#### BANK MERGERS AND DEPOSIT RETENTION: ONE AND ONE MAKES TWO?

by

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## Abstract

The flurry of merger activity sweeping across the U.S. financial services sector is drastically restructuring its retail banking segment. The integration and streamlining of operations has highlighted the role deposit market shares play in the merger mix. Firstly, we investigate whether banks successfully retain their deposits, post-merger; secondly, we investigate the effects of pre-merger institutional attributes on deposit retention. The results to the first question appear to confirm that banks retain their deposits. The findings of the second question indicate that the nature of competition in the market, the magnitude of retail banking focus, institution age, market and institutional deposit growth all have significant effects on deposit retention.

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## 1. Introduction

A movement toward bank consolidation has been gaining momentum around the globe as far back as the 1980s. This trend peaked during the mid 1990s as the financial environment was experiencing unprecedented transformation in the realms of globalization, deregulation, and technology. These continuously evolving factors are exposing cost inefficiencies and overcapacities while also creating potentially valuable opportunities, and the banking industry's response has been to consolidate.

The sustained consolidation of the U.S. banking industry from 1980 to 1998 resulted in approximately 8,000 bank mergers involving about \$2.4 trillion in acquired assets.<sup>1</sup> The annual number of mergers has greatly outpaced new charters such that the outcome of this resulting and sustained merger activity has been an increased concentration in the deposit-taking segment of the financial services sector.<sup>2</sup>

The intensified competitive environment means that banks' strategic pursuit of deposit market share is at critical levels; through acquisitions, banks may seek to further entrench and expand their market presence as well as penetrate new markets. The process of integrating operations and eliminating overcapacities of two merging banks poses significant challenges. The resulting service disruptions, change in brand, and potential branch rationalization might create disaffected customers who will withdraw their deposits and go elsewhere for their banking needs. Therefore it is not necessarily guaranteed that a bank will preserve its entire pre-merger market share. Maximizing deposit retention is a key priority.

The question of deposit retention sets the stage for this thesis. We will examine whether merging banks indeed retain their pre-merger deposit base and the extent of this retention. We also examine the relationship between this deposit retention and the merging banks' characteristics with the aid of a regression model. This is believed to be the first academic study addressing this research question.

<sup>&</sup>lt;sup>1</sup> Rhoades (2000) provides a detailed report on this bank merger activity and the resulting industry structure. Berger et al. (1999) also provide a useful commentary (complete with over 250 references) on the merger wave that has encompassed the financial services industry.

<sup>&</sup>lt;sup>2</sup> See Appendix: Figure I and Figure III for the statistics on two kinds of deposit-taking institutions, commercial banks and thrifts.

The paper is structured as follows. Section 2 begins with a backgrounder on mergers and the financial services industry; then describes the possible motivations driving these mergers. The research question is introduced in Section 3. A description of the data and modeling approach is provided in Section 4. Section 5 presents the statistical models and their results. Section 6 ends the paper with conclusions and a note on future research.

# 2. Background

### 2.1 Mergers

The globalization phenomenon has played its part in fuelling competition in the financial sector. Competitors from any market can enter another banking market with superior products, and in doing so, threaten established banks. Trade blocs such as North America under NAFTA and the European Union, the latter now operating under a common currency regime, are also blurring the boundaries of financial markets. The international outlook of the financial sector is enticing banks to expand their operations geographically; clients are increasingly demanding global products and services. The playing field is increasingly shifting in scope from the local to the national to the international.

The merger, literature as exemplified by Mitchell and Mulherin (1996), identifies the origins of merger waves as emanating from industry shocks – there is a link that exists between industry shocks and subsequent takeover and restructuring activity in the financial services sector. This suggests that industry-wide phenomena, and not target firm attributes, are explaining this powerful merger momentum. Studying 1980s data, the authors cite deregulation and financial innovation as the principal catalysts of mergers and acquisitions.

Andrade et al. (2001) build upon this foundation by studying merger activity of the 1990s. They contend that merger activity in this time frame was strongly clustered by industry. Banking was one such high-profile industry. Deregulation's role as catalyst for merger since the late 1980s was also emphasized. Moreover, deregulation was believed to

account for almost half of all mergers since then. The role of deregulation as protagonist moves the authors to observe that the 1990s were "the decade of deregulation". Drawing parallels between these findings and the banking industry, it becomes apparent that technological innovation and deregulation are the shocks that have precipitated the bank merger wave.

In this so-called digital age, consumers have come to expect immediate and highly accessible services. What this means for banks is that they are expected to deliver financial services to their consumers on demand. Innovative financial products have grown to satisfy these consumer demands. Despite the branch channel maintaining its ubiquitous presence, consumers are increasingly demanding alternative delivery channels from which to conduct their finances. The prominent role of the traditional bank branch model has been tempered by the advent of a variety of alternative delivery channels. These include PC banking, telephone banking, ABMs etc. Consumers are also coming to rely on some form or another of electronic channel for their banking needs.<sup>3</sup> Undoubtedly, technological innovation has intensified the competitive environment. It has threatened the banks' monopoly of payment systems and the profitability of their products.

The most notable of these innovations is the internet, which has made markets and prices more competitive. This sentiment is echoed by Brown and Goolsbee (2002), who studied the effects of the internet on the price of life insurance products. As the percentage of internet users grows, there will be a corresponding decline in price levels. Banking products are definitely implicated here. This is primarily because of the reduced search costs associated with using the internet may have a significant and weakening effect on banks' market power as exercised through more traditional channels in the future, if it has not already done so to some degree.

The role of the bank as financial intermediary is further being eroded as consumers have direct access to capital and are able to make investments, both via alternative channels. The virtual bank is becoming a reality; the internet has given seed to a number of these virtual financial institutions. The significant expenses associated with acquiring a branch network render the internet an ideal and affordable platform to launch

<sup>&</sup>lt;sup>3</sup> See Kennickell and Kwast (1997)

new financial services. Brick and mortar branches have responded by cutting their costs and countering these virtual institutions with direct products of their own. This robust expansion of e-commerce might be interpreted as a potential threat to conventional branch banking accounts.<sup>4</sup>

Information technology (IT) has also been a potential source of scale economies in retail banking: the declining costs of hardware and software coupled with the move from dual paper and electronic systems to integrated automation is leading to the restructuring of the retail banking sector.<sup>5</sup> Banking giants relying on obsolete technology will be threatened by rivals armed with cutting edge IT.

Another potential threat touched on by Harker and Zenios (2000), though somewhat speculative, is that of software companies. Software products like Intuit's Quicken and Microsoft's Money are replicating services traditionally offered by banks: "It is not sufficient for the CEO of Chase Manhattan to be concerned about the competitive strategies of Deutsche Bank or Banque Nacionale de Paris; he also has to ponder whether Microsoft is also a bank."<sup>6</sup> Micrsoft's financial software forays may be a stepping stone towards the eventual acquisition of a bank. What is more, mutual funds and investment dealers with the aid of technology can now facilitate the deposit of funds into investment and other types of accounts, and in the process, bypass traditional deposit-taking channels.

Regulations that prohibited geographic expansion and erected entry barriers around certain financial activities are gradually being repealed. The resulting environment has made it highly conducive for banks to merge. After all, regulatory barriers, and not technological ones, pose the initial challenge to successful consolidation. As the industry seeks to consolidate and presses for the removal of regulatory barriers, the topic of deregulation in the realm of the financial services sector appears to be a

<sup>&</sup>lt;sup>4</sup> The services provided by brick and mortar branches have traditionally been indispensable to a bank's operations. It appears though that these branches still play important strategic roles in garnering and maintaining market share, and that may also likely be the case in the foreseeable future. They also serve as barriers to entry for potential competitors and their roles are increasingly shifting from the operational to more sales and service oriented ones. Interestingly, branch numbers have been steadily increasing as the merger phenomenon has yielded steadily decreasing bank numbers (See Appendix: Figure II).

<sup>&</sup>lt;sup>5</sup> See the report by Deloitte and Touche Consulting Group (1995).

<sup>&</sup>lt;sup>6</sup> Harker and Zenios (2000, p6).

serious policy concern for governments. Such is the case in the U.S where geographic restrictions on banking are on a path to complete liberalization.

The U.S. banking system's historical growth and industry structure was molded by regulatory forces at both the state and the federal levels of government. The resulting patchwork of regulations heavily restricted geographic expansion and limited financial services activities. Interstate banking and branching was prohibited. The operations of banks headquartered in a certain state were limited in scope to that state, and hence prohibited from branching across state lines. That coupled with heavy restrictions on intrastate branching that varied by state (for example, the prohibition of opening branches in counties other than the head office's county) ensured the survival of thousands of banks and resulted in a highly fragmented financial system. At levels more local than the state, such as a county or rural area, it was, however, very possible to observe high market concentrations.

The myriad of geographic restrictions on branching between and amongst states makes for an intriguing case study. Some states eventually started permitting interstate banking only with institutions whose home states reciprocated. And at one stage, this only applied to neighboring states. Within the states themselves, branching restrictions varied. For example, some states might only permit branching in counties that were contiguous to a bank's home county or simply limit a bank's branching activities to one county. This was indeed an interesting scenario considering that there are fifty states. There was a certain way to circumvent these inter- and intrastate restrictions for banks wishing to expand geographically. Some states allowed for multi-bank holding companies, which were technically not banks themselves, to "branch" by acquiring other institutions.<sup>7</sup>

As technology and consumer preferences have evolved, the scope of retail banking markets may have expanded beyond local bounds to at least the state level.<sup>8</sup>

The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 cleared the path to unrestricted geographic expansion. The Act superseded prior state restrictions by allowing for the provision of branching across and within state lines. By the time the

<sup>&</sup>lt;sup>7</sup> For an accessible and concise history of geographic regulations governing banking see Jayaratne and Strahan (1997).

<sup>&</sup>lt;sup>8</sup> See Radecki (1998).

law was fully implemented in 1997, many states had already opened the doors to interand intrastate branching. Texas and Montana were the only states that opted out of Riegle-Neal, meaning that out-of-state institutions could not enter their markets and their in-state institutions still faced restrictions preventing them from branching within and across state lines. The passage of Riegle-Neal marked a critical turning point by removing the apparatus that had created a fragmented U.S. financial system, and allowing for almost unhindered consolidation.

