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The Regulatory Roots of the 2007 Financial Crisis

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THE REGULATORY ROOTS OF THE 2007 FINANCIAL CRISIS

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Economics

by
Jane Coetsee
May 2010

Accepted by:
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ABSTRACT

The rate of home ownership in the US had remained around 65% since the end of the Second World War. Between 1994 and 2006 the rate of home ownership climbed to 69%. In 2006, the combined assets of the top 5 bank holding companies were \$6 trillion. Between 2007 and 2009 almost \$2 trillion of bank assets evaporated as widespread mortgage defaults triggered a crisis. The pressing question is why were so many bad loans originated in the first place and what induced firms and investors to hold them? The primary mortgage market is intensely regulated and the secondary market is dominated by the government-sponsored enterprises (GSEs). Therefore it is important to examine the regulatory incentives to originate risky mortgages.

This dissertation looks at influence of the Community Reinvestment Act (CRA, 1977) and the GSEs to originate and hold different kinds of mortgages. Chapter One looks at the how the patterns of origination change for institutions subject to the CRA at the time of a merger. Chapter Three estimates the propensity of lenders to retain or sell their mortgages to GSEs and private institutions. Chapter Two links Chapters One and Three by examining the effect of the CRA on securitization. The research shows that institutions subject to the CRA lower their rates of denial and securitize more assets when they plan to merge and are under community group pressure. The research also reveals that the GSEs faced more competition after 2003 and as a result may have lowered their lending standards by accepting loans with higher ratios of loan amount to annual income.

Chapter Two shows that investors accepted loans originated in response to CRA pressure without requiring a higher proportion of credit guarantees. This means that market participants may not have been fully cognizant of how the riskiness of mortgages changed in response to CRA pressure.

While many questions about the roots of the financial crisis are still to be answered, the results presented in this paper indicate that regulation played a significant role in altering the patterns and extent of origination.

DEDICATION

This dissertation is dedicated to the memory of my father, who taught me to pause and think after reading each and every line.

ACKNOWLEDGMENTS

I extend my thanks to my committee for their guidance and encouragement. In particular I would like to thank Professor Dougan for insisting that I do not undersell the implications of my research and Professor Warner for his ideas and insight. I am also in debt to the Public Sector workshop, whose advice and comments have been invaluable.

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INTRODUCTION

In 2007 a wave of defaults on subprime loans left experts and laypersons wondering what would induce a sophisticated financial market to create and hold mortgages that gave every impression of being likely to default. There are many theories about possible reasons. This dissertation contends that banks were induced to originate risky loans to meet the requirements of the Community Reinvestment Act (CRA) and that the appetite of government-sponsored enterprises (GSEs) for risky loans lowered the cost of origination to all institutions.

This dissertation will establish that the CRA influenced the origination patterns of banks under community group pressure in the year preceding a merger. Previous studies that looked at delays in the merger process and the profitability of banks with high CRA scores miss the strategic behavior that banks engage in to avoid delays due to merger protests. The research presented in Chapter One finds that the CRA is responsible for the origination of at least an additional \$114bn and possibly as much an additional \$983.3bn worth of loans between 2001 and 2006, depending on how many times the institutions under community group pressure merged. Banks get CRA credit for originating and purchasing, but not for holding, loans to lower income households in their community. Chapter One leaves the question of what banks did with the originated CRA loans unanswered. Chapter Two picks up this thread and presents evidence that banks were able to securitize around a quarter of the loans originated for CRA purposes in the year

preceding a merger. The findings presented in Chapter Three reveal that lending standards, as measured by the ratio of the loan amount to income, were higher for private purchasers than for GSEs.

The three chapters address the roots of the financial crisis by exploring the supply of and demand for risky mortgages. The findings suggest that government regulation influenced both sides of the market and therefore had a profound influence on the quantity of risky loans in the financial market. The CRA alone could account for the origination of as many as \$983.3bn CRA mortgages. The lower bound on CRA related mortgages is \$141bn, which is still economically significant. The panel regression in Chapter Two estimates that banks securitize \$260 for every \$1,000 worth of acquired assets when they face a CRA exam the quarter before a merger. Chapters One and Two together show that banks change their lending practices when they are both merging and under CRA pressure and that they do not hold many of the loans they originate for CRA purposes.

Chapter Three presents evidence that the GSEs are buying many of the risky mortgages that banks are originating. Banks originate low and moderate-income (LMI) loans to meet the requirements of the CRA and GSEs purchase LMI loans to fulfill their Department of Housing and Urban Development (HUD) goals. As the loan amount to income value on a loan application rises it becomes more likely to end up on the balance sheet of Fannie Mae than any other entity. The data presented in Chapter Three show

that although GSEs were privately owned institutions before 2007, non-market related forces drive their performance. The 2003 surge in Fannie Mae purchases cannot be linked to any observables in the applicant pool. The three chapters together present a picture of the creation and flow of risky mortgages through the financial system. The results show that from origination to purchase on the secondary market, regulation plays an important role in determining the fate of home loan applications.

CHAPTER ONE

THE COMMUNITY REINVESTMENT ACT AND HOME- LOAN ORIGINATION: THE MERGER PROCESS AS A DISCIPLINING MECHANISM AND THE ROLE OF COMMUNITY GROUPS

Introduction

In wake of the subprime mortgage crisis of 2007, the Community Reinvestment Act (CRA) has attracted defenders and detractors alike. The strongest defense of the CRA is the fact that a majority of subprime loans were originated by independent mortgage companies, that are not subject to the provisions of the CRA (Yellen, 2008). Chapter Three will deal with the incentives for *all* primary lenders to originate risky loans by GSEs. This chapter looks at origination data for both mortgage companies and banks, but I must stress that the comparison is not an exercise in accounting for subprime loans by source.

The implications of the risk undertaken by banks differ from that of mortgage companies with respect to macroeconomic stability. That is why the focus of the research presented here is to understand through what channels the CRA exerts its

influence on bank lending and the changes in lending it elicits. Specifically, I examine the merger process and the role of community groups in that process. A bank is required to fulfill the provisions of the CRA in order to merge, and community groups have the right to protest a merger. The merger process is therefore an interesting theater in which to observe how the interaction between banks and community groups precipitates changes in lending practices. The “community” to which the provisions of the CRA refer is defined geographically. However many protests to mergers are on the basis of racial, not spatial, discrimination.

Using a panel of 162 banks, I examine how denials as a percentage of applications for black applicants, white applicants and for applicants who conceal their race and ethnicity respond to mergers, protests and community group pledges. Unlike previous research in this field, I am able to observe the assessment areas and compare lending within the assessment area to lending outside to determine to what extent the CRA leads to localized changes or to a relaxation of overall lending standards. I indicate the presence of community group pressure with a dummy variable that is equal to 1 if a bank has ever had to pledge to increase its CRA lending to a community group. The origination of refinance loans is also examined to get an indication of how the CRA influences the origination of risky mortgage products.

I find that merging banks that are under pressure from community groups decrease the percentage of denials to black and white applicants as well as to low and

moderate-income (LMI) households within their assessment areas. This change in lending is overwhelmingly limited to the assessment area. Black denials decline by 10% if a bank is merging and under community group pressure. White denials decline by 2.3% under the same conditions. I find that banks under community group pressure wait until they want to merge to change their lending. There was no indication in the data that banks “recycled” existing CRA loans by purchasing as opposed to originating new loans. The origination of refinance loans increases by 4.3% if a bank under community group pressure is planning to merge. In addition to this, banks appear to satisfy the terms of their current CRA lending pledges to community groups by originating refinance loans. Banks who make CRA pledges increase their origination of refinance loans by 5% if they have made a CRA pledge in the current year. The interaction between the merger process and community groups resulted in the origination of an additional \$15.7 bn. worth of loans to black applicants, \$40.3 bn. worth of loan to white applicants and \$85 bn. of refinance loans, at the very least¹. The maximum estimate is \$94 bn. worth of loans to black applicants, \$242 bn. worth of loans to white applicants and \$647 bn. of refinance loans.

¹ This estimate is based on the average loan amount for each category of lending between 2001 and 2006, an estimate of 350 banks that are under community group pressure (Silver and Brown, 2007) and at least 1 merger per bank during the 6 year period in question for the minimum and 6 mergers for the maximum amount.

1.1 The Regulatory Environment

1.1.1 The Community Reinvestment Act: History and Enforcement

The CRA was passed in 1977. The stated intention of the Act was to encourage lending institutions to increase lending to their communities. The passage of the CRA was a response to a pattern of bank lending activity known as redlining. Community activists in Chicago in the 1960's are credited with coining the term "redlining". The term refers to the practice of banks to avoid lending to poor and declining neighborhoods. This practice is arguably a relic of the stringent standards set by the federally funded Home Owners Loan Corporation (HOLC), established in 1933 as part of the New Deal. Given that HOLC loans ceased in 1935, long before the passage of the CRA, this contention is unlikely to be true. The law requires that lending be undertaken in a safe and sound manner.

The provisions of the CRA were tightened throughout the 1990's. Before 1995, banks could earn good ratings by documenting their efforts to lend to low and moderate-income households. After 1995, banks were required to report their lending activities within the assessment areas. Although no explicit benchmarks were provided, lending could be compared across institutions and to previous assessments. The changes made in 1995 were believed to be so burdensome that in 2005 the asset size requirement for a

large bank assessment was raised from \$250 million for unaffiliated banks² to \$1 billion. Banks with assets exceeding \$250million and less than \$1billion were the made subject to requirements that were less burdensome than those on large banks (see below).

As a consequence of the CRA, banks are subject to routine assessments and are assigned ratings based upon the extent to which they “met the needs of their assessment area”. The Office of the Comptroller of the Currency (OCC) assesses national banks. The Office of Thrift Supervision (OTS) assesses thrifts and Savings and Loans. The Federal Reserve Bank (FRB) assesses state chartered banks. The FDIC assesses non-national banks and banks that are not state chartered with federal deposits insurance. Assessments are usually conducted every 2-3 years. The regulators are required to consider public comments when ratings are assigned and when rendering a decision on a merger application. The four possible ratings are: *Outstanding, Satisfactory, Needs to Improve, and Substantial Non-Compliance*. A rating of at least *satisfactory* was required if the bank’s application for “a new deposit facility” was to be approved by the regulators. A “new deposit facility” can be a new branch, a merger, or an acquisition. The Act therefore influences banks’ lending choices by potentially limiting their ability to expand. All depository institutions are subject to the provisions of the Act, including wholesale and business banks. Wholesale and business banks are assessed according to the extent of their community development lending.

² A threshold of \$1billion dollars was set for “conglomerated” banking institutions, presumably to deter the practice of creating separate corporate identities to avoid the provisions of the CRA. (Federal Register, Vo. 60, no. 86, 1995 page 22178)

The tests differ depending on the size of the bank. Banks are classified as small, intermediate-sized and large. Small banks have assets valued at less than \$250 million. Intermediate-sized bank have assets exceeding \$250 million, but less than \$1 billion. Large banks have assets that exceed \$1 billion. Table 3 on page 21 summarizes the frequency of examination types and scores. Small banks are assessed on 5 performance standards. These standards are: (1) the loan to deposit ratio (2) percentage of credit extended within the assessment area (3) credit extended to low and moderate-income³ (LMI) borrowers and small businesses and farmers (4) the geographic distribution of loans and (5) actions taken in response to written complaints. Small banks are exempt from the community investment and service requirements. The intermediate-sized bank tests were introduced as part of the 2005 reform. Before 2005 banks whose assets fell within this asset range were subject to the same tests as large banks. Intermediate-sized banks are subject to a lending test similar to the one to which small banks are subject to. In addition to the lending test, the community development investments and services of intermediate banks are subject to community development tests. (CRA 101, Federal Reserve Bank of San Francisco) Large banks are subject to 3 tests: a lending test, a service test and an investment test. The investment test involves an examination of the contribution of banks to affordable housing, community services and economic activity in LMI neighborhoods.

³ Low and moderate income is defined as 50% or less and between 50% and 80% of the median household income for the Metropolitan Statistical Area (MSA) respectively.

The lending test is the most important component of the assessment. Depending on the nature of a bank's operations, the proportion of loans by value and volume to small businesses, small farms or loans to moderate and low-income households are assessed. The values of these proportions are reported, but there are no explicit evaluation benchmarks. The proportion of bank lending to LMI households is compared the size of the LMI population in the assessment area and to the lending activity of banks with similar size and assessment areas. A bank with an *outstanding* lending test can never receive an overall rating that is less than *satisfactory*, regardless of how poorly it may score on the other tests. The service test establishes whether or not there are enough branches and ATMs to service the community as well as the innovativeness and ambition of the bank's community development services. Examples of community development services include technical assistance to non-profit organizations, whose primary focus is community development, serving on the board of an organization that furthers affordable housing goals, and developing financial educational programs for LMI individuals. For large banks, the lending test accounts for 50% of the CRA rating, while the investment and service tests each account for 25% of the rating. Several revisions have been made to the Act during its history; these are summarized in Table 1.1 and discussed below.

TABLE 1.1
The Regulatory History of the CRA

Year	Regulation	Changes Made to CRA
1977	CRA	-
1989	Federal Institutions Recovery, Reform and Enforcement Act (FIRREA)	Required the public disclosure of CRA scores and reports
1992	Federal Housing Enterprises Financial Soundness and Safety Act	Required Fannie Mae and Freddie Mac to purchase and securitize mortgages
1994	Riegle Neal Interstate Banking and Branching Efficiency Act	Relaxed restrictions on interstate banking and required banks applying for in-state branches to have at least a <i>satisfactory</i> CRA rating
1995	Changes to the Code of Federal Regulations	Required CRA examinations to be more “performance” and less “procedure” oriented. Effectively made CRA examinations more stringent.
1999	Gramm-Leach-Bliley Act	Repealed the Glass-Steagall Act (1933), thereby permitting commercial banks to offer investment banking services and insurance products to its clients. All commercial banks applying to expand the range of products on offer had to be CRA compliant. Required banks to disclose the terms of all their agreements with community groups.
2005	Small Bank Regulatory Relief Code of Federal Regulations	Less frequent and stringent exam for bank with less than \$1bln worth of assets.

In 1989, CRA ratings and reports were made public (see Financial Institutions Reform, Recovery and Enforcement Act of 1989). In 1995, the standards of compliance were tightened. Before the changes of 1995, banks could satisfy the provisions of the CRA by presenting their documented efforts to increase lending to the community. After the 1995 tightening, banks were assessed on the basis of their ratio of lending within the “assessment area” to lending outside that area (See below). The regulatory agency that oversees a particular bank administers the assessment. An assessment is conducted approximately every 3 years. In 1999, in response to the Gramm-Leach-Bliley Act⁴, the CRA was expanded to require banks to be CRA-compliant if they desired to engage in investment banking and insurance. The Gramm-Leach-Bliley Act also required banks to disclose written agreements between depository institutions and non-governmental groups in connection with the CRA (See FRB regulation G).

The CRA requires that an assessment area must consist of whole “geographies” and/or political divisions. This means it is a set of *entire* census tracts, the assessment area cannot include only a *portion* of a census tract. (CRA §228.41 (a) through (e)) The assessment area must include the census tracts in which its main office, branches and deposit taking ATMs are located. In addition to these tracts, a bank must include the tracts in which it has originated a “substantial portion” of its loans. Section 228 permits banks to adjust the boundaries of their assessment areas to reflect the area which they be” reasonably expected to serve.” Banks are therefore permitted to exclude portions of the

⁴ The Gramm-Leach-Bliley Act repealed part of the Glass-Steagall Act by allowing the same institution to engage in banking, investment banking and insurance provisions

cities and towns in which they have branches located. Census tracts with low median income relative to the MSA may not be “arbitrarily omitted” if they are adjacent to the bank’s assessment area. The larger the bank, the less likely it will be permitted to omit an LMI tract. (CRA §228.41 (e)(3)) Banks define their assessment area, within the provisions of the CRA, to maximize their rating⁵. Banks seek to include tracts into their assessment area if it will improve their record of lending within the assessment area. In order to do this they must document their growth history and plans within the area.⁶ The fact that banks have some say in selecting their assessment areas makes the assessment area itself endogenous. However, it should be noted that this flexibility is limited. Although banks have the freedom to include census tracts in their assessment areas, it is costly for a bank to omit a census tract from their assessment area if it is in close geographic proximity to the tracts within the assessment area. (CRA §228.41 (e)(3)) Table 1.2 summarizes when an originated or purchased loan is within the assessment area.

⁵ For web based products that facilitate selection see http://www.rataassociates.com/products_comply_features.asp

⁶ http://www.bankersonline.com/lending/guru2007/gurus_ldng032607a.html

TABLE 1.2
When a Loan Falls within an Assessment Area

Scenario	Inside AA†	Outside AA	Under Certain Conditions
A purchased or originated loan to purchase a property located in a census tract where the bank has a branch	√		
A purchased or originated loan to purchase a property located in a poor census tract adjacent to at least one census tract where the bank has a branch or originates at least 10% of its loans.			The larger the bank, the more likely the loan falls within the banks AA
A purchased or originated loan to purchase a property located in a census tract where the bank originates at least 10% of its loans.	√		
A purchased or originated loan to purchase a property located in a census tract where the bank neither has a branch nor originates many loans.			Only if the bank has made a case to include the tract in its AA

† AA denotes assessment area.

Data collected under the provision of the Home Mortgage Disclosure Act (HMDA) and comments from the community are the basis for assessment. Under the provisions of the HMDA, a bank must submit loan application registers (LAR) and CRA disclosure records to the Federal Financial Institutions Examination Council (FFIEC) every calendar year. Bank lending data collected under the HMDA is published on the

FFIEC website. Community groups and aggrieved borrowers are able to review a bank's lending history and submit comments. The CRA gives individuals and community groups the right to take action against banks that are not adequately serving the needs of the community. Such action usually takes the form of written complaints to the bank or regulatory agency. These complaints sometimes result in a lower CRA rating, a delay in the merger process or the denial of a merger application.

In this chapter and the next, we will turn our attention to one type of bank expansion: mergers and acquisitions. Branching has not been addressed because there is no evidence that community groups protest branch openings. Given that more than 93% of banks have the *satisfactory* score necessary to open new branches and that branch openings are seldom, if ever, protested, it is unlikely that annual originations will be discernibly responsive to branching.

1.1.2 The Bank Merger Process

The parties to a bank merger are required to submit form S-4 to the Securities and Exchange Commission if both or all banks involved have at least a satisfactory CRA score. If at least one party to the merger has a *Needs to Improve* or a *Substantial Noncompliance* score the bank will either wait until the next assessment or it will file an appeal to the bank regulator. Applications by banks with only one subsidiary with a less

than satisfactory score have been denied⁷. In the 2001 case of Wesbanco, the bank met with community members to draft a plan of community investment. Due to these efforts, the FDIC agreed to alter the score. (Squires,2003). The bank merger process is lengthy, sometimes taking 6 to 9 months. Both the bank regulator and the Department of Justice review the competitive aspects of the bank merger and the state bank regulator may appeal the anti-trust finding. Public notice of the merger is given and the community is invited to submit comments to request hearings. At this stage community groups are given donations and lending pledges by banks. A 2007 National Community Reinvestment Coalition (NCRC) report states that since 1977, 466 CRA agreements have been signed and \$4.5 trillion has been pledged to LMI neighborhoods. (NCRC, 2007) The regulator will then examine the evidence and make a decision. (Smith and Biddle, 2005) FOIA applications to the FDIC, FRB and OCC reveal that between 2001 and 2007 less than 2% of merger applications were declined or withdrawn.

