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Disparities in mortgage lending, bank performance, economic influence and regulatory oversight

Keith D. Harvey

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I am submitting herewith a dissertation written by Keith D. Harvey entitled "Disparities in mortgage lending, bank performance, economic influence and regulatory oversight." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

M. Cary Collins, Major Professor

We have read this dissertation and recommend its acceptance:

Thomas Boehm, Matthew Murray, Ronald Shrieves, James Wansley

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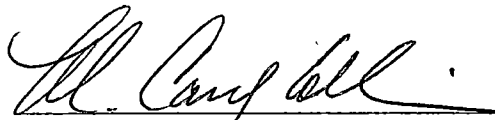
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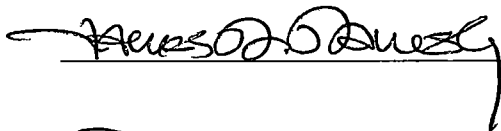
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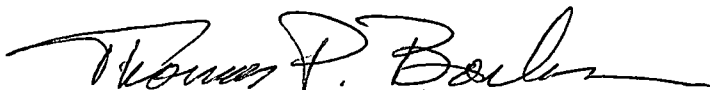
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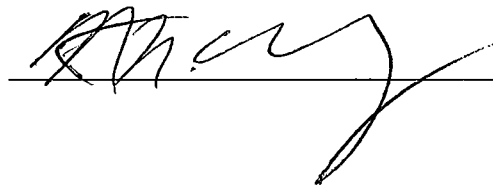

M. Cary Collins, Major Professor

We have read this dissertation
and recommend its acceptance:










Accepted for the Council:


Associate Vice Chancellor and
Dean of the Graduate School

**Disparities in Mortgage Lending, Bank Performance,
Economic Influence and Regulatory Oversight**

A Dissertation

Presented for the

Doctor of Philosophy Degree

The University of Tennessee, Knoxville

Keith D. Harvey

August 2000

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DEDICATION

This dissertation is dedicated to my wife,
Carolyn, whose love and encouragement
contributed greatly to its completion.

ACKNOWLEDGEMENTS

I want to offer special thanks to my chairperson, Dr. Cary Collins, for his exemplary encouragement, guidance, and willingness to invest so much of his time and resources in my professional development. I also wish to thank the committee members, Dr. Thomas Boehm, Dr. Matthew Murray, Dr. Ronald Shrieves, and Dr. James Wansley, for all of their advice and insight. Finally, I could not have completed my education without the loving support of my wife, Carolyn.

ABSTRACT

Large racial disparities in mortgage loan denial rates and low minority representation among applicants for mortgage credit have created concerns that mortgage lenders discriminate against minorities. This dissertation investigates factors that influence changes in these disparities in 25 MSAs in the U.S. during 1991-1997. During the latter portion of the sample period racial disparities in mortgage denial rates declined significantly, while minority representation in the mortgage applicant pool increased. Some industry observers attribute these changes to improvements in regulatory enforcement of the fair lending laws and Community Reinvestment Act (CRA). I hypothesize that improvements in economic conditions during the period that reduce default loss probabilities on mortgage loans contribute to reductions in denial rate disparities, since minorities represent a disproportionate percentage of the marginal loan applicants in this sample. I anticipate that improvements in the financial condition and performance of financial institutions may have had a similar effect.

In Chapter 4 of the Dissertation, an empirical model is developed to formally test the joint affect of market forces, including changes in the economy and lender financial condition and performance, as well as regulatory influence on mortgage lending outcomes. The model incorporates the Home Mortgage Disclosure Act (HMDA) data on characteristics of applicants for conventional home purchase mortgage loans in 25 metropolitan statistical areas (MSAs). These data are matched to census tract data from

the 1990 U.S. census, bank-specific financial data from the bank reports of condition and income, and state and MSA-level macroeconomic series. A partial adjustment framework is employed to model lending institutions' response to established 'targets' for racial disparities in denial rates and minority representation. Since these targets are jointly determined, the two-stage least squares (2SLS) method for estimating simultaneous equations is used to estimate the 'disparity' and 'representation' models.

The results of the 2SLS estimation overall are not consistent with a regulation-induced shift in racial disparities in denial rates and minority representation, after controlling for market forces. While there is some evidence to support a regulatory influence on changes in minority representation, this effect is restricted to institutions that already have satisfactory performance ratings under CRA. The results suggest that changes in the mortgage market during the period disproportionately benefited the minority applicant group. Specifically, changes in the quality of the applicant pools, economic conditions in the MSAs under study, and the financial condition and performance of the lending institutions are found to have a statistically significant influence on mortgage lending outcomes.

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Chapter 1

Introduction

Since the federal government began publicly reporting data on racial disparities in mortgage denial rates in 1990, numerous studies have attempted to identify the sources of such disparities. The data reveal that black loan applicants are denied mortgage credit at two to three times the rate of white applicants.¹ Empirical evidence regarding discrimination in mortgage markets is mixed. Most studies conclude that the disparities in denial rates are due to economic differences among racial groups. A few widely-cited studies, however, find evidence of discrimination after controlling for economic differences.²

Evanoff and Segal (1996) document significant growth in mortgage lending to low- and moderate-income groups as well as minority groups during 1990-1995. During this period the annual number of mortgage originations to these groups nearly doubled. Moreover, the data reveal large declines in the racial disparity of mortgage denial rates and an increase in minority representation in the applicant pool. One possible explanation for this trend is that mortgage lenders were under increasing pressure from industry regulators to extend additional credit to minorities and low-income groups during the period. For

¹ I refer to black rather than African-American applicants in keeping with the regulatory codes associated with the Home Mortgage Disclosure Act data.

² Munnell, Tootell, Browne, and McEneaney (1992) provide the most widely cited evidence supporting the argument that discrimination is economically significant in a Boston Federal Reserve Bank study of Boston-area mortgage lenders.

example, some industry observers cite increasing pressure to comply with the Community Reinvestment Act (CRA), as evidenced by the growing number of protests of merger applications and referrals to the Department of Justice under the regulation. An alternative explanation is that market forces such as improvements in the economy and in bank financial condition and performance affected default loss estimates and credit standards in a way that disproportionately benefited minority and low-income applicants.

If minorities represent a disproportionate percentage of the marginal loan applicant pool, improvements in overall credit quality estimates or liberalization of credit standards should result in a reduction in the racial disparity of mortgage credit denials and an increase in minority representation. Evidence from prior studies indicates this is the case, with minority applicants for mortgage credit exhibiting below average credit quality and higher than average default rates than white applicants. For example, data on the characteristics of applicants included in the Boston Federal Reserve's study of mortgage lending in the Boston area during 1990 reveal significant differences in several measures of applicant quality (Munnell et al., 1992). The data indicate that minority applicants were more likely to have delinquencies and defaults on their credit record, were less likely to have an established credit history, were less likely to meet lender's underwriting standards, and made lower down payments than white applicants. Furthermore, minority applicants' median net worth was less than half that of white applicants, and minorities had a lower amount of liquid assets available to meet closing costs. Finally, measures of debt burden,

including housing expense and total obligations as a percent of income, were similar for the two groups.

Careful evaluation of trends in mortgage lending volume among racial groups and detection of the factors driving observed disparities by race is clearly of great interest to regulatory agencies and to policy makers. Recently, regulators have responded to these persistent disparities by increasing their efforts to screen mortgage lending institutions for discriminatory practices and by refining the analytic methods for such screening.³ In Chapter 4 of the dissertation, empirical models are developed to identify factors affecting mortgage lending outcomes for a sample of lending institutions in 25 metropolitan statistical areas (MSAs) in the U.S. during 1991-1997. The two-stage least squares (2SLS) method of estimating a system of simultaneous equations is employed to test whether observed changes in the racial disparity of mortgage credit denials and minority representation in the applicant pool result from: 1) a financial institution portfolio response to changes in either institution-specific factors affecting portfolio choice, or macroeconomic-specific factors that influence mortgage default loss probabilities; or 2) fair lending compliance pressure on financial institutions from industry regulators. The model includes each institution's periodic CRA rating as a proxy for regulatory pressure related to discrimination in mortgage lending practices. The model also includes a regime binary variable to test for a significant shift in regulatory influence after 1992.

³ See the Federal Financial Institutions Examination Council Interagency Fair Lending Examination Procedures dated January 5, 1999 for details on the fair lending examination process.

1.1 Policy Implications of the Research

If the observed changes in racial disparities are a response to market forces, including institution-specific or macro-economic-specific variables, then the recent decline in these disparities might be expected to reverse course during the next economic contraction. Moreover, policy makers should consider the impact of these forces when assessing whether mortgage credit has been successfully provided to all qualified persons in a particular demographic market. Lenders may periodically alter the characteristics of their portfolios in ways that could appear to be discriminatory, when in fact the changes reflect a rational economic response to changing economic conditions, rather than insidious behavior. Finally, a finding that disparities in mortgage lending outcomes respond to economic conditions would reinforce the need to adequately control for lender assessments of credit risk when evaluating compliance with fair lending statutes and CRA, and to recognize that these criteria may be adaptive to the prevailing market and economic climate.

Alternatively, a finding that disparities diminish at specific institutions facing regulatory pressure also would have important implications for regulators. If the declines reflect efforts by lending institutions to ensure that their mortgage lending practices are not racially biased, then the identification of problem lenders resulting from increased regulatory oversight achieves the desired societal objective. On the other hand, if the

declines reflect an uneconomic reallocation of credit solely to deflect costly attention from regulators, then a re-examination of regulatory policy and enforcement is warranted.

1.2 Summary of the Empirical Results

The univariate statistics provided in Chapter 5 demonstrate significant declines in the racial disparity of denial rates and significant increases in minority representation during the sample period, especially during 1993-1994. These findings are consistent with the growth in lending to racial minorities during the period documented by Evanoff and Segal (1996). Trends in overall denial rates and the racial disparity in denial rates are consistent with a portfolio response that disproportionately benefited the minority applicant group. Specifically, both aggregate denial rates and the racial disparity in denial rates exhibit significant declines during 1993-1994. The data also demonstrate significant improvement in measures of the financial condition of the sample lending institutions and of economic conditions in the sample MSAs after 1992, suggesting these market forces may have contributed to the observed declines in disparities and increase in minority representation.

The results of the 2SLS estimation overall are not consistent with a regulation-induced shift in racial disparities in denial rates and minority representation, after controlling for market forces. Instead, changes in the quality of the applicant pools, economic conditions in the MSAs under study, and the financial condition and performance of the lending institutions are found to have a greater influence on these

outcomes. Both the CRA rating and regime shift binary variables are insignificant in all specifications of the equation with the racial disparity in denial rates as the dependent variable. While there is some evidence to support a regulatory influence on changes in minority representation, this effect is restricted to institutions that already have satisfactory performance ratings under CRA.

1.3 Organization of the Dissertation

The next chapter provides a review of the literature relating to CRA, discrimination in mortgage lending, bank portfolio choice, and factors influencing mortgage default loss estimates. Chapter 3 develops a model of mortgage underwriting and the hypotheses to be tested by the empirical models. Chapter 4 provides a description of the data and empirical methods. The empirical results are discussed in Chapter 5, and Chapter 6 concludes the dissertation.

Chapter 2

Literature Review

This chapter provides a review of the relevant prior literature. The chapter is divided into four sections. First, background on the fair lending laws and CRA is provided in section 2.1. This is followed by a discussion of studies that examine discrimination in mortgage lending in section 2.2. Finally, sections 2.3 and 2.4 review factors influencing mortgage default estimates and bank portfolio choice, respectively.

2.1 Overview of Federal Fair Lending Legislation

There are two principal veins of federal fair lending legislation. First, the 1974 Equal Credit Opportunity Act (ECOA) and 1968 Fair Housing Act (FH Act) prohibit lender discrimination against credit applicants on the basis of race, ethnic origin, gender, or religion. Second, the 1977 CRA addresses geographic discrimination by requiring that depository institutions meet the credit needs of their entire service area. The ECOA and FH Act address discrimination against individuals, while CRA prohibits discrimination against neighborhoods, a practice commonly known as 'redlining'. Additionally, supervisory agencies use data collected under the requirements of the Home Mortgage Disclosure Act (HMDA) to target institutions and products for examination of compliance with the fair lending regulations. Sections 2.1.1 through 2.1.3 provide detail on the regulations and their enforcement, and section 2.1.4 discusses the effectiveness of CRA.

2.1.1 The Fair Housing Act and Equal Credit Opportunity Act ('fair lending' laws)

FH Act was passed by the Congress as part of the Civil Rights Act of 1968. The Act prohibits discrimination in all facets of residential real estate transactions, not just lending, including the following (FFIEC, 1998): 1) Making loans to buy, build, repair or improve a dwelling; 2) purchasing real estate loans; 3) selling, brokering, or appraising residential real estate; and 4) selling or renting a dwelling. The regulation prohibits discrimination on the basis of the following applicant characteristics (FFIEC, 1998): 1) race or color; 2) national origin; 3) religion; 4) gender; 5) familial status; and 6) handicap.

ECOA, passed by the Congress in 1974 as an amendment to the broader Consumer Credit Protection Act of 1968, applies to discrimination in credit transactions.⁴ The Act applies to any extension of credit, including those to small business, corporations, partnerships, and trusts. Regarding credit transactions, it is broader than FH Act in that it applies to virtually all lenders, while FH Act applies only to real estate-related lending. In addition to those areas protected under FH Act, ECOA prohibits discrimination on the basis of: 1) age (provided the applicant has the capacity to contract); 2) the applicant's receipt of income derived from public assistance; and 3) the applicant's exercise of any right under the Consumer Credit Protection Act (FFIEC, 1998).