Removal of these barriers to entry has intensified the competitive environment for retail deposits. While examining the deposit interest rates within states that removed or reduce legal entry barriers, Prager and Hannan (1998b) found the outcome to be one of increased price competition. As their market powers were weakened, the banks tended to follow limit pricing<sup>9</sup> strategies. This is echoed by Jayaratne and Strahan (1997), who assert that deregulation increased bank competitiveness. The resulting competitive environment meant that better-performing banks capture relatively more market share.<sup>10</sup>

Other restrictions such as the Glass-Steagall Act of 1933 created a firewall between commercial and investment banking. Banks were prohibited from engaging in any securities underwriting. The efficacy and intent of this restriction has become irrelevant as banks have been permitted to engage in investment banking through subsidiaries since 1987. Another regulation that arose out of the depression era is Regulation Q: the capping of interest rates banks could offer on deposits. Throughout the 1960s and 1970s disintermediation occurred when the rates of return offered by competing products rose above those levels, threatening the banks' competitiveness as depositors sought products with higher returns. But since 1980, the Act has been watered down by the government and is expected to be completely repealed in the very near future.

<sup>&</sup>lt;sup>9</sup> Setting prices below the short-run profit maximizing level in an effort to deter entry thereby protecting potential above-normal profits in the long-run.
<sup>10</sup> See Stiroh and Strahan (2003).

## 2.2 Motivations to Merge

Cost-driven factors like economies of scope<sup>11</sup> and economies of scale<sup>12</sup> are often cited as the prime motivations to merge into a larger entity.<sup>13</sup> In both cases, the potential for producing lower unit costs of financial services is a very attractive prospect. The most apparent cost savings are derived from the streamlining of the target and acquirer's dual central functions (backroom operations, headquarters etc.) into one. The potential for and extent of additional cost savings depends to what degree there exists overlapping branch networks between the two. Banks will tend to eliminate such costly overcapacity by rationalizing the overlapping branches. In-market<sup>14</sup> mergers will experience both of these sources of cost savings while out-of-market mergers will only experience the central functions cost savings component.

The potential to exploit cost savings stemming from overcapacity might be the instrumental catalyst driving the merger. The findings of Houston et al. (2001) suggest that most of the estimated value gains from mergers come from the rationalization of overlapping branch networks and consolidating backroom operations. This might especially be true when the participants' branch networks overlap extensively. Rationalizing these overlapping branches, which pose significant fixed cost savings, raises a dilemma for the acquirer: what is the relationship between the cost savings and imminent revenue losses, and how can the two be balanced?

<sup>&</sup>lt;sup>11</sup> Economies of scope exist if it is cheaper to offer two different products from one bank rather than offering equivalent outputs of each product from two separate banks.

<sup>&</sup>lt;sup>12</sup> Economies of scale exist if there are potential per unit cost advantages from producing more of the same product with the combined production capacities of the two merging banks i.e. long-run average cost declines as the rate of output increases. Economies of scale and/or scope are also commonly referred to as "cost synergies" or "synergies".

<sup>&</sup>lt;sup>13</sup> This does necessarily presume that such cost-savings potential actually exists in the big picture. Rather, the opposite (diseconomies) may be true for now while the potential for scale economies may only be realized in the foreseeable future with further technological progress. Certain retail banking activities like credit card processing, consumer loan processing, cheque processing and statement processing are currently subject to scale economies. However, diseconomies prevail over the components that are paper based and significantly human dependant, e.g. investment funds, branch networks and customer correspondence. These points are made by the Deloitte and Touche Consulting Group (1995), whom also discuss the possible tradeoff between complexity and scale economies - cost overheads could rise disproportionately as branch networks grow and increasingly different products are offered.

<sup>&</sup>lt;sup>14</sup> Areas where the acquirer and targets' branch networks overlap.

Merger activity is also fuelled by the desire to expand geographically. The gradual recession of geographic restrictions on retail deposit markets has opened up attractive markets to potential entrants that would have otherwise been off-limits. Upon reaching saturation in their base markets, financial services institutions are free to expand their operations into new markets. Alternatively, instead of stagnating in a saturated market, a target could actively court an acquirer. A locally based institution could expand within a region in order to attain more regional exposure; a regionally based institution could pursue a policy of attaining increased exposure at the national level by expanding across the country. Profitable markets, and not necessarily unsaturated markets, will also attract entry.<sup>15</sup> An immediately worthwhile outcome to the acquirer of making an out-of-market acquisition is the resulting diversification of its operations and risks.

An additional outcome, the importance of which cannot be overstated, is the increased market share as a result of a merger. The retail deposit market is one such example. In banking, as in other industries, institutions compete for market share; with a greater market share, the institution extracts more valuable market information and customer knowledge. The pursuit of market dominance could be a likely driving force behind a merger. A higher degree of market power provides an acquirer with the potential for exercising greater pricing leverage.<sup>16</sup>

The price-concentration relationship in deposit markets is well-documented by the literature. Past studies such as Prager and Hannan (1998a) indicate a negative relationship between deposit interest rates and market concentration. There are greater profits to be had in more concentrated markets – Piloff and Rhoades (2002) found that local HHI is positively and significantly related to profitability, suggesting that banks with market power will exploit their pricing leverage. From a public policy perspective, regulatory bodies will especially scrutinize the likely competitive outcome of a substantial bank merger. Though these banks appear to exercise market power in the short-run, Focarelli and Panetta (2003) citing their empirical work, find evidence there may be efficiency gains in the long-run that offset the initial higher costs. What all this suggests is that

<sup>&</sup>lt;sup>15</sup> See Amel and Liang (1997).

<sup>&</sup>lt;sup>16</sup> In terms of the retail deposit market, deposit interest rates are indicative of prices. The banking literature frequently uses deposit interest rates as a measure of price. For examples, see Berger and Hannan (1989), Calem and Carlino (1992), and Piloff (1996).

deposit interest rates are a critical weapon in the battle to preserve market share. In the short-run, banks with the capacity to exercise market power will tend to do so by raising prices to enhance their profitability. Increased market share and market power are potentially important drivers behind acquisitions. In fact, some banks that are not active acquirers may have problems retaining their deposits and market share.<sup>17</sup>

A larger bank is safer from predators, enabling it to protect its autonomy. A desire to defend itself could move a bank to take pre-emptive measures by acquiring other banks. Both acquirer and target have their respective motivations driving their union. However, the prospect of a hostile takeover could motivate a target to sell out to a friendly bidder. From the perspective of a larger bank, an institution with sizable assets and prior merger experience appears better equipped to successfully absorb smaller institutions. A large institution may command a large market capitalization that it can utilize as a vehicle for expanding through acquisitions. The pursuit of increased size through acquisitions may also be tied to agency costs such as empire building. Management's utility function is not necessarily reflective of the shareholders'. Through acquisitions and growth, they can further entrench their power base and command greater compensation packages.

A target institution may also possess information and propriety technologies that an acquirer might desire for its strategic advantage. Capturing the additional financial product know-how and the target's client base creates potential cross-selling opportunities for an acquirer. The potential tax benefits derived from relocating headquarters and/or offices to a target's home state may also prompt a merger.

## 3. Research Question: Deposit Retention

The research question explored in this paper relates to the deposit-taking<sup>18</sup> aspect of the financial services industry. Deposits are a key source of funding for retail banks, though their dependence on deposits tends to vary by institution and specialization. Despite offering customers the option to transfer their deposit accounts to the nearest branch, it is almost inevitable that the loss of convenience associated with a branch closure will result in a fraction of customers withdrawing their deposits and turning elsewhere for their banking needs. Depositors, as do customers in other industries, strongly favor conveniently located services. Using household and small business survey data, Kwast et al. (1997) and Amel and Starr-McCluer (2002), show that retail banking customers are strongly inclined to use local<sup>19</sup> banks for their deposit services. This aspect of the merger that alienates certain customers presents a challenge to the newly merged institution as it attempts to maximize the retention of its customers and their deposits.

The inconvenience associated with the rationalization of a nearby bank is not the sole source of potential deposit losses. The change in brand name may give rise to depositor hostility. It is also possible that depositors, especially those with uninsured deposits<sup>20</sup>, may view the acquirer with suspicion and fear for the financial well-being of the newly merged institution.<sup>21</sup> Davis (2000) also points out that "frustration with the inevitable service failures and changes in functionality associated with conversion to a new IT platform, the departure of trusted relationship managers – all lead to attrition

<sup>20</sup> The amount that exceeds the insurable limit in a deposit account that is covered by a government agency or private insurer e.g. if all accounts are insured up to \$100 in deposits, then the holder of a \$125 deposit account stands to lose \$25 should the bank go insolvent. The Federal Deposit Insurance Corporation (FDIC), a U.S. agency, is an example of one of these insurers; it insures deposits up to \$100,000 <sup>21</sup> Maechler and McDill (2003) show that uninsured depositors monitor the health of their banks and discipline bad bank behavior by withdrawing their uninsured deposits and demanding a higher risk premium. Uninsured depositors will punish deteriorating bank performance. Barajas and Steiner (2000) found that depositors prefer banks with comparatively stronger fundamentals. Uninsured depositors are likely to react swiftly to news of a merger as they tend to monitor their banks more closely, yet there may also be a segment of insured depositors who behave similarly.

<sup>&</sup>lt;sup>18</sup> Deposit-taking institutions are financial institutions that accept deposits and make loans. These include commercial banks and savings and loan institutions (thrifts). In economic terms, these institutions are financial intermediaries, transforming pre-existing assets and liabilities into the creation of new assets and liabilities. Deposit-taking institutions derive their profitability from the mark-up earned over the cost of holding deposits (the spread between borrowing and lending rates) and service fees.

<sup>&</sup>lt;sup>19</sup> Considered to be within 30 miles of home or the workplace.

which must be contained to achieve financial targets from the merger." The challenge of customer and deposit retention involves a delicate balance of a number of factors, some of which may be controlled for. Market share loss may also occur in corporate banking when two large corporate banks merge. To mitigate their risk exposure, large corporate clients have a minimum threshold of diversification of their banking relationships.

The topic of branch rationalization is only of particular relevance when addressing an in-market merger i.e. there is at least one area<sup>22</sup> where the branch networks of both the acquirer and target overlap. In the case of no such overlap – an out-of-market merger, branch rationalization is presumably a non-issue. When one presumes that the expenses stemming from maintaining a full-service branch (employee salaries, equipment upkeep, building maintenance) may be substantial, rationalization is a very attractive cost-cutting strategy. Again, this may not be the only result or determinant in affecting post-merger deposit levels.

The research question we have been approaching concerns the relationship of these post-merger deposit levels to their pre-merger levels. We are interested in knowing whether deposit-taking institutions retain their pre-merger deposit levels post-merger, and the extent of such retention. Additionally, we examine and attempt to identify the ex ante institutional attributes that affect deposit retention.

Use of the term 'retention' does not necessarily convey an expectation that deposit-taking institutions entirely hold on to deposits or experience a positive change in deposits, post-merger. The change in post-merger deposits may be negative, which could be likened to a bleeding effect. In our large sample of mergers to be analyzed, it is very conceivable that we may observe a wide spectrum of results. The retention could vary by merger from negative changes in deposits to positive changes in deposits.