1.1.3 The Equal Credit Opportunity Act, the Home Mortgage Disclosure Act and the Truth in Lending Act

The Equal Credit Opportunity Act (ECOA) of 1974 prohibits creditors from discriminating on the basis of gender, race, religion, nationality, and marital status. It also outlaws discrimination on the basis of income originating from government subsidies⁸.

⁷ See the section below for a discussion of the denial of a merger by First Interstate Bancsystem.

⁸ See DOJ Civil Rights Division, Housing Section Documents Title VII § 701.

The Home Mortgage Disclosure Act⁹ (HMDA) requires institutions that have at least one branch in an MSA to submit a Loan Application Register (LAR) to the FFIEC. The LAR is a record of the race, gender, ethnicity, income of each applicant together with the loan amount and action taken on the application. The race and ethnicity is recorded for each applicant that applies face-to-face for a home loan. If the applicant declines to disclose their race or ethnicity the bank employee is required to infer the applicant's race from their name and to inform the applicant of the inference. The HMDA requires that all loan application data collected be made public. Parties who protest mergers and lodge complaints against banks at the time of CRA assessments often make use of the HMDA data.

The Truth in Lending Act (TILA) of 1968 was written to protect consumers by requiring that creditors disclose all the terms and costs prior to the conclusion of loan agreement. It should be noted that although both banks and mortgage companies are subject to the TILA, HMDA and ECOA, mortgage companies are not as closely monitored as banks. While banks are subject to routine audits, the FTC examines mortgage companies in response to complaints (Laderman and Reid, 2008)

⁹ The requirements for reporting are available at: <http://www.ffiec.gov/hmda/pdf/regulationc2004.pdf>

1.2 Literature Review

Contributions to our understanding of the CRA come from both legal and economic publications. The existing economic publications offer an array of empirical regularities. The legal literature provides anecdotal evidence and theoretical considerations.

The economic literature offers two broad and critical insights. First, the CRA had some effect on home loan origination by banks. Second, mortgage companies, not institutions subject to the CRA, originated most of the risky loans involved in the sub prime meltdown. We can divide the economic literature into 3 broad categories. (1) papers that link loan origination under the CRA to some measure of performance, (2) papers that concentrate on the effect of the CRA on loan origination, (3) papers that explore the ways that banks can avoid the provisions of the CRA.

Avery et. Al. (2005) used bank-level Call Report data and home purchase lending data and determined that the profitability of the largest 500 retail banks is statistically unresponsive to the amount of lending to LMI households. A 2008 working paper by Laderman and Reid uses data that maps California home purchase loan origination activity to mortgage performance. They compare the performance of loans originated by banks to loans originated by mortgage companies. After accounting for an extensive array of borrower characteristics, type of lender and housing market control variables,

they find that loans within a bank's assessment area are less likely to foreclose than loans outside the assessment area. Preliminary results indicate that mortgage companies are responsible for originating the majority of the high-risk, poor performing loans. However, the difference between the performance of mortgage company and bank-originated loans is substantially diminished when only low to moderate-income neighborhoods are examined. No account is taken of who holds the loan and how the secondary market may lower the cost originating a risky loan.

An alternative methodology is employed by Apgar and Duda (2003) to measure the effect of the 1995 tightening on loan origination. In this paper, origination in 1993 is compared to origination in 2000. For these 2 years, they compare the percentages of home loans devoted to LMI households within their assessment areas to the percentage outside of their assessment area. They also compare the percentage of LMI home loans originated by banks to the percentage originated by mortgage companies. They find that the origination of loans to LMI households is greatest for banks within their assessment areas. However, they find a decline in assessment area lending by banks. Apgar and Duda recommend that CRA assessments look at loans made outside of the assessment area. There is evidence that the CRA increased home ownership by minorities in New York City in the 1990's (Freeman and Hamilton 2002). Freeman and Hamilton estimate a reduced-form logistic model for home-ownership for white New York City residents. They then enter the observable characteristics of for black residents into the model and use the difference between the predicted and observed values to estimate the proportion

of the difference in home ownership that is explained by observed characteristics. The exercise is repeated for the 1991, 1993, 1996 and 1999 data. Freeman and Hamilton find that the proportion of the difference in homeownership that is explained by observed characteristics rose steadily from 50% in 1991 to 63.7% in 1999. The paper provides “circumstantial evidence” that the regulatory changes in the 1990’s reduced discrimination in home purchase lending.

Some studies indicate that the CRA has fallen short of its goals. It is held that, due to vague performance benchmarks, some CRA scores appear inflated when compared to more objective benchmarks (Nesiba and Golz, 2002). There is also speculation that banks are able to circumvent the requirements of the CRA by extensive use of telephonic and electronic applications, obscuring the race and ethnicity of applicants (Wyly and Holloway 2002). Wyly and Holloway examine the cases where applicants declined to give their race and ethnicity. They define the probability that there will be no racial information for an applicant as the conditional probability that an applicant will apply electronically and that the applicant will decline to disclose her race and ethnicity. They estimate the probability that an applicant will obscure their race as a function of the racial profile of the census tract from where the application came and compare the predicted probabilities to the frequency of no racial information. Wyly and Holloway find discrepancies between the predicted probability and actual frequency and attribute this phenomenon to the ability of banks to obscure their true rates of denial by employing telephonic and electronic applications.

Banks can also find relief from the CRA by selecting the OCC as their regulator instead of the FRB and FDIC. (Matasar and Pavelka, 1998). Data on CRA assessments between 1990 and 1996 indicated that historically OCC was the most lenient of all regulators. A time series comparison showed that regulators were increasingly giving a higher proportion of outstanding scores. The comparison suggested that the difference in the mean score given by each agency was dwindling over time. Matasar and Pavelka interpret the relative frequency of scores over time to indicate a regime of competitive laxity among regulatory agencies.

The legal literature can be divided into two broad, but by no means mutually exclusive sub-categories. Studies regarding the empowerment of community groups and their influence and research focused upon the unintended distortions to both the industrial organization of lending and to bank portfolios. The influence that community groups derive from the Act is relevant to our discussion to the extent that it motivates the incentive of banks to comply with the provisions of the Act.

In practice, a CRA rating of *Satisfactory* or *Outstanding* serves to reduce the probability of community group resistance to bank mergers and other expansions. Banks with *Satisfactory* ratings have been subject to merger delays until the completion of a scheduled examination (*see First Union 1989, Cowell and Hagler 1992*). Precedent indicates that a bank's ability to merge is only as strong as its weakest subsidiary. For example, the Federal Reserve Board rejected the application of First Interstate

BancSystem to acquire Commerce BancShares on CRA grounds. Despite the *Satisfactory* ratings of the First Interstate subsidiaries, a subsidiary representing less than 2% of First Interstate's assets had failed to extend credit on the North Cheyenne Indian Reservation that fell within its assessment area.

Gramm (2002) rejects the hypothesis of benevolently motivated CRA protests in favor of rent-seeking motivations based on his finding that the probability of a CRA protest is increasing with respect to the asset size of the bank. Gramm estimates that the duration of merger applications is reduced by two days if the bank is rated *Outstanding* instead of *Satisfactory*. Gramm contends that 2 days are a long time in the merger process because deals are sensitive to delays. However, if a bank merger can take up to 9 months, 2 days does not appear to be a meaningful delay. Macey and Miller state that banks have learned to cope with the threat of potential community group action by creating funds for community lending that are not pledged to any particular group, preventing the situation where upon satisfying one group, action is then brought by another group. Often these pledges are not fulfilled once the merger has been approved.

Much of the literature in the early 1990's addresses the conflict between the assumptions underlying the CRA and the changing structure of the banking industry. While regulation permitted banks to expand across state borders, the CRA was drafted on the assumption that banking should be local (Macey & Miller, 1993). The result was an environment where "financial institutions walk a tightrope between the demands for

increased CRA efforts and the need to consolidate the industry through mergers.” (Cowell and Hagler, 1992)

Apart from potentially distorting bank consolidation, the Act encouraged risky behavior on the part of banks. Banks are penalized with poor CRA scores for investing too heavily in reserves and for diversifying beyond their assessment area. For example, AmericanWest Bank of Washington was lauded in its 2004 report for a 99% loan-to-deposit ratio, Woodford State Bank of Wisconsin exhibited a “reasonable” loan to deposit ratio of 86% in the same year. Cambridge State Bank received a *Substantial Noncompliance* rating for its “ultraconservative” lending practice of investing “too heavily in government bonds.” (Macey and Miller 1993) The Act also encourages the use of “flexible lending practices.” Flexibility in this context means low down payment mortgages, a lowering of credit standards and a wide range of risky mortgage products. (Liebowitz, 2008)

This paper is unique in that it uses bank level panel data that is not restricted to any particular state or city. The results are therefore more general. This is also the first study to use the actual assessment areas instead of an instrument, such as branch location. Furthermore, the focus of this paper is how the CRA operates through the merger process. New branch openings are seldom protested, and delays to mergers are costly and community groups have a forum to complain. This study is distinct from Gramm’s 2002 study because the LAR data provide a way to observe strategic loan origination on

the part of the bank so that they may avoid protests and delays. Data on community lending pledges are also employed to provide a more complete picture of how the interaction between community groups and banks influences lending.

1.3 Sample Selection and Data Summary

The CRA database is a record of the assessment dates, exam method and CRA scores for the 17,540 banks subject CRA assessments. A random sample of 200 bank identification numbers and regulator codes¹⁰ was taken from the CRA ratings database. To this random sample 20 large banks were added to produce a sample that accounts for the bulk of the deposits in the US. The annual electronic record of the many census tracts that comprise the assessment area is available for each bank that submits a report of agricultural and small businesses lending to the Federal Financial Institutions Examinations Council (FFIEC)¹¹. In order to create a sample of banks for which the assessment areas are observable every year, the randomly selected bank identification numbers were matched to those banks that submitted reports of CRA lending in 2002. This matching process eliminated 35 banks from the sample. In order to remain in the sample, the banks with observable assessment areas also had to submit their home lending application data (their LAR's) each year, beginning in 2001 and ending in 2006. This left 162 banks in the sample.

¹⁰ The combination of a bank identification number (ID) and regulator number produces a unique record. For example there can be 2 banks with the ID 12345, but they will have different regulators.

¹¹ This report is called the CRA disclosure report.

A random sample of 50 2002 HMDA reporting institutions with “Mortgage Company” as part of their name was selected. To remain in the sample, Lexis Nexis had to have at least one record of a SEC filing by the mortgage company or its parent company. The inclusion of mortgage companies in the sample increased the number of institutions in the sample by 41. Collectively they submitted on average 6.2 million applications per year during the window of examination. Together, the 41 mortgage companies typically submit twice as many applications as the banks¹².

Merger data for the banks were obtained under the Freedom of Information Act from the FRB and FDIC, from the Weekly Reports at the OCC website and the merger search engine on the OTS website. Merger data for the mortgage companies were obtained from searching Lexis Nexis for merger related SEC filings.¹³ Merger protest data was obtained from the released merger decision documents from the respective regulators websites and from the archives of community group websites. I obtained the dollar -value of community lending pledges from a report by the National Community Reinvestment Coalition. Banks are under no legal obligation to honor these pledges but pledges are potentially a powerful instrument for community group pressure. Using observed protests to mergers as an instrument for community group pressure is problematic because banks can potentially avoid merger protests by coming to agreements with community groups. The ability of banks to negotiate with community

¹² Countrywide alone accounts for approximately 2 million applications per annum.

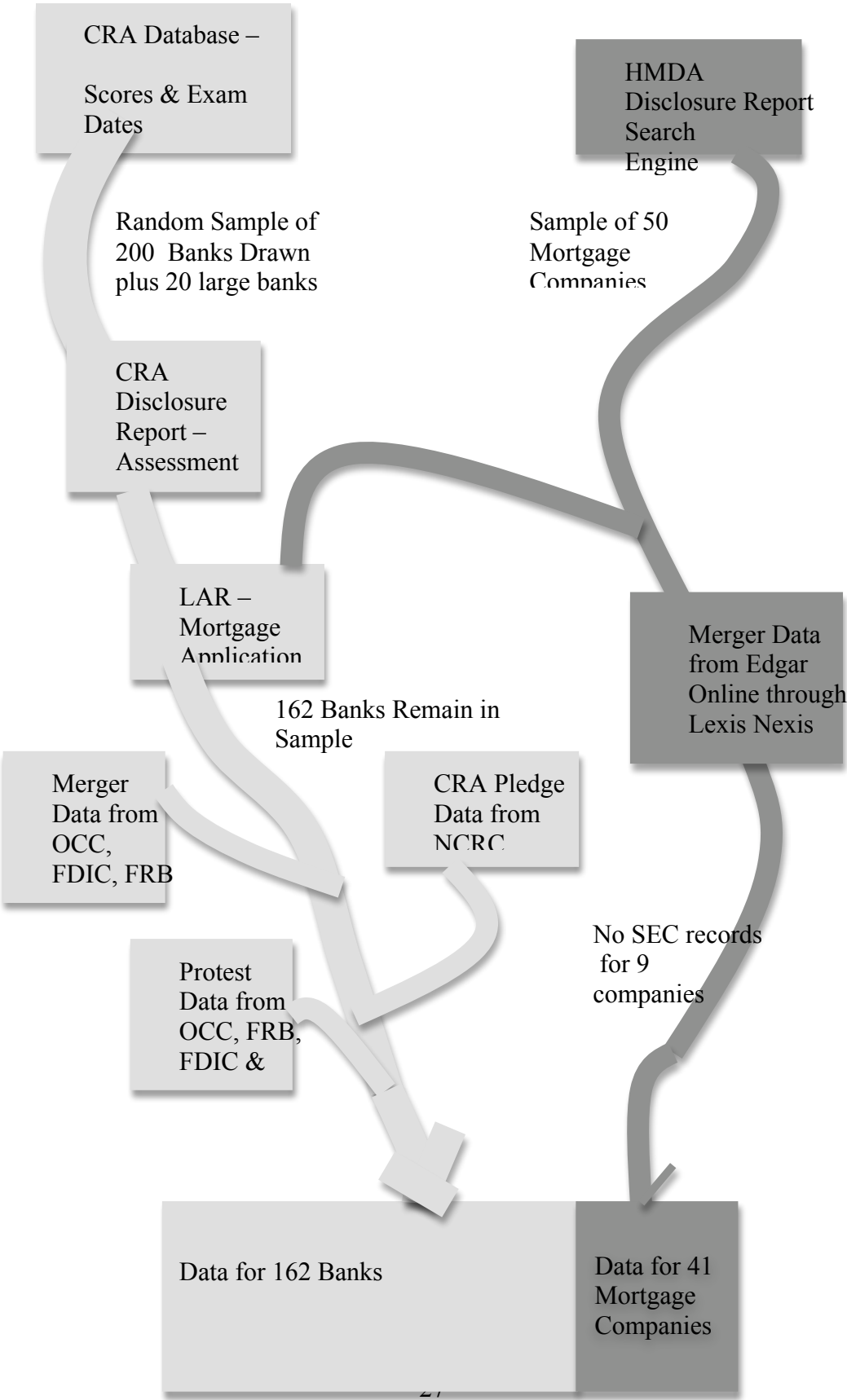
¹³ Specifically forms DEF 14C, 40-AF-M, DEFM 14A, DEFM 14C, N-14, PRE 14A, PRE 14C, PREM 14A, PREM 14C

groups makes pledges a superior instrument of community group pressure. Figure 1.1 illustrates the sample generation process. Coalition. The use of pledges or dummy variables indicating whether or not the bank has made a pledge, as an independent variable is potentially problematic. Banks that are pressured into making pledges may have higher rates of denial for LMI and minority applicants. Therefore the direction of causation between denial rates and pledges is uncertain.

The 162 banks in the sample merged 250 times between 2001 and 2006. 51 of these mergers were protested. Merging institutions are overrepresented in the sample, 2,051 mergers were recorded for the universe of 12,700 banks in the country between 2001 and 2006. This is due to the inclusion of 20 large banks in the sample. The 41 mortgage companies merged 14 times over the sample period. The banks in the sample pledged \$3.2 trillion¹⁴ of CRA lending to community groups. All banks between 1977 and 2007 pledged \$4.5 trillion of CRA lending. Banks are

¹⁴ Total home lending by the banks in the sample over the sample period was \$1,727 trillion, 53% of total pledges.

Figure 1.1: Sample Generation



Three hundred and eighty-two CRA assessments were conducted for sampled banks between 2001 and 2006. Those assessments awarded 107 scores of *Outstanding*, 271 *Satisfactory* and 1 *Needs to Improve*. The average rating was 1.72 over the sample period. A comparison of the CRA data for the sample and the population is summarized in Table 1.3 below.

TABLE 1.3
Comparison of Sample and Population CRA Data 2001-2006

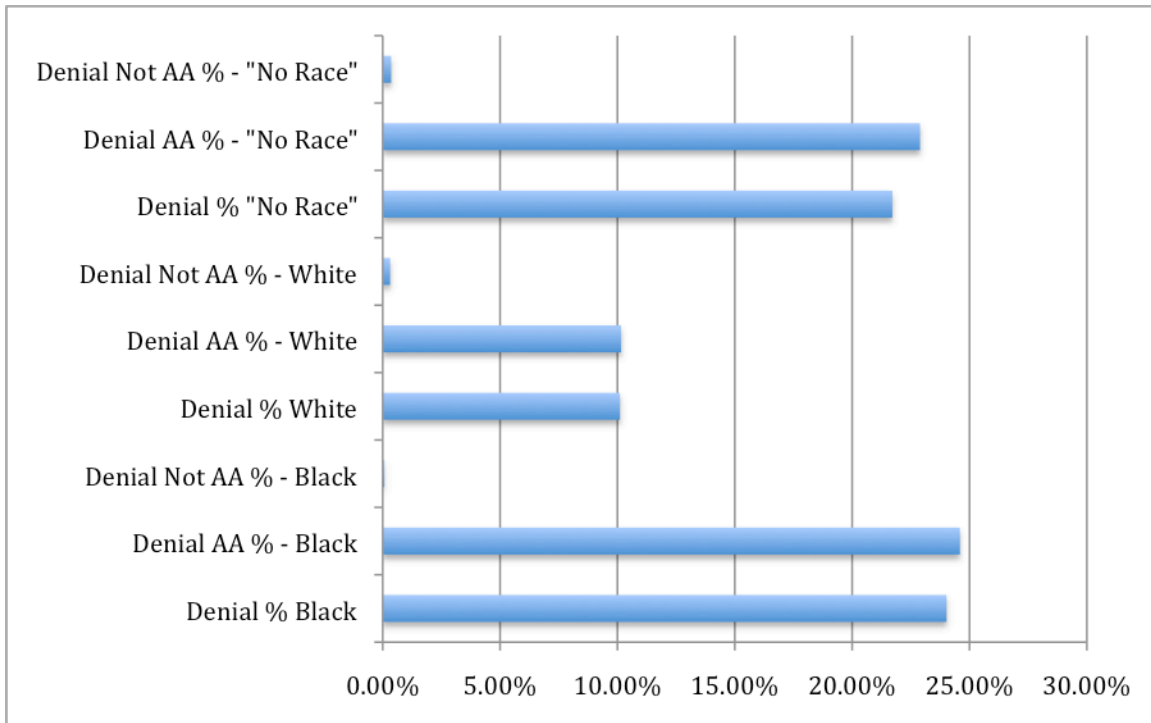
Variable	Population	Sample
Number of Banks	9,377	162
Number of Assessments	13,334	382
Average Score	1.89	1.72
Percentage <i>Outstanding</i> Scores	11%	28%
Percentage <i>Satisfactory</i> Scores	86%	71.2%
Percentage <i>Needs to Improve</i> Scores	3%	0.002%
Percentage <i>Substantial Noncompliance</i> Scores	0.009%	0%
Percentage Large Bank Assessments	23%	89%
Percentage Intermediate Bank Assessments	4%	4%
Percentage Small Bank Assessments†	70%	6%
Mean Asset Size (\$ 000's)	1,492,343	12,958,093

† The remainder of the assessments were wholesale and special purpose bank types of assessment.

