (net interest income/Total operating income)|). Revenue diversity takes values between 0 and 1 and is increasing in the degree of diversification. Net interest income is calculated as interest income minus interest expense. Ln(size) is the logarithm of the total asset. Ln(size^2) is the logarithm of total asset times total asset. E/A equals equity/total asset. ln(emp) equals the logarithm of employee expenses. Mshr is the ratio of bank deposits to aggregate banks' total assets. Dep/Lib equals deposits/liabilities, and lnoea equals a logarithm of other-earning assets. I exclude observations without basic accounting information (i.e., missing values for total assets, earning assets, operating income, equity, and market value). Data are for the years 2002 to 2010.*

Panel A	**(1)**						**(2)**						**(3)**					
	crsi		***eva***		***diva***		***vrsi***		***eva***		***diva***		***vrso***		***eva***		***diva***	
crsi			*-0.042*	***	*-0.046*													
			(0.004)		(0.028)													
vrsi									*-0.036*	***	*-0.059*	**						
									(0.003)		(0.025)							
vrso															*-0.036*	***	*-0.161*	***
															(0.007)		(0.06)	
eva	*-1.211*	***			*0.270*		*-1.230*	***			*0.251*		*-0.414*	***			*0.240*	
	(0.246)				(0.193)		(0.251)				(0.193)		(0.09)				(0.193)	
diva	*0.007*		*0.031*	***			*-0.027*		*0.030*	***			*0.013*		*0.032*	***		
	(0.016)		(0.003)				(0.017)		(0.003)				(0.012)		(0.003)			
lnSize	*-0.084*		*0.014*		*-0.212*	**	*-0.083*		*0.016*		*-0.215*	***	*0.015*		*0.024*	**	*-0.207*	**
	(0.058)		(0.01)		(0.084)		(0.064)		(0.011)		(0.083)		(0.037)		(0.01)		(0.083)	
lnSize^2	*0.005*	**	*0.000*		*0.000*		*0.005*	**	*0.000*		*0.001*		*-0.001*		*0.000*		*0.000*	
	(0.002)		(0)		(0.003)		(0.002)		(0)		(0.003)		(0.001)		(0)		(0.003)	
E/A	*-1.010*	***	*-0.922*	***	*0.094*		*-1.053*	***	*-0.923*	***	*0.074*		*-0.399*	***	*-0.921*	***	*0.062*	
	(0.246)		(0.017)		(0.208)		(0.252)		(0.017)		(0.207)		(0.107)		(0.016)		(0.205)	
lnEmp	*-0.168*	***					*-0.173*	***					*-0.031*	***				
	(0.014)						(0.015)						(0.008)					
MShr	*2.812*	***					*2.651*	***					*0.452*	***				
	(0.483)						(0.663)						(0.148)					
dep/lib			*-0.018*	***					*-0.017*	***				***	*-0.009*			
			(0.005)						(0.006)						(0.006)			

$\boldsymbol{lnOea}$			*0.191* (0.019)	***			*0.191* (0.018)	***			*0.195* (0.019)	***
$\boldsymbol{R^2}$	*0.820*	*0.979*	*0.907*		*0.829*	*0.979*	*0.907*		*0.824*	*0.978*	*0.908*	

Table 13: Individual and time effects-OLS systems estimation with alternative efficiency metrics and revenue-based measures

Panel B	(1)						(2)						(3)					
	$crsi$		evr		$divr$		$vrsi$		evr		$divr$		$vrso$		evr		$divr$	
$crsi$			*-0.067*	***	*-0.011*													
			(0.005)		(0.026)													
$vrsi$									*-0.058*	***	*0.005*							
									(0.004)		(0.022)							
$vrso$															*-0.069*	***	*0.104*	**
															(0.009)		(0.052)	
evr	*-1.254*	***			*1.068*	***	*-1.283*	***			*1.091*	***	*-0.538*	***			*1.140*	***
	(0.213)				(0.221)		(0.219)				(0.221)		(0.099)				(0.21)	
$divr$	*0.009*		*0.034*	***			*0.020*		*0.035*	***			*0.034*	**	*0.038*	***		
	(0.018)		(0.006)				(0.018)		(0.006)				(0.014)		(0.006)			
$lnSize$	*-0.091*	*	*0.014*		*-0.011*		*-0.088*		*0.016*		*-0.008*		*0.015*		*0.029*	***	*-0.006*	
	(0.055)		(0.01)		(0.056)		(0.062)		(0.01)		(0.056)		(0.037)		(0.01)		(0.057)	
$lnSize^2$	*0.004*	**	*0.000*		*-0.001*		*0.004*	**	*0.000*		*-0.001*		*-0.001*		*-0.001*	*	*-0.001*	
	(0.002)		(0)		(0.002)		(0.002)		(0)		(0.002)		(0.001)		(0)		(0.002)	
E/A	*-1.063*	***	*-0.915*	***	*0.641*	***	*-1.107*	***	*-0.915*	***	*0.663*	***	*-0.509*	***	*-0.912*	***	*0.713*	***
	(0.22)		(0.018)		(0.226)		(0.228)		(0.018)		(0.226)		(0.116)		(0.018)		(0.219)	
$lnEmp$	*-0.148*	***					*-0.152*	***					*-0.024*	***				
	(0.015)						(0.016)						(0.008)					
$MShr$	*2.804*	***					*2.634*	***					*0.408*	***				
	(0.403)						(0.558)						(0.128)					
dep/lib			*-0.014*	*					*-0.012*					***	*0.000*			
			(0.008)						(0.008)						(0.008)			
$lnOea$					*0.009*	*					*0.009*	*					*0.007*	
					(0.005)						(0.005)						(0.005)	
R^2	*0.825*		*0.969*		*0.831*		*0.832*		*0.969*		*0.831*		*0.827*		*0.967*		*0.831*	