FH Act and ECOA do not explicitly define what practices are discriminatory. As a result, the various supervisory agencies that enforce the legislation have been responsible

⁴ The ECOA is implemented by the Federal Reserve Board's Regulation B. The regulation describes specific practices that are prohibited, permitted, or required (FFIEC, 1988).

for developing their own standards for identifying discrimination, guided by court decisions (Walter, 1995). In 1994, an interagency task force representing the 10 federal agencies responsible for implementation and enforcement of the fair lending laws was formed to coordinate policy.⁵ The task force issued guidelines regarding what policies and practices constitute violations of FH Act and ECOA. According to the guidelines, a lender may not, because of a prohibited factor (FFIEC, 1998):

- Fail to provide information or services or provide different information or services regarding any aspect of the lending process, including credit availability, application procedures, or lending standards
- Discourage or selectively encourage applicants with respect to inquiries about or applications for credit
- Refuse to extend credit or use different standards in determining whether to extend credit
- Vary the terms of credit offered, including the amount, interest rate, duration, or type of loan
- Use different standards to evaluate collateral
- Treat a borrower differently in servicing a loan or invoking default remedies
- Use different standards for pooling or packaging a loan in the secondary market

⁵ The task force consisted of representatives of The Department of Housing and Urban Development (HUD), The Department of Justice (DOJ), The Office of the Comptroller of the Currency (OCC), The Board of Governors of the Federal Reserve (FRB), The Office of Thrift Supervision (OTS), The Federal Deposit Insurance Corporation (FDIC), The Federal Housing Finance Board (FHFB), The National Credit

- Express, orally or in writing, a preference based on prohibited factors or indicate that it will treat applicants differently on a prohibited basis
- Discriminate because of the characteristics of a person associated with an applicant or prospective occupants of either the property to be financed or the neighborhood or other area where property to be financed is located.⁶

The task force guidelines also instruct compliance examiners on the type of evidence required to establish a violation of the fair lending statutes. The courts have recognized three forms of evidence: 1) overt evidence of discrimination; 2) evidence of ‘disparate treatment’; and 3) evidence of ‘disparate impact’.

Overt evidence is the most apparent and least common of the three forms. This occurs “when a lender blatantly discriminates on a prohibited basis”, or “expresses—but does not act on—a discriminatory preference” (FFIEC, 1998). Disparate treatment, which is subtler and more common than overt discrimination, does not require intent to discriminate. The task force guidelines define disparate treatment as occurring “when a lender treats a credit applicant differently based on one of the prohibited bases. Disparate treatment ranges from overt discrimination to more subtle disparities in treatment. It does not require any showing that the treatment was motivated by prejudice or a conscious intention to discriminate against a person beyond the difference in treatment itself. It is

Union Administration (NCUA), The Federal Trade Commission (FTC), and The Office of Federal Housing Enterprise Oversight (OFHEO).

⁶ This statement addresses concerns regarding ‘redlining’ that are the focus of the CRA, and is indicative of the overlap between the ‘fair lending’ statutes and CRA.

considered by the courts to be intentional discrimination because no credible, nondiscriminatory reason explains the difference in treatment on a prohibited basis” (FFIEC, 1998).

Disparate treatment is most likely to occur among applicants where the credit decision is not clear, and there may be a necessity for compensating factors to overcome some adverse information in the applicant’s credit history. In these cases, there are two ways in which disparate treatment occurs most often (FFIEC, 1998). First, lenders exercise discretion in deciding to ‘override’ a denial based on compensating factors. Second, the ability of marginal applicants to qualify for a loan may depend on the level of assistance provided by the lender in filling out the credit application, the degree to which they encourage the applicant to continue with the application process, and their effort in searching for compensating factors. While lenders are not obligated to provide such assistance, to the extent they do, they must not treat applicants differently on a prohibited basis (FFIEC, 1998).

Disparate impact discrimination occurs “when a lender applies a racially or otherwise neutral policy practice equally to all credit applicants, but the policy or practice has a disproportionate adverse impact on applicants from a group protected against discrimination” (FFIEC, 1998). The fact that a policy results in a disparity on a prohibited basis does not in itself constitute disparate impact discrimination. Rather, examiners seek to determine whether the policy or practice is justified by ‘business necessity’. Considerations such as cost and profitability may provide such justification. However,

even where these are relevant, the policy or practice may still be considered a violation if an alternative could provide the same results with less discriminatory effect. Furthermore, the adoption of the policy or practice need not reflect discriminatory intent in order to be a violation of the FH Act or the ECOA (FFIEC, 1998). An example of disparate impact discrimination is the establishment of a minimum loan amount that disproportionately excludes minority applicants due to their income levels or the values of properties in the neighborhoods in which minority populations are concentrated.

2.1.2 The Community Reinvestment Act

CRA Background. This study uses each institution's rating under CRA as a proxy for regulatory influence on changes in racial disparities.⁷ The primary impetus for passage of CRA was concern by community groups that banks and thrifts were failing to adequately meet the financial services needs of low and moderate-income neighborhoods (GAO, 1995). This result was viewed as having an especially adverse effect on minority groups and low-income communities, especially in the inner city. In particular, community groups argued that financial institutions accepting deposits from these markets did not adequately reinvest those deposits in the local community (Evanoff and Segal, 1996). Although ECOA and FH Act already prohibited discrimination in mortgage lending, CRA extended the scope of prohibited service discrimination to include that against neighborhoods.

⁷ The requirements of CRA are contained in Regulation BB of the Code of Federal Regulations.

The CRA legislation as initially drafted reflected the argument that banks, as government-chartered institutions with access to deposit insurance provided by the government, have a role in achieving the government's social objectives. This language included a requirement that banks satisfy credit demands in the local market from which deposits are gathered, prior to *exporting* these funds to other markets (Evanoff and Segal, 1996). Opponents of CRA expressed concern that the Act's passage would result in an uneconomic allocation of credit to 'targeted' neighborhoods, potentially threatening the safety and soundness of the banking system. The result would be a disruption in the normal flow of credit as dictated by market forces, such as the demand for loans and profit potential in different geographic areas (Garwood and Smith, 1993). Supporters of the Act countered that its purpose was to ensure that profitable loans in low and moderate-income neighborhoods were not overlooked. Safety and soundness would continue to be the primary factor considered in applications for new branches and acquisition activity (Garwood and Smith, 1993).

Another criticism of CRA was that it was largely redundant given the protections afforded by other banking laws. For example, banking legislation that preceded CRA already required that banks meet the needs of the communities in which they are chartered. The Banking Act of 1935 required banks to serve the 'convenience and needs' of their communities (GAO, 1995). The Bank Holding Company Act of 1956 requires the Federal Reserve Board of Governors (FRB) to evaluate how well a bank serves these needs when acting on acquisitions by banks and bank holding companies, within the limits of safety

and soundness (GAO, 1995). As discussed earlier, the fair lending laws addressed concerns regarding the flow of credit to protected groups based on prohibited factors, while HMDA facilitated collection of the data necessary to identify redlining. Evanoff and Segal (1996) argue that CRA is distinguished from the previous legislation by its emphasis on the asset side of the balance sheet (credit generation) rather than the liability side (deposit gathering), and the requirements it placed directly on regulatory agencies to monitor credit flows and to *encourage* reinvestment in local communities.

CRA was passed on October 12, 1977 as Title VIII of the Housing and Community Development Act of 1977. The regulation applies to all depository institutions. The four federal agencies that have primary supervisory responsibilities for depository institutions are charged with ensuring compliance with the regulation: 1) FRB; 2) the Office of the Comptroller of the Currency (OCC); 3) the Federal Deposit Insurance Corporation (FDIC); and 4) the Office of Thrift Supervision (OTS)⁸. The final language of the Act excluded any specific credit allocation criteria. Instead, the regulation requires each of the regulatory agencies to use its authority to 'encourage' the institutions they supervise to help 'meet the convenience and needs' of the local communities in which they are chartered, consistent with 'safe and sound business practice'. Assessment of performance under CRA includes the institution's performance in serving the needs of low and moderate-income neighborhoods.⁹ The regulation requires that this performance be

⁸ Although the regulations were developed on an interagency basis, each of the supervisory agencies has its own set of regulations (GAO, 1995).

⁹ The CRA addresses all credit needs of the community, not just mortgage-related needs.

considered in an institution's application for a charter, merger, acquisition, branch closing or addition, office relocation, or deposit insurance (GAO, 1995).

HMDA augments CRA. As mentioned earlier, data collected as part of reporting requirements under the HMDA assists regulators in assessing compliance with CRA. HMDA, which Congress passed in 1975, requires that depository institutions collect and disclose data on the number and dollar amount of home mortgage and home improvement loans by census tract within their respective MSAs. The HMDA data are released annually, and trends in the data are examined closely by community groups and by the press.

In 1989, Congress amended HMDA to improve regulators' ability to detect potential discrimination. HMDA now covers all commercial banks, savings and loan associations, credit unions, and nearly all other mortgage lending institutions with assets of more than \$29 million.¹⁰ The 1989 amendment to the Act requires these institutions to report data on every loan application individually. The data include the lender's decision to accept or deny the loan, the proposed loan amount, the property's census tract, whether the property is owner occupied, loan purpose (i.e. home purchase, home improvement, refinancing, or multi-family), loan type (i.e. conventional versus government insured), application income, and the applicant's and co-applicant's race and gender. The more detailed reporting requirements of the amended HMDA have enhanced the ability of

¹⁰ The 1989 amendments required those institutions with greater than \$10 million in assets to report under HMDA. The new asset size threshold was implemented in 1997, and is now revised in November of each year in accordance with changes in the Consumer Price Index.

supervisory agencies to use statistical techniques to systematically screen lending institutions for discriminatory practices.

Original Requirements of CRA. CRA mandates that lending institutions comply with a set of technical requirements that are primarily procedural. A detailed list of these requirements is provided on Table A1 in the Appendix A. They include the adoption of a CRA statement by each institution's board of directors, delineating a map of the institution's service area and the types of credit it intends to provide; the posting of a notice of consumer rights under CRA; and maintenance of a file containing the institution's most recent CRA performance evaluation and any written comments from the public received in the last two years.

While evaluation of compliance with these technical requirements is relatively straightforward, a major criticism of CRA has been the lack of specific performance criteria in assessing the requirement that institutions serve the 'convenience and needs' of local communities (Garwood and Smith, 1993). This ambiguity required the supervisory institutions to adopt their own joint framework for evaluating CRA performance. During 1978 the supervisory agencies held hearings to allow for public comment on how the legislation should be implemented. Consumer groups for the most part favored specific rules, including the application of loan-to-deposit ratios in evaluating performance. Industry groups, on the other hand, favored more flexible requirements, citing concerns about credit allocation and safety and soundness issues (Garwood and Smith, 1993).

Following the hearings, the agencies developed 12 assessment factors grouped under five performance categories (GAO, 1995). Table A2 lists the assessment factors used in the examinations. The five performance categories were: 1) ascertainment of community credit needs; 2) marketing and types of credit offered and extended; 3) geographic distribution and record of opening and closing offices; 4) discrimination and other illegal credit practices; and 5) community development. Examiners assigned one of four ratings to each factor: 1) 'outstanding'; 2) 'satisfactory'; 3) 'needs improvement'; or 4) 'substantial non-compliance'. The regulatory guidelines stressed flexibility in assessing compliance with the factors, since credit needs vary across communities, and institutions may meet these needs in a variety of ways. To ensure flexibility, the guidelines did not apply any specific weighting scheme to the various assessment factors in arriving at a composite rating (GAO, 1995). In December 1979, the FRB issued a policy statement, subsequently adopted by the Federal Financial Institutions Examination Council (FFIEC), that reinforced the desire for flexible implementation. Some of the principal points of the policy statement are as follows (Garwood and Smith, 1993):

- CRA does not impose credit allocation
- Disparities in loan-to-deposit ratios are not, on their face, evidence of poor CRA performance
- A lack of applications is not an adequate explanation for a lack of lending in a particular neighborhood

- Commitments for future action are not part of CRA record, but may receive weight as an indicator of potential improvement
- Communication between applicants and protesting parties is encouraged, but the supervisory agencies will not approve or enforce any agreements

In general, an institution could expect to be criticized under CRA if its loan applications and approvals were geographically concentrated in high-income areas while low-income neighborhoods in its service area were under-represented (Garwood and Smith, 1993).

Revisions to CRA. During 1989, important revisions were made to the legislation surrounding fair lending. First, the Financial Institutions Reform, Recovery and Enforcement Act of 1989 (FIRREA) amended CRA to require that examiner assessments of CRA compliance be released to the public. Second, as mentioned earlier, a 1989 amendment to the HMDA required the addition of information on individual applicant race, gender, and income in the reporting requirements. Importantly, the amendment required public release of the HMDA data for the first time.

The large disparities in originations and denial rates across racial groups and neighborhoods apparent in the HMDA data were widely publicized, and set the stage for increased public debate regarding the effectiveness of CRA during the early 1990s. The Congress initially responded by seeking to improve the support of low- and moderate-income housing initiatives by government-sponsored secondary market purchasers of mortgage loans (Evanoff and Segal, 1996). In 1991, Congress passed the Federal Housing Enterprises Financial Safety and Soundness Act that established specific

mortgage purchasing goals for the Federal National Mortgage Association (FNMA) and the Federal Home Loan Mortgage Corporation (Freddie Mac) related to low- and moderate-income housing.

Mounting criticism of CRA by both industry and community groups led to a reform initiative announced by the President in July, 1993. The reforms were aimed at addressing the industry's concern that CRA documentation requirements were overly burdensome and performance assessment guidelines were vague, while improving enforcement and providing more effective penalties for non-compliance (GAO, 1995). In May 1995, after much public debate over the proposed revisions, the FRB, OCC, FDIC, and OTS released the revised CRA regulations. The revisions placed greater emphasis on performance and less on effort and documentation (Garwood and Smith, 1993). The 12 assessment factors were replaced by three performance tests: *lending*, *investment*, and *service*.¹¹ For each test the examiner assigns one of five ratings, ranging from 'outstanding' to 'substantial non-compliance'. The scores from each test are weighted in arriving at one of the four possible composite ratings. Table A3 contains the scores assigned to the ratings under each of the tests, as well as the composite scoring system. Table A4 provides data on CRA ratings by regulator from 1991-1997. The data reveal that the vast majority of banks receive ratings of satisfactory or better, with the fraction of

¹¹ The new guidelines were implemented in July of 1997 for small institutions and July of 1998 for large institutions. Small institutions are defined as independent retail institutions with total assets of less than \$250 million and holding company affiliates with total assets of less than \$1 billion. The regulation includes a streamlined examination for small institutions (GAO, 1995).

banks in the two lowest rating categories declining to less than 2% after 1994. This relative lack of variation in ratings has been an additional source of criticism of CRA.

The lending test evaluates an institution's performance in meeting the credit needs of its local community. It considers the number, amount, and distribution of loans across income groups and geographic areas for home mortgages, small business, and small farm loans.¹² The volume of an institution's community development loans is also considered. The lending test is weighted more heavily than investment and service in computing the composite score. An institution must receive a rating of at least 'low satisfactory' in order to score 'satisfactory' or better on the composite rating (GAO, 1995). This emphasis on lending is consistent with the goal of developing a more performance-based evaluation, reducing the importance of process and documentation.