Much like the objective of a firm is often presumed to be to maximize profits, such is the case with deposit-taking institutions. Deposits are an important input in the overall aim to meet profit targets. With this in mind, it can be assumed that banks will prefer increasingly higher levels of post-merger deposits, and will take measures in order to pursue those ends. What cannot, however, be assumed is that a loss of post-merger

<sup>&</sup>lt;sup>22</sup> The question of what should constitute such an area, e.g. city, county etc., is addressed later in the paper. For now we will assume this area to be sufficiently large such that an acquirer and target may compete for the same depositors within its boundaries.

deposits is necessarily an unfavorable outcome for bank management. For example, the objectives of the acquisition could be to increase bank size so that the new institution can shift its focus away from the retail side of banking to other pursuits.

The literature on the question of deposit retention has, rather surprisingly, yet to be developed. It is possible that the question may have previously been posed by a related study, but to our knowledge, the question has not been answered.<sup>23</sup> This may be due to the lack of a comprehensive and publicly available data set and the proprietary nature of this institution-specific information. The question is indeed worth investigating. Bank management considering a merger scenario would find this kind of information helpful in shaping the path to the merger as well as crafting the post-merger integration process. Understanding what attributes will affect their capacity to retain deposits might help them take pre-emptive steps to exploit their favorable institutional attributes and mitigate the effects of the weaker ones; possibly helping identify suitable targets. Regulatory bodies that are responsible for approving mergers would also find such information to be useful. They would be better able to evaluate post-merger market shares and the competitive ramifications involving the consolidation of deposit-taking institutions.

In his book on the experience of bank mergers, Davis (2000) identifies client retention as a critical factor in the merger mix. The consulting fraternity, with its experience assisting the merger integration process, would presumably have a somewhat informed understanding of the topic of deposit retention. They would also be in the possession of statistics concerning past mergers, deposit data included. However, the data and information accumulated from their past merger experience would not necessarily be comprehensive and would be specific to the experience of each consulting firm. This is believed to be the first such study to use a comprehensive data set in answering this very pertinent question of deposit retention and its potential determinants.

To predict whether deposit retention is prone to be negative or positive is no straightforward task. At first blush, it is tempting to assume the banks would experience at least some sort of bleeding effect on their deposits – the possible disruptions that result from the integration process as well as the post-merger cost reductions (e.g. branch rationalization) indicate that retaining all pre-merger deposits poses a serious challenge.

<sup>&</sup>lt;sup>23</sup> Which explains the omission of a literature review in this paper devoted entirely to the research question.

As Davis (2000) points out, banks consider client retention to be a high priority in the merger mix, and so it can be expected that they will take steps to maximize client retention. Market share is a critical source of profit and indispensable to a firm's survival.

The steps a bank might take to prevent disaffected customers from leaving could include price incentives (e.g. offering relatively more competitive deposit interest rates at and around locations especially affected by service disruptions and rationalization). While it may not be able to dissuade all disaffected customers from leaving, the newly merged entity may pursue an aggressive policy of attracting new customers and increasing its deposit base. Such an outcome could partially or fully offset the deposit losses from disaffected customers or even result in higher overall deposits despite the customer defection. Banks will adopt a proactive rather than a passive stance towards maximizing customer retention.

## 4. The Data

All data used in this study were extracted from the Federal Deposit Insurance Corporation's (FDIC)<sup>24</sup> public database<sup>25</sup>. The Summary of Deposits (SOD) is a cross-sectional data set describing a useful range of branch-specific attributes and spans the entire FDIC-insured U.S. deposit-taking system. The SOD provided the deposit data and much of the institutional attributes that were analyzed.

The SOD data contains deposit amounts at the branch level for all FDIC-insured institutions. Presently there are over 85,000 branches. The FDIC collects deposit balances for commercial banks, while the Office of Thrift Supervision (OTS) collects deposit balances for savings institutions. This is done annually on June 30. The SOD data are presently available for June 30 of every year from 1994 through to 2003.

The Institution Directory (ISD) data, also available from the FDIC, lists all institutions insured by the FDIC, past (inactive) and present (active). Currently this list

<sup>&</sup>lt;sup>24</sup> The Federal Deposit Insurance Corporation (FDIC) insures deposits in banks and thrift institutions for up

to \$100,000 in the U.S. financial system. It is an independent agency of the U.S. federal government.

<sup>&</sup>lt;sup>25</sup> See http://www.fdic.gov

contains 26,769 such institutions, of which 9,212 are active. This figure includes commercial banks<sup>26</sup> (banks), savings banks, and savings and loan associations<sup>27</sup> (thrifts).<sup>28</sup> The ISD contains some institutional attributes of interest not found in the SOD e.g. an institution's financial performance measures and the date it was established. Institutional attributes from both of these data sources are captured in the modeling of deposit retention. This extensive data set was comprised in its entirety of approximately 870,000 rows and 100 columns.

### 4.1 Dependent Variable

At this early stage, it is worth defining what is meant by the seemingly vague term, 'deposits'. According to the FDIC, "The definition relates to domestic deposits held, or accepted, by the reporting bank in its main office and in any branch located in any State, the District of Columbia, the Commonwealth of Puerto Rico, or any U.S. territory or possession which include but are not limited to Guam and the U.S. Virgin Islands."<sup>29</sup>

In other words, foreign deposits held overseas by U.S. banks are excluded. All deposits reside in the continental U.S., Hawaii, Puerto Rico, and the territories of American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, Palau, and Virgin Islands. These territories will be referred to as non-domestic areas henceforth. The deposit holdings in these non-domestic areas are not

<sup>&</sup>lt;sup>26</sup> Commercial banks are primarily in the business of making commercial loans and accepting chequable and savings deposits. Mortgage lending is an area which these commercial banks have embraced in recent times.

<sup>&</sup>lt;sup>27</sup> Institutions largely restricted to mortgage lending.

<sup>&</sup>lt;sup>28</sup> Although they are different types of institutions, the deposit-taking activities of banks and savings institutions (thrifts) have converged to a point where they both perform very similar deposit-taking roles. (The 1982 Depository Institutions Act helped relax differences amongst the types of deposit-taking institutions with savings banks permitted to issue money market accounts and increasing their commercial loaning powers). Tokle and Tokle (2000) even find evidence that competition from thrifts caused banks to raise deposit interest rates. Commercial banks predominate the deposit-taking sector with more extensive and numerous branch networks and a greater share of the deposit market. In light of this and for brevity's sake, the term, bank, will be identified with a deposit-taking institution in the general sense. The terms, bank and deposit-taking institution, may also be used interchangeably unless otherwise specified. The terms, commercial bank and thrift, will be employed when distinguishing between the types of deposittaking institutions.

<sup>&</sup>lt;sup>29</sup> See http://www2.fdic.gov/sod.

relatively significant; however, banks in the U.S., particularly larger banks, may operate branches in these areas. So a merger involving any of those banks could potentially impact branches and deposits residing in these non-domestic areas.

The FDIC broadly describes the nature of all these deposits as encompassing the sum of all deposit types including demand deposits, money market deposits, other savings deposits, and time deposits.<sup>30</sup> In essence, all types of deposits received by a financial institution in its normal course of business that are insurable by the FDIC will be captured by the dependent variable – deposits.

The availability of data on these deposits at the branch level is especially useful in discerning the markets<sup>31</sup> impacted by mergers. It allows for the identification of *de novo* entry into markets, in-market mergers, out-of-market mergers, and institutional exposure, i.e. deposit reliance, to certain markets. Market structure and concentration as measured by a Herfindahl-Hirschmann index<sup>32</sup> (HHI) and an *n*-firm concentration ratio<sup>33</sup> (CR<sub>n</sub>) can also be evaluated. These structural measures will vary in proportion to the level of market definition: deposit concentration will increase as the market level is disaggregated from the national to the zip code level. Of special interest is the degree of geographic overlap between merging institutions, which is suggestive of the potential capacity for branch rationalization. Branch-specific data, particularly deposits as well as geographic attributes facilitate the identification and extent of overlap.

<sup>32</sup> The Herfindahl-Hirschmann index is a common measure of market concentration and is equal to the sum of squares of market shares. It may vary between 0 (perfect competition) and 1 (monopoly). HHI =  $\sum s_i^2$ .

<sup>33</sup> The *n*-firm concentration ratio is the sum of market shares of the largest *n* firms.  $CR_n = \sum_{n=1}^{n} s_i$ .

<sup>&</sup>lt;sup>30</sup> See http://www2.fdic.gov/idasp.

<sup>&</sup>lt;sup>31</sup> It is possible to stratify the market at the zip code, county, city, Metropolitan Statistical Area, state, regional or national levels. This analysis will be conducted at the state level. This does not necessarily equate the market to the state. The analysis will include all 50 U.S. states and the District of Columbia. Non-domestic areas are excluded from the analysis although these areas may contribute to an institution's total deposits and assets.

## 4.2 Modeling Approach

A list of inactive institutions was extracted from the ISD data. Of these institutions, those that became inactive due to unassisted<sup>34</sup> mergers from July 1 1994 to June 29 2003 served as the preliminary selection of mergers for analysis. The 4,927 mergers that occurred in this time frame are indicative of the wave of consolidation that the financial sector has been undergoing in recent times.

The SOD data was parsed accordingly and mapped to the list of merging institutions. The variable of primary interest, deposits, was included along with the institution attributes presumed to influence deposit retention. The Institution Directory data, from which the list of mergers was extracted, contained certain additional institutional attributes also presumed to influence deposit retention. The nature of these variables is described in detail in the following sections.

The analysis of mergers required evaluating the change of deposits between two points in time. Because the data were not reported at the beginning or end of a calendar year, but rather in the mid-year mark, a rule was implemented to assign the pre and post-merger data of an acquisition to a certain year. All mergers taking place from June 30 of year t to June 29 of year t + 1 were deemed year t for the sake of pre-merger data. For example, if we were studying the effects on deposits of a merger occurring in November 2001 or February 2002, the June 30 2001 data would serve to provide the pre-merger deposit information. If studying the change in deposits over a single year period, then the following year's data would provide the post-merger information. In this instance it would be the June 30 2002 data. If analyzing this change over a two year period, then the subsequent, i.e. June 30 2003, data would provide the post-merger information. Observations over one year will capture annual merger activity from 1995 to 2002. The last year, 2002, falls away from the two year observation window because of the lack of

<sup>&</sup>lt;sup>34</sup> This precludes mergers facilitated by any of the regulatory bodies. For example, the FDIC may assume control of an insolvent or failed institution until a suitable acquirer can be found for the troubled institution. Acquisitions of this nature are not considered as unassisted mergers – mergers between seemingly solvent institutions. Additionally, consolidation of institutions belonging to the same Multi-Bank Holding Company (MBHC), are not considered as unassisted mergers. Strictly speaking, the term, consolidate, is used when referring to the consolidation of institutions within the same MBHC. The focus of this study pertains to the institutional level of deposits and the terms, merger and consolidation, are used interchangeably to imply unassisted mergers.

data after 2003, precluding mergers taking place in 2002. Consequently, the two year scenario will capture merger activity from 1995 to 2001. 1994 mergers are excluded due to the lack of the previous year's data – one year historical growth in deposits of acquirers and targets are included in the model i.e. for mergers occurring in year t, the model uses data from the years t-1, t and t+1.