Table 14 : Individual and time effects-2SLS systems estimation with alternative efficiency metrics and asset-based measures

Table 14 Notes: *This table presents six individual and time effects-2SLS systems estimation with alternative efficiency metrics and asset-based measure in Panel A and revenue-based measures in Panel B. Each panel presents three (1), (2), (3), equation systems using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. Exogenous variables omitted from each equation are used to identify the system. For identification of the system, the number of excluded exogenous must be equal to or greater than the number of included endogenous in each equation. 2SLS takes the projections of each endogenous variable provided by Table 2 and puts these in the place of right-hand side-endogenous variables. Year level time effects estimates omitted for clarity. Panel robust standard errors are in () and the 10, 5, and 1% significance levels are denoted with *, **, and *** respectively. Crsi is an input-oriented efficiency measure using constant return-to-scale technology. Vrsi is input-oriented efficiency, and Vrso is output-oriented efficiency measuring variable return-to-scale technology. Eva is excess value measured based on asset diversity Evr is excess value measured based on revenue diversity. Diva is an asset-based diversity measure and is calculated as 1-2*(\.5 – (net loans/Total earning assets)\). Asset diversity takes values between 0 and 1 and is increasing in the degree of diversification. Revenue diversity measures diversification across different sources of income and it is calculated as 1-2*(\.5-(net interest income/Total operating income)\). Revenue diversity takes values between 0 and 1 and is increasing in the degree of diversification. Net interest income is calculated as interest income minus interest expense. Ln(size) is a logarithm of total asset. Ln(size^2) is a logarithm of total asset times total asset. E/A equals equity / total asset. ln(emp) equals logarithm of employee expenses. Mshr is the ratio of bank deposits to aggregate banks' total assets. Dep/Lib equals deposits/liabilities, and lnoea equals a logarithm of other earning asset. I exclude observations without basic accounting information (i.e., missing values for total assets, earning assets, operating income, equity, and market value). Data are for the years 2002 to 2010. Variance reduction is the percentage reduction in variance when going from pooled data to within or fixed effects.*

Panel A	(1)						(2)						(3)					
	crsi		***eva***		***diva***		***vrsi***		***eva***		***diva***		***vrso***		***eva***		***diva***	
crsi			*-0.034*	***	*-0.064*													
			(0.011)		(0.091)													
vrsi									*-0.032*	***	*-0.061*							
									(0.01)		(0.09)							
vrso															*-0.198*	***	*-0.130*	
															(0.061)		(0.655)	
eva	*17.402*	***			*-2.233*	**	*16.313*	***			*-2.198*	**	*-1.017*				*-1.961*	
	(2.759)				(1.1)		(3.006)				(1.079)		(2.348)				(1.414)	
diva	*-1.199*	***	*0.071*	***			*-1.178*	***	*0.069*	***			*0.178*		*0.091*	***		
	(0.192)		(0.007)				(0.211)		(0.007)				(0.165)		(0.01)			
lnSize	*-0.574*	***	*0.018*	*	*-0.187*	**	*-0.545*	***	*0.018*	*	*-0.186*	**	*0.033*		*0.023*	***	*-0.179*	**
	(0.089)		(0.009)		(0.084)		(0.097)		(0.009)		(0.084)		(0.069)		(0.009)		(0.082)	
lnSize^2	*0.010*	***	*0.000*		*0.000*		*0.010*	***	*0.000*		*0.000*		*-0.001*		*0.000*		*0.000*	
	(0.002)		(0)		(0.003)		(0.002)		(0)		(0.003)		(0.001)		(0)		(0.003)	