The investment test evaluates an institution's record in making community development investments. Four factors are considered: 1) the dollar amount of qualified investments;¹³ 2) their innovativeness or complexity; 3) their responsiveness to the economic development needs of the community; and 4) the degree to which the investments are not routinely available from private investors (Thomas, 1998).

The service test evaluates an institution's systems for delivering retail financial services throughout its service area. The test is divided into retail banking services and

¹² The test also includes consumer loans at the institution's option, or if the regulator determines that consumer lending is a substantial portion of the institution's business (GAO, 1995).

¹³ Qualified investments are defined by the regulators as investments, grants, or deposits that have the primary purpose of community development (Thomas, 1988). Examples include keeping deposits in

community development services (Thomas, 1988). The retail services test includes four performance criteria: 1) the geographic distribution of the institution's branch network; 2) the record of opening and closing branches; 3) the availability of alternative delivery mechanisms, such as banking by telephone, computer, Automated Teller Machines (ATMs), and mail;¹⁴ and 4) the range of available services, including non-credit services, and the degree to which services are designed to meet the needs of consumers at various income levels¹⁵ (GAO, 1995). The community development portion of the test includes the provision of community development services and their responsiveness and innovativeness. The most important performance factor, however, is the geographic distribution of the institution's full-service branch locations.

At the request of the House Banking Committee, the General Accounting Office (GAO) conducted a review of the revised guidelines during 1995. The GAO conducted interviews with industry representatives, community groups, and regulatory officials and identified the following issues as ongoing concerns regarding the revised regulations:

- Inconsistency in applying standards resulting in part from examiners having considerable discretion in interpreting standards
- Continued uncertainty regarding assessment of performance criteria

minority-owned institutions in the inner city, making donations to low-income housing initiatives, or purchasing bonds and mortgages used to finance low- and moderate-income housing.

¹⁴ Alternative delivery mechanisms, such as ATMs, are considered only to the extent they are effective alternatives in meeting the needs of low- and moderate-income consumers (GAO, 1995).

¹⁵ Examples of tailoring services to meet the needs of low-income consumers might include offering low-balance checking accounts or extended lobby hours.

- Omission of proposals to strengthen CRA enforcement beyond denials of expansion applications
- Increased data collection and reporting requirements for large institutions, while exempting small institutions from additional data requirements

2.1.3 Enforcement of the Fair Lending Laws and CRA

The fair lending laws and CRA are enforced in three ways. First, the federal supervisory agencies may take action in response to complaints about institutions. Second, consumers or the Department of Justice may bring a civil court action against an institution. Third, the supervisory agencies may take remedial or punitive action against an institution as a result of violations discovered in a compliance examination.

Compliance Examinations. Enforcement of CRA, FH Act and ECOA rely heavily on the examination process. The supervisory agencies conduct on-site 'consumer compliance' examinations that are modeled after the safety and soundness examinations. Examinations generally take place every eighteen months to two years. Institutions with poor compliance records may be reviewed more frequently. Those with the lowest CRA rating—'substantial non-compliance'—are often examined every six months, with performance tracked quarterly (Garwood and Smith, 1993).

Examiners look for evidence of overt, disparate treatment and disparate impact discrimination in underwriting, pricing or marketing based on a prohibited factor, as well as evidence that lenders 'steer' prohibited basis applicants to inferior loan products. Table

A5 lists the 'risk factors' investigated by examiners for each of these categories.

Regarding disparate treatment in *underwriting*, large disparities in denial rates for applicants of different race within income categories warrant further investigation. Other indicators are disparities in application processing times, a higher proportion of withdrawn or incomplete applications, subjective underwriting criteria, and lack of clear documentation and guidance in making exceptions to underwriting criteria (FFIEC, 1998).

Since the early 1990s, statistical tests have been commonly employed in examining the underwriting practices of large institutions (Walter, 1995). The tests use multiple regression techniques to investigate the correlation between the frequency of denials and minority status, holding constant other factors in the application. Typically, this consists of a logistic regression where the independent variable is a binary variable indicating whether the application was accepted or rejected. Only one in ten institutions generates enough applicants in both non-minority and minority categories to allow for valid statistical testing (Walter, 1995). Since lending volume is concentrated in the largest institutions, however, a large portion of mortgage loans is subject to the techniques (Walter, 1995).

For those institutions where sample size is too small to justify statistical tests, less formal tests are employed. These tests are also used at large institutions to further investigate exceptions identified by the statistical techniques. Examiners form a sample of accepted and rejected applicants, focusing primarily on *marginal* approved and denied applications. Detailed information from the credit file is used to identify cases where

applicants from the prohibited basis group and those from a control group are similarly qualified but have different credit outcomes. The examiner documents the extent to which applicants in the prohibited basis group received different assistance in the application process, and whether waivers of credit policy were applied unevenly to the two groups. Where potentially discriminatory outcomes are identified, a more intensive examination is conducted, and underwriters are given an opportunity to explain the reasons for the outcomes.

Disparities among interest rates, fees or points charged to applicants who differ on a prohibited basis characteristic are a potential indicator of discrimination in the *pricing* of loans. Others include any relationship between loan pricing and compensation of loan officers, and the presence of broad discretion in pricing. Examiners form samples of loans for the prohibited basis group and a control group that closed on the same dates. They also control for whether loans were sold or held in portfolio, since this will influence pricing. The examiner seeks to identify loans where the control group applicant receives favorable pricing despite their having negative creditworthiness factors that are equal to or worse than the prohibited basis group applicant.

Discrimination in lending can occur before the decision to accept or reject the loan. *Steering* violations involve a decision by a lending institution's personnel to guide an applicant's choice between loan product types that differ in their quality. Institutions that offer government-insured loans as well as conventional loans are investigated for potential steering of prohibited basis applicants to the government-insured product, since

government-insured loans are generally more expensive than conventional loans. Institutions that have a 'sub-prime' mortgage subsidiary are evaluated for potential steering of applicants to the subsidiary. Sub-prime loans are usually reserved for customers that have one or more serious derogatory factors in their credit record, and are significantly more expensive than 'prime' loans. A significant difference in the percentage of prohibited basis applicants applying for government-insured or sub-prime loans as compared to a control group is considered an indicator of potential discrimination. The process for recommending loan types and referring applicants to subsidiaries is also considered (see Table A5).

Another form of discrimination that affects the volume of loans from protected classes involves the marketing of loan products to the consumer. Examiners compare the racial and gender makeup of the institution's application pool to that of its market area. Significant differences for a prohibited basis group may indicate that the lender discourages applications from this group by 'prescreening' applicants. The institution's choice of media and geographic distribution of marketing programs and mailing lists are also considered. A lender may also be in violation if it solicits business from realtors, brokers, home improvement contractors, and other agents that it knows would serve only one racial or ethnic group in the market.

The 'redlining' portion of a compliance examination attempts to identify whether portions of the lender's market area that are populated predominantly by low-income residents and members of racial or national origin minority groups are under-represented

in its loan applications, approvals, and marketing efforts.¹⁶ Differences by geography in marketing, appraisal practices, application processing, pricing, evaluation of collateral, and the geographic distribution of branches are also considered. The examination can be adapted to include access to credit for areas of geographic concentration on prohibited bases other than minority or income status, such as age.

Investigation of redlining issues requires the examiner to determine the appropriate market area for evaluation. As discussed previously, CRA requires an institution to define its CRA assessment area. However, in some cases this definition may be too limited. The FFIEC fair lending examination guidelines state that access to credit should be compared in areas where the lender actually marketed and provided credit, and where it could 'reasonably be expected' to have marketed and provided credit. Some portion of this area might extend beyond the CRA assessment area. After the market area is defined, the examiner must delineate those areas within the market that are predominantly minority or non-minority in composition. The process for comparing outcomes is similar to that used in the underwriting analysis, except that applicants are placed in prohibited basis and control groups based on characteristics of the neighborhoods from which they are drawn.

Denial of Expansion Applications. The primary enforcement mechanism of CRA is the denial of an application to undertake expansion of a depository institution. While CRA performance is not the only factor to be considered in approving an application, it

¹⁶ The practice of redlining is a violation of the FH Act and ECOA in addition to the CRA. The CRA examination is a major component of an institution's compliance examination. In some instances, such as

may play a major role (GAO, 1995). Supervisory agencies have come under criticism by community groups and some members of Congress for the relatively small number of applications denied due to CRA issues (GAO, 1995). Table A6 lists the number of applications and denials by regulator from 1989-1996. The supervisory agencies have defended their record of denying few applications by stating that they consider such action to be a last resort (GAO, 1995). The FRB and FDIC have approved applications conditional on commitments for increased investment or lending efforts in low-income neighborhoods. However, the guidelines require that such commitments can only be used to remedy specific problems in an otherwise satisfactory record. The FDIC and OTS have typically granted only conditional approvals based on commitments, where the transaction cannot be consummated until the commitments are realized (GAO, 1995). Table A7 shows the number of applications approved with commitments by regulator from 1989 to 1996.

To provide incentives for institutions to comply with the provisions of CRA, the regulation allows community groups and competing institutions, in addition to the regulatory agencies, to participate in the approval process for proposed branch expansion, merger, acquisition, or deposit insurance. CRA protests of expansion applications are potentially very costly in that they generate negative publicity and may require the expenditure of significant resources in formulating a response, including the commitment

when an application for a depository facility is pending, a CRA examination is performed independently from the examination of compliance with the other regulations.

of financial resources to address community needs. Moreover, protests can disrupt the market timing of strategic initiatives, such as merger plans, resulting in costly delays.

Protests by community groups frequently result in financial commitments from institutions in exchange for withdrawal of a challenge. The industry has expressed concern that protests, and the associated negative publicity and threat of public hearings, are often used to force lenders to make such commitments (GAO, 1995). Table A8 lists the number of protests and associated denials of applications between 1989 and 1996. In order to expedite the application process, supervisory agencies frequently facilitate meetings between the parties, encouraging them to resolve their differences prior to formal submission of the application (GAO, 1995). The regulators do not, however, sanction or enforce any resulting agreements.

2.1.4 Effectiveness of CRA

If CRA is effective, the result will be an increase in lending to low- and moderate-income neighborhoods. While CRA does not address racial disparities specifically, the concentration of minority populations in these areas implies that these disparities should decline as well. On the other hand, Masulis (1980) argues that the regulation may have the opposite effect since CRA grants lenders latitude in defining their service area. The fair lending laws limit a lender's ability to vary mortgage loan terms across borrowers. Significant variance in terms across borrowers or neighborhoods that differ on a prohibited basis put the lender at risk of increased regulatory scrutiny and punitive action. If

prohibited basis applicants or neighborhoods are characterized by significantly higher risk characteristics, such as higher property depreciation rates or lower applicant credit quality on average, then lending to groups targeted by CRA may be unprofitable. Since lenders are unable to significantly vary loan terms to either reduce the risk or earn higher revenues as compensation for the increased risk, they may attempt to reduce the amount of loans made available to these segments of the applicant population. Masulis argues that in order to accomplish this objective, lenders may strategically locate their offices in a way that avoids inclusion of low and moderate-income neighborhoods in their CRA assessment area, and lending to those neighborhoods will decline as a result.

Empirical tests offer only limited support for the effectiveness of CRA. As discussed earlier, Evanoff and Segal (1996) demonstrate strong loan growth to low and moderate income and minority groups during 1990-1995. The data also indicate a decline in the odds for denial of minority applicants relative to non-minorities. One potential explanation for this increase in lending to groups targeted by CRA is that lending institutions were responding to increased regulatory influence during the period. The authors investigate this hypothesis by comparing trends in denial rate disparities for depository institutions with mortgage companies that report their HMDA data to HUD. It is generally believed that the HUD-regulated lenders are subject to less stringent regulatory oversight than the depository institutions (Evanoff and Segal, 1996). Thus, if observed declines in racial disparities are driven largely by regulatory pressure, the HUD-regulated entities should exhibit less significant declines than the non-HUD group. The

evidence provided in the study, however, does not support this hypothesis. The data reveal similar trends in disparities for both groups, and the authors conclude that the overall trend “may not be the result of increasing regulatory scrutiny” [Evanoff and Segal (1996), p. 38].

Schill and Wachter (1994) take a similar approach to test the effectiveness of CRA in five metropolitan areas using the Boston Fed data set. They test whether lending to low- and moderate- income neighborhoods differs for institutions subject to CRA relative to mortgage companies not covered by the regulation. A significant difference across regulated and non-regulated institutions is found in only one of the five metropolitan areas, suggesting CRA does not consistently effect mortgage lending outcomes.¹⁷

In order to avoid the potential costs associated with a poor CRA rating, one hypothesis suggests institutions might establish minimum thresholds for lending volumes in low-income areas and among minority populations. Evanoff and Segal (1997) develop a model in which institutions strategically respond to fair lending regulation by targeting acceptable year-end racial disparity ratios. One scenario considered is that the institution ‘window dresses’ its performance by adjusting its underwriting criteria in the latter part of the year to compensate for poor year-to-date performance. An alternative approach is that institutions will implement special marketing programs at specific time intervals

¹⁷ Significant differences are found in the Boston MSA only. Other MSAs included in the study are Atlanta, Houston, Los Angeles, and Philadelphia.

during the year in order to enhance the probability of compliance. Either of these scenarios creates the potential for intrayear variation in observed disparities.

The study provides 20 quarters of data on denial rates spanning 1990-1994 that demonstrate substantial intrayear variation, with consistent reductions in denial rates occurring after the first quarter of the year. There is also significant variation in the racial disparity of denials, which show a reduction occurring in the fourth quarter relative to the first three quarters of the year. The empirical results indicate that window dressing occurs for those institutions actively engaged in merger activity, but is not a significant phenomenon for the full sample. Finally, there is evidence that window dressing is more prevalent in the latter part of the study period, consistent with the authors' contention that costs associated with non-compliance increased during the period.

2.2 Discrimination in Mortgage Lending

The fair lending laws and CRA are designed to prevent discrimination in lending markets. There continues to be considerable debate, however, regarding the extent of such discrimination. Empirical research in this area has developed along four lines: 1) application accept/reject studies; 2) default rate studies; 3) institution performance studies; and 4) redlining studies. An overview of the research in each of these classifications is provided in this section.