The terms "single year period" and "two year period" do not necessarily reflect those lengths of time between a merger's pre and post-merger deposits. These terms are relative. For example, in a merger occurring in December of a year, June 30 deposits in that year would provide for pre-merger data and the subsequent June 30 deposits would provide post-merger data. In actuality, such a merger would have had only six months to mature in the single year analysis, yet it and all other mergers in that year, of which many have also occurred at intermediate times, are assumed to all have a one year maturity. A similar situation exists in the analogous two year case where merger maturity may range from one to two years in actuality.

As such, mergers were observed over two different time frames: one year and two years. There were motivating factors behind conducting these two experiments over differing lengths of time rather than one uniform length of time. Perhaps there was an immediate, short-lived, effect of the merger that the single year observation could capture when compared with its two year counterpart. Conversely, the two year observation window could expose the potential of banks to correct any immediate effect seen over one year. The one year scenario may not capture an immediate effect while depositors took a little while longer to react (especially if having to wait until maturity to withdraw time deposits), which would appear in the two year scenario. If both cases displayed consistently similar results, then any inferences drawn would be further strengthened.

The mergers appearing in the two year sample could be construed as tracking the ones previously observed over one year. The two year sample is smaller because after a year some of these institutions participate yet in more acquisitions thus disqualifying themselves from further analysis. In fact, all mergers in these samples participated in no more than one merger in their constituent observation periods. This rule is further elaborated shortly. Two year samples are also smaller due to their exclusion of the 2002 mergers.

The pre-merger data provided the attributes of each of the acquirer and target, the most important being their respective deposits. When summed together, these deposits served as the total deposits prior to consolidation. The post-merger data precluded any information about the target as it had become an inactive institution by that point. The acquirer still existed; its deposits and branch networks reflected those of the absorbed target. This provided the post-merger deposits to be analyzed.

Analyzing all these mergers in their entirety presented some complications. Firstly, there were numerous cases of acquirers acquiring multiple targets at varying times throughout a given year. Secondly, there were a significant number of cases where acquirers that had already acquired a target, themselves became targets (all in a given year). In fact, there could up to three such mergers: an acquirer acquires a target then this acquirer becomes a target for another acquirer, which, in turn, becomes a target itself.

Such cases of compound and multiple mergers were prevalent throughout. The given form of the data set renders it difficult to untangle these compound and multiple mergers, isolate each merger, and perform an even-handed analysis across all mergers. Therefore, these cases had to be omitted from the merger list. This left 2,218 mergers that occurred from July 1 1994 to June 29 2003, each of which was a "one to one" pairing. The participants, acquirer and target, of each of these mergers were not party to any acquisition other than their own in a given year. It was, however, possible for some acquirers to appear more than once on this list at different times so long as their acquisitions did not overlap in a given year. This list of mergers for the analysis was further reduced to 1,878 because of the consideration of variables that relied on data one year prior to merger, thus ruling out 1994 mergers because of the lacking 1993 data.

The implication of removing the case of acquirers making multiple acquisitions in a given year could mean that many of the relatively larger banks, who could potentially be responsible for much of this activity, may not appear in the analysis. After implementing these criteria, for example, we only manage to observe one merger for a mega-bank such as Wachovia Bank; that example will not be particularly telling as Wachovia's deposits overshadow the target's deposits by at least 10,000 fold.

This situation of multiple acquisitions within a given year may be worth some further study in the future. What would render them especially interesting is the tendency

for these acquirers to be acquisition prone, and so develop a reputation for aggressive consolidation that may reveal some useful insights into the question of deposit retention (especially in areas where the target and acquirer overlap).

With respect to geographic attributes, the analysis distinguishes between two types of cases. The first case encompasses all mergers regardless of region. This sample includes mergers involving financial institutions in any combination of states. This facilitates the identification of the potential effects of overlapping states and out-of-state acquisitions. But this is only in the general sense. A drawback that presents itself here is the apparent complexity of identifying the effects of each state. Given that any number and combination of the 51 states could potentially play a role in a merger, the task of pinpointing regional effects would be very difficult. A subset of this sample, the intrastate mergers, has the capacity to pinpoint a regional effect. Intrastate mergers are strictly within one state. The acquirer and target are located in no more than one state i.e. branches and their deposits related to the merger mix only reside in one state, thus making it possible to distinguish between regions. Incidentally, the intrastate cases do predominate in the sample – 79% over one year and 80% over two years.

Four types of cases have been outlined so far. To begin with, there are two observation periods – one and two years. These are further classified into all mergers occurring across and within all states and then strictly intrastate mergers. Four potential models are the result:

- 1. One year effects for all mergers (1Y)
- 2. One year effects for intrastate mergers (1YS)
- 3. Two year effects for all mergers (2Y)
- 4. Two year effects for intrastate mergers (2YS)

Note that the mergers in 2 also appear in 1; mergers in 4 appear in 3; and that the mergers in 2, 3, and 4 all appear in 1. The models mainly differ in that the intrastate models test for specific effects within each of the 51 states. The model of all mergers tests for broader market conditions like the effects of intrastate mergers versus multi-state mergers.

The terms 1Y, 1YS, 2Y, and 2YS will be used to describe the models described by 1, 2, 3, and 4, respectively.

# 5. Empirical Methodology

## 5.1 Testing for Deposit Retention

The question of whether, and to what extent, banks retain deposits post-merger is formally answered in this section.

At first glance, a logical approach to answering this question would be to simply compare the combined pre-merger deposits of acquirer and target to their post-merger levels. If pre-merger exceeded post-merger deposits, that would indicate negative retention. If the opposite were true, that would disprove a theory that banks lose some of their deposits, thus supporting the claim that banks effectively retain deposits. As previously mentioned, there are two observation periods in comparing pre to post-merger deposits: in the single year case, all pre- and post-merger deposits are buffered by one full year, while pre- and post-merger deposits are buffered by two full years in the two year case.

Such a side-by-side comparison is not as straightforward as it initially appears. One has to control for exogenous factors that would misleadingly inflate or deflate postmerger deposits. One of these factors to consider is the time value of money - interest earned on deposits held at the merging institutions will unduly inflate post-merger deposits. Deposit interest rates offered by banks may vary widely by geography, bank, year (and time of year), and product. This renders the task of identifying and parsing each of the acquirer and target's deposits by product and location, and controlling for the related deposit interest rates, a prohibitively intricate and complex process, assuming the data are attainable.

Economic factors would also very likely influence post-merger deposit levels. It is very conceivable that the ripple effects of factors like employment levels, Gross Domestic Product growth, and consumers' propensity to spend or save their earnings will spill over to deposit levels as these factors continually play out over time. To compound the problem, the effects may be regional, statewide, or possibly more 'local'<sup>35</sup>. For example, the nation as a whole may experience economic and deposit growth while a

<sup>&</sup>lt;sup>35</sup> Metropolitan or rural areas, for example.

state or metropolitan area may concurrently be experiencing economic and deposit decline (this does not necessarily imply deposit growth is positively correlated to economic growth). As is the case with the deposit interest rates, explicitly factoring in all these exogenous variables for a national sample of merging institutions spanning ten years presents a formidable challenge.

A simple, yet reasonably attainable, proxy that would control for this exogenous post-merger deposit inflation (or deflation) is required. The SOD data provides such a proxy. By calculating the growth of deposits at the state level by year for bank and thrift institutions, many of the previously mentioned exogenous factors are presumably absorbed into these market growth figures. Admittedly, this could be construed as a somewhat broad measure, but it will serve an important role in identifying the extent to which deposit retention is attributed solely to a merging institution's characteristics. In effect, it performs a benchmarking role. Moreover, the question of deposit retention now takes on the following guise: *relative to the expected growth of deposits for all comparable institutions, do merging banks experience deposit retention?* 

Market growth is evaluated as the percentage change in deposits over one and two years for the two respective models. The market growth value for a merged institution is calculated as the weighted average of their combined pre-merger deposits based on their respective deposit allocation in the U.S. states, D.C., and non-domestic areas. Upon viewing the data, bank and thrift institutions appeared to experience markedly differing degrees of market growth. Consequently, rather than blend both as one measure of market growth, each acquirer and target's market growth values are based on their type of institution. Equation I shows how this expected growth of a merged institution is calculated. The variables m and n represent the respective number of areas<sup>36</sup> in which the acquirer and target hold deposits; DEP<sub>m</sub> and DEP<sub>n</sub> are the respective deposits residing in those areas; TOTAL is the combined pre-merger deposits of the acquirer and target; STATEGR<sub>i</sub> and STATEGR<sub>k</sub> represent state growth of deposits. MKTGR<sub>i</sub> is thus the

<sup>&</sup>lt;sup>36</sup> All 50 U.S. states, D.C., and non-domestic areas. In total, 59 such areas where market growth was calculated by year (for one and two year intervals) for each of banks and thrift institutions.

calculated percentage growth in deposits derived as a weighted average of state deposit growth.<sup>37</sup>

#### Equation I

$$MKTGR_{i} = \sum_{j=1}^{m} \left( \frac{DEP_{j}^{acquirer}}{TOTAL} \right) \cdot STATEGR_{j}^{acquirer} + \sum_{k=1}^{n} \left( \frac{DEP_{k}^{target}}{TOTAL} \right) \cdot STATEGR_{k}^{target}$$

A side-by-side comparison of pre- and post-merger deposits is possible now that market growth can be accounted for. This requires subtracting corresponding market growth from the percentage growth of deposits then performing the comparison. The cases of nominal (excluding market growth) deposit growth and deposit growth net of market growth are now analyzed.

Table I provides summary statistics for the nominal percentage growth of postmerger deposits. All mergers for the single (1Y) and two year (2Y) cases are depicted along with the intrastate single year (1YS) and intrastate two year (2YS) cases.

		•	
	No. of OBS	Mean	Mean Std. Error
1Y	1878	6.93	.70
2Y	1388	18.36	1.06
1YS	1476	7.03	.77
2YS	1111	17.54	1.04

Table 1 Summary statistics of nominal change in dep	posits
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*Note: The mean and mean standard error are percentages.* 

It is evident that post-merger deposits comfortably exceed their pre-merger levels judging by the positive mean values in Table I. As may be expected, the two year cases are noticeably greater than their one year counterparts – which can probably be attributed, at least in part, to a longer duration of market growth. The differences in deposits might

<sup>&</sup>lt;sup>37</sup> Note that the market growth of the acquirer and target depends on whether each is a bank or thrift. For example, if a thrift acquires a bank, the acquirer and target's market growth will be derived from both historical thrift and bank market growth. If both merging institutions are banks, market growth pertaining to the merger will be derived solely from historical bank market growth.

show some strong variability; however, low mean standard errors suggest tight confidence intervals for the positive means.