Table 1.3 reveals the extent to which large banks have been oversampled. This is appropriate for this study because large banks are more likely to be under community group pressure and this paper is concerned with the role of communities groups in bank mergers.

Table A1 of Appendix A shows the summary statistics for banks and Table A2 shows the summary statistics for mortgage companies. On average banks purchase¹⁵ 20% of the new loans on their balance sheet and deny 20% of their applications. They deny 30% of the applications within their assessment area¹⁶. The denial rate for black applicants is approximately 22% both within and outside of the assessment area. The average bank in the sample gets 12,229 applications from whites every year and denies 10% of these both within and outside of its assessment area. Figure 1.2 shows denials as a percentage of applications by race.

FIGURE 1.2
Total, Assessment Area and Non-Assessment Area Denial Rates by Race



Note: AA denotes assessment are

¹⁵ Purchased loans are loans originated by other institutions

¹⁶ Rate of denial is a fraction of (originations+purchases) minus purchases.

Banks originate only 52% of the applications they receive from LMI households. Loans to LMI applicants are only available for 2005 and 2006, this is when the HMDA data began to record median census tract income. 51% of the applications banks receive are for refinance loans.

Table A2 of Appendix A contains the summary statistics for mortgage companies. The average mortgage company in the sample receives 5 times as many applications as the average bank. 22% of new loans on the average mortgage company's balance sheet are purchased. The denial rate of loans to white applicants is about 16% and the denial rate on black applications is about 22%. 55% of the loans mortgage companies originate are refinance loans. The variables used in the panel estimation are tabulated and defined below in Table 1.4. Applications by LMI households are only observed in 2005 and 2006. Panel estimation is therefore impractical for the origination of loans to LMI households. In the case of applications by LMI households, the change in the rate of origination between 2005 and 2006 is the dependent variable so that bank specific effects are differenced out.

TABLE 1.4
List of Variables and Definitions

Variable Name	Definition
Explanatory Variables	
<i>Merger</i>	A dummy variable equal to 1 if the institution merges or acquires another institution in the current year.
<i>Merger Protest</i>	A dummy variable equal to 1 if any entity lodged an objection to a merger with the bank's regulator.
<i>Pledge</i>	A dummy variable to 1 during the current year if the institution pledged to a community group to expand CRA lending.
<i>Ever Pledge</i>	A dummy variable equal to 1 if the institution made any pledge to a community group since 1977.
<i>Ever Pledge*Merger (T+1)</i>	The interaction between these two variables is intended to control for merging banks under community group pressure.
<i>CRA Exam</i>	A dummy variable equal to 1 if the institution was subject to a CRA Exam during the current year.
<i>CRA Rating</i>	The CRA rating of the institution as of its last CRA exam.
Dependent Variables	
<i>Denial Rate</i>	The number of applications by members of a particular racial group that denied as a fraction of the total applications by members of the racial group.
<i>Change in LMI Originations as a Percentage of LMI Applications</i>	The difference between the percentage of loans to LMI applicants originated in 2006 and the percentage of loans to LMI applicants (applicants with less than 80% of the median MSA income) originated in 2005.
<i>Origination of Refinance Loans as a Percentage of Applications for Refinance Loans</i>	The number of refinance loans either originated or purchased from other institutions as a fraction of total applications for refinance loans.

1.4 Econometric Model

A fixed-effects panel model is used to estimate the influence of CRA control variables and mergers on lending. The panel is unbalanced and short, having only 6 years and 142 institutions.

The fixed effects model to be estimated is generally written as:

$$y_{it} = X'_{it}\beta + \alpha_i + \varepsilon_{it} \quad (1)$$

Where α_i denotes the fixed effect, or conditional mean for the “group”. In this case the i subscript denotes the identification number of the banks. Institutions will most certainly differ in the extent to which they originate home loans as opposed to small business and agricultural loans. They will also differ with respect to their propensity for risk according to the form of ownership. The individual fixed-effects coefficients will capture institution specific effects and therefore eliminate one source of omitted variable bias. The vector product $X'_{it}\beta$ for this paper denotes a set of CRA control variables and their coefficients. Specifically,

$$X'_{it}\beta = \beta_1 + \beta_2(\text{everpledge} * \text{merger}(t+1))_{it} + \beta_3(\text{everpledge}) + \beta_4(\text{merger}(t)) + \beta_5(\text{merger}(t+1))_{it} + \beta_6(\text{MergerProtest})_{it} + \beta_7(\text{CRAExam})_{it} + \beta_8(\text{CRARating})_{it} \quad (2)$$

The estimates of the coefficients will allow us to perform the following inferences:

TABLE 1.5
Inference Tests and Interpretation

Coefficients	Interpretation
$\left \hat{\beta}_2 \right \geq 0$	Firms that merge in the next period should change some of their lending patterns more if they are under community group pressure
$\left \hat{\beta}_2 \right \geq \left \hat{\beta}_3 \right $	The effect of community group pressure on lending should be more intense when firms are planning to merge
$\hat{\beta}_6 \neq 0$	Banks higher denial and lower origination rates should invite CRA protests. When the dependent variable is the rate of denial, the occurrence of a protest predicts a higher rate of denial. When the dependent variable is the rate of origination, the occurrence of a protest predicts a lower rate of origination.
$\left \hat{\beta}_7 \right \geq 0$	Banks undergoing a CRA assessment during the current year should change their lending patterns by more than banks that are not being assessed.
$\left \hat{\beta}_8 \right \geq 0$	Banks with lower numeric (i.e. better) scores should have on average fewer denials and more originations in the lending categories examined.

The fixed effects panel model is estimated using the method of OLS. Year fixed-effects are also tested for significance.

1.5 Empirical Investigation: Mergers and the CRA

A CRA score of at least *satisfactory* is needed only when a bank wants to expand. This paper selects mergers to identify the effect of the CRA on lending because most banks already have the at least the *satisfactory* rating needed to expand and therefore the enforcement mechanism of the CRA is through protests and complaints. New branching

applications are rarely protested and therefore banks are much more likely to strategically change lending patterns around the time of a merger. Earning at least a *satisfactory* score gives banks the option to expand in the future and therefore a dummy variable indicating whether or not the bank was subject to a CRA exam is included. The other explanatory variables are dummies for whether a merge was protested and whether the bank made a pledge to community groups to increase their lending to disadvantaged groups.

I use 3 margins of comparison to test the effects of mergers on lending. First I use the occurrence of mergers in the current year as a treatment effect and compare merging banks vs. non-merging banks. This comparison identifies changes in lending due to the CRA. It is in fact testing a joint hypothesis: the effect of merging on lending and the effect of the CRA on lending. Banks may change their lending patterns in response to a merger because the behavior of outgoing managers changes in anticipation of a merger.

In order to determine to what extent the change in lending may be attributed to the CRA, I use whether the institution is subject to the CRA as a treatment and compare merging banks to merging mortgage companies. I then compare the lending of merging banks within the assessment area to their lending of merging banks outside of the assessment area. This is a test of whether the CRA leads to targeted changes in lending or to an overall decline in lending standards (Liebowitz, 2008). The set of tests are summarized in Table 1.6.

TABLE 1.6
Empirical Test Overview

Comparison	Hypothesis	Interpretation
<i>Lending of Merging Banks</i> vs. <i>Non-Merging Banks</i>	Coefficients on the dummy variable MERGE are significantly different from zero	The CRA influences the kinds of lending undertaken by merging banks.
<i>Lending of Merging Banks</i> vs. <i>Lending of Merging Mortgage Companies</i>	The lending of mortgage companies is invariant to merger plans while the lending of banks is altered	The changes in lending around the time of a merger are due to the CRA and not to agency costs
<i>Lending of Merging banks within the Assessment Area</i> vs. <i>Lending of Banks Outside of the Assessment Area</i>	The lending of merging banks should change both within and outside of the assessment area	The CRA leads to a general change in standards not to targeted changes.

The next question is to what kinds of lending do we turn our attention to in order to gauge the effects of the CRA? The three key dimensions are: race, income and riskiness. Many protests of bank mergers are lodged on the basis of racial discrimination. Therefore I compare total denials as a fraction of total applications for black applicants, white applicants and applicants that do not disclose their race. At this juncture it is important to address the Wyly and Holloway (2002) result. If banks deflate the rate of denial to black applicants by using telephonic applications we can test the robustness of these results by regressing of the proportion of applicants who do not disclose their race as a function of whether or not the institution plans to merge. The CRA is written to encourage lending to LMI households, therefore the denial rate of loans to LMI households is also of interest.

The data can also contribute to our understanding of how and to what extent the CRA influenced “risky” lending. The data set does not show what proportion of loans went into default, but from previous research (Gramlich, 2007) we know that refinance loans carry high default risk. For banks and mortgage companies separately I regress a panel of each denial rate on an expansion dummy that is equal to 1 if the institutions is planning to merge. For banks the denial rate is also regressed on a set of CRA variables. The CRA variables are listed in Table 1.4. To see the influence of the CRA on risky lending I regress the percentage of originated refinance loans as a fraction of application for refinance loans in merger and CRA variables.

1.6 Results

The results are displayed in Appendix B. Year fixed-effects were rejected for all panel regressions. By comparing the results presented for banks in Tables B1 through B3 to the results for mortgage companies presented in the first columns (a), (b) and (c) of Table B6 we can see that denial rates for black applicants, white applicants and applicants who do not disclose their race behave similarly in the presence of merger activity for both banks and mortgage companies. However, the interaction between an upcoming merger and the instrument for community group pressure results in a reduction in denials to black applicants. Table B1 column (c) shows that this result is particularly pronounced for black applicants within the assessment area. Unless banks have the

power to select their assessment area to minimize denials to black applicants, a comparison between the rates of denial between black applicants inside and outside the assessment area as shown in columns (c) and (d) of Table B1 suggests that the effects of the CRA are limited to the assessment area and do not lead to an overall change in lending standards. A merging bank under CRA pressure will decrease its denial rate of black applicants by 10.4% in the year before the merger is granted. A merging bank under CRA pressure will decrease its denial rate of black applicants by 2.3% in the year before the merger is granted. The results from the CRA control variables are presented in Table 1.7. It is problematic that the dummy variable *Ever Pledge* has an effect in the panel regressions. Around 76% of the banks in the sample made a pledge before the sample period began and the fact that the dummy alone explains some variation not captured by the bank fixed effect suggests that there is some time dependence in the *Ever Pledge* dummy variable. In Tables B1 and B2 the effects were more significant and larger in the pooled regressions for black and white denial rates respectively. These higher and more significant coefficients for the pooled regressions are consistent with the hypothesis that some banks have higher average rates of denial than others. In the panel regressions the bank fixed effect absorbs some of the power of the marginal effect of *Ever Pledge*.

TABLE 1.7
Inference Tests and Interpretation¹⁷

Tests	Meaning	Denial – Black	Denial - White	Denials – “No Race”	Originatio ns –LMI Loans	Originations -Refinance
		Table B1	Table B2	Table B3	Table B4	Table B5
$\left \hat{\beta}_2 \right \geq 0$	Effect of Merger stronger under community group pressure	√	√	X	√	√
$\left \hat{\beta}_2 \right \geq \left \hat{\beta}_3 \right $	Community group pressure operates through mergers	√	√	X	√	√
$\hat{\beta}_6 \neq 0$	Protests explain higher rates of denial and lower origination	√	√	X	X	X
$\left \hat{\beta}_7 \right \geq 0$	Banks change their lending in anticipation of a CRA assessment	X	X	X	X	X
$\left \hat{\beta}_8 \right \geq 0$	Protests explain higher rates of denial and lower origination	X	X	X	X	X

¹⁷ These results are for lending within the assessment area.

While the interaction between community group pressure and a merger in the next period leads to a reduction in the rate of denial of black applicants, and to limited extent, white applicants within the assessment area, Table B3 shows that this effect is not present for applicants who choose not to disclose their race. This pattern of results could be due to the credit worthiness kind of applicants who apply telephonically and no not disclose their race. The percentage of loans to applicants who do not disclose their race as a fraction of total applications was regressed on the same CRA and merger variables used in Tables B1 through B3. A possible interpretation of the negative coefficients on *Ever Pledge* for the denial rates of applicants who do not declare their race presented in columns (b) and (c) of Table B3 is that banks under community group pressure use electronic applications to avoid community group scrutiny. A regression of the number of loan application on parties that do not disclose their race on CRA and merger independent variables showed no evidence to suggest that banks were strategically utilizing channels that allow applicants to conceal their race and ethnicity. TableB4 shows that the origination of loans to LMI applicants is responsive to the interaction between community group pressure and a future merger. Column (b) of Table B4 indicates that this effect is pronounced within the assessment area. Bank under community group pressure will increase their origination of CRA loans by 4.3% when they are planning to burn.

An examination of the coefficients of the *Ever Pledge* dummy in Tables A1 through A3 offers a surprising result. Banks who respond to community group pressure

by making pledges have higher rates of denial to black applicants, white applicants and to applicants who do not disclose their race. This finding could be due to the fact that community groups exert more pressure on banks with higher rates of denial. Nevertheless, when interpreted in conjunction with the positive effect of the interaction between *Ever Pledge* and future mergers, it suggests an interesting strategy by pressurized banks. That is: only respond to community group pressure when you are planning to merge. Table A5 shows that banks that both face community group pressure and are merging in the next year originate more refinance loans within their assessment areas and fewer refinance loans outside their assessment area. By comparing the coefficients on *Ever Pledge* and whether or not the bank made a pledge in the current year in Table B6 reveals that the origination of refinance loans is more responsive to current pledges than to past ones. This suggests that banks fulfill their current pledges by temporarily increasing their originations of refinance loans. The results in terms of the empirical strategy outlined in Table 1.5 are summarized in Table 1.8.

TABLE 1.8
Summary of Empirical Test Results

Comparison	Hypothesis	Results
<i>Lending of Merging Banks</i> vs. <i>Non-Merging Banks</i>	Coefficients on the dummy variable MERGE are significantly different from zero	Merging is only important if the bank is under community group pressure
<i>Lending of Merging Banks</i> vs. <i>Lending of Merging Mortgage Companies</i>	The lending of mortgage companies is invariant to merger plans while the lending of banks is altered	Column (d) of Table B6 indicates that merging mortgage companies originate 7.7% more refinance loans in the year before they merge. Merging banks do not. Exhibit a similar pattern unless they are under community group pressure. Merging mortgage companies do not change the racial pattern of their originations, but merging banks do. (Tables B1-B3)
<i>Lending of Merging banks within the Assessment Area</i> vs. <i>Lending of Banks Outside of the Assessment Area</i>	The lending of merging banks should change both within and outside of the assessment area if the CRA leads to an overall change in lending standards.	Lending within the assessment area is much more sensitive to mergers under CRA pressure than lending outside the assessment area. Unless banks can vary their assessment areas freely every year, this indicates targeted changes as opposed to an overall change in lending standards.

I calculate the change in the total value of loans originated due to the interaction between banks and community groups at the time of a merger by using the average loan amount for white applicants, black applicants, applicants who do not disclose their race and refinance loans. By using *Ever Pledge* as an indicator of community group pressure, the NCRC report indicates that there are 350 banks under community group pressure. If we assume that each of the 350 banks merged only once during the 6 year period, the interaction between the merger process and community groups resulted in the origination of at least an additional \$15.7 bn. worth of loans to black applicants, \$40.3 bn. worth of loan to white applicants and \$85 bn. of refinance loans. If we assume that each of the 350 banks merged 6 times in 6 years, the maximum estimate is an additional \$94.3 bn. worth of loans to black applicants, \$242 bn. worth of loans to white applicants and \$647 bn. of refinance loans. The banks under community group pressure in the sample merged an average of 3.2 times each between 2001 and 2006.

1.7 Concluding Remarks

The CRA influences bank lending by jointly constraining the merger process and giving community groups the right to protest. With the exception of refinance loans, neither the merger process nor pledges to community groups alone can change patterns in origination. The effect is largely limited to lending within the assessment area. This may be because the assessment area itself is endogenous and chosen by banks to maximize

their performance under the CRA. However, the fact that changes in lending patterns are confined to the assessment area strengthens the result that changes in lending are due the CRA and that banks respond to CRA pressure **not** by lowering lending standards in general but by strategic lending. The differential effect within and outside of the assessment area strengthen the case that changes in lending patterns are due to the CRA. The changes in lending by banks in anticipation of a merger are not explained by other merger related factors, otherwise we would see similar effects both for banks planning to merge that are not under pressure from community groups and for merging mortgage companies. All of these differentials constitute persuasive circumstantial evidence that the CRA lead to changes in lending standards.

The effects of the CRA do not appear to be negligible. The banks under community group pressure are typically very large institutions that are required to originate many more qualifying loans to satisfy the requirements of the CRA. If these banks merged 6 times in 6 year, the CRA could for account as many as \$983.3bn additional loans in the system. The lower bound of \$141bn of CRA related loans is still economically significant.

Banks get credit for originating and purchasing loans, but not for holding them. There still remains the question of what the banks do with the CRA loan they originate. Chapter Two explores the propensity to securitize CRA loans and Chapter Three looks at

the appetite of public and private firms on the secondary market to purchase risky mortgages.

CHAPTER TWO
THE COMMUNITY REINVESTMENT ACT AND SECURITIZATION
OF ASSETS BY COMMERCIAL BANKS

Introduction

The fact that banks are given CRA credit for purchasing or originating community loans, but not for holding them has the potential to create perverse incentives. If banks are not holding loans to maturity, they may lower standards in ways that may be unclear to buyers of mortgage-backed securities (MBS). This paper relates the timing of CRA exams to the bank's securitization activities. I find that the presence of a CRA examination does not significantly alter the propensity of a bank to securitize unless the bank is planning a merger.

I also find that the secondary market absorbs \$260 in securitized assets for every \$1,000 worth of assets acquired during the merger if the institution faces a CRA examination in the quarter before the merger. There is strong circumstantial evidence to suggest that this change is due to the CRA exam. Commercial banks that do not face a CRA exam in the quarter before a merger actually reduce the amount they securitize in the current quarter.

2.1 The Community Reinvestment Act and Mergers

The Act was passed in 1977. The intention of the Act was to encourage lending institutions to serve their communities. Banks had to undergo assessments and were assigned ratings¹⁸ based upon to extent to which they met the needs of their assessment area. A rating of at least *satisfactory* was required if the bank's application for a new deposit facility was to be approved by the regulators. A new deposit facility refers to any new branch, merger or acquisition. The Act therefore limits the ability of a lending institution to expand. All depository institutions are subject to the provisions of the Act, including wholesale and business banks.

Many revisions were made to the Act during its brief history. In 1989, CRA ratings and reports were required to be public. In 1995, the standards of compliance were tightened. Banks were assessed on the basis of explicit proportions of lending within the assessment area to lending outside. The assessment consists of three components: the lending test, the service test and the investment test.