Approval/Denial Studies. Most empirical studies that employ the HMDA data to test for racial and neighborhood discrimination have concluded that economic differences

account for observed disparities in denial rates.¹⁸ The HMDA data, however, provide only limited information applicable to the credit decision. Specifically, the data do not include information regarding credit history, personal debt ratios, loan-to-value-ratios, or other information considered important to mortgage underwriters. The most notable of the accept/reject studies was conducted by The Federal Reserve Bank of Boston. The study examines the lending patterns of Boston area mortgage lenders during 1990. The authors use a much more extensive data set than any prior study for racial discrimination, allowing them to control for applicant credit history, personal debt burdens, employment history, and personal wealth, among other factors. The results indicate that after controlling for economic characteristics, black and Hispanic applicants were more likely to be denied mortgage credit than similarly-situated white applicants (Munnell et al., 1992). The study received great attention in the press and heightened concerns regarding the existence of racial discrimination in mortgage markets.¹⁹ Largely as a result of the Boston Fed study, the federal supervisory agencies altered their fair lending examination procedures, and secondary market agencies re-examined the impact of their credit guidelines on mortgage approvals.

¹⁸ Examples of studies using HMDA data and finding either weak or no evidence of racial discrimination in mortgage lending include Black, Schweitzer, and Mandell (1978), Avery and Buynak (1981), Canner, Passmore and Smith (1994), Schill and Wachter (1993), Berkovec, Canner, Gabriel, and Hannan (1994), and Holmes and Horvitz (1994).

¹⁹ Examples of articles in the popular press discussing racial disparities in mortgage lending include "Loan Denial Rate Is Still High for Blacks", The Wall Street Journal, December 21, 1993; "Sniffing Out Unfair Lenders", Business Week, October, 1993; "Under Strong Pressure, Banks Expand Loans For Inner-City Homes", The Wall Street Journal", February 23, 1994.

Subsequent studies have criticized the validity of the results reported in the Boston Fed study. Day and Liebowitz (1993) report that the Boston Fed results are biased as a result of data errors, noting several examples of data that were obviously miscoded. Zandi (1993) reports that the omission of an important credit risk variable in the Munell et al. work is responsible for the race effect found by the Boston Fed.

A comprehensive review of the Boston Fed study was undertaken by Horne (1994). In addition to evaluating the influence of data errors and omitted variables, the author examines the sensitivity of the race effect to model specification, using a subset of the Boston Fed data that consists of the FDIC-supervised institutions. A review of the credit files confirms that serious data errors are present, and that omission of important credits factors potentially bias the results. The findings shed additional light on measurement problems with the Boston Fed study by reporting that in many cases the dependent variable—application outcome—was inaccurately measured. For example, several withdrawn applications were coded as denials. Furthermore, the results challenge the stability of the Boston Fed parameter estimates when errors in variables are corrected and modifications to model specification are made, such as including a binary variable indicating whether the applicant met the lender's underwriting criteria.

A further criticism leveled at these studies is their use of single-equation models to test for discrimination. Rachlis and Yezer (1994) argue that single-equation techniques can only test for the absence of discrimination, since the coefficient on race is biased in favor of finding a discrimination effect. Applicant self-selection of underwriters and

selection of loan terms introduce bias in the single-equation approaches, since these factors are assumed to be exogenous in these models. Yezer, Phillips, and Trost (1994) provide empirical support for this single-equation bias by conducting Monte Carlo simulation on the Boston Fed data.

Browne and Tootell (1995) conduct a follow-up analysis to respond to the criticisms leveled on the initial Boston Fed study. They provide revised model estimates and find that the race effect persists after incorporating changes that address various criticisms of the original model. Separately, Glennon and Stengel (1994) also support the findings of the original Boston Fed study, after adjusting for the various criticisms of the data and methodology.

Default Rate Studies. The default rate studies compare the default experience of minority and majority borrowers on the hypothesis that if minorities are held to a higher credit standard, then default rates should be lower for the minority group. A study by Berkovec et al. (1996) is representative of this line of research. The authors find a higher likelihood of defaults and higher loss rates for black borrowers, after controlling for various characteristics of the loan, borrower, and property. The results suggest lenders are holding black borrowers to a lower credit standard than whites, perhaps as a means of ensuring compliance with regulatory requirements.

Ferguson and Peters (1995) have criticized the use of equal or higher default rates for minorities as evidence that minorities are not victims of discriminatory treatment. They argue this conclusion ignores differences in the distributions of credit quality for the

minority and majority applicants. The fact that the average credit quality of minority applicants is lower than that of majority applicants implies that for any credit standard, the average credit quality of minority borrowers (approved applicants) lies below that of majority borrowers. Thus, while default rates for the applicants at the margin (those who just meet the credit standard) should be equal, average minority default rates can exceed majority default rates even when minorities are discriminated against. The analysis also has implications for using denial rates as evidence of discrimination. The differences in average credit quality will result in higher denial rates for minorities, even when no discrimination occurs.

Ferguson and Peters summarize their results using the two-by-two matrix in Figure 1, which characterizes denial rate and default rate possibilities. The first row represents the common finding with respect to denial rates, that is, minority denials (Denial_m) exceed majority denials (Denial_w). The lower average credit quality of minority borrowers leads to the conclusion in the upper left cell of the matrix, where the denial rate and default rate are both lower for the majority group. In this scenario, the respective credit standards for minority and majority borrowers can have any relationship with each other if they are relatively close in magnitude, and still generate higher denial and default rates for minorities. Thus, no conclusion can be drawn regarding discrimination. In the upper right cell, we can conclude that minorities are discriminated against because they generate default rates that are less than *or equal to* the majority group, despite minority borrowers' having lower than average credit quality.

	Default_w < Default_m	Default_w ≥ Default_m
Denial_w < Denial_m	No inference can be drawn	Minorities are discriminated against
Denial_w ≥ Denial_m	The majority is discriminated against	This combination cannot be observed

Figure 1

Denial rate and default rate possibilities matrix

This result would require minority applicants being held to a higher credit standard, and contradicts the common assertion of the default rate literature that equal default rates imply an absence of discrimination.

The result represented by the lower right cell will not be observed, given that minority average credit quality is lower than the majority average. In order for the majority to experience higher default rates, they must be held to a higher credit standard. However, this would result in an even greater disparity in the average creditworthiness of approved majority and minority applicants, resulting in higher default rates for minorities. This result indicates that it is not possible to equate both denial rates and default rates across the two groups when there are differences in average credit quality (Ferguson and Peters, 1995).

Finally, in the lower left cell majority applicants must be held to a higher standard in order for them to experience greater or equal denial rates while defaulting less frequently

than minorities. In summary, lending discrimination may be detected using denial and default rates in the two cases where one group experiences higher denial rates but lower default rates. Furthermore, equal denial and default rates do not imply non-discrimination. Instead, equal default rates are indicative of discrimination against minority applicants while equal denial rates are indicative of discrimination against majority applicants. The only outcome that can be consistent with non-discrimination is the upper left cell. However, discrimination against the majority or minority is also possible in this scenario. This ambiguity leads Ferguson and Peters to argue against using denial rate or default rate outcomes to test for discrimination. Instead, they recommend the tests of bank performance, and cite Becker's (1971) argument that discrimination will be evident where institutions forego profitable opportunities to satisfy a "taste for discrimination."

Performance Studies. The empirical studies of bank performance proceed along two lines. The first measures the profitability of making loans in low-income neighborhoods. If this lending is unprofitable, then CRA will adversely affect the performance of institutions that comply with its requirements. The second area investigates the impact of discrimination on institution performance. Becker's (1971) hypothesis suggests that when some group of lenders chooses to discriminate and forego profitable lending opportunities, others non-discriminatory lenders will enjoy profitable opportunities in the minority community. Under this hypothesis, effective enforcement of CRA should result in improved performance among banks that previously chose to discriminate in the absence of regulatory constraints.

Among the limited number of studies in the first vein of performance-related research, Canner and Passmore (1996) find no evidence of lower profitability for banks concentrating in low-income markets. The findings of other studies are consistent with these results. Beshouri and Glennon (1996) and Malmquist, Phillips-Patrick, and Rossi (1997) find that while low-income lending generates higher operating costs, overall profitability is not adversely affected. Thus, the evidence suggests that CRA does not allocate credit in an uneconomic fashion or adversely affect profitability in the banking industry.

The second line of research has investigated the performance of minority-owned institutions, since these lenders may be less likely to discriminate against minorities. This difference in discriminatory behavior is consistent with the "cultural affinity" hypothesis developed by Calomiris, Kahn, and Longhofer (1994). The authors argue that a lack of familiarity with the culture of minority applicants may cause white loan officers to treat minorities differently. In particular, lenders may be more likely to rely on information that can be acquired at a low cost for minority applicants, such as the basic information in the credit application, since the cost of obtaining additional information is higher due to the cultural differences. Hunter and Walker (1996) provide some empirical support for this hypothesis. Using the Boston Fed data, they find that marginal black and Hispanic

applicants are held to a higher standard on objective information such as credit history and debt obligations.²¹

If disparities in cultural understanding are less prevalent at minority-owned institutions, and if discrimination is practiced by other lending institutions, then the minority-owned institutions should experience lower minority denial rates and greater profitability, *ceterus paribus*. Thus, comparing the profitability of minority-owned institutions affords an opportunity to test Becker's (1971) hypothesis. The empirical results in this area generally do not support these conclusions. A number of studies document lower profitability at minority-owned banks, including Bates and Bradford (1980), Boorman and Kwast (1974), and Brimmer (1971). These findings suggest discrimination is not an economically significant factor in mortgage markets.

Redlining Studies. The fourth group of empirical studies investigates the practice of redlining at financial institutions. These studies attempt to determine whether the supply of funds to a neighborhood is influenced by the racial composition of the neighborhood. Early studies have been criticized for suffering from omitted variables bias (Holmes and Horvitz, 1994). If certain attributes of a neighborhood that are correlated with race are not captured by the explanatory variables, then the influence of these attributes will affect the coefficient on the race variable. For example, a more recent study by Holmes and Horvitz (1994), who examine mortgage flows in Houston, Texas, finds

²¹ The authors employ a logistic regression model to predict the accept/reject decision, and find statistically significant interactions of the credit history and debt obligation variables with the race variable.

that the exclusion of certain risk attributes that proxy for the probability of default and price depreciation results in a finding of redlining. Conversely, when these risk attributes are included, the racial composition of a neighborhood does not influence the allocation of credit. Another frequent criticism of redlining studies is their lack of control for demand-side influences (Holmes and Horvitz, 1994). Holmes and Horvitz attempt to address this by controlling for the scale of the census tracts and the historical mobility of applicants in the tract.²²

The methodological problems inherent in studies of redlining have led some researchers to prefer less formal techniques. For example, Benston and Horský (1992) employ survey data in a study of redlining in several U.S. cities. They survey homebuyers and sellers regarding difficulties they experienced in completing purchase and sale transactions. The survey specifically asks participants whether a lender or real estate agent either stated or implied that the neighborhood in which a property is located might make obtaining a mortgage more difficult. The authors conclude that there is a lack of evidence of discrimination or unmet demand.

In summary, after much empirical research on the topic, debate continues regarding the economic significance of discrimination in mortgage lending markets.

²² In calculating the dependent variable, the authors divide the number of loans made by the number of owner-occupied units in the tract to account for scale. They include three measures of mobility: 1) the percentage of residents who moved in during the previous five year; 2) the change in the percentage of owner-occupied units; 3) the percentage of rental units.

Additional empirical work and continued improvement in empirical techniques and data availability will be required to definitively resolve this debate.

2.3 Factors Affecting Mortgage Applicant Default Risk Estimates

Changes in estimated default probabilities clearly will influence the rate of mortgage approvals. As overall estimates of default probabilities decline, acceptance rates at the lower end of the credit applicant distribution will increase. Since minorities represent a disproportionate percentage of lower-quality applicants, racial disparities in mortgage flows should diminish with improvement in general economic conditions that are correlated with mortgage default and the overall credit quality of mortgage applicants. I hypothesize that changes in economic conditions in the MSAs included in this study contribute to observed changes in racial disparities during the study period.

Quercia and Stegman (1992) provide a comprehensive review of the literature in residential mortgage default, citing 29 empirical studies completed over a 30 year period. The most persistent variable contributing to mortgage default in these studies is the loan-to-value ratio. Avery, Bostic, Calem and Canner (1996) report that for 30-year fixed rate mortgage loans, default on those with a 90% loan-to-value at origination is 230% more likely than on loans with an 80% loan-to-value. Moreover, the default rate for FHA-insured loans with down payments of less than three percent is double that of loans with

10-15% down payments, and five times as high as those with down payments of 25% or more.²³

Mortgage originators, insurers and secondary market underwriters focus heavily on debt burden ratios. The three government sponsored enterprises (GSEs) active in the secondary market for mortgages—the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, and the Government National Mortgage Association—all establish maximum acceptable ratios of applicant debt-to-income. Studies employing the HMDA data, but lacking other applicant information, typically include some combination of applicant income, the loan amount, and the loan-to-income ratio to capture the effect of these requirements.

Holding loan amount constant, higher applicant income should improve the prospects for debt repayment. Similarly, holding income constant, a smaller loan amount places a lower debt service burden on the borrower, reducing the likelihood of default. Quercia and Stegman (1992) report that loan-to-value ratios are inversely correlated with income. The HMDA data lack information on the property's appraised value. The empirical models developed in chapter 4 include both applicant income and loan-to-income to proxy for the effect of loan-to-value ratios on underwriting decisions.

Schill and Wachter (1993) argue that declines in home values in specific geographic areas are correlated due to externalities. Homeowners with lower incomes are

²³ Avery et al. cite "The state of the Private Mortgage Insurance Industry," Special Report, Duff and Phelps Credit Rating Company, December 1995.

unable to invest in home repairs. This pattern reduces property values, leading to lower investment in home repair by neighboring homeowners. Thus, ex-ante forecasts of future changes in home value, and therefore mortgage loan approval rates, are likely to exhibit a positive relation with both applicant income and average income for households in the area in which the applicant resides. Furthermore, homes in neighborhoods with low levels of owner-occupancy and high vacancy rates are more likely to decline in value. Homes occupied by tenants and vacant properties are less likely to be maintained adequately. Vacancy rates may be indicative of a perception that ongoing investment in homes in the area is not economically rational.

The condition of the macro-economy in the MSAs under study is another factor likely to influence lenders' assessment of default probabilities. General improvement in measures such as income and employment should lead to improvements in the overall credit quality of the applicant pool, and should lessen the likelihood of the default "triggering events" discussed by Avery et al. (1996). They emphasize the dual role of such events, concurrent with low equity values, in leading to the borrower's decision to exercise the default option. A triggering event by itself does not cause default, since a borrower with positive equity in the home could sell the home to realize the value of the equity. However, where equity is negative this is not an option, and default is more likely.