E/A	*16.054*	***	*-0.915*	***	*-2.218*	**	*15.027*	***	*-0.916*	***	*-2.187*	**	*-0.935*		*-0.919*	***	*-1.969*	
	(2.507)		(0.014)		(1.047)		(2.733)		(0.014)		(1.028)		(2.147)		(0.014)		(1.361)	
$lnEmp$	*-0.218*	***					*-0.220*	***					*-0.026*	***				
	(0.016)						(0.017)						(0.01)					
$MShr$	*11.728*	***					*11.058*	***					*0.136*					
	(1.428)						(1.593)						(1.135)					
dep/lib			*-0.019*	***				***	*-0.018*	***				***	*-0.010*	*		
			(0.006)						(0.006)						(0.005)			
$lnOea$					*0.226*	***					*0.224*	***					*0.224*	***
					(0.024)						(0.024)						(0.038)	
R^2	*0.272*		*0.811*		*0.395*		*0.292*		*0.811*		*0.395*		*0.479*		*0.811*		*0.395*	

Table 14: Individual and time effects-2SLS systems estimation with alternative efficiency metrics and revenue-based measures

Panel B	(1)						(2)						(3)					
	crsi			***evr***		***divr***		***vrsr***			***evr***		***divr***		***vrso***			***evr***		***divr***	
crsi				*-0.124*	***	*-0.642*	***													
				(0.026)		(0.242)														
vrsi											*-0.155*	***	*-0.673*	***						
											(0.036)		(0.241)							
vrso																		*-0.159*	***	*3.872*	**
																		(0.041)		(1.917)	
evr	*-27.904*	***				*-3.220*		*-12.070*					*-3.618*		*-26.469*	***				*8.995*	***
	(6.773)					(2.281)		(7.636)					(2.277)		(6.617)					(3.189)	
divr	*-1.051*	***	*-0.052*					*-1.405*	***	*-0.166*					*0.899*	***	*0.240*	***			
	(0.235)		(0.081)					(0.279)		(0.113)					(0.231)		(0.052)				
lnSize	*0.395*	***	*0.003*			*-0.029*		*0.094*		*-0.001*			*-0.020*		*0.516*	***	*0.021*	*	*-0.118*	*	
	(0.14)		(0.011)			(0.059)		(0.16)		(0.012)			(0.059)		(0.13)		(0.011)		(0.066)		
lnSize²	*-0.014*	***	*0.000*			*-0.001*		*-0.005*		*0.000*			*-0.001*		*-0.016*	***	*0.000*		*0.005*		
	(0.005)		(0)			(0.002)		(0.005)		(0)			(0.002)		(0.004)		(0)		(0.003)		
E/A	*-26.501*	***	*-0.947*	***	*-3.343*			*-11.796*	*	*-0.991*	***	*-3.729*	*		*-24.513*	***	*-0.848*	***	*8.131*	***	
	(6.374)		(0.031)		(2.095)			(7.168)		(0.043)		(2.096)			(6.183)		(0.023)		(3.051)		
lnEmp	*0.381*	***						*0.118*							*0.384*	***					
	(0.121)							(0.134)							(0.114)						
MShr	*-9.635*	***						*-2.616*							*-11.285*	***					
	(3.128)							(3.541)							(3.018)						
dep/lib			*-0.016*	*						*-0.008*						***	*-0.021*	**			
			(0.009)							(0.01)							(0.009)				
lnOea					*0.010*	*						*0.003*							*-0.067*	*	
					(0.005)							(0.006)							(0.039)		
R²	*0.272*		*0.764*		*0.097*			*0.292*		*0.764*		*0.097*			*0.479*		*0.763*		*0.095*		