These tests assess the extent to which the bank is lending, providing services for and investing in its community. The proportion of loans by value and volume to small businesses, small farms and moderate to low-income households came under scrutiny. The values of these proportions are reported, however there are no transparent

¹⁸ The four possible ratings are: Outstanding, Satisfactory, Needs to Improve and Substantial Non-Compliance.

benchmarks. What is clear is the importance of the lending test. A bank with an *outstanding* lending test can never receive an overall rating that is less than *satisfactory*, regardless of how poorly it may score on the other tests.

In 1999, in response to the Gramm-Leach-Bliley Act¹⁹, the CRA was expanded to require banks to be CRA compliant if they desired to engage in investment banking and insurance. In 2005, less strict requirements were placed on small and intermediate banks²⁰.

The CRA conferred the right upon community groups to take action against banks that were not adequately serving the needs of the community.

2.2 Literature Review

Asset securitization is best defined as the “partial or complete segregation of a specific set of cash flows from a corporation’s other assets and the issuance of securities based on these cash flows.” (Iacobucci&Winter, 2005) Between 1986 and 2006, the initial apprehension present in asset securitization literature gave way to enthusiasm.

¹⁹ The Gramm-Leach-Bliley Act¹⁹ allowed the same institution to engage in banking, investment banking and insurance provisions

²⁰ Initially, a small bank was defined as a bank with fewer than \$1 billion worth of assets.

2.2.1 Judgment Proofing

Initially, there was a great deal of debate surrounding the potential for corporations to "judgment proof" their assets through securitization. (LoPucki, 1996) The "judgment proofing school" held that corporations could separate the ownership and the operation of assets through securitization. When tort liability arose in the normal course of business, claims would be limited to the meager assets of the operating firm.

Detractors of judgment proofing contended that the assets of a firm that engaged in securitization would not be diminished. The firm would receive consideration equal to the present value of the future benefits generated by the asset and, unless the consideration was paid out to the shareholders, the ability of the firm to meet the claims of creditors would be unchanged. (Schwarcz, 1999) The growing propensity of firms to securitize assets that do not generate tort liabilities²¹ diverted intellectual energy from judgment proofing to efficiency gains.

2.2.2 Tailoring Risk Exposure to Preference

Asset securitization is held to facilitate a better match of risk bearing with risk preference (Berger&Benveniste, 1994). In the event of liquidation of the originating firm, investors in securitized assets are protected because they have preferential claim to

²¹ For instance, debt obligations.

specific assets. In this respect asset securitization is similar to secured debt. As the “partition²²” between the assets and firms is stronger in the case of asset securitization, it is arguably superior to secured debt. Mortgage backed securities (MBS) advance the matching of security to both risk preference and investor specific information. Investors in MBS are able to choose between general claims, interest only or principal only obligations.

2.2.3 Hidden-Information

The phenomenon of asset securitization is highly amenable to theories that assume asymmetric information. The literature that analyzes the incentives to securitize that derive from asymmetric information falls into two categories: theories of hidden-information and theories of hidden-action. (Iacobucci&Winter, 2005)

Hidden-information theories differ in terms of whether there is an asymmetry of information on the non-securitized assets or the securitized assets of the firm. They are similar in the respect that they rely upon “market forces to allocate claims to those investors who are best informed about returns.”

In the case of the asymmetric information about *non-securitized* assets, securitization is the means by which the securities market circumvents the lemons market

²² The *partition* in this context is a legal one. Securitization approximates a “true sale” of assets to a greater extent than the issuing of secured debt. It is therefore less likely that the preferential claim of the investor in securitized assets will be compromised. (Iacobucci&Winter 2005)

premium on claims to the pooled assets of the firm. An asymmetry of information between inside and outside investors is assumed to exist. The managers of high-quality firms securitize the assets about which investors are equally informed in order to signal the quality of the remaining assets. This leads to securitization on the part of managers of lower quality firms, as the decision to not securitize would signal low quality assets.

(Myers&Majluf, 1984)

The latter hidden-information explanation assumes an asymmetry of information between different types of investors about the *securitized* assets of the firm. The investors who specialize in information regarding one kind of asset are the investors most willing to accept a higher level of risk regarding the asset. The firm securitizes this type of asset. When specialized investors purchase subordinated tranches of these assets, they provide a quality assurance to other investors. (Schwarcz, 2002) In this case, firms will not use the services of ratings firms. (Schwarcz, 1994)

The hidden-information problem can also be overcome through the combination of securitization and the services of ratings firms. (Iocabucci & Winter, 2005) In this case, firms with high-quality securitizable assets will signal that quality by paying the high transactions costs associated with ratings assessments.

2.2.4 Hidden-Action

This literature utilizes the variation in the sensitivity of different cash flows to managerial effort. The literature predicts that the likelihood of securitization is proportional to the invariance of the cash flow to managerial effort. A tenuous²³ distinction is drawn between the ability of management to influence the *value* of cash flows and the ability of management to influence the *collection* of cash flows. It is assumed that while the former is insensitive to managerial effort, the latter is susceptible to managerial shirking.

Agency costs may be reduced by asset securitization. This method of reducing agency costs may in fact be superior to requiring that managers be residual claimants. Asset securitization is a way to avoid risk aversion on the part of management when required to hold a substantial form of their wealth in the form of residual claims. (Iacobucci&Winter, 2005)

Monitoring of managerial effort is enhanced when cash flows, which are insensitive to managerial effort, are separated from those that are not. In an application of Holoström's model of the effect of managerial reputation on action and effort, the decision to securitize assets signals managerial commitment to great effort.

²³ The distinction is *tenuous* because anecdotal evidence suggests that there exists some set of skills, apart from the absence of shirking, which are suited to collection. Therefore, even in the absence of shirking, the value of future cash flows may be different depending on the talent of the manager in charge of collection. (www.calculatedrisk.blogspot.com)

Through securitization, firms may also be able to reduce the probability of a take-over. Firms that are poorly managed are more likely to be acquired than firms with poor assets. Managers have a reduced incentive to expend effort in order to avoid a take-over when there is a chance that the market will mistake poor asset quality for poor management. In order to increase managerial effort, it is therefore in the firm's interests to securitize all assets that are insensitive to managerial effort. (Iacobucci&Winter, 2005)

2.3 Regulatory motives for Securitization by Banks

Securitization by banks in particular has an added complication when the contract includes recourse provisions. A recourse provision is an agreement by the bank to absorb some of the risk of the assets. Such provisions include agreements to pay shortfalls in interest (STRIPS) and principal, an agreement to buy the asset back from the investor in the event of default, (SLCs²⁴) or the retention of the riskiest tranche²⁵ of the securitized assets. Berger and Benveniste (1992) perceive the SLC as an uninsured demand deposit. Their paper argues that securitization with SLC credit enhancement improves efficiency²⁶ by allowing banks to circumvent the prohibition of issuing senior debt

If in fact SLCs create uninsured demand deposits, the ramifications for bank risk should be considered. In the absence of deposit insurance, demand deposits contracts

²⁴ Secured Letters of Credit (SLC's)

²⁵ The most junior claim to the proceeds of pool of securitized assets.

²⁶ . The regulation against senior debt reduces efficiency by restricting the kind of contracts banks can write.

lead to multiple equilibria, which include a bank run equilibrium. (Dvbovig&Diamond, 1983) Just as the expectation that the bank will not be able to satisfy all demand deposits tomorrow leads to a bank run today; so too can the simultaneous fall in value of securitized assets lead to the synchronous exercising of multiple SLCs.

Regulatory arbitrage is purported to be a motivation for asset securitization by banks. Regulatory arbitrage refers to the reallocation of assets that occurs when a firm's true risk deviates from the level of risk consistent with the constraints imposed by regulation. If a bank's reserves are in excess of what is required to meet claims by depositors and to cover for loan defaults, the bank will securitize its less risky assets until the riskiness of the loan portfolio held is commensurate with reserve requirements. (Greenspan, 1998) Chapter Three deals more explicitly with regulatory arbitrage.

2.4 A Model of the Incentives to Securitise and Offer Credit Enhancements under the CRA and when the Institutions Desires to Merge

Assumption 1: there are 2 regimes, a CRA and a non-CRA regime, where community loans do and do not contribute toward a bank's ability to expand respectively.

Regime 1: Bank Expansion and CRA Compliance are unrelated

Assumption 2: there are only 2 kinds of assets to be securitized, High Quality and Low Quality.

Let, i denote the yield received by buyer
 p denote the actual rate of return on high quality asset to seller
 X denote the face value of the pool of assets securitized
 CE denote credit enhancements offered by the seller
 h denote high quality assets
 l denote low quality assets
 q index the quality of the asset, $q \in \{h, l\}$

Assumption 3: q is known to the seller, but not to the buyer

$$\text{Return to the buyer: } \Pi_B = (1 + i_q)X + CE \quad (1a)$$

$$\text{Return to seller: } \Pi_S = (1 + p_q)X - CE - (1 + i_q)X \quad (1b)$$

For “High Quality” Assets

$$\text{If } \Pi_s \geq 0, \text{ then } \Rightarrow (p_h - i) \geq \frac{CE}{X} \quad (2)$$

For “Low Quality” Assets

$$\text{If } \Pi_s \geq 0, \text{ then } \Rightarrow (p_l - i) \geq \frac{CE}{X} \quad (3)$$

In Regime 1, buyers can require CE^* to ensure that only “High Quality” assets are sold.

Regime 2: CRA Compliance related Bank Expansion

Assumption 4: A bank’s ability to expand is proportional the number of community loans originated and purchased, but not held.

Assumption 5: The more community loans a bank originates or purchases, the more community loans it will securitize.

Assumption 6: All “Low Quality” loans are community loans.

Assumption 7: Only firms that securitize “High Quality” loans are able to expand.

Assumption 8: Expanding firms will securitize both “High Quality” and “Low Quality” loans.

Let, $\beta^e =$ The present value of the future benefits of a future business expansion
 $\theta =$ The proportion of loans that are “Low Quality”
 $\phi =$ The probability of a satisfactory CRA rating
 $T =$ The sum of the face values of “High Quality” and “Low Quality” assets securitized

if ,

$$\phi(\theta) \text{ and } \phi' > 0 \quad (4)$$

and if,

$$\theta = \frac{X_l}{X_l + X_h} \quad (5a) \quad \text{and} \quad (1 - \theta) = \frac{X_h}{X_l + X_h} \quad (5b)$$

then,

$$\text{Profit to the seller} = \pi_{s,CRA} = (1 - \theta) \left[p_h - i - \frac{CE}{X_h} \right] + \theta \left[p_l - i - \frac{CE}{X_l} \right] + \phi(\theta) \beta^e \quad (6a)$$

The maximum CE the seller is willing to offer satisfies the following condition:

$$(1 - \theta) \left(p_h - i - \frac{CE}{X_h} \right) + \theta \left(p_l - i - \frac{CE}{X_l} \right) + \phi(\theta) \beta^e = 0 \quad (6b)$$

and is given by,

$$CE = \left[p_h - \theta(p_h - p_l) - i + \phi(\theta) \frac{\beta^e}{X_T} \right] \left(\frac{X_h + X_l}{2} \right) \quad (6c)$$

Setting $CE = 0$ and solving for i , we arrive with

$$CE = 0 \Rightarrow i = p_h - \theta(p_h - p_l) + \phi(\theta) \frac{\beta^e}{X_T} \quad (7a)$$

and,

$$\frac{\partial i}{\partial \theta} = -(p_h - p_l) + \left(\frac{\beta^e}{X_T} \right) \phi' \quad (7b)$$

The seller generates a higher return by selling “Low Quality” loans because of the benefit it receives in the form of more probable future expansion.

The buyer will not raise CE above CE^* because the raise would not alter the proportion of “Low Quality” loans in the bundle.

Let, λ denote the probability that the buyer will receive r from the bundle

$$\text{The expected Profit to the buyer: } E(\pi_{B,CRA}) = \lambda(\theta)r + \frac{CE^*}{X_i} \quad (8)$$

The use of credit enhancements will “exclude” the banks that securitize only “Low Quality” loans, but will not prevent banks that securitize “High Quality” loans from securitizing “Low Quality” ones as well.

Predictions from the Model:

- I Banks should securitize *more* when if they plan to expand in the future
- II The credit enhancements that banks offer will *not* increase before expansion

2.5 The Empirical Test

To test the model given above we examine a panel of banks that securitized loans from the second quarter of 2004 until the first quarter of 2006. Fixed effects panel data models are estimated for the following dependent variables:

- value of pools securitized
- credit enhancements on securitized pools
- the ratio of the credit enhancements to the pools securitized

A panel data model is convenient because the median and distribution of income for the bank's assessment area is difficult to measure. Firm fixed effects will capture the unobserved firm specific heterogeneity. Time fixed effects will capture the heterogeneity in the propensity of buyers to purchase loans²⁷. Random effects models offered no improvement over the fixed effects models, suggesting very little change in character of the assessment areas over the window of time sampled.

Under examination are:

- the marginal effects of having a CRA exam
- the marginal effects of having a CRA exam when you plan to expand in the future

With that in mind, after controlling for the value of bank deposits, the effects of an assessment in the previous, current and next quarter on the dependent variables are estimated. The value of an upcoming merger or acquisition and the interaction between

²⁷ In particular, there was a change in the policy of Fannie Mae to buy subprime loans late in 2005.

current assessment and the value of an *upcoming* merger or acquisition is included amongst the independent variables. The results are presented in the Table 2.1.

Some important omitted variables are measurements of community group pressure and expansion through the establishment of new branches. Community group pressure is omitted because level call report disclosure is made for banks on a more disaggregated level of the corporate structure than pledges to community groups, which are usually undertaken by the parent companies. The parent companies of the banks filing the call report are often no observable. Branching is not included as a measure of expansion because community groups do not appear to protest the opening of new branches. There are many instances of community group protests for mergers and acquisitions, and it is to these margins of expansion that we direct our attention.

TABLE 2.1
Results of Panel Regression of Securitized Assets and Credit Enhancements on Bank and
CRA-Related Variables

	(1)	(2)	(3)
	Securitized Assets (SEC)	Credit Enhancements (CE)	Ratio of CE and SEC
Deposits	0.156** (0.002)	0.005*** (0.0004)	0.000 (0.000)
Exam (t-1)	-10603 (56707)	-2103.15 (8561.68)	0.0113 (0.012)
Exam (t)	-39217.53 (56439.83)	-2524.6 (8521.33)	-0.0028 (0.012)
Exam (t+1)	-22792.63 (57128.12)	-3978.9 (8640.42)	0.0028 (0.013)
Future	-0.293612*** (0.01158)	-0.0172*** (0.0018)	-0.000 (0.000)
Expansion	0.2867** (0.1245)	0.0322* (0.0187)	-0.000 (0.000)
*Exam (t)			
ARM (t-1)		-0.007*** (0.0019)	
Constant	-7919.25 (18144)	33977.46*** (2601.8)	0.380*** (0.005)
R^2 within	0.5163	0.0557	0.0002
R^2 between	0.7511	0.3601	0.0011
R^2 overall	0.7400	0.3369	0.0001
Pr>F(Indep.)	0.0000	0.0000	0.9854
Pr>F(groups)	0.0000	0.0000	0.0000
σ_u	3183177.4	379434.9	0.432
σ_e	893947.63	134940.25	0.196
ρ	0.9268	0.888	0.829
Number obs.	5344	5338	5344
Number Groups	669	669	669

*** - significant at the 1% level, ** - significant at the 5% level

Table 2.2 contains the results of a similar panel regression that measures the change in securitized assets as a proportion of total deposits. Total deposits were used instead of total assets to give an indication of the proportion of securitized assets to bank size while avoiding the problems caused by the negative relationship between off balance sheet and on balance sheet assets. Although the coefficients do not explain a great deal of variation in the proportion of securitized assets and credit enhancements, we see the same pattern in the effects of exams and mergers on their own and when interacted.

TABLE 2.2
Results of Panel Regression of Securitized Assets and Credit Enhancements as a Fraction of Deposits on Bank and CRA-Related Variables

	(1)	(2)
	Securitized Assets (SEC) as a Fraction of Deposits	Credit Enhancements (CE) As a Fraction of Deposits
Exam (t-1)	-0.0061*** (0.0022)	-0.00117 (0.0008)
Exam (t)	-0.0083*** (0.00313)	-0.00365 (0.00173)
Exam (t+1)	-0.0071*** (0.00254)	-0.00044 (0.0009)
Future	-0.0004** (0.0004)	0.000013*** (0.0000079)
Future	0.00056*** (0.000028)	0.000717*** (0.00000812)
Expansion		
*Exam (t)		
Number obs.	5344	5338
Number Groups	669	669

*** - significant at the 1% level, ** - significant at the 5% level

2.6 Interpretation of Results

The occurrence of a CRA assessment has no significant effect on any of the dependent variables. This result is inconsistent with the impression that banks compete for high CRA assessments in order to generate goodwill. However, if a firm is planning to expand in the future *and* is undergoing an exam in the current quarter, an increment of \$1,000 in the value of future expansion predicts an increase of \$286.70 in the amount of securitization.

The same increase of \$1,000 in the value of future expansion predicts an increase in credit enhancements of only \$32. The difference in the magnitude of these effects seems to be consistent with the predictions of the model: the requirement of a least a “satisfactory” CRA rating increases the total amount of securitization, but not the credit enhancements. The lack of proportionality of credit enhancements offered for securitizing riskier loans constitutes evidence that banks do not incur the full costs of originating risky loans. This result will strengthen the incentive to originate loans for CRA compliance. This is also consistent with the results presented in column (c) of the Table 2.1. None of the explanatory variables, particularly the interaction between future expansion and current assessment, explains any of the variation in the ratio of credit enhancements to securitized assets.

2.7 Concluding Remarks

The data shows that the Act is applied as it is written: CRA compliance is important when a bank is planning an expansion. The results reveal that banks do not retain all of the loans they originate in order to comply with the CRA. The primary lender does not have to offer more credit enhancements as a proportion of securitized assets in order to induce investors to accept the newly securitized assets. This means that investors may not be fully cognizant of the riskiness of the loans they are purchasing. More importantly it indicates that banks may not have to incur the full cost of originating loans for CRA purposes. If these riskier CRA related loans do not carry a higher proportion of credit enhancements, banks do not incur greater costs in the event of default. Therefore, banks have an added incentive to originate risky CRA loans.

CHAPTER THREE

AN INVESTIGATION INTO THE CHANGING LENDING STANDARDS OF GSES AND PRIVATE FIRMS IN THE SECONDARY MARKET BETWEEN 2001 AND 2006

Introduction

Firms with widely divergent regulatory structures compete for mortgages on the secondary market. Specifically, private securitizers compete with government-sponsored giants, Freddie Mac and Fannie Mae. For 30 years these firms operated as privately owned public utilities. Although they raised capital on the private market, they enjoyed special regulatory protections and advantages. In return for these advantages, they were required to purchase loans to low and middle-income (LMI) households in prescribed proportions. This paper investigates the types of loans the primary lenders kept²⁸ and the types sold to GSEs and private firms on the secondary market.

I predictably find that lenders are less likely to originate refinance loans, subprime loans and subordinate lien or unsecured loans. However once they have been originated, lenders are more likely to keep these kinds of loans. Against the benchmark of the

²⁸ Primary lenders may keep the loans it does not sell on the balance sheet or they may create their own mortgage-backed securities. In the case of the latter, the primary lender is often still exposed to downside risk through the guarantees and credit enhancements offered on securitized loans.

primary lender retaining a loan, I use a multinomial logit regression to compare the likelihood that a loan may either find its way to a wholly private securitizer or the public-private chimaeras, Fannie Mae and Freddie Mac. The results also indicate that Fannie Mae engages in buying risky loans as measured by higher loan amount to income ratios. In 2005 and 2006, each unit increase in the ratio of the loan amount to income, increased the probability of Fannie Mae purchasing the loan by 0.11%.