Loss of income resulting from unemployment is perhaps the most common such event, and the unemployment rate is included as a proxy for regional income variability in several default studies. Studies by Williams, Beranek, and Kenkel (1974), Campbell and

Dietrich (1983), and Case and Shiller (1996) find significant positive correlations between default probability and regional unemployment rates. Case and Shiller (1996) also find that foreclosure rates are inversely related to lagged changes in state-level per capita personal income. Separately, Evanoff and Segal (1996) find that the growth rate in real gross domestic product has a significant positive relation with the growth rate in mortgage originations in the U.S. during 1970-1995. Not surprisingly, given the important role of the loan-to-value ratio in predicting mortgage default rates, regional changes in real estate prices have a significant influence on default outcomes. Case and Shiller (1996) find that binary variables for quarters in which nominal house prices in a state fell significantly are highly significant in explaining foreclosure rates during 1975-1993.

2.4 Bank-Specific Factors Influencing Portfolio Choice

The financial health of financial institutions in the U.S. has improved significantly since the most recent economic contraction during 1990-1991. As a result, banks may respond to reductions in their financial risk (leverage) by simultaneously increasing their asset risk, as suggested by mean-variance models of portfolio choice. Koehn and Santomero (1980) and Kim and Santomero (1988) argue that regulatory efforts to increase capital levels and thereby reduce bank risk will be unsuccessful if banks respond by increasing asset risk to reach their desired position on the efficient frontier. If institutions lower the acceptable mortgage underwriting standards to increase asset risk, then mortgage lending disparities are likely to decline, since as discussed earlier, data on

the distribution of risk attributes of mortgage applicants demonstrate that minorities represent a disproportionate percentage of the marginal loan applicants.

Several studies offer empirical evidence of bank lending responding to financial condition and performance. For example, Shrieves and Dahl (1992) employ a simultaneous equations framework in which the capital level and level of asset risk, as proxied by a risk-weighted asset measure similar to that used by the regulatory agencies, are treated as endogenous variables. The results show a positive relationship between changes in capital and asset risk, supporting the mean-variance portfolio choice assertion that managers use leverage and asset risk as substitute mechanisms in achieving the desired risk level. Additional evidence is provided by the empirical literature relating to the so-called "credit crunch" of the early 1990s. Numerous studies document a contraction in credit flows, especially to small business, during 1990-1991. This period was characterized by increasing capital requirements and loan losses at commercial banks, resulting in capital deficiencies, combined with an economic contraction. While there is considerable debate regarding the relative contribution of "supply side" and "demand side" factors to the contraction of credit flows, several studies contend that bank's willingness or capacity to lend diminished during the period.²⁴ This evidence of loan growth responding to bank financial condition and performance provides empirical support for the hypothesis that improvements in bank balance sheets and profitability during the 1990s

²⁴ See Syron (1991), Bernanke and Lown (1991), Peek and Rosengren (1993), Hancock and Wilcox, (1992), Furlong (1992), Shrieves and Dahl (1995).

may have encouraged financial institutions to alter their portfolio characteristics by easing credit standards and setting a higher target risk level as the economic expansion progressed.

Black, Collins, and Cyree (1997) investigate the influence of lender-specific risk attributes on mortgage flows. They develop an empirical model that measures the influence of loan loss reserves, charge-offs, core deposits, equity capital, and return on assets on mortgage loan approval probabilities. Separate logistic regressions are performed for 49 White-owned and 32 black-owned institutions using annual data for 1992 and 1993. Overall, the results reported by Black et al. (1997) are consistent with more liberal credit standards being applied at banks that possess strong levels of capital, liquidity and profitability. They reveal that higher levels of capital, including both equity and loan loss reserves, have a significant positive relationship with approval rates. These results are consistent with the theory that financially strong banks may be more aggressive in their asset portfolio decisions. Liquidity is found to have a significant positive relation with approval rates at the black-owned institutions. Profitability as measured by ROA also has a significant and positive relationship at the black-owned lenders. The authors report that the coefficient on charge-offs as a percent of assets, which is positive and significant at the black-owned lenders, has the "wrong sign". However, a positive relationship between *contemporaneous* charge-offs and acceptance rates is not surprising,

since those lending institutions with the most aggressive lending posture will likely experience higher loan losses.

The degree to which banks specialize in mortgage lending may also influence their aggressiveness in underwriting and thereby affect denial rate disparities. Institutions specializing in mortgage lending may realize economies of scale in various facets of the lending process, such as data processing, marketing, and documentation. As a result, lower per-unit costs may lead to higher acceptance rates for lenders specializing in mortgage products. Harrison (1998) provides empirical support for a positive relationship between acceptance rates and mortgages as a percentage of assets, significant at the 1% level. Black, Collins, and Cyree (1997) report that specialization increases mortgage acceptance rates of black applicants. Also, the overall mortgage acceptance rates at 32 black-owned institutions increases with specialization in mortgages, as measured by mortgages as a percent of assets.

Chapter 3

Model of the Mortgage Underwriting Decision and Changes in Denial Frequencies

Ferguson and Peters (1995) develop a model of mortgage underwriting in which lenders ration credit by setting a minimum credit standard that is applied evenly to all credit applicants. They demonstrate that when there are differences in credit quality across racial groups, unequal denial rates are not evidence of discrimination. Rather, equality of denial rates would require discrimination against the high quality group. A similar analysis is used here to examine the effects of shifts in credit quality among groups, and changes in the minimum credit standard on racial disparities in mortgage denial rates.

In the underwriting process, mortgage lenders evaluate a number of factors to arrive at an assessment of applicant credit-worthiness. Credit scoring models are frequently employed as a means to filter a diverse set of variables into a single score for each applicant. The model developed here assumes that lenders base their underwriting decisions on such a composite measure of applicant credit quality, represented by θ . For each applicant, lenders determine θ by observing a vector of applicant-specific characteristics (\underline{A}), as well as a number of variables measuring the quality of the neighborhood in which the subject property is located (\underline{N}). Lenders also consider a number of factors related to general economic conditions in their regional markets when assessing θ . Factors that are highly correlated with the probability of default on mortgage

loans, $(1 - F(\theta))$, will be given the greatest weight in this process. These variables might include home prices, unemployment rates, income growth rates, and personal bankruptcy rates.²⁵ Improvements in these economic factors reduce default probabilities, increasing the estimate of θ for all applicants. The vector of economic conditions considered in estimating θ is denoted \underline{E} . The resulting $\theta(\underline{A}, \underline{N}, \underline{E}) \in [0, 1]$ is the lender's measure of the probability of repayment of the loan. Lenders are assumed to observe θ without error. Moreover, θ is exogenous and its measurement is not influenced by the mortgage application process.

Let the population of mortgage applicants adhere to a normal probability density function (PDF) $f(\theta)$ and cumulative distribution function (CDF) $F(\theta)$. In light of this distribution, each lender establishes a minimum acceptable credit quality θ^* , such that applicants with $\theta < \theta^*$ are denied mortgage credit. Lenders are assumed to condition the underwriting decision on θ only, which is perfectly observed for both groups. Let the loan amount for each loan equal \$1. For simplicity, assume there are only two possible outcomes regarding repayment of the loan: 1) the loan is repaid in full and the lender earns a rate of return on the loan equal to r ; or 2) the borrower defaults and the lender receives no payment or other consideration, such that the lender suffers a loss of the entire \$1 loan amount. Thus, a lender's expected profit on a loan, π , is $E(\pi) = \theta r - (1 - \theta)$,

²⁵ See section 2 for a discussion of the literature on mortgage default behaviors.

where $(1 - \theta)$ is the probability that the borrower defaults on the loan. Assume lenders set θ^* at a level that ensures each loan has a positive expected rate of return. Then the credit standard must satisfy the following inequality: $\theta^* > (1+r)^{-1}$.

In addition to the market rate of return available on mortgage loans, lenders also consider a number of measures of their own financial condition when establishing θ^* , represented by the vector \underline{L} . For example, models of mean-variance portfolio choice suggest lenders treat asset risk and capital risk as substitutes in complying with regulatory limits on the total risk level (Koehn and Santomero, 1980). Thus, lenders may lower θ^* in response to improvements in measures of their financial condition and performance:

$\partial\theta^*/\partial\underline{L} < 0$. Finally, θ^* depends on each lender's unique credit policy and underwriting standards, denoted by \underline{C} : $\partial\theta^*/\partial\underline{C} > 0$. Credit policy changes might include relaxation of underwriting standards in response to regulatory pressure to increase lending to low-income and minority segments of the institution's service area. I assume the credit standard θ^* is set below the point of equal density of the distributions (the point where the distributions cross one another). This assumption is consistent with data that show mean denial rates for both the minority and white mortgage applicant distributions lie well below the means of the respective distributions.²⁶

²⁶ Mean denial rates in this study are roughly 10% for white applicants and 21% for minority applicants.

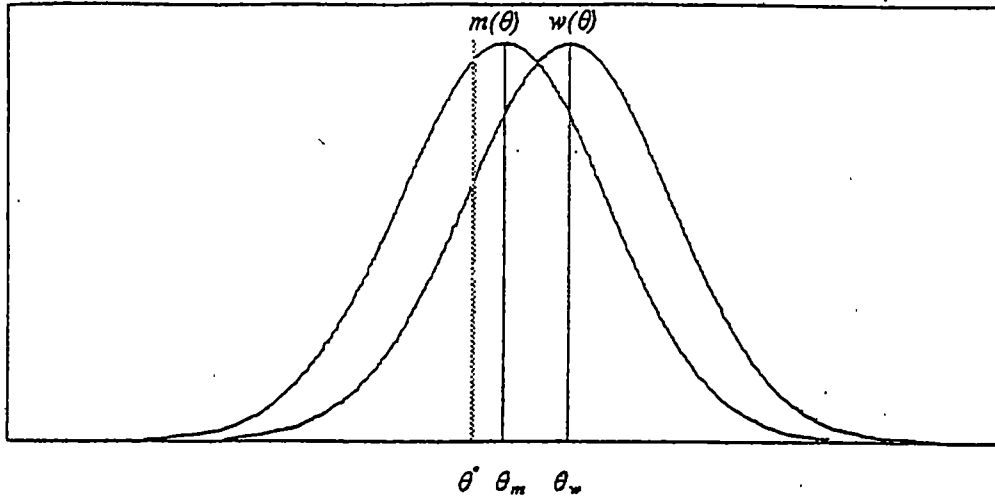
Assume the applicant population can be divided into two segments possessing economically significant differences in average credit quality. This assumption is consistent with the evidence cited earlier regarding observed differences in credit quality and default experience across racial groups. Let the high credit quality group exhibit normal PDF $w(\theta)$ and the low credit quality group have normal PDF $m(\theta)$. Let the CDFs of the two populations be $W(\theta)$ and $M(\theta)$, respectively. As a generalization, and in keeping with the literature and its findings, I will refer to the high credit quality group W as the “white” group and the low credit quality group M as the “minority” group. Assume that $W(\theta)$ exhibits first order stochastic dominance over $M(\theta)$. This dominance implies that the mean quality of applicant-specific and neighborhood-specific characteristics for whites (A_w, N_w) theoretically exceeds that of the minority group (A_m, N_m). I assume that other moments of the respective distributions do not differ significantly.

Given these assumptions, the average credit quality for the white and minority applicant groups is:

$$\theta_w = \int_0^1 \theta w(\theta) d\theta \quad \text{and} \quad \theta_m = \int_0^1 \theta m(\theta) d\theta,$$

where $\theta_w > \theta_m$.

This result is depicted in Figure 2. As the graph suggests, the credit quality of the marginal accepted applicant in each group is equal to θ^* , however, the groups differ in average credit quality by an amount equal to $(\theta_w - \theta_m)$. The equality of the credit quality



When average credit quality for the minority group (θ_m) is below that of the white group (θ_w), and the same credit standard (θ^*) is applied to both groups, the frequency of the minority applicant population denied credit exceeds that of the white applicant population:

$$\int_0^{\theta^*} m(\theta)d(\theta) > \int_0^{\theta^*} w(\theta)d(\theta).$$

FIGURE 2
Denial rate disparity prior to policy shift

of marginal applicants follows from the assumption that lenders base the credit decision on θ only, which is measured without error. Figure 2 demonstrates that the differences in average credit quality result in a higher denial rate for minority applicants relative to white applicants. Thus, the disparity ratio, defined as the frequency of minorities denied credit

relative to the frequency of white denials, exceeds 1.0: $\frac{\int_0^{\theta^*} m(\theta)d(\theta)}{\int_0^{\theta^*} w(\theta)d(\theta)} > 1.0$. As discussed

in the introduction, the raw disparity ratio is often cited as evidence of discrimination in mortgage markets. However, as shown in Figure 2, unequal denial rates do not imply

discrimination when average credit quality of the white applicant group exceeds that of the minority group. Rather, equality of denial rates would necessitate white applicants being held to a higher credit standard than minority applicants, or alternatively, minority applicants being held to a lower credit standard.

Now consider the case in which a lender lowers θ^* to $\theta^{*'}$ in response to improvements in their own financial condition ($\Delta L > 0$) or regulatory influence on credit policy ($\Delta C < 0$). As a result, the frequency of mortgage applicant denials declines:

$$\int_0^{\theta^{*'}} f(\theta)d(\theta) < \int_0^{\theta^*} f(\theta)d(\theta).$$

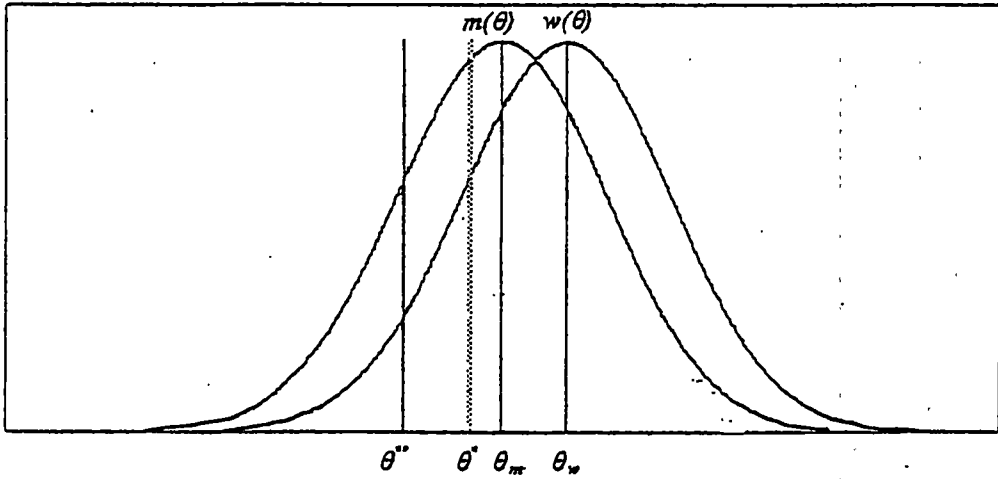
However, assuming the distributions of minority and white applicant groups do not change (lenders draw from the same distributions in each time period),²⁷ the *reduction* in the frequency of applicants denied is greater for the

minority applicant pool than for the white applicant pool: $\int_{\theta^{*'}}^{\theta^*} m(\theta)d(\theta) > \int_{\theta^{*'}}^{\theta^*} w(\theta)d(\theta)$.