Drawing reliable inferences from the observed nominal deposit growth values in Table I may be very misleading. The positive changes in deposits may be masked by market growth - these merging institutions may simply be augmenting their deposits by capturing some of the deposit market growth. This is not an unlikely scenario judging by the consistently increasing deposit levels in the deposit-taking sector observed since 1994 (See Appendix: Figure V). Therefore, controlling for such market growth provides a valuable benchmark with which to measure the differences between pre- and post-merger deposits.

Incorporating the market growth factor yields the results shown in Table II. The values here are calculated as the same values in Table I (post minus pre-merger deposits) subtracted by the market growth values derived from Equation I.

		<u> </u>	
	No. of OBS	Mean	Mean Std. Error
1Y	1878	1.60	.71
2Y	1388	7.45	1.07
1YS	1476	1.73	.78
2YS	1111	6.75	1.08

Table II Summary statistics of change in deposits net of market growth

*Note: The mean and mean standard error are percentages.* 

It appears that despite controlling for market growth, post-merger deposit levels exceed their pre-merger levels. The mean values of the change in deposit levels are all positive, although substantially lower than those of Table I. Still, low mean standard errors suggest tight confidence intervals around these positive means.

Positive nominal deposit changes occur in 72%, 80%, 74% and 81% of the mergers for 1Y, 2Y, 1YS and 2YS. When market growth is accounted for, we observe a drop in these figures – the corresponding positive deposit changes occur in 45%, 52%, 45% and 52% of the mergers. See Appendix: Figures VI thru XIII for illustrative histograms reflecting the distribution of these deposit changes.

#### 5.1.1 Results

Recall that the working hypothesis claims that banks retain deposits post-merger. To formally test this hypothesis, two-sided t-tests are employed on all four cases of the sample. The test value is zero. Tables III and IV depict the results for the nominal and net of market growth changes, respectively.

The restriction for nonlining in deposits					
			0.95 Confidence	ce Interval	
	Mean	t	Lower	Upper	
1Y	6.93***	9.86	5.55	8.31	
2Y	18.36***	17.29	16.28	20.44	
1YS	7.03***	9.12	5.52	8.55	
2YS	17.54***	16.87	15.50	19.58	

#### Table III Test results for nominal change in deposits

Note: The test value is zero. \*, \*\*, \*\*\* denote significance at the 0.10, 0.05, and 0.01 levels. respectively

	Mean		0.95 Confidence	ce Interval
		t	Lower	Upper
1Y	1.60**	2.242	.20	3.00
2Y	7.45***	6.938	5.35	9.56
1YS	1.73**	2.220	.20	3.26
2YS	6.75***	6.280	4.64	8.86

#### Table IV Test results for change in deposits net of market growth

Note: The test value is zero. \*, \*\*, \*\*\* denote significance at the 0.10, 0.05, and 0.01 levels, respectively

The strictly positive confidence intervals in Table III agree with the hypothesis of deposit retention, albeit nominally. For more definitive proof, we turn our attention to the results of the change in deposits net of market growth. And the results, once again, show strictly positive confidence intervals. This confirms the hypothesis that, on the aggregate, merging banks effectively retain their pre-merger deposit base.

Relative to the expected growth of deposits for all comparable institutions, these merged institutions even experience slight deposit augmentation. By beating this benchmark, it appears that either these banks are taking the appropriate steps to maximize

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deposit retention or that a potential deposit bleeding effect is not captured by this particular aggregated analysis. These results may come as a surprise to some observers, but may not be that surprising when one considers that it is the total institutional deposit bases that are being analyzed from a sample composed of unrestricted merger types – negative retention by some bank types might be counterbalanced by positive retention by other bank types.

# 5.2 Testing for Effects of Institutional Attributes on Deposit Retention

#### 5.2.1 Modeling Deposit Retention

We will consider a model that is designed to explain deposit retention *before* the merger has occurred. Post-merger developments are not considered. The model is thus prospective rather than retrospective in nature. Characteristics specific to each merger will be employed in an explanatory role; they will take the form of institutional attributes drawn from both the acquirer and target as well as from environmental/competitive conditions.

A characteristic of the merger that might immediately spring to mind is the amount of the deposits involved in a merger. The higher the deposit levels, the more challenging it may be to retain those deposits due to the associated complexity arising from greater numbers of depositors and larger branch networks. Moreover, the greater the retail deposit focus of the banks, the more sensitive their post-merger deposit levels are to the whims of disaffected customers.

As previously addressed, the extent of overlapping branch networks (and hence the potential for branch rationalization) may have a strong relationship to deposit retention: the greater the overcapacities that are eliminated, the more vulnerable a bank is depositor disaffection.

The sheer diversity and vastness of the U.S. geography could result in certain regions (e.g., at the state, county or city levels) affecting deposit retention more adversely or favorably than others. This could be due to regulatory differences between states.

The nature of competition for deposits could be an important factor. The existence of alternative banks in certain areas could mean that merging banks will take measures to retain deposits that they would not have done otherwise. Variables which measure market concentration (e.g., Herfindahls and concentration ratios) and branch density by region might capture such effects.

The model outlined above is by no means exhaustive, but it serves to provide a framework and approach from which to begin modeling deposit retention. The consideration of the question of deposit retention should be foremost when selecting and/or constructing the variables (from the many possible options) to be utilized. The range of feasible options will be restricted by the nature of the available data set. An ideal data set would include information from which one can glean both acquirer and target attributes as well as environmental/competitive conditions. Fortunately, the empirical model to follow is derived from one such data source, as will be evident when we encounter the diverse array of explanatory variables.

#### 5.2.2 The Empirical Model

Ordinary least squares regressions were employed to evaluate the potential effects of the merging institutions' attributes on deposit retention. Accordingly, four such models were constructed. The 1Y and 2Y models are identical in structure but for one variable to be elaborated on shortly; the 1YS and 2YS models are also identical in structure but for one variable, also to be elaborated on shortly. The all vs. intrastate merger models differ in a number of respects primarily due to their geographic conditions. These differences will be addressed as the empirical models are described.

The underlying rationale for i) a model for all mergers across all state boundaries, and ii) a model for strictly intrastate mergers, is the flexibility afforded in terms of characterizing region-specific attributes. The former is national in scope i.e. free of geographic restrictions, while the latter is more 'local' in scope i.e. state-specific. For reasons previously pointed out, it is overly complex to equip a model that is national in scope with region-specific variables. Rather, such a model can be equipped to distinguish between general geographic attributes such as a multi-state acquirer or an intrastate merger. An intrastate model, though constrained by geographic considerations, allows for identification of specific regions as well as market structure attributes such as the HHI. The intrastate models (1YS, 2YS) are special cases of the all merger models (1Y, 2Y).

The following linear regression model, Equation II, is estimated for each merger in the one year case for all mergers (1Y):

#### Equation II

$$\begin{split} & \text{RETENTION}_{i} = \beta_{0} + \beta_{1} \text{DEPOSITS}_{i} + \beta_{2} \text{MKTGR}_{i} + \beta_{3} \text{OVERLAP}_{i} + \beta_{4} \text{AGET}_{i} \\ & + \beta_{5} \text{AGEA}_{i} + \beta_{6} \text{RETEXPT}_{i} + \beta_{7} \text{RETEXPA}_{i} + \beta_{8} \text{DEPGR}_{i} + \beta_{9} \text{SIZE}_{i} \\ & + \beta_{10} \text{LEARNING}_{i} + \beta_{11} \text{UNITT}_{i} + \beta_{12} \text{THRIFTT}_{i} + \beta_{13} \text{THRIFTA}_{i} + \beta_{14} \text{MULTT}_{i} \\ & + \beta_{15} \text{MULTA}_{i} + \beta_{16} \text{INTRA}_{i} + \beta_{17} \text{INTER}_{i} + \beta_{18} \text{MKTCOV}_{i} + \beta_{19} \text{Q4}_{i} + \varepsilon_{i} \end{split}$$

The following linear regression model, Equation III, is estimated for each merger in the two year case for all mergers (2Y):

Equation III

$$\begin{split} & \text{RETENTION}_{i} = \beta_{0} + \beta_{1}\text{DEPOSITS}_{i} + \beta_{2}\text{MKTGR}_{i} + \beta_{3}\text{OVERLAP}_{i} + \beta_{4}\text{AGET}_{i} \\ & + \beta_{5}\text{AGEA}_{i} + \beta_{6}\text{RETEXPT}_{i} + \beta_{7}\text{RETEXPA}_{i} + \beta_{8}\text{DEPGR}_{i} + \beta_{9}\text{SIZE}_{i} \\ & + \beta_{10}\text{LEARNING}_{i} + \beta_{11}\text{UNITT}_{i} + \beta_{12}\text{THRIFTT}_{i} + \beta_{13}\text{THRIFTA}_{i} + \beta_{14}\text{MULTT}_{i} \\ & + \beta_{15}\text{MULTA}_{i} + \beta_{16}\text{INTRA}_{i} + \beta_{17}\text{INTER}_{i} + \beta_{18}\text{MKTCOV}_{i} + \varepsilon_{i} \end{split}$$

The single difference between II and III rests with the variable  $Q4_i$ . Recall that in the one year case, a merger could have occurred in a one year window any time right up until the post-merger data are reported.  $Q4_i$  is a dummy variable equal to 1 if the merger occurred anywhere within 3 months of the reported June 30 post-merger data, 0 otherwise. The intent of  $Q4_i$  is to capture the potential effect of such a relatively very short merger maturity as it is unlikely that full integration (rationalization, change of target brand etc.) occurred by then, let alone begun, or that depositors are even aware of the merger. Timing of mergers within the two year case is of less concern as those mergers have had at least one whole calendar year to mature.

The deposit based variables start with the dependent variable, RETENTION<sub>i</sub>, being the nominal percentage change in deposits of the institution.<sup>38</sup> This is the variable of interest that reflects the magnitude of deposit retention across all mergers. The combined pre-merger deposits of the acquirer and target are represented by DEPOSITS<sub>i</sub>. The extent of deposit retention may be contingent on the magnitude of the deposits involved. To evaluate whether market growth<sup>39</sup> may account for any retention, the explanatory variable MKTGR<sub>i</sub> is included – the weighted average growth of deposits for acquirer and target by state and year. For mergers occuring in year t, DEPGR<sub>i</sub> is the combined percentage growth of acquirer and target deposits from t-1 to t. This variable captures institution-specific deposit growth leading up to the merger.