I also use a nested logit regression to measure how the probabilities of origination, retention and to sell to a GSE change from 2001 until 2006. The results reflect the increasing intensity of competition in the secondary market after 2003. The probability of selling a loan to a GSE, conditional on the institutions decision not to keep it, declines from 67% to 35% between 2001 and 2006. The extent of competition in the secondary market has profound implications for GSEs because of their unique regulatory structure and incentives.

3.1 Overview of the Primary and Secondary Markets for Mortgages

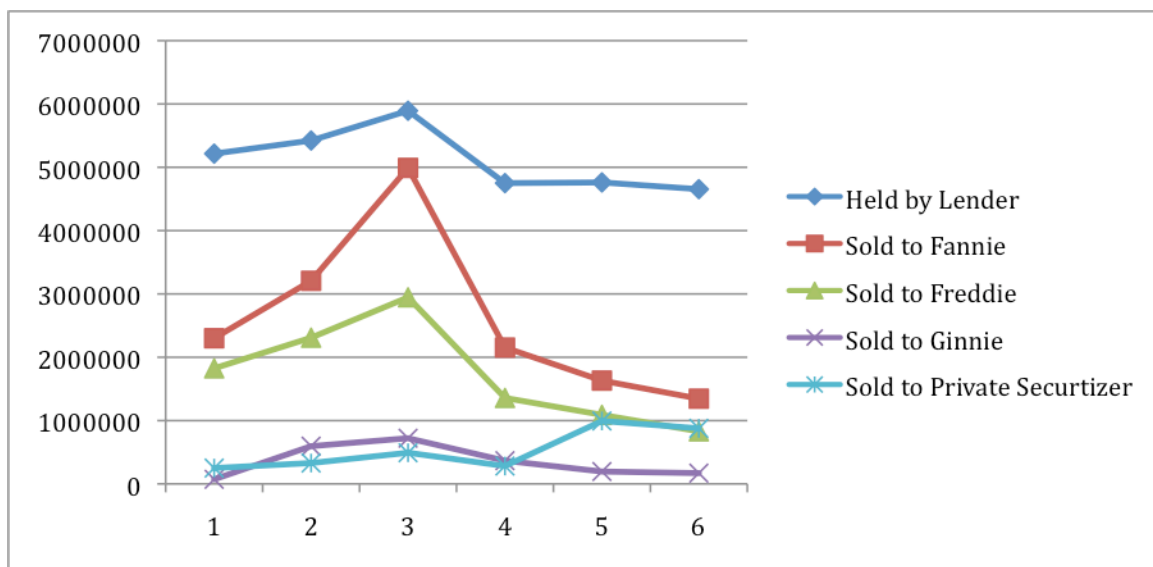
Banks and mortgage companies do not keep all the loans that they originate and purchase on their balance sheet²⁹. Figure 3.1 displays the number of loans held and sold to different firms on the secondary market between 2001 and 2006. Lenders typically

²⁹ When an institution alienates a loan it is often not an outright sale, ownership may revert to the institution if the loan does not perform within limits set by the contract at the time of sale.

held between 27% and 38% of the loans they originated and purchased over this period. The lenders sold between 15% and 37% of their loans to GSEs. In 2001, lenders sold over 16 times as many loans to GSEs as they did to private securitizers. By 2006, that multiple had dwindled to 2.4. The secondary market seems to have become more competitive between 2001 and 2006.

FIGURE 3.1

Number of New Loans held and sold on the Secondary Market between 2001 and 2006



Source: HMDA Loan Application Register Data

Many institutions choose to exchange their loan stock for cash and mortgage-backed securities (MBS). Loans are purchased and repackaged as MBS on the secondary market. The same banks that sold the loans to be repackaged on the secondary market often purchase these MBS. The minimum ratio of equity to debt is regulated according to the kind of assets that banks hold. AA rated MBS require a 1.6% rate of capitalization,

while residential mortgages require 4%. Assuming that debt is cheaper than equity³⁰, banks can lower their cost of capital by selling loans and purchasing MBS on the secondary market. The provisions of the Basel II accord of 2004 would have eliminated this advantage to MBS if it had been widely adopted³¹.

Mortgage companies, Federal Home Loan Banks, the largest commercial banks and securities trading firms compete with the GSEs on the secondary market. GSEs are able to raise capital more cheaply than these entities. Studies estimate that the GSEs debt is between 25 and 29 basis points below banking sector bonds that are AA rated (Ambrose and Warga, 2002). An equity to asset ratio of less than 4% for both GSEs corroborates these findings. At this juncture it is necessary to address the reasons for the regulatory advantages GSEs enjoy and their overall regulatory environment.

3.2 GSEs: Background and Regulatory Framework

The Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Corporation (Freddie Mac) dominate the secondary market, these firms are collectively called government-sponsored enterprises (GSEs). The GSEs were initially wholly government owned and operated entities. Fannie Mae was created during the Great Depression to purchase government guaranteed loans. Between 1968 and 2007,

³⁰ Assuming that the provisions of Modigliani and Miller do not hold exactly in the “real world”

³¹ Widespread adoption of the Basel II accord has been postponed, pending further discussion since 2004.

Fannie Mae was privately owned and funded and no longer purchased government guaranteed loans. Freddie Mac was created in 1970 in order to provide liquidity to the secondary market. The privately funded GSEs enjoyed a variety of federally granted advantages over their competitors in the secondary market. The federal government *expressly* did not guarantee GSE debt and securities, however it conferred so many protections upon the GSEs that investors behaved as though the debt and securities are guaranteed. (see below)

The GSEs are exempt from state and local income taxes. The securities they issue are classified as government securities. This means that they may be purchased in unlimited amounts by banks. Government securities are exempt from SEC registration and reporting requirements. However Fannie Mae voluntarily registered its securities with the SEC in 2003. The treasury has the right to purchase \$2.25 bn. of GSE securities and the Federal Reserve may purchase the securities as part of their open market operations. The value of the bundle of protections and advantages bestowed upon the GSEs is often referred to as a “halo” or charter value.

It is the stated intention of the regulatory structure to pass on lower borrowing costs to households and to encourage home ownership. GSEs pay for their lower borrowing costs by meeting the loan purchase targets set for them by the Department of Housing and Urban Development (HUD). Table 3.1 contains the HUD goals and GSE performance from 2001 until 2007. The numbers represent the percentage of all GSE

purchases in a given year that must be devoted to home purchase loans³² to LMI households.

TABLE 3.1
Overview of GSEs Housing Performance 2001-2007

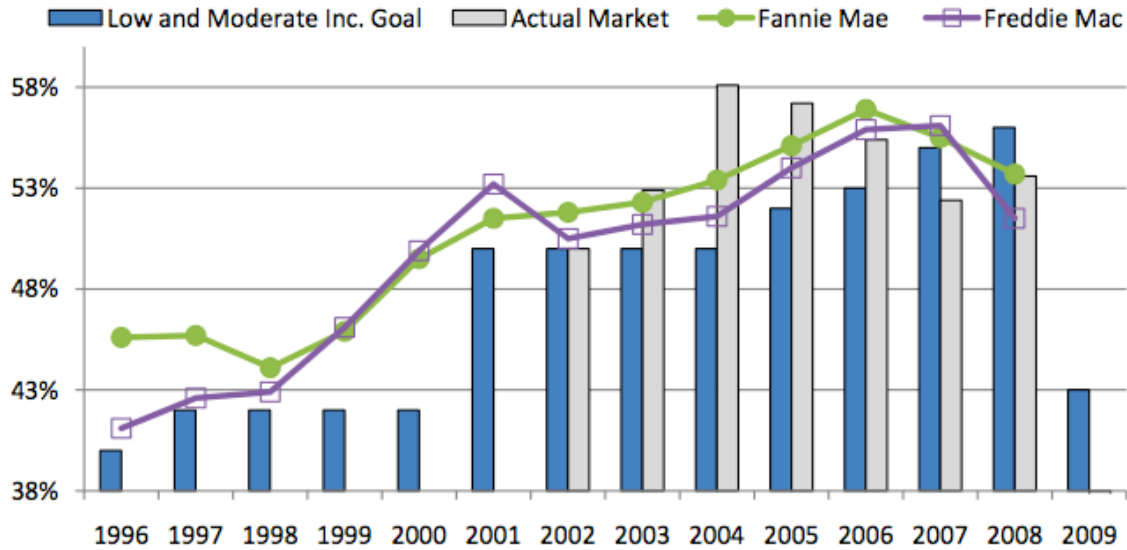
Goal ²	GSEs' Housing Goal Performance ¹									2000 Goals	2001-04 Goals	2005 Goals	2006 Goals	2007 Goals
	2000	2001	2002	2003	2004	2005	2006	2007	Ratio 2007-2000					
Low- and Moderate-Income:														
Fannie Mae	49.5%	51.5%	51.8%	52.3%	53.4%	55.1%	56.9%	55.5%	1.12	42%	50%	52%	53%	55%
Freddie Mac	49.9%	53.2%	50.3%	51.2%	51.6%	54.0%	55.9%	56.1%	1.12					
Ratio	1.01	1.03	0.97	0.98	0.97	0.98	0.98	1.01						
Underserved Areas:														
Fannie Mae	31.0%	32.6%	32.8%	32.1%	33.5%	41.4%	43.6%	43.4%	1.40	24%	31%	37%	38%	38%
Freddie Mac	29.2%	31.7%	31.0%	32.7%	32.3%	42.3%	42.7%	43.1%	1.48					
Ratio	0.94	0.97	0.95	1.02	0.96	1.02	0.98	0.99						
Special Affordable:														
Fannie Mae	19.2%	21.6%	21.4%	21.2%	23.6%	26.3%	27.8%	26.8%	1.40	14%	20%	22%	23%	25%
Freddie Mac	20.7%	22.6%	20.5%	21.4%	22.7%	24.3%	26.4%	25.8%	1.25					
Ratio	1.08	1.05	0.96	1.01	0.96	0.92	0.95	0.96						
Special Affordable Multifamily ⁴ :														
Fannie Mae	\$3.79	\$7.36	\$7.57	\$12.23	\$7.32	\$10.39	\$13.31	\$19.84	5.23	\$1.29	\$2.85	\$5.49	\$5.49	\$5.49
Freddie Mac	\$2.40	\$4.65	\$5.22	\$8.79	\$7.77	\$12.35	\$13.58	\$15.12	6.30	\$0.99	\$2.11	\$3.92	\$3.92	\$3.92

Source: HUD and FHFA analysis of data submitted by the GSEs. Some results differ from performance reported by the GSEs in their Annual Housing Activities Reports (AHARs).

The LMI goal is set higher after 2000 and then increases steadily after 2004. In Figure 3.2 the bars labeled “Actual Market” represent the HUD estimates of the actual LMI market for mortgages. Between 2004 and 2008, the GSE LMI goals rise 49% to 54% and the HUD estimates of the size of the market fall from 58% to 52%. In 2007 and 2008, the GSEs were required support the collapsing market by purchasing troubled mortgages. The GSE goals therefore exceed the estimated market share.

³² Not refinance

FIGURE 3.2
GSE Goals and Performance (1996-2009)



source: GSE Report Financial Crisis Inquiry Commission (2010)

Between 2003 and 2007 the GSEs routinely met the LMI goals. In 2005 the HUD estimated that the GSEs would have to originate an additional 400,000 qualifying loans to meet their goals. (HUD, 2005) 400,000 loans are less than 10% of the number loans they financed in 2005 and represent approximately a 2% rise in the LMI goal. (Mortgage Banking, 2005) The margin by which the GSE exceeded their goals fell after 2001, from between 3% and 6% to between 1% and 3%. This indicates that the HUD goals were becoming more burdensome after 2001.

3.3 GSE Conforming Loans

The GSEs buy only loans that meet prescribed requirements to create a kind of uniformity in the loans in the MBS they sell and to control the credit risk of the MBS pool. In order for a loan to be a conforming loan, the applicant must supply certain documentation and must not exceed prescribed debt-to-income ratios. Traditionally, loans eligible for purchase by a GSE required a 20% down payment and did not carry payments exceeding 28% of monthly income and total debt servicing costs did not exceed 36% of income³³. The property value must also not exceed a certain threshold. The threshold depends upon the average MSA property price and the number of families that the home is built for. The threshold exceeds the loan amount of 95% of home values³⁴. The intention of the threshold is to preclude the purchase of “jumbo loans”, or home loans that are over \$400,000.

However, there was erosion in GSE underwriting standards³⁵ and conforming loan requirements. Deficiencies in the percentage down payment could be compensated for on other dimensions of loan quality and vice versa. The ambiguity in the GSE conforming loan algorithm favored a general lowering of lending standards. GSEs offered brokers incentives to persuade borrowers to accept higher rates of interest in return for lower down payments³⁶.

³³ This is known as the 23-36 front-back rule.

³⁴ Measured as a percentage of total applications in excess of \$400,000 in 2004.

³⁵ Fannie Mae CEO Daniel Mudd testified to the Financial Crisis Inquiry Commission in 2010 that underwriting standards began to slip in 2004, despite the contrary intentions of the executive.

³⁶ This type of monetary incentive is called a Yield Spread Premium.

3.4 The GSEs, Risk and Moral Hazard

GSEs receive government protection from insolvency and, through lowering borrowing costs, government protection from competition. These twin protections have opposing implications for risk taking. The latent³⁷ guarantee on GSE debt and MBS obligations has clear moral hazard implications. GSEs are said to have a government protected charter value. Much of the theory of risk taking and charter value is adapted to GSEs from the banking literature.

Technically, the charter value would be measured by a Tobin's Q type measurement. Passmore (2005) estimated the present value of the stream of future charter benefits to shareholders to be \$79 million. A 2004 Congressional Budget Office study estimated the charter benefit to be \$19.6 bn for the single year of 2003. The same study accrued \$13.4bn. of this benefit to consumers, through lower rates of interest, and \$6.2 bn. of this benefit to shareholders. The \$6.2 bn. benefit to shareholders for 2003 is consistent with the Passmore study using a 7% discount rate. This was not an unreasonable estimate at the time of the study. It falls between the return on equities of 8.86% and the return on debt of 4.7%³⁸. (Damodaran, 2006)

Theory predicts that risk taking is inversely proportional to charter value. Owners avoid making decisions that have large down side risk to avoid insolvency and the loss of

³⁷ The use of the adjective "latent" is mine. "tacit" or "implied" are usually used to describe the GSE guarantee. They do not capture expressed denial by at least one party. Latent, defined as *potentially existing but not presently evident or realized*, is more appropriate.

³⁸ Using 2001-2006 data

the charter value provided there is a credible threat that they will lose their interest in the case of insolvency. The charter value is held to be the sum of the going concern value and the value of the real option of taking risks and avoiding losing ownership if a negative outcome is realized. Boyd and Nicolo (2005) argue charter value could be positively related to risk seeking because market power in the loan market could lead to charging higher interest rates and higher probability of default.

Empirical investigations that regress the Tobin's Q for banks on earnings volatility find in favor of an inverse relationship between charter value and risk taking. (Demsetz, Saldenber, and Strathan, 1996; Allen and Rai, 1996) A body that is separate from the HUD is responsible for overseeing GSE safety and soundness. The Office of Federal Housing Oversight (OFHEO) was established in 1992 to set and monitor rates of capitalization and GSE activities. The GSEs are required to capitalize at a rate equal to the greater of the sum of 2.5% of their on balance sheet assets and 0.45% of their off balance sheet assets **OR** a percentage proportional to the capital required to sustain operations for 10 years in the event of shocks to the interest rate³⁹, as measured by "stress tests". In addition to these capital requirements, GSEs were required to hold 30% above the minimum requirements to cover operating risks, such as losses due to fraud and negligence. However, the protection provided by these regulations depends upon the accounting standards employed by the GSEs and inversely to the degree regulatory laxity. Both GSEs experienced accounting scandals between 2003 and 2004 and Fannie

³⁹ Stress tests, or estimates of the distribution of loss given default, were typically conducted for a 75% increase in the interest rate or a 50% decline in interest rates.

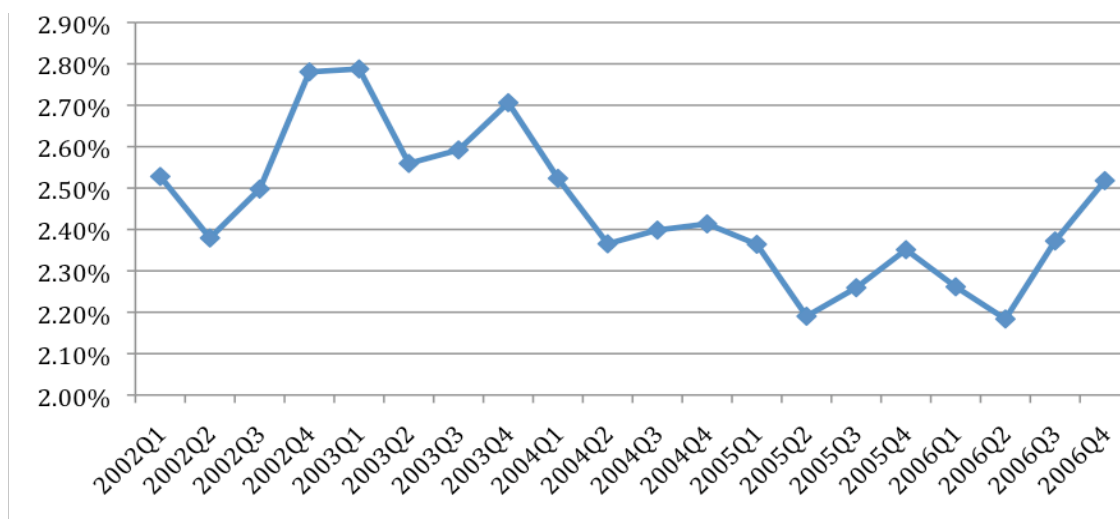
Mae was notorious for recognizing delinquencies when payments were 24 months past their due date⁴⁰ (GSE Report, Financial Crisis Inquiry Commission, 2010) and for using “cookie jar” reserves to delay recognizing income until it was necessary to offset losses. Fannie was said to have a corporate culture that expressly emphasized performance smoothing over fidelity to accounting standards (Haggerty et. al. (2004)). The inputs to a model of risk-based capital were therefore flawed. Therefore, the models deliberately underestimated the variance in performance.

The literature tells us that risk aversion is proportional to charter value and inversely related to competition, but it does not give an indication of the relative value of the charter or the extent of the competition. Frame and White (2007) purport that the entry of Federal Home Loan Banks (FHLB) into the secondary market and the adoption of Basel II would lead to a reduction in the charter value and an increase in risk taking behavior by the GSEs. Frame and White state that the most cost effective way for the GSEs to take on more risk is by using riskier financial instruments and arrangements and not by lowering conforming loan standards⁴¹. However, it should be noted that defaults on Fannie Mae loans (Figure 3.3) are negatively correlated with the decline in Fannie Mae’s market share as illustrated in Figure 3.1. Figure 3.3 below shows that loans originated from 2004 onwards had higher rates of default than loans originated before that time. It should be noted that the low default rates in 2002 and 2003 are attributable

⁴⁰ Commercial banks are required to recognize delinquencies when payments are more than 30 days overdue.