This result is illustrated in Figure 3.

An alternate scenario is that the lender does not change the credit standard, but instead, the lender's inferred average credit quality for the two groups changes. This behavior occurs if, for example, improvements in general economic conditions ($\Delta E > 0$) result in lenders lowering their estimate of average default probabilities on mortgage loans.

²⁷ This assumption points out the importance of controlling for changes in the relative demand for mortgage credit for the two groups when performing empirical tests of the model. The empirical models developed later accomplish this by including a measure of minority representation in the applicant pool.



When the credit standard is lowered to θ^{**} from θ^* , the reduction in the frequency of minorities denied credit exceeds the reduction in the percentage of white denials:

$$\int_{\theta^{**}}^{\theta^*} m(\theta)d(\theta) > \int_{\theta^{**}}^{\theta^*} w(\theta)d(\theta).$$

This result also holds in the case where the credit standard is held constant, but both distributions of credit quality improve such that: $\Delta\theta_m \geq \Delta\theta_w$.

FIGURE 3
Denial rate disparity following policy shift

Consider the case in which average credit quality for both groups improves by the same amount: $\Delta\theta_w = \Delta\theta_m > 0$. The result is the same as the case where the credit standard is lowered, with changes in the frequency of minority applicant denials exceeding those of white applicants. Clearly, any relative changes in average credit quality between the white and minority groups, $\Delta\theta_m - \Delta\theta_w$, also will influence relative changes in the frequency of

minority and white applicant denials: $\int_{\theta^{**}}^{\theta^*} m(\theta)d(\theta) - \int_{\theta^{**}}^{\theta^*} w(\theta)d(\theta)$. Specifically, if

average minority credit quality improves relative to average white credit quality ($\Delta\theta_m >$

$\Delta\theta_w$), then the frequency of minority denials will decline at a faster rate than the frequency of white denials, and vice versa.

The hypotheses developed here imply that relative changes in denial frequencies depend on changes in the credit quality of minority and white applicant groups, $\Delta\theta_m$ and $\Delta\theta_w$, as well as changes in factors that influence the credit standard θ^* , including regional economic variables \underline{E} , lender financial characteristics \underline{L} , and lender credit policies \underline{C} .

Let ΔD equal the *change* in the minority denial frequency minus the *change* in the white denial frequency when the credit standard is lowered from θ^* to $\theta^{*'}:$

$$\Delta D = \int_{\theta^{*'}}^{\theta^*} m(\theta)d(\theta) - \int_{\theta^{*'}}^{\theta^*} w(\theta)d(\theta).$$

Then a model of relative changes in denial frequencies can be written as:

$$\Delta D = f(\Delta\theta_m, \Delta\theta_w, \Delta\underline{E}, \Delta\underline{L}, \Delta\underline{C})$$

where $\Delta\theta_m = f(\Delta A_m, \Delta N_m)$ and $\Delta\theta_w = f(\Delta A_w, \Delta N_w)$.

The model suggests four testable hypotheses:

H1: *Improvements in macro-economic conditions and local housing markets lead to a reduction in the racial disparity of mortgage denial rates and an increase in minority representation.*

H2: *Improvements in the financial condition and performance of mortgage lending institutions lead to a reduction in the racial disparity of mortgage denial rates and an increase in minority representation.*

H3: Financial institutions with poor CRA ratings respond to regulatory pressure by targeting reductions in racial disparities in mortgage denial rates and increases in minority representation that are greater than those for institutions with stronger historical CRA performance.

H4: Increasing regulatory enforcement pressure on lending institutions, beginning in 1993, resulted in a regime shift in the racial disparity of mortgage denial rates and minority representation in the mortgage applicant pool, as institutions altered their underwriting standards and marketing efforts to increase lending to minority applicants.

In Chapter 4 empirical models are specified to test these hypotheses. A number of regional economic series (\underline{E}) and institution-specific financial variables (\underline{L}) are included in the analysis. In order to capture the effects of changes in applicant-specific (\underline{A}) and neighborhood-specific variables (\underline{N}), the model also includes the differences in the averages of these characteristics for white and minority groups at the institution-MSA level each period. Variables that proxy for regulatory influence are included to evaluate the effects of any change in regulatory pressure on institution-level credit policy (\underline{C}).

Chapter 4

Empirical Techniques

4.1 Data Sources

This study employs quarterly data on all mortgage loan applications reported pursuant to the requirements of the Home Mortgage Disclosure Act (HMDA) for the 28 quarters during 1991-1997.²⁸ From the universe of applications, I select those originating in the 25 MSAs for which I have data on housing starts from the HAVER database. These MSAs represented approximately 26% of the U.S. mortgage market in 1997. A list of the MSAs included in the study is provided in Table B-1 in Appendix B. Only those applications for conventional home purchase mortgages for one-to-four family, owner-occupied properties generated by commercial banking entities or their mortgage banking affiliates are included in this study. Mortgage product lines must be studied separately due to differences in underwriting standards across loan types. I focus on conventional loans since concerns regarding lending discrimination are greater for this category than for government-insured mortgages, which are generally considered an inferior product choice due to their higher cost.

I match the loan application data to the institution-specific financial data using the regulator-unique institution identifier in the HMDA information. The bank performance data are obtained from the Federal Reserve Bank of Chicago's database of Consolidated

²⁸ Although the HMDA data include information on specific application dates, this data is only made available to the regulatory agencies for privacy reasons. The date information for this study was provided by the OCC, and includes the quarterly period for each application rather than the specific date.

Reports of Condition and Income (Call Reports) filed by all commercial banks. I also collect the periodic CRA rating for every institution in the sample from the FFIEC. As such, the firm-specific explanatory variables include capital to assets, charge-offs to assets, return on assets, mortgage loans to assets, the growth rate in total assets, and the periodic CRA rating. The sample includes an average of 320 commercial banks per year ranging in asset size from \$11.8 million to \$297 billion and operating in 25 different MSAs.

Absent a loan-to-value ratio, data from the 1990 U.S. Census are used to control for the demographic and neighborhood characteristics of the census tract in which the subject property is located. I match the census data to the geocode information reported on each of the applications in the HMDA data. The following census tract data are collected: 1) the median household income; 2) the percent of rental households; 3) the percent of vacant units; 4) the percent of households on public assistance; 5) the percent of female-headed households; and 6) the percent of minority residents in the tract. These variables are consistent with those factors identified by Schill and Wachter (1993) as being important in forming ex-ante forecasts of mortgage default rates.

Finally, the data are matched to MSA and state-level quarterly macro-economic series. I collect quarterly data on state-level gross product and unemployment from the HAVER database to proxy for economic conditions in the state. At the MSA level, I collect the number of new housing starts and the median home sales price for each quarter, also from the HAVER database.

4.2 Empirical Models

The hypotheses developed in Chapter 3 suggest that changes in denial rate disparities and minority representation may respond to discretionary behavior at mortgage lending institutions. For example, regulatory pressure to improve performance under CRA guidelines may result in banks establishing ‘target’ levels for maximum denial rate disparities or minimum minority representation. Observed changes in the economy and bank performance may indirectly affect these targets through their influence on underwriting standards. For example, improvements in economic conditions that lower default loss probabilities may result in a reduction in the underwriting standard and lower disparity rates, *ceteris paribus*. Conditional on the established underwriting standard, observed changes in the relative quality of minority applicants have a direct impact on the level of denial rate disparities.

A partial adjustment framework is employed to model the response of denial rate disparities and minority representation to these factors.²⁹ In this framework, the change in these variables at each lending institution is a fraction of the difference between the lender’s ‘target’ and its observed disparity or representation during the previous period:

$$\Delta D_{i,t} = \beta(D_{i,t}^* - D_{i,t-1}) \quad (1)$$

$$\Delta M_{i,t} = \gamma(M_{i,t}^* - M_{i,t-1}) \quad (2)$$

²⁹ When I discuss a ‘response’ of denial rate disparities or minority representation, I am referring to changes in the ‘targets’ for these variables in the partial adjustment framework.

where $\Delta D_{i,t}$ ($\Delta M_{i,t}$) is the change in the denial rate disparity (minority representation) for lender i during period t , $D_{i,t}^*$ ($M_{i,t}^*$) is the target disparity (minority representation), and $D_{i,t-1}$ ($\Delta M_{i,t-1}$) is the observed disparity (minority representation) in the previous period. The partial adjustment approach recognizes that due to rigidities and costs of adjustment, institutions are unable to completely adjust to the target in the current period. Rather, they respond gradually toward the target, where the coefficients β and γ measure the rate of adjustment. The partial adjustment model has been used in the literature to model changes in bank balance sheets. For example, Shrieves and Dahl (1992) employ the framework to model banks' response to target capital and risk levels.

Consistent with the hypotheses developed in Chapter 3, the target disparity ($D_{i,t}^*$) and target minority representation ($M_{i,t}^*$) are modeled as linear functions of variables in five categories expected to influence underwriting decisions and mortgage demand: 1) concurrent characteristics of the applicant pools, \underline{A} ; 2) concurrent quality of the neighborhoods from which applicants are drawn, \underline{N} ; 3) lagged changes in macro-economic conditions in the MSAs in which the lending institutions operate, \underline{E} ; 4) lagged changes in lending institution condition and performance \underline{L} ; and 5) regulatory pressure on lending institutions that influences credit policy, \underline{C} . The fact that outcomes for both disparities and representation are components of an overall CRA assessment by regulators suggests targets for these variables are jointly determined. As such, the endogenous variables $\Delta D_{i,t}$ and $\Delta M_{i,t}$ are also included as explanatory variables in the opposite's

equation, and the two-equation system is estimated using the two-stage least squares method. Substitution of the variables determining the targets $D_{i,t}^*$ and $M_{i,t}^*$ in equations (1) and (2) results in the ‘disparity model’ and ‘representation model’:

$$\Delta D_{i,t} = a_0 + \beta_1 \Delta M_{i,t} + \beta_2 \Delta A_{i,t} + \beta_3 \Delta N_{i,t} + \beta_4 \Delta E_{i,t-1} + \beta_5 \Delta L_{i,t-1} + \beta_6 \Delta C_{i,t} - \beta_7 D_{i,t-1} + e_{i,t} \quad (3)$$

$$\Delta M_{i,t} = b_0 + \gamma_1 \Delta D_{i,t} + \gamma_2 \Delta A_{i,t} + \gamma_3 \Delta N_{i,t} + \gamma_4 \Delta E_{i,t-1} + \gamma_5 \Delta L_{i,t-1} + \gamma_6 \Delta C_{i,t} - \gamma_7 M_{i,t-1} + e_{i,t} \quad (4)$$

A detailed list of the variables in each category and their definitions is provided below.

The applicant pool variables are measured as the change in the average of minority applicant characteristics minus the average of white applicant characteristics for each bank in an MSA for a specific quarter. I assume that the targets established by lenders respond gradually to changes in their own financial condition and performance. As such, the institution performance variables are specified as the quarterly change in a lagged four-quarter moving average. This specification is consistent with the specification employed by Berger and Udell (1994) in a model for bank portfolio responses to changing risk profiles. The economic variables are specified as lagged one-quarter growth rates in each of the series, consistent with the lagged effect of these series on mortgage defaults (Quercia and Stegman, 1994).

Proxies for regulatory influence include the level of each bank’s CRA rating for the previous quarter. A binary variable for observations in 1993 and later is included to test for a regime shift in regulatory pressure during this period, as evidenced by the two-fold increase in CRA protests. Quarterly binary variables are included to control for seasonal differences in mortgage demand. Each observation is for a bank operating in an

MSA in a single quarter. Thus, banks operating in multiple MSAs are represented by multiple observations in a single period. The observations are weighted by the number of applications used in calculating bank-MSA level means of applicant and census tract attributes, ensuring that banks are represented in proportion to their share of MSA-level mortgage market activity.^{30, 31}

The definitions of the variables are as follows:

Dependent Variables

<u>Symbol</u>	<u>Definition</u>
Δ DISPARITY	The quarterly change in the percentage of minority applicant denials minus the percentage of white applicant denials
Δ MINORITY	The quarterly change in the percentage of total applicants who are black or Hispanic

Explanatory Variables

Applicant pool characteristics

Each variable is the contemporaneous quarterly change in the Bank-MSA level average minority applicant characteristic minus the average white applicant characteristic

Δ LOANINC	The ratio of mortgage loan application amount to applicant income
Δ INCOME	The income of all applicants on the credit request

³⁰ The sample includes only applications drawn from the 25 MSAs listed in Table B1. Thus, non-MSA tracts in these regions are excluded.

³¹ An F-test for equality of the variance of the dependent variables grouped by application volume indicates that observations with application volume below the median have variance that exceeds that of observations with application volume above the median. Weighting the observations by the volume of applications addresses the problem of unequal variance.

Neighborhood Characteristics

Each variable is the contemporaneous quarterly change in the Bank-MSA level average minority applicant neighborhood characteristic minus the average white applicant neighborhood characteristic. Factor analysis is employed to create a factor score representing 'Neighborhood Quality'.