Deposit-taking institutions can specialize in certain areas of the banking business e.g. commercial lending, mortgage lending, and agricultural banking. Their dependence on deposits is contingent on their specialization and their exposure to retail banking. Some banks' operations may be heavily reliant on retail deposits while others' could be more dependent on wholesale funds to sustain their operations. To capture this 'exposure' to retail banking, the variables, RETEXPT<sub>i</sub> and RETEXPA<sub>i</sub>, are constructed for the acquirer and target respectively (variables ending with a 'T' pertain to the target and ones ending in an 'A' pertain to the acquirer, with INTRA<sub>i</sub>, BRANINT<sub>i</sub>, and MKTINT<sub>i</sub> being exceptions to the rule). This 'exposure' is measured as the ratio of the bank's total deposits to its total assets.<sup>40</sup>

The size of the acquirer relative to the target might affect the deposit retention. A bank's size is commonly measured by the value of its total assets. Collinearity issues arise if asset values are included in the model because deposits (DEPOSITS<sub>i</sub>) are already considered – as deposits increase so do assets, and so both are correlated. However, the ratio of acquirer assets to target assets can be considered. This is represented by SIZE<sub>i</sub>.

<sup>38</sup> RETENTION<sub>i</sub> =  $100 \times (DEPOSITS_i^{t+1} - DEPOSITS_i^t)/DEPOSITS_i^t$ 

<sup>&</sup>lt;sup>39</sup> See Equation I

<sup>&</sup>lt;sup>40</sup> A similar deposit-to-asset ratio variable is employed by Berger (1998) in measuring the degree of retail business focus of merging banks.

Perhaps the most telling component that might yield disaffected customers and precipitate deposit losses would be the extent to which the acquirer and target's branch networks overlap. In such instances, some degree of branch rationalization is presumably very likely.<sup>41</sup> The prospect of isolating the areas of branch rationalization for analysis and then observing their impact on total deposits at the institutional level is an attractive one, but should be exercised cautiously. The post-merger bank could simultaneously open and/or close branches in non-overlapping areas and for reasons seemingly unrelated to the merger. The next best alternative is to establish an index that measures the degree of ex ante overlap.

Just as definition of the market is critical in the regulatory merger review process, so is the delineation of boundaries in identifying where the acquirer and target overlap. An area more 'local' than a state is necessary. Counties, cities, and Metropolitan Statistical Areas are all feasible; however, these areas are still quite expansive. Measuring overlap by a shared zip code appears to be a suitably precise and flexible way of capturing bank proximity.<sup>42</sup> The variable OVERLAP<sub>i</sub> is one such index, and it measures the percentage of all branches shared by the acquirer and target at the zip code level.

The  $age^{43}$  of each of the merging institutions is captured by AGET<sub>i</sub> and AGEA<sub>i</sub>. An established bank may be well-respected in a local community and command a high degree of depositor loyalty whereas a relatively new bank may encounter depositor

<sup>43</sup> Calculated as the number of years since the bank was established up until the year of merger.

<sup>&</sup>lt;sup>41</sup> In the 1Y, 1YS, 2Y, and 2YS samples, at least some form of branch rationalization (branch closures) occurred in 61%, 58%, 70%, and 66% of the mergers where the acquirer and target overlapped in at least one ZIP code. Rationalization is more prevalent when observed over two years due to the longer time and considering that the possibly lengthy process of closing branches may likely exceed a one year time frame. Curiously, there are some cases where positive branch growth is observed in overlapping areas, postmerger. The corresponding statistics are 3%, 3%, 3% and 4%.

<sup>&</sup>lt;sup>42</sup> In a study that examined merger activity and changes in branch banking, Avery et al. (1999), found the two to be significantly related at the ZIP code level. Where merging institutions have overlapping branch networks at the ZIP code level, the merger is strongly related to a reduction in branches per capita across time, rural, and urban markets. In-market mergers at more diluted levels than ZIP code and out-of-market mergers failed to show strong relationships to changes in branch banking. Only at the ZIP code level did mergers show a consistent and inverse relationship with changes in branching levels. A key implication of all this is that a "local neighborhood" region is a feasible geographic area for analyzing the potential consequences of mergers on branch banking levels. Considering these conclusions, it can be presumed that the greater the extent of branch overlap at the ZIP code level, the more pronounced any deposit losses will be due to the ensuing branch rationalization. The extent of overlap can also be captured by a variable that is the proportion of deposits of the merging banks in the same local market. Berger (1998) employs such a variable in studying X-efficiencies. However, a variable that captures branch overlap is more pertinent in this situation as branch closures are direct causes of deposit erosion.

hostility. These variables also implicitly capture *de novo* acquirers and targets. A *de novo* institution is generally considered to be less than five years of age. These newly formed institutions are a source of interest.<sup>44</sup> Younger institutions as represented by AGET<sub>i</sub> and AGEA<sub>i</sub> may allude to the possibility of this *de novo* effect. A caveat regarding these variables is that they represent a linear age effect that will not identify the potential intensities of the effects of different ages.

Deposit-taking institutions with a history of acquisitions have experience in integrating a target's operations with theirs, and very importantly, maintaining premerger banking relationships with clients. Presumably an acquirer would face a learning curve, so to speak, in absorbing a target as effectively as possible – including retaining its pre-merger deposit base. LEARNING<sub>i</sub> tests for the existence of such an effect and is quantified as the number of acquisitions an acquirer has made in the 5 years prior to an observed merger.

Historical regulations in many U.S. states heavily restricted intra and inter-state branching of banks. This resulted in the statewide proliferation of hundreds, and at times thousands, of unit banks. Unit banks are stand-alone institutions that operate a single branch. Today, these fine fragments of the banking system might be insignificant players in an urban market, yet they may enjoy monopoly power in very local areas such as rural areas. Their numbers have been in steady decline since the Great Depression; one could imagine that branching deregulation and the ensuing merger wave have rendered these unit banks as an endangered species, but that may not be the case.<sup>45</sup> Seeing that many of these institutions enjoy strong ties to their local communities, an interesting question worth addressing is how their depositors would react to their unit bank becoming a target. UNITT<sub>i</sub> is a dummy variable equal to 1 if the target is a unit bank, 0 otherwise.

<sup>&</sup>lt;sup>44</sup> According to the Federal Reserve Bank of Chicago *Executive Update* (June 2001), "Consolidation in the banking industry has fueled the growth of *de novo* banks. On the demand side, new banks form because of a perceived service gap, which can result when larger banks merge. The perception is that often the local decision-makers are gone. On the supply side, corporate layoffs at merging banks provide knowledgeable people who are able to use their existing talents and relationships to start a competitive bank." Given their presumably advantageous local connections and fresh business model, these *de novo* institutions, especially targets might hold an advantage when attempting to hold onto their deposits post-merger.

<sup>&</sup>lt;sup>45</sup> Brickley et al. (2003) dispute the proposition that small banks' survival is in question, and find evidence that suggests small community banks in less urban areas will continue to play a major role in the economy, partly because of customers' aversion to dealing with a branch belonging to a distantly headquartered company and the local knowledge of management.

Despite their being characterized as distinct types of institutions, the deposittaking component of banks' and thrifts' operations are apparently quite similar; although, that doesn't appear to be the situation judging by their markedly different deposit growth patterns by year and market.<sup>46</sup> Still, one type of institution, commercial bank or thrift, may tend to retain more deposits compared to the other. THRIFTT<sub>i</sub> is a dummy variable equal to 1 if the target is a thrift, 0 otherwise; THRIFTA<sub>i</sub> is a dummy variable equal to 1 if the acquirer is a thrift, 0 otherwise.

A host of variables capturing geographic attributes are included in the model. INTRA<sub>i</sub> is a dummy variable equal to 1 for an intrastate merger, 0 otherwise. Both the acquirer and target's operations do not extend beyond a certain state's boundaries for an intrastate merger. INTER<sub>i</sub> is a dummy variable equal to 1 for an out-of-state merger, 0 otherwise. The acquirer and target do not operate in any common state in an out-of-state merger. MULTT<sub>i</sub> is a dummy variable equal to 1 for a target that operates in more than one state, 0 otherwise. MULTA<sub>i</sub> is the analogous dummy variable for the acquirer. MKTCOV<sub>i</sub> is a variable capturing the market 'coverage' of the merger – the union of the number of states that the acquirer and target operate in. A caveat regarding the interpretation of this variable is that it does not distinguish between degrees of regional overlap.

The following linear regression model, Equation IV, is estimated for each merger in the one year case for intrastate mergers (1YS)

Equation IV

<sup>&</sup>lt;sup>46</sup> From 1990 to 1994, banks and thrifts experienced similar deposit growth patterns. These patterns diverge from 1994 onwards as banks experience consistent deposit growth while thrift deposits levels remain relatively steady (See Appendix: Figure V). While both banks and thrifts have been steadily declining in number from 1990 to 2002, one could also argue that the thrift sector is itself in decline. As bank branches have been steadily proliferating, the number of thrift branches has been steadily decreasing over this period. (See Appendix: Figure II for banks and Appendix: Figure IV for thrifts).

$$\begin{split} & \text{RETENTION}_{i} = \beta_{0} + \beta_{1}\text{DEPOSITS}_{i} + \beta_{2}\text{MKTGR}_{i} + \beta_{3}\text{OVERLAP}_{i} + \beta_{4}\text{AGET}_{i} \\ & + \beta_{5}\text{AGEA}_{i} + \beta_{6}\text{RETEXPT}_{i} + \beta_{7}\text{RETEXPA}_{i} + \beta_{8}\text{DEPGR}_{i} + \beta_{9}\text{SIZE}_{i} \\ & + \beta_{10}\text{LEARNING}_{i} + \beta_{11}\text{UNITT}_{i} + \beta_{12}\text{THRIFTT}_{i} + \beta_{13}\text{THRIFTA}_{i} + \beta_{14}\text{BRANINT}_{i} \\ & + \beta_{15}\text{MKTINT}_{i} + \beta_{16}\text{HHI}_{i} + \beta_{17}\text{MKTSHT}_{i} + \beta_{18}\text{MKTSHA}_{i} + \beta_{19}\text{Q4}_{i} + \varepsilon_{i} \end{split}$$

The following linear regression model, Equation V, is estimated for each merger in the two year case for intrastate mergers (2YS)

Equation V

$$\begin{split} & \text{RETENTION}_{i} = \beta_{0} + \beta_{1} \text{DEPOSITS}_{i} + \beta_{2} \text{MKTGR}_{i} + \beta_{3} \text{OVERLAP}_{i} + \beta_{4} \text{AGET}_{i} \\ & + \beta_{5} \text{AGEA}_{i} + \beta_{6} \text{RETEXPT}_{i} + \beta_{7} \text{RETEXPA}_{i} + \beta_{8} \text{DEPGR}_{i} + \beta_{9} \text{SIZE}_{i} \\ & + \beta_{10} \text{LEARNING}_{i} + \beta_{11} \text{UNITT}_{i} + \beta_{12} \text{THRIFTT}_{i} + \beta_{13} \text{THRIFTA}_{i} + \beta_{14} \text{BRANINT}_{i} \\ & + \beta_{15} \text{MKTINT}_{i} + \beta_{16} \text{HHI}_{i} + \beta_{17} \text{MKTSHT}_{i} + \beta_{18} \text{MKTSHA}_{i} + \varepsilon_{i} \end{split}$$

The intrastate merger regression models share many of the same explanatory variables as their all merger counterparts. No further commentary on these shared variables is required as they serve similar roles in this instance.