FIGURE 3.4

Default Rate for Commercial Banks on First Lien loans secured by Real Estate (2002-2006)

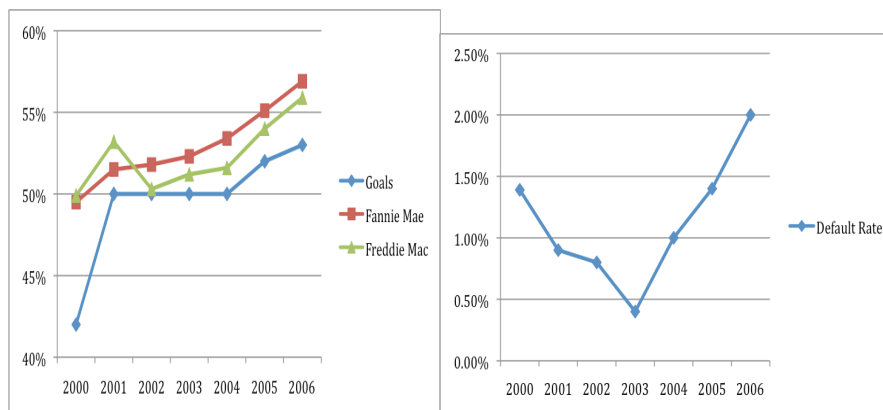


Source: FFIEC Call Report

By comparing figures 3.3 and 3.4, we see that although the default rate on loans held by commercial banks is higher than that for GSEs, the rate for GSEs is increasing while the rate for commercial banks is not. This pattern suggests that while the lending standards for commercial banks stayed relatively stable between 2003 and 2006, lending standards for GSEs fell after 2003. If we read Figure 3.3 in conjunction with the GSE LMI goals, we see that the increase in GSE LMI purchases and goals in 2001 corresponds to a decline in default rates. There appears to be a positive correlation between GSE goals, performance and default rates after 2004, even if we ignore the questionable pre-2004 accounting. Figures 3.5.1 and 3.5.2 track the relationship between the GSE default rate and the HUD goals.

FIGURES 3.5.1 & 3.5.2

GSE Goals, Performance and Default Rates



The coincidence of the decline in lending standards by the GSEs and the increase in competition in the secondary market is consistent with Frame and White’s hypothesis. There is also an indication that default rates after 2004 are related to LMI mortgage goals and purchases. The decline in GSE lending standards after 2004 can therefore be attributed, in uncertain proportions, to both market and regulatory forces.

3.5 Trends and Data Description

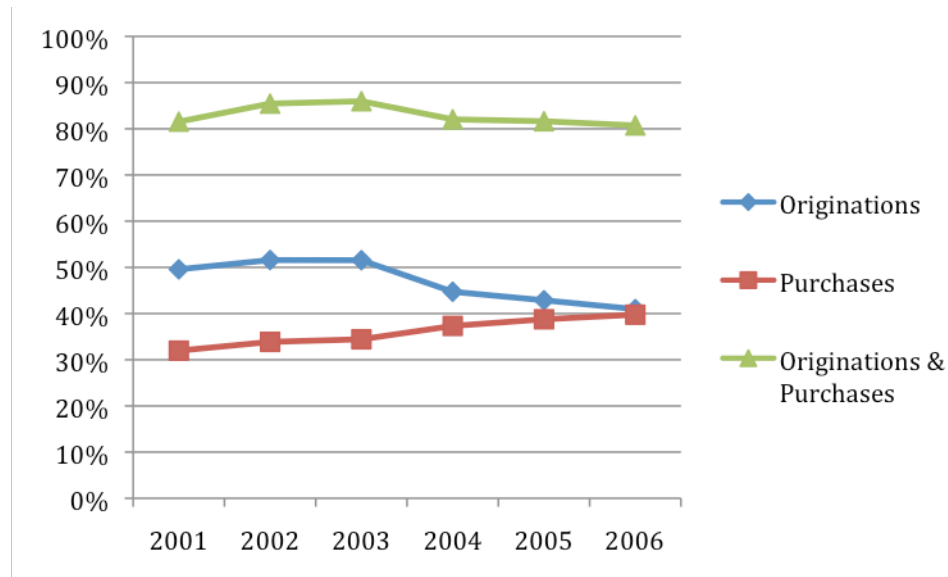
The loan application data is from the Loan Application Registers (LAR) that lenders in metropolitan areas are required to complete for all their loan applications. The Home Mortgage Disclosure Act (HMDA) requires lenders to keep LARs. LARs record the income and race of the applicant, the loan amount and the decision by the bank to originate, purchase or deny the application. If the lender intends to sell the loan to a

GSE, another bank, private securitizer or mutual fund, this is recorded on the LAR.

GSEs⁴³ provide free software that indicates whether a loan is eligible for sale to the GSE at the time of application.

From 2005, the LAR required the lender to record the demographic and income characteristics of the census tract where the home in question is located. Between 27 million and 41 million home loan applications were filed each year between 2001 and 2006. The acceptance rate over this period of time is illustrated in Figure 3.6.

FIGURE 3.6
Originations and Purchases as a Fraction of Total Applications between 2001 and 2006



Source: HMDA Data

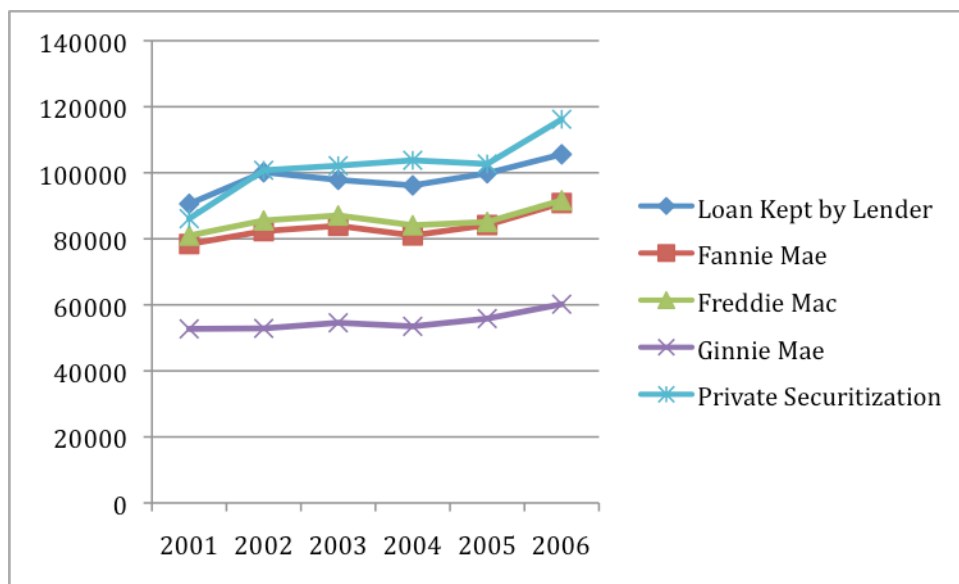
Figure 3.6 shows that a large number of applications for new loans are accepted. It also shows that the percentage of origination fell after 2003. It also showed that after

⁴³ Private securitizers usually charge for their approval software.

2003, the rate at which loans were purchased from other institutions increased.

Typically, the average applicant income for loans originated and kept by the lender and loans sold to private securitizers is higher than the applicant income for loans sold to GSEs. Figure 3.7 below shows the average applicant income over time.

FIGURE 3.7
Average Income by Loan Destination

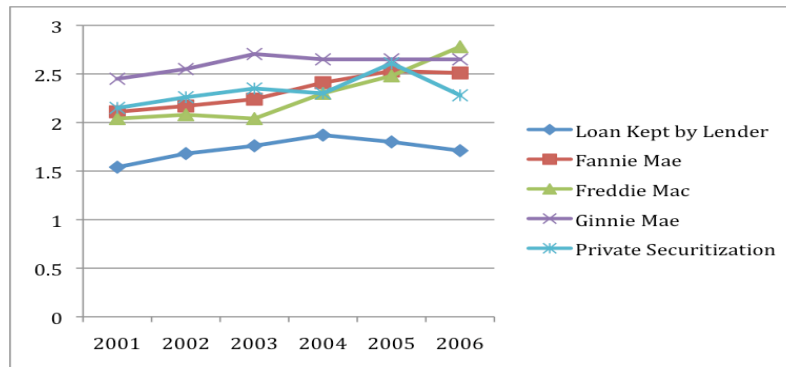


Source: HMDA

Figure 3.7 shows the average income of Fannie Mae borrowers tracks closely with Freddie Mac borrowers. The average income of borrowers whose loans are kept by the bank and sold to private securitizers exceeds that of those sold to GSEs throughout the period. Unfortunately, the HMDA data does not capture credit scores. However, examination of the loan to income ratio gives some idea of the riskiness of the loans.

FIGURE 3.8

Loan Amount to Income Ratio by Loan Destination

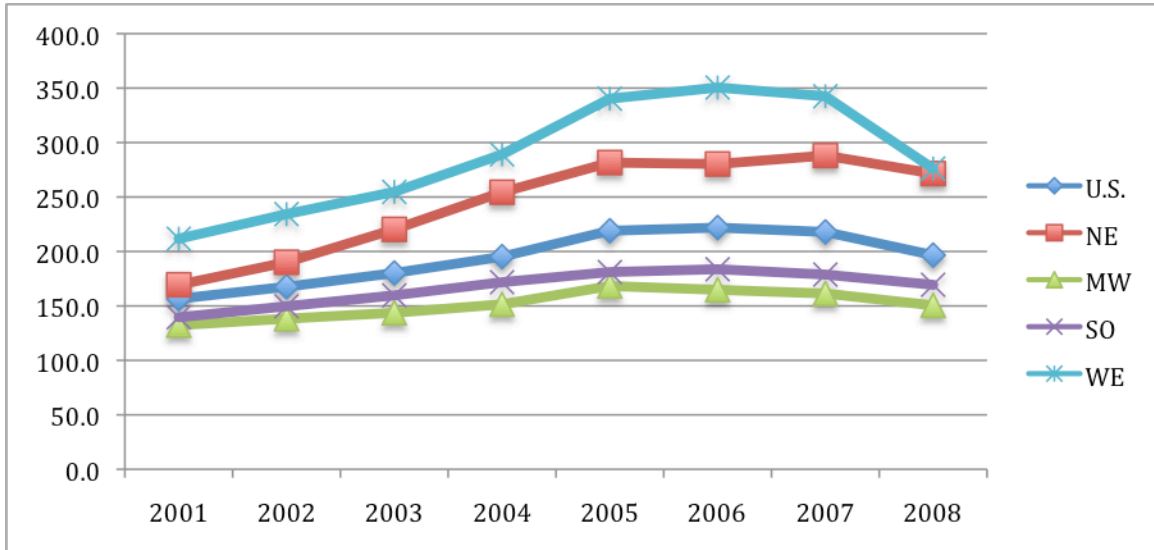


Source: HMDA

Reading Figures 3.7 and 3.8 together we see that lenders typically keep loans with a higher average income and a lower loan amount to income ratio. Ostensibly riskier investments are moved to the secondary market. Between 2003 and 2006, the loan to income ratio for GSEs rises, while the ratio rises and falls for lenders and private securitizers.

Figure 3.9 graphs the change in median US home price by region between 2001 and 2008. Between 2001 and 2002, 11 of 159 Metropolitan Statistical Areas (MSAs) experienced a decrease in median home price, between 2005 and 2004 only 4 MSAs experienced a decline. The steady increase in the median house price between 2001 and 2005 fueled a speculative market.

FIGURE 3.9
Median Home Price for US and by Region



Source: National Association of Realtors

However, by 2006 signs of general decline emerged as 35 MSAs showed a decline in median home value. As a crude barometer of speculative activity one may note that between 2001 and 2006 total applications grew by 23% and applications for non-owner occupied housing grew by 131%. The trajectory of median home prices is important not only because of speculative activity on the one side, but also because the willingness of lenders to approve applications is influenced by the value of the assets pledged as security.

3.6 A Brief Account of Some of the Variables

The “no recourse” provision

In some states, in the event of a foreclosure, lenders are not permitted to claim any assets of the borrowers apart from the house. Such a limitation on the rights of the lender is called a no recourse provision. A dummy variable equal to 1 indicates if the loan application arose in a state where such recourse against the borrower is not permitted⁴⁴.

HOEPA loans

The Home Owner Equity Protection Act (1994) protects subprime borrowers, whose debt is secured by their home, from dramatic changes to the terms of their repayments. A loan is said to have HOEPA status if either the annual percentage rate (APR) or the sum of any amount paid to lower the interest rate and the fees exceeds a “trigger” amount⁴⁵ over and above the treasury with a comparable maturity at the time of origination. If a loan has HOEPA status, the borrower is protected against balloon payments and hikes in the rate of interest that exceed levels prescribed by HOEPA.

⁴⁴ The “no recourse” states are: AK, AZ, AR, CA, CO, DC, GA, HI, ID, MS, MO, MT, NV, NH, OR, TN, TX, VA, WA, WV.

⁴⁵ The trigger amount during the period in question was 8% APR for first lien loans and 10% APR for subordinate lien loans. Fees and payments for reductions in the rate of interest could not exceed 8% of the outstanding amount for first and subordinate lien loans.

Mortgage Companies

Mortgage companies do not have to satisfy demand deposits and are not subject to the same regulatory requirements and scrutiny as banks and thrifts.

FHA Loans

A mortgage guaranteed by the Federal Housing Administration (FHA). Low-income applicants who do not qualify for private mortgage insurance (PMI) and who cannot afford a down payment are granted FHA loans if the FHA determines that the loan is not too risky. The FHA agrees to pay any unpaid principal to the lending institution and the lender pays an insurance premium to the FHA.

Ginnie Mae Loans

The Government National Mortgage Association (Ginnie Mae) was created to assume the role that Fannie Mae was originally intended for, to purchase FHA loans. Unlike the MBS of Fannie Mae and Freddie Mac, Ginnie Mae's MBS are expressly government guaranteed. Ginnie Mae was created in 1968, at the time that Fannie Mae was "privatized".

3.7 Empirical Investigation: Multinomial Logit

I make use of a multinomial logit model to estimate the marginal effects of loan characteristics, borrower characteristics, lender characteristics and the demographic data for the tract where the property is located on the fate of a particular loan application. A random sample of 338,283 loan applications was taken from the 2005 and 2006 LAR data⁴⁶. The summary statistics can be found in Table D1 of Appendix D. The coefficients will indicate whether an independent variable makes it more or less likely that a loan will be allocated to a particular buyer, relative to the base case of being kept by the lender. By comparing the estimated marginal effects we can tell something about the relative appetite of the purchasers for different kinds of loans.

A loan application can be denied, originated and kept by the bank, originated and sold to Fannie Mae, Freddie Mac, Ginnie Mae, a private securitizer or some other buyer. By comparing the marginal effects for Ginnie Mae, the GSEs and private securitizers we can understand how the intensity of government protection influences the incentives to take risk in the secondary market. The possible outcomes are:

⁴⁶ 2005 and 2006 applications had fields that captured the demographic data for the location of the property to be purchased or borrowed against.

TABLE 3.2
Possible Values for the Dependent Variable

Number	Outcome	Notes
0	Loan Application is Denied	-
1	Loan is Originated and kept by the bank	The lender keeps the loan or the bank chooses to securitize the loan in house.
2	Loan is sold to Fannie Mae	The lender sells the loan to Fannie Mae in return for MBS or cash. No obligations remain on the part of the lender.
3	Loan is sold to Freddie Mac	As above
4	Loan sold to Ginnie Mae	The government owned entity buys the loan.
5	Loan is sold to private securitizer	The bank may still service the loan, the loan could revert back to the bank in the event of default.
6	Other Purchaser	For example credit unions, mutual funds, insurance corporations.

The independent variables are selected to capture the risk of the loan and the appetite for risk by the lender. Table 3.3 lists some of the independent variables and the justification for their inclusion. Not all variables have been listed as some do not require any explanation.

TABLE 3.3
Selected Independent Variables

Variable	Explanation
Loan Amount/Income	A measurement of the risk attached to the loan. The higher the loan amount relative to income, the riskier the loan.
Refinance Loans	Borrowers use refinance loans to pay off existing loans to take advantage of lower interest rates and better terms. Often distressed borrowers use this option, these loans could be riskier than conventional loans.
Non-owner Occupied Housing	Borrowers are more likely to walk away from properties they don't live in. Sensitive to systematic risk.
HOEPA status	High interest sub prime loans, lenders are not permitted to adjust interest rates and terms as they please.
FHA	Government guaranteed sub prime loans.
Subordinate Lien	Lender will get paid after the other creditors in the event of liquidation. Risky Loan.
Median MSA Home Price	An indication of the value of the property that secures the loan. The more valuable the property, the more to be recouped in a liquidation.
Income/Median MSA Income	An indication of risk, a borrower living above his means.
Tract to MSA Income Ratio	A measurement of the affluence of the neighborhood where the property is located.
Mortgage Companies	Mortgage companies do not have to satisfy demand deposits, they are likely to be less risk averse than banks

The values of the estimated marginal effects for the secondary markets players relative to the base case of keeping the loan indicates the propensity of the different purchasers to take risks in the secondary markets.

The results for the unordered multinomial logistic regression are presented in Appendix D. Column (1) of Table D1 indicates that lenders are selective when it comes to loans with high loan amounts relative to applicant income, refinance loans, loans with subordinate lien provisions and unsecured loans. HOEPA loan applications are 33% less likely to be denied than they are to be originated and kept on the books.

Column (4) shows Ginnie Mae fulfilling its role of purchasing FHA loans.

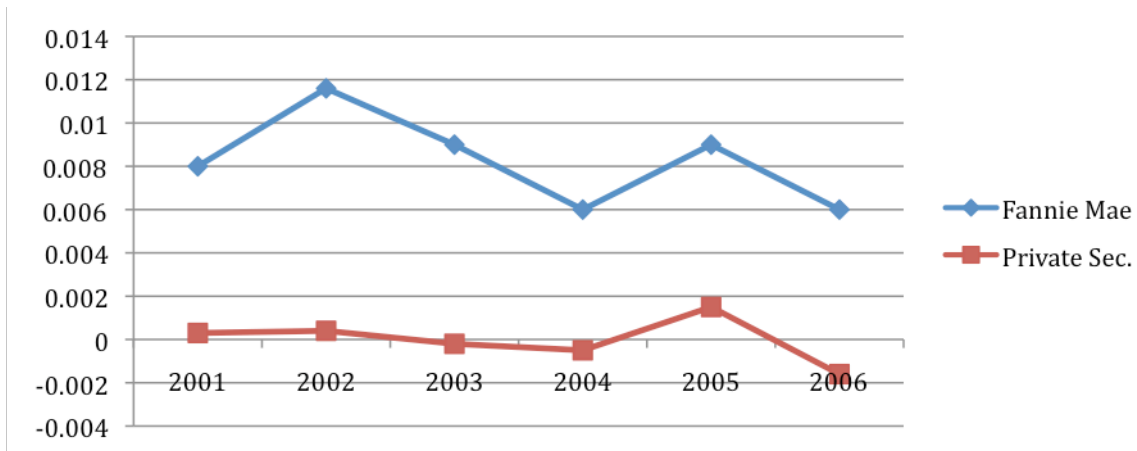
Examining the coefficients on Loan Amount/ Income in columns (2) and (3) to column (5) reveals that it is more probable that loans with higher Loan Amount to Income ratios are sold to Fannie Mae than they are to be kept by the lender. The GSEs are less likely than private securitizers to purchase unsecured loans, loans with subordinate liens and refinance loans. Calculated at the sample means, HOEPA loan applications are 27% less likely to be denied and more likely to stay in the possession of the lender. Mortgage companies are more likely to use private securitizers than GSEs.