Table 15: Endogeniety tests and OLS vs. 2SLS estimates with asset-based measures

Table 15 Notes: *Table presents six individual and time effects-OLS and 2SLS systems estimates of each system's endogenous variables appearing on the right hand from tables 3 and 4, a Wu test p-value for endogeneity of its own appearance on the right hand side in the system, a Wu endogeniety test p-value of prospective endogenous variables as a group in each equation, and an overall Wu endogeneity test p-value for each three-equation system. Each panel contains estimates and tests from three (1), (2), (3) equation systems using each efficiency measure separately with either asset- or revenue-based excess value and diversification measures as dependent variables. Individual Wu tests (for each endogenous variable separately) is a t-test of prediction errors (made from Table 2 first-stage projections) that are included in the equation where the endogenous variable appears on the right-hand side. The null hypothesis is that the candidate variable is not endogenous. The significance of prediction errors is evidence that right-hand-side variables are correlated with the error term of that equation; therefore the tested candidate variable is endogenous. The equation Wu test is a Wald with two degrees of freedom testing whether prediction errors of both included prospective endogenous variables are exogenous. For the individual and equation Wu test, each equation is run separately for the test, in typical 2SLS fashion. The System Wu tests sets up 2SLS estimates as a three-equation system in GMM, making sure each equation uses its appropriate instruments and forming a Wald test with six degrees freedom of all six coefficients' projection errors. The 10, 5, and 1% significance levels are denoted with *, **, and ***. Crsi is an input-oriented efficiency measure using constant return-to-scale technology. Vrsi is input-oriented efficiency, and Vrso is output-oriented efficiency measuring variable return-to-scale technology. Eva is excess value measured based on asset diversity, and Evr is excess value measured based on revenue diversity. Diva is an asset-based diversity measure and is calculated as 1-2*(|.5 – (net loans/total earning assets)|). Asset diversity takes values between 0 and 1 and is increasing in the degree of diversification. Income diversity measures diversification across different sources of income and it is calculated as 1-2*(|.5- (Net interest income/Total operating income)|). Revenue diversity takes values between 0 and 1 and is increasing in the degree of diversification. Net interest income is calculated as interest income minus interest expense. Ln(size) is a logarithm of the total assets. Ln(size^2) is a logarithm of total asset times total asset. E/A equals equity/total asset. ln(emp) equals the logarithm of employee expenses. Mshr is the ratio of bank deposits to aggregate banks' total assets. Dep/Lib equals deposits/liabilities, and lnoea equals the logarithm of other earning asset. I exclude observations without basic accounting information (i.e., missing values for total assets, earning assets, operating income, equity, and market value). Data are for the years 2002 to 2010. Variance reduction is the percentage reduction in variance when going from pooled data to within or fixed effects.*

Panel A		(1)			(2)			(3)		
		crsi	***eva***	***diva***	***vrsi***	***eva***	***diva***	***vrso***	***eva***	***diva***
crsi	*ols*		-0.042***	-0.046						
	2*sls*		-0.034***	-0.064						
	Wu		0.000***	0.061*						
vrsi	*ols*					-0.036***	-0.059**			
	2*sls*					-0.032***	-0.061			
	Wu					0.000***	0.006***			
vrso	*ols*								-0.036***	-0.161***
	2*sls*								-0.198***	-0.13
	Wu								0***	0.005***
Eva	*ols*	-1.211***		0.27	-1.23***		0.251	-0.414***		0.24
	2*sls*	17.40***		-2.233**	16.31***		-2.198**	-1.02		-1.961
	Wu	0.000***		0.133	0.000***		0.161	0.000***		0.173
diva	*ols*	0.007	0.031***		-0.027	0.03***		0.013	0.032***	
	2*sls*	-1.199***	0.071***		-1.178***	0.069***		0.178	0.091***	
	Wu	0.058*	0.112		0.004***	0.142		0.006***	0.153	
EaWu		0.000***	0.000***	0.023**	0.000***	0.000***	0.002***	0.000***	0.000***	0.002***
System		0.000***			0.000***			0.000***		

Table 15: Endogeniety tests and OLS vs. 2SLS estimates with revenue-based measures

Panel B		(1)			(2)			(3)		
		crsi	***evr***	***divr***	***vrsi***	***evr***	***divr***	***vrso***	***evr***	***divr***
crsi	*ols*		-0.067***	-0.011						
	2*sls*		-0.124***	-0.642***						
	Wu		0.000***	0.358						
vrsi	*ols*					-0.058***	0.005			
	2*sls*					-0.155***	-0.673***			
	Wu					0.000***	0.117			
vrso	*ols*								-0.069***	0.104**
	2*sls*								-0.159***	3.872**
	Wu								0***	0.033**
Evr	*ols*	-1.254***		1.068***	-1.283***		1.091***	-0.538***		1.14***
	2*sls*	-27.90***		-3.22	-12.07		-3.618	-26.47***		8.995***
	Wu	0.000***		0.000***	0.000***		0.000***	0.000***		0.000***
divr	*ols*	0.009	0.034***		0.02	0.035***		0.034**	0.038***	
	2*sls*	-1.051***	-0.052		-1.405***	-0.166		0.899***	0.24***	
	Wu	0.357	0.000***		0.119	0.000***		0.032**	0.000***	
EqWu		0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
System − Wu		0.000***			0.000***			0.000***		

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