Isolating intrastate mergers can be useful because the region-specific information gleaned can provide potential insights into the deposit retention question. Dummy variables for all states could be constructed<sup>47</sup>. The market penetration of the acquirer and target with a region may be useful attributes. Market shares of each of the acquirer and target, MKTSHA<sub>i</sub> and MKTSHT<sub>i</sub>, are included in Equations IV and V.

With region-specific data, it is also possible to calculate the branch intensity of banks – the number of branches per 10,000 market residents. This was accomplished with the aid of annual state population data.<sup>48</sup> BRANINT<sub>i</sub> is such a variable. It captures the combined branch intensities of the acquirer and target i.e. the combined number of branches per 10,000 residents within the relevant state. The overall branch intensity at the state level, i.e. the total number of branches per 10,000 residents within the state, may well affect the extent of deposit retention. A higher degree of statewide branch intensity

 <sup>&</sup>lt;sup>47</sup> In fact, this was initially attempted, and although a handful of state-specific mergers either experienced positive or negative significant retention, the results, overall, did not show any regional effects (clusters of significant states) or other phenomena worth reporting and were excluded from the final model.
 <sup>48</sup> The data was obtained from the Bureau for Economic Analysis of the U.S. Department of Commerce

<sup>&</sup>lt;sup>48</sup> The data was obtained from the Bureau for Economic Analysis of the U.S. Department of Commerce (www.bea.doc.gov)

may indicate higher levels of competition for deposits. Disaffected customers produced by mergers in such areas presumably face lower switching costs in finding banking alternatives. This statewide intensity of branches is represented by MKTINT<sub>i</sub>.

Market Herfindahls as represented by HHI<sub>i</sub> are employed for the intrastate models.<sup>49</sup> MKTINT and HHI are both measures of market concentration. Increasing levels of market concentration narrows the number of banking alternatives available to depositors.<sup>50</sup> And the lessening of competition amongst banks suggests that they may not have to take the same aggressive steps to maximize client retention that they would have otherwise.<sup>51</sup>

<sup>&</sup>lt;sup>49</sup> Four-firm concentration ratios were also included initially but were insignificant. This was possibly because of the high fragmentation of the industry, even at the state level. This concentration measure was excluded from the final model.

<sup>&</sup>lt;sup>50</sup> According to Heitfeld and Prager (2004), regulatory authorities assessing the likely competitive impact of mergers might derive some useful information from concentration measures that are more expansive than the local level i.e. at the state level; the extent to which large geographically diversified banks dominate state banking markets is also reflected by such concentration measures.

<sup>&</sup>lt;sup>51</sup> Other variables worthy of mention that were included in earlier versions of the model but later omitted were financial indicators and merger years. The ex ante return on assets (ROA) and return on equity (ROE) of both acquirer and target showed conflicting and inconsistent signals. Dummy variables for each merger year, 1995 to 2002, were insignificant and failed to indicate any trends over time.

### 5.2.3 Results

Table V below represents the regression results for all models: 1Y, 1YS, 2Y, and 2YS. The results of the regression analysis support some of the hypotheses outlined above, but a number of surprises also surface. They also reveal differing effects across the four estimated equations. Recall that the dependent variable, RETENTION, is the combined deposit growth of the acquirer and target.

	1 <b>Y</b>	2Y	1YS	2YS
INTERCEPT	39.191***	70.916***	57.354***	84.206***
	(5.08)	(5.82)	. (5.74)	(5.46)
DEPOSITS	-3.150E-07***	-1.971E-07	-9.601E-07*	1.409E-07
	(-2.67)	(-1.07)	(-1.84)	(.19)
MKTGR	.158	.343***	.211*	.231***
	(1.58)	(4.44)	(1.82)	(3.02)
OVERLAP	.0580	045	.094**	003
	(1.53)	(84)	(2.45)	(07)
AGET	020	061**	008	051*
	(-1.05)	(-2.20)	(354)	(-1.75)
AGEA	040**	076***	046**	080***
	(-2.35)	(-2.94)	(-2.23)	(-2.81)
RETEXPT	256***	175*	493***	285**
	(-3.93)	(-1.70)	(-6.03)	(-2.34)
RETEXPA	200***	483***	117	523***
	(-2.86)	(-4.36)	(-1.30)	(-3.94)
DEPGR	.014	.012	.046**	.073**
	(1.17)	(.63)	(2.55)	(2.56)
SIZE	.024*	024	.079***	093
	(1.73)	(78)	(3.05)	(-1.59)
LEARNING	316	.015	217	.270
	(-1.34)	(.04)	(55)	(.494)
UNITT	996	1.833	907	2.718
	(63)	(.78)	(54)	(1.19)
THRIFTT	-2.494	-1.007	-5.143**	-2.798
	(-1.23)	(33)	(-2.25)	(92)
THRIFTA	413	1.434	949	-1.607
	(18)	(.41)	(36)	(45)
MULTT	-1.478	-10.661	-	-
	(30)	(-1.31)		
MULTA	5.219	.306	-	- '

Table V Regression results for attribute effects on deposit retention

	(1.15)	(.04)		
INTRA	8.326*	5.314	-	-
	(1.80)	(.74)	Υ.	
INTER	3.396	6.364	-	<b>-</b> 1
	(.77)	(.90)		
MKTCOV	1.510	1.691	-	-
	(1.23)	(.73)		
BRANINT	-	-	17.201	-6.173
			(.746)	(21)
MKTINT	<b>-</b> `	-	.825	.806
			(.83)	(.61)
HHI	-	-	.002	.005**
			(.99)	(2.30)
MKTSHT	-	-	-1.335	-2.868
			(85)	(-1.43)
MKTSHA	-	-	787	.656
			(-1.22)	(.83)
Q4	-1.105	-	.522	-
	(66)		(.29)	
No. of OBS	1878	1388	1476	1111
$\operatorname{Adj} R^2$	.028	.056	.055	.062

Note: The t-statistics are in parentheses. \*, \*\*, \*\*\* denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

Due to the timing concerns previously addressed, the one year models may not be as truly reflective of reality as the two year models. It is possible that merged banks may not even have begun the integration process within a one year time frame, or that depositors are yet fully aware of the acquisition. Our inclination is to interpret the one year results with some degree of caution. The two year models are assumed to be more trustworthy – more reliable inferences can be drawn from them. The two year model does come with its own caveat though: there is more time for factors unrelated to the merger to confound the analysis. The description of the data that follows is selective – the description is not sequential; where possible, variables with a connection to each other will be grouped together.

Deposit totals (DEPOSITS) prior to merger are only significant in the single year models. Both coefficients in 1Y and 1YS are negative and significant (at the .01 and .10 levels respectively). Greater pre-merger deposit levels lead to higher deposit losses. Yet this effect is short-lived as these deposit levels seem irrelevant in the two year models.

These deposit levels may be related to the retail banking exposure (RETEXPT and RETEXPA) as those measures are functions of deposit levels. For acquirers, we observe negative coefficients in all models and significance at the .01 level in 1Y, 2Y, and 2YS. Although not significant, the coefficient of 1YS is negative with a relatively low p-value of 0.195, indicating that the effect of the single year intrastate acquirers' retail exposure is similar to their two year counterparts. The coefficients are all negative and significant in the case of the target for all models; 1Y, 2Y, 1YS, and 2YS show significance at the .01, .10, .01, and .05 levels. The strong significance observed in the single year cases might relate to the corresponding deposit amounts (DEPOSITS) of those models. Higher pre-merger deposits coupled with increased levels of retail exposure suggest an acute loss of deposits observed over one year; higher retail exposure observed over two years also points to a negative deposit retention effect. Overall, there appears to be a negative relationship between the retail focus of banks and their deposit retention; the effect is more pronounced for target institutions.

The deposit growth leading up to the merger (DEPGR) plays a factor in the two intrastate models. Their coefficients are both positive and significant at the .05 level. However, the magnitudes of these coefficients are relatively low – below 0.1. Merging intrastate banks are seemingly good performers in terms of their deposit growth. The fact that these are intrastate mergers suggests that the familiarity of these banks with their markets might translate into better deposit retention for them, ex post. And this is despite positive market growth (MKTGR), whose coefficients are all positive and significant at the .01, .10, and .01 levels for 2Y, 1YS and 2YS. The corresponding magnitudes of the coefficients all fall below 1. The overall positive deposit retention can partially be explained by the positive market growth of deposits. It plays a more prominent role in both the two year models.

Relatively larger acquirers show better deposit retention when observed over one year according to the variable, SIZE. In 1Y and 1YS, coefficients are respectively positive and significant at the .10 and .01 levels. This only seems to be a short-term effect as the corresponding coefficients in the two year models turn negative although neither is statistically significant.

We now recall the variable of primary interest, OVERLAP, which might possess a high propensity to affect the magnitude of retention. Its coefficient only shows significance in 1YS, quite surprisingly. More surprising is that this coefficient is positive in both one year models – overlapping branch networks are resulting in better retention levels. A caveat regarding the one year models is the brief time merging banks might have to fully integrate their operations. They may even maintain the ex ante status quo long enough to not be captured by the one year time frame. Caution is necessary when interpreting this overlap over one year. The two year coefficients, though insignificant, are slightly negative. According to the results, the ex ante overlap does not appear to be a decisive factor when it comes to retention. This might be that despite potential branch closures and ensuing deposit losses, these banks are compensating by absorbing increasingly higher deposit levels at the institutional level by either i) garnering mark share in non-overlapping areas ii) maximizing deposit retention in overlapping areas with aggressive marketing, the effective maintenance of customer relationships, or very competitive prices.

Institution age (AGET and AGEA) appears to be negatively related to the extent of retention. This is especially relevant in the case of acquirers: AGEA has negative coefficients that are particularly significant at .05, .01, .05, and .01 for 1Y, 2Y, 1YS, and 2YS. The corresponding target results convey a similar message yet not as convincingly: all coefficients are negative with significance at .05 and .10 for the two year models, 2Y and 2YS. Older institutions seem to gain relatively less deposits than their younger counterparts, especially with respect to acquirers. One possible explanation may be that younger institutions utilize more current IT systems and not be mired internally by an outdated culture or entrenched management structure. However, this is a conjecture and cannot be verified, but it is plausible.