The regression suggests that if GSEs wanted to increase their risk exposure they would do so by accepting loans with high loan to income ratios as opposed to refinance

loans and loans for no-owner occupied housing. Separate multinomial logit models were run for each year from 2001 until 2006. Figure 3.10 compares the marginal effects of an increase in the ratio of loan amount to income, measured at the sample means, on the probability of a loan being sold of Fannie Mae and to Private Securitizers each year.

FIGURE 3.10

A Comparison of the Estimated Marginal Effects of Loan Amount/Income on the Sale of a Loan to Fannie Mae and Private Securitizers (2001-2006)



The estimated marginal effects for the Fannie Mae equations were statistically different from zero at the one percent level every year from 2001 until 2006. The estimated marginal effects for the private securitizer equations were not. Between 2001 and 2006, Fannie Mae had a greater appetite than private securitizers for loan with higher loan amount to income ratios. Figure 3.10 does not show a systematic deterioration in Fannie Mae's lending standards, as measured by the ratio of loan amount to income. Nor does it show a decline in lending standards for private securitizers. Figure 3.3 indicates

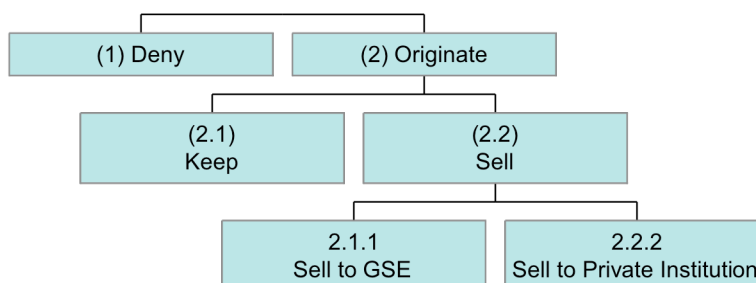
that there must have been continual deterioration in lending standards after 2004. Figure 3.10 suggests that this deterioration must have been on some other margin than purchasing loans with higher loan amount to income ratios.

3.8 Empirical Investigation: Nested Logit

The multinomial logit model is attractive for its simplicity but assumes that there is no correlation between the error terms of the different outcome equations. The multinomial logit model suffers from the assumption of the independence of irrelevant alternatives (IIA). This assumption is not reasonable for the given problem, changes in reserve requirements for different kinds of mortgage back securities will effect not only the likelihood of keeping a loan, but it will also effect how many are sold to GSEs and how many are sold to private securitizers. I employ a nested logit model to partially relax the IIA assumption by grouping different sets of alternatives together. The nesting structure used is presented in Figure 3.11.

FIGURE 3.11

Nested Logit Structure for the Outcome of a Loan Application



The loan application is either denied or rejected in the first stage, originated loans are either kept or sold and loans that are sold are sold to either GSEs or private institutions. The IIA assumptions are relaxed across nests but not within nests. Ginnie Mae loans were omitted because private firms or securitizers seldom, if ever, buy FHA loans. The categories of private securitizing firms and private firms were collapsed into a single category. Loans sold to Fannie Mae and Freddie Mac were collapsed into a single GSE outcome. The choices of purchaser have been reduced to two to eliminate the danger of imposing the IIA assumption. A 2% random sample of non-FHA and VA applications was taken from the population of applications.

A nested logit model was run for every year from 2001 until 2006, the results are presented in Table E3 of Appendix E. Tables E1 and E2 of Appendix E show the incidence and proportion of different outcomes in the sample by year. Table E1 in Appendix E shows that the number of applications in the sample climbs every year, with the exception of 2006. The rate of origination increases between 2001 and 2003 and

declines after 2003. In 2003 the originating institutions retained the highest number and the lowest proportion of mortgages. The proportion of mortgage sold to GSEs declines from 67% in 2002 to 36% in 2006. Banks are therefore originating a lower proportion of a higher number of applications every year. The rate of retention falls and rises over the period in question and the proportion and number of loans sold to GSEs declines throughout.

Although the outcomes can easily be grouped into in subsets that are suitable for a nested logit regression, the independent variables do not fall into categories that correspond to the different nests. For instance, the applicants income and the loan amount are not exclusively relevant to the origination decision or the retention decision but to all decisions. Therefore the independent variables were located to the first nest so that the outcome of all applications could be conditioned upon them instead of only the subsample of originated or sold loans.

Table E3 in Appendix E presents the coefficients of the first stage of the nested logit. The first stage is the origination decision, the denial outcome was used as the base and the coefficients are interpreted as the change in the log odds of origination, relative to denial, due to a change in the independent variable, holding all others constant. All coefficients are significant at least at the 5% level. The first row of Table E3 shows the declining value of income as a predictor of origination after 2001. The regression suggests that once a lender takes on a risky loan, it is more likely to hold or perhaps to

securitize the loan in house. A possible explanation is that lenders have access to more information about the credit worthiness of borrowers of many riskier mortgage products. In 2001, a \$1,000 increase in income increases the log odds of origination by 0.4%. In 2006, the change in the log odds of origination is only 0.09% for a \$1,000 increase in income.

Lenders measure the ability of an applicant to meet their obligations by the fraction of debt service to monthly income. This measurement of credit risk will be correlated with the ratio of the loan amount to annual income. Row 3 of Table E3 shows that applications that record a higher loan amount relative to annual income are less likely result in origination. If the relationship between this ratio and credit risk were stable over time, then row 3 would suggest that lenders were the least risk averse in 2002 and tightened their standards slightly in 2006.

It is reasonable to expect that the current value and expected future value of the underlying property will influence the lenders decisions to originate the loan. HMDA does not collect home value. I employed the median home price of the MSA where the property is located and a dummy variable (West) to indicate if the property was located in one of the western states or Florida to capture the value of the home and to indicate whether an appreciation in the value of the home could be expected. Both variables had positive coefficients in the origination equation, however the dummy for the western state

and Florida exhibited greater economic significance. In 2004 the fact that an application was for a property in one of these states increased the log odds of origination by 12%.

Distressed borrowers often apply for refinance loans, refinance loans therefore are less likely to be originated. After 2004, the absolute value of the coefficient for refinance loans increases by 8 fold. Non-owner occupied housing includes speculative properties. An application for a loan to buy non-occupied housing is more likely to be originated than applications for primary residences. Applicants with enough income to service an additional property are likely to be wealthier and to have better credit ratings.

Mortgage companies employ electronic and telephonic applications, which are less costly for a household to make. Mortgage companies received more applications and have a greater denial rate than depository institutions because of their application media. Although the application technology is constant throughout this period, in 2005 and 2006 the change in the log odds of origination for an application at a mortgage company declined. This could indicate a possible lowering of standards at mortgage companies.

Figure E4 in Appendix E shows the conditional probabilities from the logistic regression for selected outcomes. The first graph shows the unconditional probability of origination from 2001 until 2006. The second graph shows the probability of a loan being sold, conditional on origination. The third graph shows the probability of selling an unretained loan to a GSE. The probability of denial, the conditional probability of

selling a loan and selling a loan to a private institution are respective mirror images of the graphs shown. The graphs in Figure E4 show that the probability of origination peaks in 2003 before reverting to its 2001 level. The probability of retaining a loan conditional on its origination stays fairly constant throughout the period. The third figure shows the declining market share of GSEs between 2001 and 2006. The probability that a loan is sold to a GSE, conditional on its being sold decreases from 67% in 2001 to only 35% in 2006.

3.9 Concluding Remarks

The 2003 surge in the purchase of new loans by Fannie Mae and, to a lesser extent Freddie Mac, is not explained by any change in the observable characteristics of the lender or loan characteristics. Therefore, GSE appetites for loans appear to be driven by regulatory impulses. The fact that over 4 million originations can be driven by non-market forces and that GSE lending standards declined after 2003 suggests that many risky loans were originated because of the GSEs. The decline in lending standards that was illustrated in Figure 3.3 is reflected in the propensity of GSEs to purchase mortgages with higher loan amount to income ratios. The multinomial logit regression estimates that an increase in the loan amount to income ratio of a single unit increases the probability that a loan application will be sold to Fannie Mae by 0.11%. Private securitizers purchase loans from applicants with higher incomes and are slightly less likely to purchase a loan as the loan amount to income ratio rises.

GSE LMI targets and the propensity of GSEs to purchase loans with higher loan amount to income ratios add a new dimension to the findings in Chapters One and Two. The secondary market enables the origination of risky loans by banks. Banks under CRA pressure change their lending patterns as they merge and securitize \$260 worth of assets for every \$1,000 of merger value. GSEs are required to purchase LMI loans to fulfill their HUD goals and are more likely to buy loans with high loan amount to income ratios than any other kind of institution.

CONCLUSION

The three chapters in this dissertation present strong circumstantial evidence that both the supply and demand for risky loans was influenced, to a large extent, by regulation. The complementarity of these regulations is not coincidental. Banks are expressly given credit for originating and purchasing, but not for holding CRA related loans. GSEs are given credit for purchasing them. These regulatory measures are designed to work in concert to expand home ownership for LMI households. With two such compelling regulatory measures working for the same goal it is hardly surprising that over \$2 trillion was allocated to bad mortgages.

The secondary market lowered the cost of originating risky loans. Chapter One shows that lending to LMI households changed for CRA regulated firms around the time of a merger. Chapter Two shows that investors did not demand credit enhancements commensurate with the increased riskiness of the securitized pool of assets. Chapter Three presents evidence that GSEs had lower lending standards than private securitizers in order to fulfill their HUD quotas. Between \$141bn and \$983.3bn additional mortgages were originated in order for banks to comply with the provisions of the CRA. These numbers exceed what they would have been if the secondary market had not enabled LMI household loans. Chapter One shows that the regulatory framework facilitated strategic origination on the part of banks as opposed to a general lowering of lending standards.

Appendix A

Summary Statistics

TABLE A1
Summary Statistics - Banks

Variable	# Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
<i>Total Number of Applications</i>	766	20676.89	147349.9	15	2942238
<i>Applications within AA†</i>	665	16196.17	106413.9	1	1551447
<i>Total Originated and Purchased</i>	766	13777.31	99379.14	14	1960851
<i>Originated and Purchased within AA</i>	665	10864.53	72287.78	1	992818
<i>Total Purchased</i>	766	2862.798	27267.33	0	635801
<i>Purchased within AA</i>	665	1394.642	10442.59	0	167909
<i>Total Denials</i>	766	3496.222	22008.17	0	442059
<i>Denials in AA</i>	665	2913.992	17508.57	0	280856
<i>Total Applications Black Applicants</i>	766	1117.697	7194.9	0	101129
<i>Applications Black Applicants within AA</i>	665	930.3398	5912.999	0	82438
<i>Denial of Black Applicants</i>	766	364.4452	2049.75	0	23997
<i>Denial of Black Applicants within AA</i>	665	310.4226	1723.58	0	19550
<i>Total Applications White Applicants</i>	766	12229.2	90170.83	2	1719861
<i>Applications</i>	665	10586.38	77173.65	0	1264578

<i>White Applicants within AA</i>					
<i>Denial of White Applicants</i>	766	1968.223	14497.97	0	320657
<i>Denial of White Applicants within AA</i>	665	1674.403	11705.94	0	216724
<i>Total Applications No Race Given</i>	766	3209.832	26900.96	0	657543
<i>Applications No Race Given Applicants within AA</i>	665	1745.391	9884.086	0	168418
<i>Denial of No Race Applicants</i>	766	422.1018	2180.947	0	26759
<i>Denial of No Race Applicants</i>	766	270.7467	1545.407	0	24561
<i>Ever Pledge</i>	766	.1072363	.3095484	0	1
<i>Applications LMI Households</i>	196	26877.45	13580.27	11	1184245
<i>Originations LMI Households</i>	196	17663.11	91697.87	8	821500
<i>Applications LMI Households within AA</i>	196	23397.79	126263.2	4	168418
<i>Originations LMI Households within AA</i>	196	15425.49	85816.9	3	778715
<i>Applications Refinance Loans</i>	766	10585.57	75942.98	0	1571693
<i>Applications Refinance Loans within AA</i>	665	8431.171	55677.96	0	965966
<i>Origination Refinance Loans</i>	766	7109.021	51012.63	0	994645

<i>Originations</i>	665	5562.565	36934.31	0	618016
<i>Refinance Loans within AA</i>					

† AA denotes assessment area

TABLE A2
Summary Statistics – Mortgage Companies

Variable	# Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
<i>Total Number of Applications</i>	188	110344.4	427360.2	6	2824152
<i>Total Originated and Purchased</i>	188	61438.56	306865.1	0	2414722
<i>Total Purchased</i>	188	25955.07	160134.6	0	1302495
<i>Total Denials</i>	188	17829.93	80991.85	0	617517
<i>Total Applications Black Applicants</i>	188	8521.378	31234.69	0	211492
<i>Denial of Black Applicants</i>	188	1936.027	7956.633	0	58253
<i>Total Applications White Applicants</i>	188	54453.72	246553	0	1864939
<i>Denial of White Applicants</i>	188	7189.473	33705.52	0	307538
<i>Total</i>	188	6939.218	36614.21	0	321457

<i>Applications No Race Given</i>					
<i>Denial of No Race Applicants</i>	188	857.4468	7145.469	0	95028
<i>Applications LMI Households</i>	63	126657.3	450147.5	9	2233396
<i>Originations LMI Households</i>	63	66454	304788.4	0	1743167
<i>Applications Refinance Loans</i>	188	74154.79	289509.2	0	1992411
<i>Origination Refinance Loans</i>	188	34759.75	176640.9	0	1703567

Appendix B
Chapter 1: Results

TABLE B1
Effect of CRA and Mergers on the Percentage Denials to Black Applicants by Banks

	(a)	(b)	(c)	(d)
	Black Denial Rate Pooled	Black Denial Rate (BDR) Panel (FE)	(BDR) Inside AA† Panel (FE)	(BDR) Outside AA Panel (FE)
	Coefficient	Coefficient	Coefficient	Coefficient
	(se)	(se)	(se)	(se)
Ever Pledge*	-0.094***	-0.043	-0.104**	0.031*
Merger (T+1)	(0.054)	(0.031)	(0.042)	(0.019)
Ever Pledge	0.161**	0.169**	0.212**	-0.011
	(0.041)	(0.076)	(0.089)	(0.02)
Merger (T)	0.052	0.026	0.016	0.005
	(0.027)	(0.018)	(0.021)	(0.01)
Merger (T+1)	0.025	0.007	0.044*	-0.024*
	(0.028)	(0.019)	(0.023)	(0.013)
Merger Protest	0.0743	0.043**	0.043*	0.003
	(0.043)	(0.021)	(0.022)	(0.003)
Exam	-0.002	-0.01	-0.015	-0.000
	(0.017)	(0.013)	(0.013)	(0.007)
CRA Rating	-0.017	0.053	0.043	0.006
	(0.019)	(0.036)	(0.042)	(0.011)
Constant	0.234***	0.123***	0.14***	-0.007
	(0.035)	(0.071)	(0.081)	(0.019)
<i>N</i>	688	688	571	571
<i>Groups</i>	-	157	154	154
<i>F</i>	8.79	1.86	2.06	0.87
<i>Cluster Variable</i>	-	Bank	Bank	Bank

† AA denotes assessment area

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

TABLE B2
Effect of CRA and Mergers on the Percentage Denials to White Applicants by Bank

	(a)	(b)	(c)	(d)
	White Denial Rate (WDR)	WDR	WDR Inside AA†	WDR Outside AA
	Pooled Regression	Panel (FE)	Panel (FE)	Panel (FE)
	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
Ever Pledge*	-0.048 (0.27)	-0.03 (0.01)	-0.023* (0.014)	-0.009 (0.007)
Ever Pledge	0.084** (0.033)	0.07** (0.021)	0.075*** (0.022)	0.005 (0.009)
Merger (T)	0.017* (0.010)	-0.009 (0.005)	0.014*** (0.005)	-0.004 (0.003)
Merger (T+1)	0.021** (0.010)	0.006 (0.007)	0.00 (0.006)	0.004 (0.006)
Merger Protest	0.059*** (0.021)	0.027 (0.011)	0.02* (0.012)	0.005 (0.03)
Exam	-0.003 (0.004)	-0.004 (0.002)	-0.008** (0.003)	0.00 (0.002)
CRA Rating	-0.018 (0.011)	-0.016 (0.009)	-0.011 (0.008)	0.000 (0.003)
Constant	0.12 (0.021)	0.119 (0.015)	0.111*** (0.014)	0.002 (0.006)
<i>N</i>	761	761	660	660
<i>Groups</i>	-	162	160	160
<i>F</i>	7.69	4.24	3.98	0.74
<i>Cluster Variable</i>	-	Bank	Bank	Bank

† AA denotes assessment area

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

TABLE B3

**Effect of CRA and Mergers on the Percentage Denials to Applicants who do not Disclose their Race
by Banks**

	(a)	(b)	(c)	(d)
	“No Race” Denial Rate (NRDR)	NRDR	NRDR Inside AA†	NRDR Outside AA
	Pooled Regression	Panel (FE)	Panel (FE)	Panel (FE)
	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
Ever Pledge*	-0.00149 (0.0733)	0.0609 (0.0558)	0.0175 (0.053)	-0.0056 (0.0167)
Ever Pledge	-0.0027 (0.0551)	-0.2935*** (0.0628)	-0.2761*** (0.0574)	0.0199 (0.0238)
Merger (T)	-0.0039 (0.0378)	-0.0189 (0.0308)	-0.0013 (0.0322)	-0.0098 (0.008)
Merger (T+1)	0.0471 (0.0404)	0.0150 (0.0339)	0.0454 (0.0354)	-0.0065 (0.01)
Merger Protest	-0.0319 (0.0583)	-0.0695* (0.0416)	-0.0725* (0.0413)	0.001 (0.0046)
Exam	0.0129 (0.0237)	-0.0125 (0.0133)	-0.0029 (0.0147)	0.0002 (0.007)
CRA Rating	0.0526* (0.0262)	-0.0284 (0.0698)	0.0137 (0.0772)	-0.007 (0.017)
Constant	0.1142*** (0.0485)	0.3104*** (0.122)	0.2415* (0.135)	0.0172 (0.0299)
<i>N</i>	647	647	533	533
<i>Groups</i>	-	157	147	147
<i>F</i>	1.01	4.80	7.64	1.12
Cluster	-	Bank	Bank	Bank
Variable				

† AA denotes assessment area

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

TABLE B4
Effect of CRA and Mergers on Loan Origination to LMI
Applicants for Banks

	(a)	(b)	(c)
	Change in % LMI Origination	Change in % of LMI in AA†	Change in % LMI Outside AA
	Linear Regression	Linear Regression	Linear Regression
	Coefficient	Coefficient	Coefficient
	(se)	(se)	(se)
Ever Pledge*	0.052 **	0.063 **	-0.006
Merger (T+1)	(0.025)	(0.031)	(0.005)
Ever Pledge	-0.045***	-0.058**	0.002
	(0.015)	(0.026)	(0.004)
Merger (T)	0.016	0.009	-0.007
	(0.0163)	(0.022)	(0.005)
Merger (T+1)	-0.021	-0.033	0.01*
	(0.025)	(0.033)	(0.005)
Merger Protest	-0.012	-0.008	0.002
	(0.016)	(0.021)	(0.003)
Exam	-0.014	-0.01	0.003
	(0.011)	(0.01)	(0.002)
CRA Rating	-0.017	-0.022	0.003
	(0.018)	(0.025)	(0.003)
Constant	0.024	0.047	-0.008
	(0.037)	(0.051)	(0.006)
<i>N</i>	136	89	89
<i>R Sq.</i>	0.04	0.06	0.09
<i>Root MSE</i>	0.07	0.076	0.075
Standard Error	Bootstrap	Bootstrap	Bootstrap
Correction			