Δ MEDINC	median household income
Δ RENTAL	percent of rental households
Δ VACANT	percent of vacant units
Δ PUBLIC	percent of households on public assistance
Δ FEMHH	percent of female-headed households
Δ MINTRACT	percent minority residents in the tract

Institution-specific variables

Δ CAPITAL	The quarterly change in the ratio of stockholder's equity to total assets
Δ CHARGES	The quarterly change in the ratio of net charge-offs to total assets
Δ ROA	The quarterly change in ratio of net income to total assets
Δ MORTGAGE	The quarterly change in the level of the ratio of mortgage loans on 1-4 family residential properties to total assets
Δ SIZE	The contemporaneous quarterly growth rate in total assets
Δ SOLD	The contemporaneous quarterly change in the percentage of minority applicant mortgage loans sold in the secondary market minus white applicant loans sold
MINOWN	A binary variable equal to one if the bank is minority-owned

Macroeconomic Variables

Δ GSP	Growth rate in gross state product lagged one quarter
Δ UNEMPL	Quarterly change in the state-level unemployment rate
Δ INTEREST	The quarterly change in the average interest rate on 15-year mortgage loans
Δ PRICE	The growth rate in the median sales price of homes in the MSA lagged one quarter
Δ STARTS	The growth rate in the number of housing starts in the MSA lagged one quarter

Regulatory influence variables

CRA	The periodic CRA rating
Y93-97	A binary variable for observations after 1992
FED	A binary variable for institution's for which the Federal Reserve is primary federal regulator (OCC-regulated institutions are the base group)
FDIC	A binary variable for institution's for which the FDIC is primary federal regulator (OCC-regulated institutions are the base group)

Seasonality variables

QUART2	A binary variable equal to one for observations in the second quarter of the year (observations in the first quarter are the base group)
QUART3	A binary variable equal to one for observations in the third quarter of the year (observations in the first quarter are the base group)
QUART4	A binary variable equal to one for observations in the fourth quarter of the year (observations in the first quarter are the base group)

4.3 Discussion of the Explanatory Variables

Applicant pool variables. The Δ LOANINC and Δ INCOME variables are intended to capture changes in the quality of the minority applicant pool relative to changes in the white applicant pool. These variables are measured as the quarterly change in the average of minority applicant characteristics minus the average of white applicant characteristics for each bank-MSA observation for a specific quarter. For example, Δ INCOME is calculated as follows:

$$\Delta\left[\left(\sum_{i=1}^N \text{application income}_i / N\right) - \left(\sum_{j=1}^M \text{application income}_j / M\right)\right]$$

where i =minority applicant, j =white applicant, and the change is calculated for each institution in an MSA.

Δ INCOME proxies for relative improvement in the economic status of the minority pool, and therefore should exhibit a negative relation with Δ DISPARITY. That is, if average minority income increases at a rate that is greater than the rate for whites, Δ INCOME will be positive and the expected denial rate disparity will decline. A positive value for Δ LOANINC indicates deterioration in minority debt service capacity relative to whites, suggesting an increase in minority denials. As such, a positive coefficient is predicted for Δ LOANINC .

Neighborhood variables. The neighborhood variables are measured at the census tract level. The variables are calculated as the contemporaneous quarterly change in the average of the minority (black or Hispanic) applicant tract characteristics minus the

average of the white applicant tract characteristics for each bank-MSA observation. As such, they are intended to capture relative changes in the quality of census tracts from which the applicant pools are drawn. An increase in MEDINC represents an improvement in relative minority neighborhood quality, since drawing minority applicants from higher income tracts reduces the likelihood that these applicants will default. Increases in RENTAL and VACANT indicate deteriorating minority neighborhood quality due to the negative externalities resulting from these attributes (Schill and Wachter, 1993). MINTRACT exhibits a positive relation with default rates (Berkovec et al., 1994), and PUBLIC is negatively correlated with income levels, suggesting lower credit quality in neighborhoods with these attributes. FEMHH is included to control for differences in household income and perceived credit quality of households headed by females.

Factor Analysis. The two-equation system requires estimating parameters for a large number of explanatory variables. Factor analysis is employed to attempt to specify a more parsimonious model. Examination of Table 1 indicates that the variables measuring neighborhood quality exhibit high correlations making this category a good candidate for implementation of the factor analytic technique. The correlations among the economic and financial institution variables are much lower, suggesting a common factor may not exist for these categories.

The results of the factor analysis for the neighborhood quality measures are reported in Table 2. The eigenvalues of the reduced correlation matrix reported in Panel A indicate that one common factor explains nearly all of the variance of the six variables,

Table 1. Correlations for quarterly changes in selected variables during 1991 through 1997.

<i>Applicant and Neighborhood Variables:</i>	Loan-to-Income	Minorities in tract	Female head of household	Median Income	Public assist. Households	Vacant households	Rental households
Income	-0.0536	-0.0852	-0.1058	0.2066	-0.0899	0.0385	-0.0493
Loan-to-income		-0.0116	-0.0138	0.0183	-0.0160	-0.0119	-0.0210
Minorities in tract			0.7934	-0.5130	0.6902	0.1496	0.3655
Female head of household				-0.5399	0.8067	0.1152	0.3844
Median Income					-0.5529	-0.2483	-0.6414
Public assistance households						0.1983	0.4078
Vacant households							0.2930

<i>Economic Variables:</i>	Unempl-Oymnt	House Price	Housing Starts	Interest Rate
Gross state product	-0.2323	0.1311	-0.0237	-0.0637
State unemployment rate		-0.0121	-0.2731	-0.0729
MSA median house price			0.2645	-0.3341
MSA housing starts				-0.1528

<i>Bank Variables:</i>	Charge-Offs	Return on Assets	Mortgage Loans	Total Assets
Equity Capital to assets	0.0353	0.3136	0.1431	-0.1357
Charge-offs to assets		-0.0951	-0.1272	-0.0340
Return on Assets			-0.0225	0.0025
Mortgage loans to assets				0.1027

Table 2. *Factor analysis of six measures of neighborhood quality.*

Panel A: Eigenvalues of the reduced correlation matrix.

Factor	Eigenvalue
One	2.950
Two	0.534
Three	-0.008
Four	-0.053
Five	-0.126
Six	-0.188

Panel B: Correlations between the common factor and the six measures of neighborhood quality.

Variable	Factor Loading
Minorities in tract	0.79
Female head of household	0.85
Median Income	-0.71
Public assistance households	0.82
Vacant households	0.27
Rental households	0.58

while the remaining eigenvalues are well below one. The correlations of each of the variables with the single factor representing neighborhood quality are reported in Panel B of Table 2. The correlations of each of the variables with the single factor are used in calculating a factor score for each observation representing relative changes in 'neighborhood quality' (Δ NEIGHBORHOOD). Factor analysis was also performed on the economic and financial institution variables. However, the low correlations among these variables did not allow for the identification of a common factor for each category. In both instances the eigenvalues of the reduced correlation matrices were well below one.

Quarterly growth rates in the median home sales price (Δ PRICE) and the number of housing starts (Δ STARTS) in the MSAs are included in the model as proxies for mortgage demand. These variables provide a direct measure of the strength of the MSA-level housing markets, and should be positively correlated with expectations for homeowner equity values in the MSA (Case and Shiller, 1996). This suggests negative relations for both variables with respect to Δ DISPARITY due to their dampening effect on default loss estimates. As discussed earlier, home equity values are consistently found to have a significant negative relation with default rates.

Institution-specific variables. The institution-specific variables Δ CAPITAL, Δ CHARGES, and Δ ROA are calculated as quarterly changes in a moving average of the ratios for the previous four quarters, lagged by one quarter. The hypotheses developed in Chapter 3 suggest that improvements in bank balance sheets and profitability during the 1990s may have encouraged financial institutions to alter their portfolio characteristics by

easing credit standards and setting a higher target risk level as the economic expansion progressed. A portfolio adjustment of this type would result in a reduction in racial disparities and an increase in minority representation, since minorities are concentrated at the lower end of the credit spectrum in this data set. Based on the mean-variance portfolio choice models and empirical studies reporting a positive relation between changes in asset risk and capital ratios [(Shrieves and Dahl, 1992), (Black et al., 1997)] a negative association is predicted between Δ CAPITAL and Δ DISPARITY. That is, a reduction in racial disparities is expected if banks alter their portfolios and credit standards to accept more asset risk in response to increasing capital levels.

Similarly, a negative relation is also predicted between Δ ROA and Δ DISPARITY. Improving profitability mitigates concerns about the impact of increased portfolio risk on the viability of the bank's charter. Thus, banks' exhibiting increases in ROA may show a greater propensity to lower credit standards as estimates of default loss decline with general improvement in economic conditions. Black et al. (1997) provide evidence that ROA has a significant positive relation with mortgage loan approval rates. Conversely, increases in lagged loan charge-offs represent deteriorating asset quality, and may encourage lenders to increase the credit standard to reverse this trend. Thus, a positive relation is predicted between Δ CHARGES and Δ DISPARITY.

Based on the potential scale economies and expertise garnered from specialization in mortgage lending [(Harrison, 1998), (Black, et al., 1997)], a negative sign is predicted for Δ MORT. That is, a higher proportion of mortgage loans to total loans (MORT) is

expected to reduce the racial disparity in denial rates. Specialization lowers per-unit costs and negates the information externalities inherent in mortgage lending.³² Δ SIZE, defined as the quarterly growth rate in total assets, is included to control for the potential influence of asset growth on credit underwriting standards. Loans sold in the secondary market must meet the credit standards established in those markets. If these credit standards exceed those for loans held in the institution's portfolio, a negative relation is predicted between Δ SOLD and Δ DISPARITY. On the other hand, if institutions pursuing a more aggressive lending strategy are able to use the secondary market to lay off some portion of the additional risk, a positive relation will result. Finally, MINOWN is a binary variable coded one for institutions that are minority-owned, and zero otherwise. The cultural affinity hypothesis suggests loan officers at minority-owned institutions may have superior ability to evaluate minority loan applicants (Calomiris, Kahn, and Longhofer, 1994), and some studies document differences in applicant pool characteristics at these institutions (Black, Collins, and Cyree, 1997). MINOWN is included to control for the effect of these factors on institution-level underwriting practices.

Regulatory influence variables. The bank CRA ratings are included as a proxy for regulatory pressure. Institutions seeking to improve their CRA performance can attempt to do so by increasing marketing and lending efforts in areas with greater numbers of moderate- and low-income households and minority residents. If CRA is effective in

³² See Avery, Beeson and Sniderman (1997) for a discussion of information externalities in mortgage markets.

disciplining institutions with poor lending records of making loans in these areas, then institutions with poor CRA ratings should experience declines in racial disparities in denial rates and increases in minority representation relative to institutions with stronger historical CRA performance. This suggests the coefficient on CRA will be negative for Δ DISPARITY and positive for Δ MINORITY.³³ Binary variables are included for identification of the primary federal regulator (FDIC and OCC, where the Federal Reserve regulated banks are the base group), since pressure to improve CRA performance may differ across regulators.

The binary variable Y93-97 is included to test for a structural shift in disparities and representation during the study period as a result of increasing regulatory influence. The variable has a value of one for observations occurring after 1992, and is zero otherwise. As discussed in Chapter 2, various measures of CRA enforcement increased substantially during 1993-1994, and regulatory agencies began evaluating proposals for revisions to improve enforcement of the Act during the latter portion of the sample period. Finally, quarterly binary variables are included to account for the observed seasonality in the demand for mortgage credit.

Predictions for coefficients in the minority representation model are opposite those in the disparity model. The hypotheses developed in Chapter 3 suggest the supply of credit to minorities will increase as applicant characteristics, economic conditions and lender

³³ The CRA rating may also be improved by increasing marketing efforts targeted at moderate- and low-income and minority communities. To the extent these efforts result in a reduction in average minority

condition and performance improve. Demand from minority applicants should also increase with a stronger economy and improvements in minority applicant income.

applicant credit quality, disparities may increase. Inclusion of the minority representation variable controls for this effect on racial disparities.

Chapter 5

Empirical Results

5.1 Univariate Statistics

Trends in Denial Rates, Disparities and Minority Representation. The model of mortgage underwriting developed in Chapter 3 suggests that racial disparities respond to changes in the underwriting standard. As such, the trend in changes in racial disparities should be similar to that in total denial rates, which are representative of the credit standard, holding constant the quality of the applicants. Table 3 provides annual means of the total denial rate and the racial disparity in denial rates, as well as the results of difference of means tests for these variables for each year. The data reveal that these series do trend together. Both the overall denial rates and their disparity decline significantly from 1991 to 1994, and then reverse course through 1997. Figure 4 provides a graphical representation of this trend. Minority representation increases during 1993 and 1994, a period during which denial rates were declining for both minority and white applicants. The combined findings are consistent with the strong growth in mortgage originations to minorities during the period as documented by Evanoff and Segal (1996).

Difference of means. The hypothesis that racial disparities are a function of the denial rate relies on there being significant differences in the quality of the minority and white applicant pools. These differences are evident in the data on Table 4, which demonstrate that the white applicant group mean is more favorable than the minority

Table 3. Mean denial rates, racial disparity in denial rates between white and minority applicant groups, and minority applicant representation.

The means are calculated at the institution level with weighting by total applications.