While the thrifts and banks have historically been distinct types of deposit-taking institutions, the THRIFTT and THRIFTA variables may be able to shed some light on their increasingly similar deposit retail activities; specifically, the capacity of thrifts to retain deposits compared with their bank counterparts. The only significant coefficient appears in 1YS for the target, yet all target coefficients are negative, seeming to indicate

some deposit losses when targets are thrifts. The coefficients for the acquirer are inconsistent.

We now describe the results stemming from the models' geographic attributes. The fact that an acquirer or target is a multi-state institution (MULTT and MULTA) appears to be of little consequence due to their insignificance. The same could be said about MKTCOV, the number of states affected by the merger. Mergers that preclude any state overlap (INTER) are also fail to show any influence on deposit retention (which is somewhat intuitive considering that there is no potential for branch rationalization). Intrastate mergers (INTRA) appear to have relatively better retention over one year - the coefficient is positive and significant at the .10 level. The corresponding two year coefficient is positive. Slightly better deposit retention may be observed for in-market mergers, but this inference should be tempered by our previous caveat that the results gleaned from the one year models are not necessarily reliable.

Attention is now turned to the region-specific variables that appear in 1YS and 2YS. Branch intensity as measured by BRANINT is insignificant across both models, and as seen before in a handful of previous variables, the coefficients in the one and two year models are in disagreement. Market intensity (MKTINT) fails to be a significant factor. But, another variable that measured the degree of market competition, HHI, appears to be relevant. Its coefficient is positive and significant at the .05 level - increased concentration in a market where banks merge makes it seemingly easier for them to retain their deposits. Merging banks operating in relatively less concentrated markets will find it more difficult to effectively retain pre-merger deposits because of the greater number banking alternatives available to consumers. With its negative coefficient and p-value equal to .152, the two year ex ante market share of the target, MKTSHT, indicates that a target with higher market share results in some negative deposit retention. The lack of significance, however, mitigates the support for such a claim. Considering the previous variables, it does appear though, that a type of merger vulnerable to deposit losses would involve a target with high market share, high retail banking focus, and high deposit levels. The acquirer market shares (MKTSHA) are insignificant.

The merger learning (LEARNING) hypothesis fails to live up to its billing: none of its coefficients are significant. Similar outcomes apply to unit banks (UNITT) and the merger timing variable in the one year models (Q4).

# 6. Conclusions

The results have shown that banks, in general, retain their combined pre-merger deposit market share, post-merger. This inference is drawn vis-à-vis the benchmark of expected market growth for comparable institutions. Moreover, these banks experience a slight augmentation of their deposits when measured against this benchmark.

Modeling the deposit retention with institutional attributes revealed some noteworthy insights. All geographically related attributes: in vs. out-of-state, multi-state acquirers and targets, market coverage, acquirer and target state shares, market and institution branch intensity, failed to show effects on retention. This may indicate that markets are more local in scope. One variable that counterbalances this argument is the HHI, which significantly affects deposit retention. Merging banks better retain their deposits in more concentrated markets. Such an outcome might indicate that an associated increase in market power is experienced by these merging banks.

Market growth does explain some of the institutional deposit growth, but not entirely. Banks involved in intrastate transactions appear to have growing deposit bases prior to merger, which also explains some of the positive deposit retention.

Younger banks, both acquirers and targets, especially the former, experience better deposit retention than their older counterparts. This is an interesting result for which we cannot fully explain with our data and knowledge. It may suggest a depositor hostility effect, or that younger banks have a more dynamic culture and infrastructure that served them better in the integration process.

The ex ante overlap, contrary to expectations, proved to be inconsequential. Despite the possible depositor fallout from branch rationalizations, banks are still attracting enough deposits at the institutional level to compensate for such an effect. The extent of banks' retail focus greatly influences deposit retention. Higher levels of retail focus render a bank more vulnerable to post-merger deposit losses. This may appear as a somewhat intuitive result considering that a strong retail deposit focus might attract a segment of cliental that is highly sensitive to convenience disruptions and/or brand change. The effect is especially acute for acquirers, and may indicate that these banks steadily shift their focus away from retail banking as they grow in size with every acquisition.

This thesis lays the groundwork for future research in this area. A future study that might be informative would entail comparing merged banks with respect to all banks rather than measuring them against a benchmark as was done in this study. A sample of merger types such as megamergers and 'Mergers of Equals' would be very worthwhile analyzing. The potential for branch rationalization (and hence lost depositors) in such cases may be relatively more significant.

The use of interest rate data could potentially be a useful explanatory tool in analyzing deposit retention - the differences in pre-merger deposit interest rates between institutions and by location. What might confound the utilization of interest rates is that an institution's total deposit base is generally composed of variously distinct deposit account types, which offer differing interest rates and conditions. Should the data be available, separating an institution's total deposit base by account type (e.g., chequing vs. savings) and consequently performing deposit retention analyses might be very insightful. In a similar vein, decomposing an institution's total deposit base by its insured and uninsured deposits could also provide further insights.

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# Appendix











Figure III Thrifts: new charters and mergers, 1990 - 2002

Figure IV Thrifts: institutions and branches, 1990 - 2002





Figure V Deposits: commercial banks and thrifts, 1990-2002 (in trillions)

Figure VI Histogram of deposit changes for 1Y



Figure VII Histogram of deposit changes for 2Y







Figure IX Histogram of deposit changes for 2YS





Figure X Histogram of deposit changes net of market growth for 1Y

Figure XI Histogram of deposit changes net of market growth for 2Y





Figure XII Histogram of deposit changes net of market growth for 1YS

Figure XIII Histogram of deposit changes net of market growth for 2YS



Table VI Variable definitions

AGEA	Age of acquirer
AGET	Age of target
BRANINT	Combined number of branches of acquirer and target per 10,000 state inhabitants
DEPGR	Combined deposit growth of acquirer and target leading up to merger
DEPOSITS	Combined deposits of acquirer and target prior to merger
HHI	Herfindahl-Hirschman index of state deposits
INTER	Indicator variable identifying mergers with non-overlapping states
INTRA	Indicator variable identifying intrastate mergers
LEARNING	Number acquisitions by acquirer within 5 years before merger
MKTGR	Market growth
MKTCOV	Number of states with acquirer and/or target branches affected by merger
MKTINT	Total number of branches per 10,000 state inhabitants
MKTSHA	Acquirer's share of state deposits
MKTSHT	Target's share of state deposits
MULTA	Indicator variable identifying a multi-state acquirer
MULTT	Indicator variable identifying a multi-state target
OVERLAP	Percentage of total acquirer and target branches that exist within similar
	ZIP codes
RETENTION	Combined percentage growth of acquirer and target deposits after merger
RETEXPA	Retail deposit exposure of acquirer – deposits over assets
RETEXPT	Retail deposit exposure of target – deposits over assets
SIZE	Ratio of acquirer to target assets
UNITT	Indicator variable identifying a target unit bank
THRIFTA	Indicator variable identifying a thrift acquirer
THRIFTT	Indicator variable identifying a thrift target
Q4	Indicator variable identifying mergers within the last quarter of a year

	N	Mean	Std. Dev.
AGEA	1878	77.61	44.20
AGET	1878	63.65	40.30
DEPGR	1878	17.95	59.37
DEPOSITS	1878	2,083,267,000.79	8,312,865,207.69
INTER	1878	.12	0.43
INTRA	1878	.79	0.43
LEARNING	1878	1.33	3.47
MKTCOV	1878	1.36	0.87
MKTGR	1878	5.33	7.37
MULTA	1878	.10	0.43
MULTT	1878	.03	0.00
OVERLAP	1878	6.97	18.63
Q4	1878	.22	0.43
RETENTION	1878	6.93	30.34
RETEXPA	1878	79.26	12.57
RETEXPT	1878	82.25	13.00
SIZE	1878	13.50	58.94
THRIFTA	1878	.16	0.43
THRIFTT	1878	.23	0.43
UNITT	1878	.30	0.43

Table VII 1Y: Descriptive statistics: 1Y

Table VIII Descriptive statistics: 2Y

	N	Mean	Std. Dev.
AGEA	1388	78.70	43.59
AGET	1388	64.93	39.86
DEPGR	1388	17.41	57.37
DEPOSITS	1388	1,764,448,000.66	7,203,311,114.72
INTER	1388	.12	0.37
INTRA	1388	.80	0.37
LEARNING	1388	1.18	2.98
MKTCOV	1388	1.31	0.75
MKTGR	1388	10.91	14.16
MULTA	1388	.09	0.37
MULTT	1388	.03	0.00
OVERLAP	1388	7.89	19.75
RETENTION	1388	18.36	39.49
RETEXPA	1388	79.81	12.29
RETEXPT	1388	82.78	12.29
SIZE	1388	10.60	35.77
THRIFTA	1388	.16	0.37
THRIFTT	1388	.25	0.37
UNITT	1388	.31	0.37

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	Ν	Mean	Std. Dev.
AGEA	1476	75.68	41.88
AGET	1476	64.16	39.57
BRANINT	1476	.04	0.00
DEPGR	1476	15.49	43.41
DEPOSITS	1476	866,191,000.29	2,083,256,489.47
HHI	1476	748.05	514.04
LEARNING	1476	.97	2.31
MKTGR	1476	5.30	6.92
MKTINT	1476	3.30	0.77
MKTSHA	1476	.87	2.31
MKTSHT	1476	.21	0.77
OVERLAP	1476	7.83	19.98
Q4	1476	.22	0.38
RETENTION	1476	7.04	29.58
RETEXPA	1476	81.26	10.37
RETEXPT	1476	83.63	11.14
SIZE	1476	9.12	33.81
THRIFTA	1476	.15	0.38
THRIFTT	1476	.22	0.38
UNITT	1476	.33	0.38

Table IX Descriptive statistics: 1YS

Table X Descriptive statistics: 2YS

	N	Mean	Std. Dev.
AGEA	1111	, 76.99	41.33
AGET	1111	65.11	39.00
BRANINT	1111	.04	0.00
DEPGR	1111	14.41	36.66
DEPOSITS	1111	803,283,000.75	2,001,533,265.50
HHI	1111	738.0	508.97
LEARNING	1111	.92	2.33
MKTGR	1111	10.79	14.00
MKTINT	1111	3.30	0.67
MKTSHA	1111	.88	2.33
MKTSHT	1111	.22	0.67
OVERLAP	1111	8.70	21.00
RETENTION	1111	17.59	34.66
RETEXPA	1111	81.89	9.33
RETEXPT	1111	84.14	10.33
SIZE	1111	7.84	21.33
THRIFTA	1111	.15	0.33
THRIFTT	1111	.23	0.33
UNITT	1111	.34	0.33