† AA denotes assessment area

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

TABLE B5
Effect of CRA and Mergers on the Origination of Refinance Loans by Banks

	(a)	(b)	(c)	(d)
	Rate of Refinance Loans Originated (RLO) Pooled Regression	Rate of RLO Panel (FE)	RLO Inside AA† Panel (FE)	RLO Outside AA Panel (FE)
	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
Ever Pledge*	0.025 (0.021)	0.028 (0.026)	0.043** (0.022)	-0.014*** (0.005)
Ever Pledge	-0.11 (0.025)	0.005 (0.041)	-0.021 (0.032)	0.015** (0.006)
Pledge (T)	-0.001 (0.03)	0.038 (0.023)	0.05*** (0.017)	-0.009 (0.006)
Merger (T)	-0.03 (0.017)	-0.005 (0.01)	-0.00 (0.11)	0.000 (0.002)
Merger (T+1)	-0.002 (0.016)	-0.00 (0.01)	0.00 (0.009)	0.001 (0.003)
Merger Protest	-0.074 (0.027)	-0.016 (0.022)	-0.023 (0.02)	0.004 (0.004)
Exam	0.012 (0.009)	0.00 (0.004)	0.000 (0.005)	0.001 (0.003)
CRA Rating	0.034 (0.011)	0.039* (0.02)	0.03 (0.02)	-0.003 (0.004)
Constant	0.763*** (0.021)	0.736*** (0.035)	0.752*** (0.036)	0.000 (0.006)
<i>N</i>	760	760	659	659
<i>Groups</i>	-	162	160	160
<i>F</i>	15.52	1.18	1.97	1.65
Cluster Variable	-	Bank	Bank	Bank

† AA denotes assessment area

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

TABLE B6
Effect of CRA and Mergers on the Percentage Denials to Applicants by Race
(Mortgage Companies)

	(a)	(b)	(c)	(d)
	Black Denial Rate	White Denial Rate	“No Race” Denial Rate	Refinance Loans Originated as % Refinance Applications
	Panel (FE)	Panel (FE)	Panel (FE)	Panel (FE)
	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
Merge (T)	0.021 (0.04)	0.012 (0.018)	-0.049 (0.098)	0.033 (0.036)
Merge (T+1)	-0.056 (0.05)	-0.04 (0.025)	0.068 (0.05)	0.077*** (0.03)
Constant	0.167*** (0.008)	0.094*** (0.0025)	0.122*** (0.005)	0.71 (0.005)
<i>N</i>	170	178	125	183
<i>Groups</i>	38	41	35	40
<i>F</i>	2.73	1.22	1.78	3.36
Cluster Variable	Mortgage Company	Mortgage Company	Mortgage Company	Mortgage Company

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level.

Appendix C

Chapter 2 Data Sources and Definitions and Sample Statistics

This paper makes use of data from the Federal Financial Institutions Examination Council (FFIEC). The council specifies guidelines and collects data from the four agencies responsible for bank regulation, the Federal Reserve Bank (FRB), the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency (OCC) and the Office of Thrift Supervision (OTS). There are two kinds of FFIEC data used above. The data on the timing of CRA exams is taken from the public search engine on the FFIEC website⁴⁷. The balance sheet and off-balance sheet data is available on the bank regulatory Wharton Research Data Services (WRDS) website. WRDS collects the bank regulatory data from the Consolidated Reports of Condition and Income⁴⁸ (the “Call Report”) that banks are required to submit to the FFIEC every quarter. Ever national, FRB member state chartered bank and insured state chartered nonmember bank is required to file a Call Report every quarter. Banks submit their reports at the close of business on the last calendar day of the quarter.

Sample Construction

The panel is the constituent of reporting banks that securitize loans. 8,303 banks submitted Call Reports in the fourth quarter of 2005. 686 of these banks securitized

⁴⁷ <http://www.ffiec.gov/CRA/ratings.htm>

⁴⁸ FFIEC 031 & 041

assets in the same quarter. 678 of these banks had CRA records⁴⁹ and filed Call Reports from the second quarter of 2004 until and including the first quarter of 2006.

Variables

Exam

Exam is a dummy variable that is equal to 1 if the bank has been given a CRA assessment that quarter.

Assets (RCON2170)

This includes investments in other companies, assets held from trading and all loans held by the bank. Off-balance sheet assets are, of course, excluded.

Deposits (RCFD2200)

As defined by the Federal Deposit Insurance Act, deposits include all checking, savings, trusts and money received by the bank. Reciprocal obligations between banks are netted.

Loans Secured by Real Estate (RCON3385)

The quarterly average of all loans secured by real estate, including home equity lines of credit, second mortgages etc.

⁴⁹ Five banks did not receive CRA assessments at the same organizational level at which they filed the Call Report.

First Lien Real Estate Loans (RCON5367)

Non-revolving loans secured by first claims on real estate on dwellings for 1-4 families.

Junior Lien Real Estate Loans (RCON5368)

Non-revolving loans secured by junior claims on real estate on dwellings for 1-4 families.

Adjustable Rate Mortgages (ARMs) (RCON5370)

All non-revolving loans secured by 1-4 family dwellings that pay floating or adjustable rates.

Mortgage Backed Securities (MBS) (RCON8639)

The sum of the bank's holding of MBS held to maturity and held for sale. Those held to maturity are valued at amortized cost; the MBS in the trading account are recorded at fair market value.

Securitized and Alienated Assets with Recourse (RCFDB705 – B711, RCFDB790)

Outstanding balance of assets sold and securitized by the reporting bank or another entity with servicing retained or other credit enhancements. The sale of real estate loans, home equity lines of credit, credit card debt, auto loans, commercial and

industrial loans are included. Includes the sale of loans to the Federal National Mortgage Association (FANNIE MAE), the Federal Home Loan Association (FREDDIE MAC) and other government-sponsored enterprises.

Credit Enhancements (RCFDB712 – B718, RCFDB797 – RCFDB803, RCFDC397-RCFD406)

The amount of interest the bank secures, residual interest⁵⁰ the bank retains and guarantees provided to the purchaser of the asset.

⁵⁰ Residual interest refers to the bank's ownership of junior claims (tranches) to the cash flows generated by the alienated assets.

TABLE C
Sample Statistics

Variable	Mean	Standard Error	Maximum Value	Minimum Value
Reserves	34220.12	1666.527	307	74296000
Assets	1146293	61268.19	14719	998466294
Deposits	747237.2	36041.32	11574	703361233
Liabilities	1004260	51386.07	11680	71761145
Real Estate Loans on Balance Sheet	513596.2	25951.65	0	314646603
First-Lien Real Estate Loans	161074.8	11056.31	0	175890800
Second-Lien Real Estate Loans	17787.49	1293.36	0	9605855
Adjustable Rate Mortgages	70125.85	5691.55	0	45448000
Mortgage Backed Securities	118644.6	7996.36	0	12166981
Securitized Assets (SEC)	162979.1	33448.03	0	103565525
Credit Enhancements (CE)	14813.36	2590.27	0	12312000
Ratio of CE to SEC	0.384	0.006	0	3.678929766
Exam Dummy	0.0557	0.003	0	1
Value of Mergers	11912.49	3320.01	-3497000	46324507
Merge Dummy	0.041	0.002	0	1

Appendix D

Chapter Three: Sample Description for Multinomial Logit

Table D1
Sample Description – Multinomial Logit

Variable	Min	Max	Mean	Std. Dev.
Loan Amount	1	47,625,000	171,593	223,690
Income	1	9,999,000	92,942	123,662
Loan Amount / Income	0.00396	417	2.23	2.93
MSA Median Home Price	67,700	775,000	244,540	130,527

Counts for Dummy Variables

Non-owner occupied housing	43966
Refinance Loans	184164
HOEPA	318
Subordinate Lien	63816
Unsecured Loans	4115
FHA	12461

Total: 338,283 observations

TABLE D2

Marginal Effects from Multinomial Logistic Regression of the Fate of Loan Applications

	(1) Application Denied	(2) Loan Sold to Fannie Mae	(3) Loan Sold to Freddie Mac	(4) Loan Sold to Ginnie Mae	(5) Loan sold to Private Securitizer
	Coeff. (se)	Coeff. (se)	Coeff. (se)	Coeff. (se)	Coeff. (se)
Loan Amount	0.00003 (0.00005)	-0.00004*** (0.00001)	-0.00002*** (0.00001)	-0.0008 (0.0014)	0.00003** (0.00001)
Income	-0.0002 (0.00016)	-0.00001 (0.00002)	-0.00002 (0.00001)	0.004 (0.0077)	-0.00006 (0.00004)
LoanAmount/ Income	0.10224*** (0.0076)	0.00117*** (0.00048)	0.0003 (0.00027)	0.000133 (0.00107)	-0.003 (0.0023)
No Recourse	-0.019*** (0.005)	0.00003 (0.00098)	-0.00004 (0.0007)	0.0000016 (0.00107)	0.0042 (0.005)
Refinance Loan	0.163*** (0.0234)	-0.012*** (0.002)	-0.005*** (0.002)	-0.000188 (0.00135)	-0.007 (0.005)
Non-Owner Occupied	-0.024 (0.015)	0.002 (0.002)	-0.002* (0.001)	-0.000663 (0.00034)	-0.0008 (0.003)
HOEPA Status	-0.27*** (0.015)	-0.0237*** (0.005)	-0.0126*** (0.003)	-0.00006*** (0.0000732)	-0.0227 (0.0233)
FHA	-0.083 (0.024)	-0.246*** (0.005)	-0.0145*** (0.004)	0.0055*** (0.00032)	-0.0342** (0.0135)
Subordinate Lien	0.065 (0.021)	-0.0526*** (0.0138)	-0.0381*** (0.0113)	-0.0002*** (0.000057)	-0.018 (0.014)
Unsecured Loan	0.299*** (0.044)	-0.0325*** (0.007)	-0.0173*** (0.0046)	-0.00077*** (0.0000441)	-0.044*** (0.0161)
Median MSA House Price	-0.0014*** (0.0002)	0.00001 (0.00003)	-0.00001 (0.0004)	-0.00001*** (0.000006)	0.00005* (0.00003)
Mortgage Company	0.0003*** (0.00004)	0.006 (0.015)	-0.006 (0.007)	-0.0007 (0.00001)	0.0685 (0.051)
	N		338,283		

*** Coefficient significant at the 1% level; ** coefficient significant at the 5% level; *coefficient significant at the 10% level

Appendix E
Sample Description and Results for Nested Logit

TABLE E1
Outcomes by Year for sample used in Nested Logit Regression

2001-2006					
Deny	64221				
Originate	197648	Keep	80563		
		Sell	117085	Sell to GSE	62548
				Sell to Private Inst.	54537
2001					
Deny	9055				
Originate	25571	Keep	11799		
		Sell	13772	Sell to GSE	9249
				Sell to Private Inst.	4523
2002					
Deny	8255				
Originate	31795	Keep	12724		
		Sell	19071	Sell to GSE	12991
				Sell to Private Inst.	6080
2003					
Deny	10833				
Originate	43960	Keep	15418		
		Sell	28542	Sell to GSE	18294
				Sell to Private Inst.	10248
2004					
Deny	11240				
Originate	31041	Keep	12103		
		Sell	18938	Sell to GSE	8723
				Sell to Private Inst.	10215
2005					
Deny	12410				
Originate	33926	Keep	14077		
		Sell	19849	Sell to GSE	7182
				Sell to Private Inst.	12667
2006					
Deny	12428				
Originate	31355	Keep	14442		
		Sell	16913	Sell to GSE	6109
				Sell to Private Inst.	10804

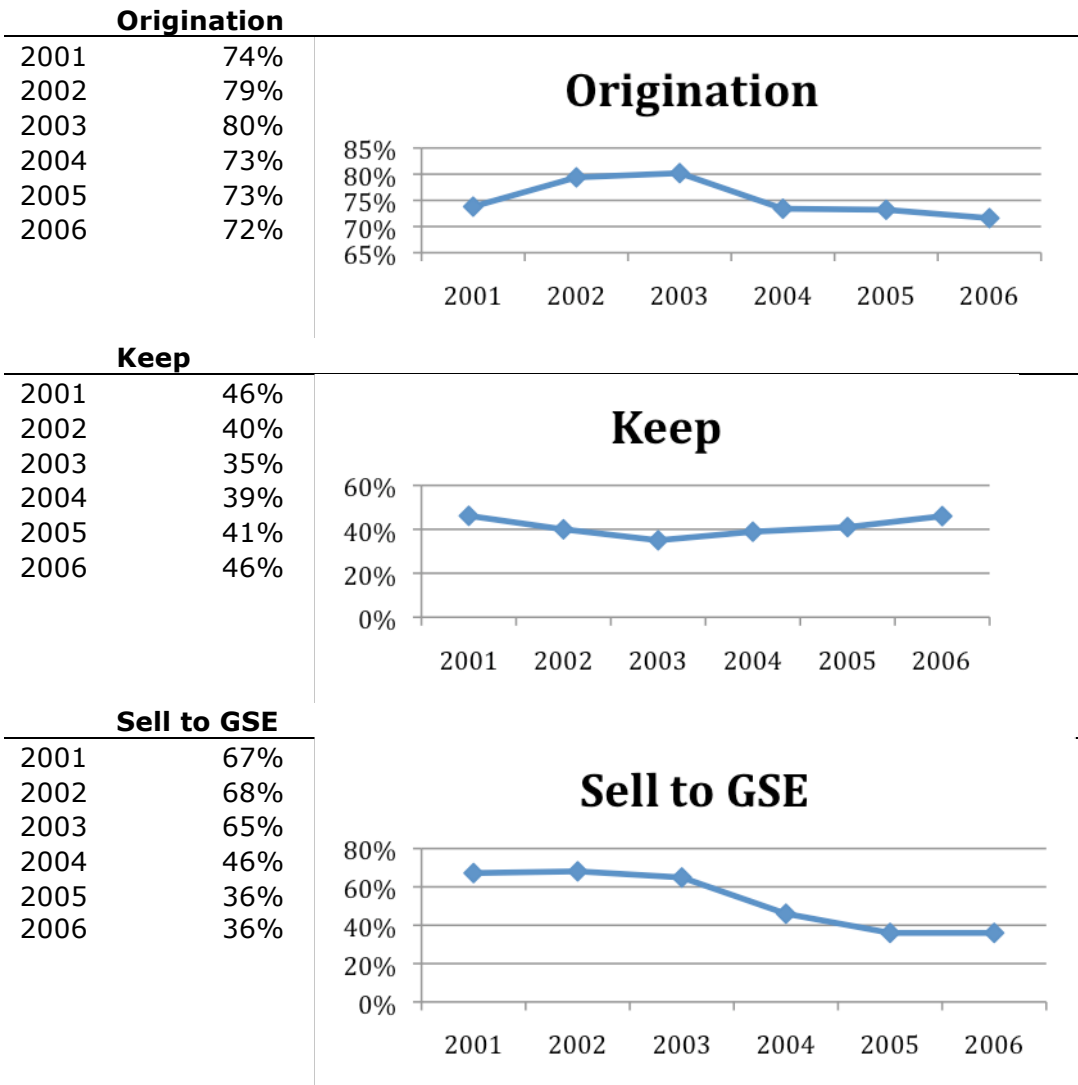
TABLE E2
Outcomes by Year for sample used in Nested Logit Regression (proportions)

2001-2006					
Deny	24.5%				
Originate	75.5%	Keep	40.8%		
		Sell	59.2%	Sell to GSE	53.4%
				Sell to Private Inst.	46.6%
2001					
Deny	26.2%				
Originate	73.8%	Keep	46.1%		
		Sell	53.9%	Sell to GSE	67.2%
				Sell to Private Inst.	32.8%
2002					
Deny	20.6%				
Originate	79.4%	Keep	40.0%		
		Sell	60.0%	Sell to GSE	68.1%
				Sell to Private Inst.	31.9%
2003					
Deny	19.8%				
Originate	80.2%	Keep	35.1%		
		Sell	64.9%	Sell to GSE	64.1%
				Sell to Private Inst.	35.9%
2004					
Deny	26.6%				
Originate	73.4%	Keep	39.0%		
		Sell	61.0%	Sell to GSE	46.1%
				Sell to Private Inst.	53.9%
2005					
Deny	26.8%				
Originate	73.2%	Keep	41.5%		
		Sell	58.5%	Sell to GSE	36.2%
				Sell to Private Inst.	63.8%
2006					
Deny	28.4%				
Originate	71.6%	Keep	46.1%		
		Sell	53.9%	Sell to GSE	36.1%
				Sell to Private Inst.	63.9%

TABLE E3
Results of Nested Logistic Regression for 2% Sample for Years 2001-2006

	(1) 2001	(2) 2002	(3) 2003	(4) 2004	(5) 2005	(6) 2006
	Coeff. (se)	Coeff. (se)	Coeff. (se)	Coeff. (se)	Coeff. (se)	Coeff. (se)
Income	0.004 (0.0004)	0.0004 (0.00001)	0.0003 (0.0001)	-0.0002 (0.00012)	-0.00011 (0.0001)	0.0009 (0.00018)
Loan Amount	0.006 (0.0002)	0.006 (0.00002)	0.0042 (0.0001)	0.003 (0.0001)	0.0026 (0.0001)	0.00077 (0.0001)
Loan Amount/ Income	-0.0242 (0.0101)	-0.00234 (0.00048)	-0.0895 (0.0077)	-0.0796 (0.007)	-0.08107 (0.007)	-0.0514 (0.008)
Median MSA House Price	0.001346 (0.0002)	0.00005 (0.00098)	0.00064 (0.0001)	0.00022 (0.0001)	0.0004 (0.00007)	0.00019 (0.00074)
Refinance Loan	-0.0538 (0.0268)	-0.0534 (0.045)	-0.06411 (0.024)	-0.485 (0.0234)	-0.5169 (0.0219)	-0.4995 (0.022)
Non-Owner Occupied	0.3542 (0.059)	0.3140 (0.0671)	0.215 (0.0466)	0.3072 (0.0433)	0.302 (0.039)	0.179 (0.038)
Mortgage Company	-0.27 (0.015)	-0.314 (0.023)	-0.684 (0.0222)	-0.595 (0.022)	-0.2158 (0.0217)	-0.1653 (0.02214)
Black	-0.6445 (0.0523)	-0.494 (0.053)	-0.798 (0.0403)	-0.521 (0.0368)	-0.534 (0.033)	-0.6162 (0.0334)
West	0.03404 (0.02884)	0.04501 (0.0294)	0.03998 (0.0241)	0.0719 (0.0249)	0.1281 (0.023)	0.0684 (0.023)
<i>N</i>	138504	169534	219172	169124	185344	175132
<i>LL</i>	-44732.44	-5632.77	-72952.068	-42281.234	-61985.64	-58107.01

FIGURE E4
Conditional Probabilities of Selected Outcomes of the Nested Logit Regression



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