Variable	1991	1992	1993	1994	1995	1996	1997
Minority Denial Rate %	28.7	25.2	19.6	18.4	19.6	21.9	22.5
White Denial Rate %	15.3	12.1	9.8	9.2	10.6	11.4	11.4
Disparity in Denial Rates %	13.4	13.1	9.9	9.2	8.9	10.5	11.0
Annual Change		-0.3	-3.2***	-0.6	-0.3	1.6***	0.5
Aggregate Denial Rate %	17.2	14.0	11.3	10.8	12.2	13.2	13.2
Annual Change		-3.3***	-2.6***	-0.6	1.4**	1.0	0.0
Minority Representation %	15.7	15.0	15.3	18.3	18.3	17.8	16.6
Annual Change		-0.7	0.3	3.0***	0.0	-0.6	-1.1**

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

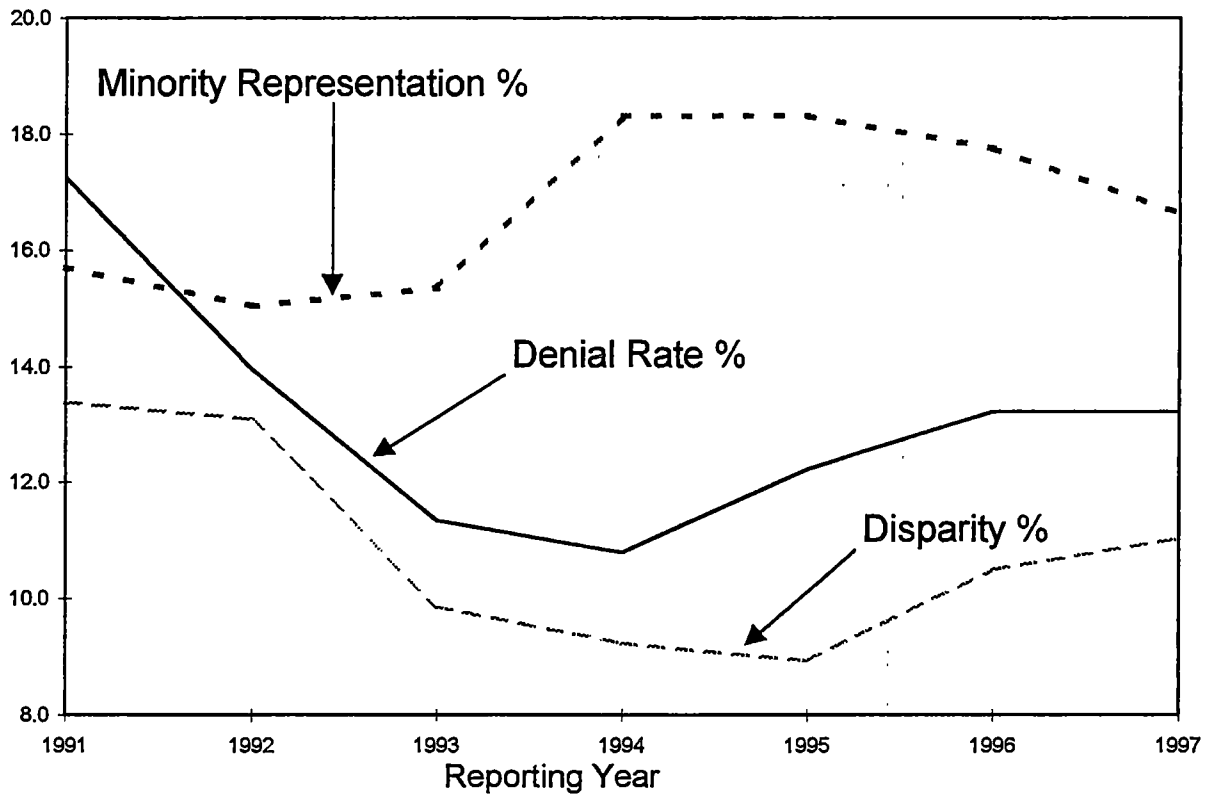


FIGURE 4

Trend in Denial, Disparity, and Minority Representation Rates: 1991-1997

Table 4. Univariate statistics for selected variables by applicant race.

Univariate statistics for selected variables from the population of applicants spanning the entire examination period, 1991 through 1997. Panel A contains information on applicant characteristics, while Panel B contains descriptive profiles of the census tracts from which applicants were drawn.

Panel A
Applicant Characteristics for Minority and White
Primary Applicants

	Means		Difference	Medians	
	Minority	White		Minority	White
Income (000)	62.28	92.15	-29.87***	56.53	81.17
Loan-to-income	2.05	1.91	0.14***	2.06	1.92
Denial rate %	20.53	10.34	10.19***	16.67	7.28

Panel B
Census Tract Characteristics for Minority and White
Primary Applicants

	Means		Difference	Medians	
	Minority	White		Minority	White
Minorities in tract %	33.59	12.65	20.94***	31.76	11.08
Female head of household %	12.74	7.82	4.92***	12.17	7.58
Median Income (\$000)	36.66	44.89	(8.23)***	35.73	44.47
Households on public assistance %	6.80	3.60	3.21***	6.04	3.29
Vacant households %	8.52	8.90	-0.38***	8.10	7.60
Rental households %	36.13	29.94	6.19***	35.02	28.18

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

applicant group mean on every metric of quality. These differences across groups are also statistically significant. The univariate statistics provided in Tables 4 through 6 also lend support to H1 and H2, which suggest that the disparity level responds to changes in the applicant pools, economic conditions and bank performance. The difference of means tests between the subperiods 1991-1992 and 1993-1997 demonstrate significant improvement in measures of variables in all three categories. These findings are consistent with the observed lower total denial rates and disparities in the latter portion of the sample period.

5.2 Disparity Model Results

The results of the 2SLS estimation of the coefficients in the disparity model are reported in Panel A of Table 7, with models numbered A1 through A5. Model 7.A1 includes the applicant characteristics and the quarterly binaries. Models 7.A2 through 7.A5 add the neighborhood, economic, institution variables, and regulatory categories, respectively. This sequential addition of variable categories allows for an F-test of the significance of each of the categories, and for inspection of the effect of collinearity across categories on the parameter estimates. The results of the F-tests of the model restrictions are reported for each model. A significant F-test indicates the additional category added statistically significant explanatory power to the model.

Table 5. Univariate statistics for selected economic and institution variables spanning 1991 through 1997.

	Means	Medians
<i>Economic Variables:</i>		
Gross state product quarterly growth rate %	1.45	1.44
Quarterly change in the state unemployment rate %	-0.06	-0.05
MSA median house price quarterly growth rate %	1.00	1.34
MSA housing starts quarterly growth rate %	8.22	0.01
Change in HUD 30-year mortgage interest rate %	-0.04	-0.04
<i>Institution Variables:</i>		
Equity Capital to assets %	8.08	7.66
Charge-offs to assets %	0.97	0.51
Return on Assets %	2.80	2.66
Mortgage loans to assets %	19.62	16.40
Total Assets (\$million)	8,353	770
Mortgages sold to originations %	31.01	12.55
CRA rating	1.72	2.00

Table 6. Means for applicant, economic and institution variables during the subperiods 1991-1992 and 1993-1997.

	1991-1992	1993-1997	Difference	t-statistic
<i>Applicant Variables:</i>				
Minority Income (%000)	55.77	62.73	6.96	7.51 ***
White Income	89.38	92.34	2.96	2.27 **
Minority Loan-to-income	2.05	2.04	-0.01	-0.07
White Loan-to-income	1.95	1.90	-0.05	-0.71
Minority Denial Rate %	26.35	20.13	-6.22	-11.33 ***
White Denial rate %	12.66	10.01	-2.66	-13.32 ***
<i>Economic Variables:</i>				
Gross state product quarterly growth rate %	0.96	1.48	0.52	18.01 ***
Quarterly change in the state unemployment rate %	0.41	-0.09	-0.50	-25.00 ***
MSA median house price quarterly growth rate %	1.10	1.00	-0.10	-1.13
MSA housing starts quarterly growth rate %	7.10	8.30	1.20	1.15
<i>Institution Variables:</i>				
Equity Capital to assets %	7.32	8.26	0.94	8.67 ***
Charge-offs to assets %	1.90	0.76	-1.14	-16.59 ***
Return on Assets %	2.19	2.95	0.76	8.61 ***
Mortgage loans to assets %	19.03	19.76	0.73	1.62
Total Assets (\$million)	7,030	8,660	1,630	2.28 **
Mortgages sold to originations %	34.42	30.22	-4.20	-3.45 ***
CRA rating	1.83	1.70	-0.13	-7.98 ***

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 7. Results of two-stage least squares estimation of the Disparity equation.

Panel A: The dependent variable is the quarterly change in the percentage of minority applicant denials minus the percentage of white applicant denials (Δ Disparity). Each observation is weighted by the total frequency of applications taken at the Bank-MSA level. Sample size is 10,702 representing quarterly observations on participating banks.

	Model 7.A1	Model 7.A2	Model 7.A3	Model 7.A4	Model 7.A5
Intercept	9.28*** (16.99)	9.24*** (16.92)	9.54*** (15.56)	9.55*** (15.49)	11.56*** (13.13)
DISPARITY _{t-1}	-0.77*** (-83.66)	-0.77*** (-83.40)	-0.77*** (-83.32)	-0.77*** (-83.37)	-0.78*** (-84.21)
Δ MINORITY _t	-0.09 (-1.47)	-0.10 (-1.59)	-0.11* (-1.72)	-0.10* (-1.65)	-0.09 (-1.38)
<i>Applicant Variables:</i>					
Δ INCOME	-0.01*** (-3.56)	-0.01*** (-2.78)	-0.01*** (-2.77)	-0.01*** (-2.72)	-0.01*** (-2.76)
Δ LOANINC	0.05 (0.85)	0.06 (1.02)	0.06 (1.01)	0.07 (1.05)	0.07 (1.11)
<i>Quarterly Binaries:</i>					
QUART2	0.16 (0.46)	0.16 (0.48)	-0.87* (-1.84)	-1.11** (-2.33)	-1.10** (-2.29)
QUART3	0.04 (0.11)	0.06 (0.17)	-0.55 (-1.11)	-0.73 (-1.45)	-0.76 (-1.51)
QUART4	0.36 (0.96)	0.32 (0.85)	-0.38 (-0.78)	-0.54 (-1.11)	-0.52 (-1.08)
Δ NEIGHBORHOOD		-1.28*** (-5.72)	-1.31*** (-5.83)	-1.31*** (-5.83)	-1.27*** (-5.69)
<i>Economic Variables:</i>					
Δ GSP			19.13 (1.56)	18.66 (1.52)	19.32 (1.58)
Δ UNEMPL			0.96*** (3.30)	1.04*** (3.56)	0.96*** (3.19)
Δ PRICE			2.92 (0.53)	2.99 (0.55)	2.51 (0.46)
Δ STARTS			0.61 (1.63)	0.62* (1.66)	0.61 (1.63)
Δ INTEREST			-0.37 (-1.20)	-0.36 (-1.15)	-0.30 (-0.95)
<i>Institution Variables:</i>					
Δ CAPITAL				102.60*** (3.04)	82.81** (2.46)
Δ ROA				-108.75 (-0.73)	-110.52 (-0.74)
Δ CHARGES				170.29 (0.85)	342.17* (1.70)

Table 7. (continued)
Panel A

	Model 7.A1	Model 7.A2	Model 7.A3	Model 7.A4	Model 7.A5
ΔMORTGAGE				-11.59 (-1.38)	-11.73 (-1.40)
ΔSOLD				-0.01** (-2.34)	-0.01** (-2.22)
MINOWN				-0.36 (-1.45)	-0.33 (-1.32)
ΔSIZE				1.59*** (3.44)	1.35*** (2.93)
<i>Regulatory Variables:</i>					
CRA					-0.18 (-0.72)
FDIC					-3.68*** (-9.19)
FED					-1.49*** (-4.91)
Y93-97					-0.77 (-1.50)
F-statistic		32.70***	3.10***	4.01***	24.91***

- * Significant at the 10% level
- ** Significant at the 5% level
- *** Significant at the 1% level

Table 7. Results of two-stage least squares estimation of the Disparity equation.

Panel B: The dependent variable is the quarterly change in the percentage of minority applicant denials minus the percentage of white applicant denials (Δ Disparity). Each observation is weighted by the total frequency of applications taken at the Bank-MSA level. Sample size is 10,702 representing quarterly observations on participating banks in each MSA during 1991-1997.

	Model 7.B1	Model 7.B2	Model 7.B	Model 7.B4
Intercept	11.40*** (12.43)	11.16*** (14.57)	11.40*** (14.45)	11.23*** (14.66)
DISPARITY _{t-1}	-0.76*** (-29.07)	-0.78*** (-83.78)	-0.77*** (-64.08)	-0.77*** (-82.14)
Δ MINORITY _t	-0.09 (-1.49)	-0.09 (-1.37)	-0.09 (-1.45)	-0.09 (-1.36)
<i>Applicant Variables:</i>				
Δ INCOME	-0.01*** (-2.76)	-0.01** (-2.76)	-0.01** (-2.76)	-0.01** (-2.79)
Δ LOANINC	0.07 (1.11)	0.07 (1.11)	0.07 (1.11)	0.07 (1.10)
<i>Quarterly Binaries:</i>				
QUART2	-1.09** (-2.27)	-1.11** (-2.31)	-1.10** (-2.28)	-1.14** (-2.37)
QUART3	-0.75 (-1.50)	-0.75 (-1.51)	-0.75 (-1.51)	-0.77 (-1.53)
QUART4	-0.51 (-1.05)	-0.52 (-1.08)	-0.52 (-1.06)	-0.55 (-1.13)
Δ NEIGHBORHOOD	-1.27*** (-5.70)	-1.27*** (-5.69)	-1.27*** (-5.70)	-1.26*** (-5.66)
<i>Economic Variables:</i>				
Δ GSP	19.46 (1.59)	19.94 (1.63)	19.28 (1.57)	19.21 (1.57)
Δ UNEMPL	0.96*** (3.19)	0.98*** (3.24)	0.95*** (3.17)	0.98*** (3.25)
Δ PRICE	2.53 (0.47)	2.55 (0.47)	2.43 (0.45)	2.64 (0.49)
Δ STARTS	0.61 (1.63)	0.62* (1.65)	0.61 (1.62)	0.61 (1.61)
Δ INTEREST	-0.33 (-1.32)	-0.30 (-0.96)	-0.29 (-0.95)	-0.30 (-0.97)

Table 7. (continued)
Panel B

	Model 7.B1	Model 7.B2	Model 7.B3	Model 7.B4
<i>Institution Variables:</i>				
Δ CAPITAL	82.87** (2.46)	84.79** (2.52)	82.44** (2.45)	83.80** (2.49)
Δ ROA	-111.37 (-0.75)	-117.18 (-0.79)	-111.52 (-0.75)	-113.93 (-0.77)
Δ CHARGES	336.96* (1.68)	328.83 (1.64)	335.77* (1.67)	357.04* (1.78)
Δ MORTGAGE	-11.65 (-1.39)	-11.24 (-1.34)	-12.01 (-1.43)	-11.02 (-1.32)
Δ SOLD	-0.01** (-2.22)	-0.01** (-2.23)	-0.01** (-2.23)	-0.01** (-2.24)
MINOWN	-0.33 (-1.32)	-0.33 (-1.35)	-0.33 (-1.31)	-0.33 (-1.33)
Δ SIZE	1.35*** (2.93)	1.38*** (2.99)	1.33*** (2.89)	1.35*** (2.92)
<i>Regulatory Variables:</i>				
CRA	-0.07 ^a (-0.26)			
CRA Binary		1.97 ^b (1.23)	-0.18 ^c (-0.58)	0.71 ^d (1.13)
DISPARITY _{t-1} * CRA	-0.01 (-0.59)			
DISPARITY _{t-1} * CRA Binary		0.04 (0.59)	-0.02 (-0.96)	-0.12*** (-2.84)
FDIC	-3.69*** (-9.21)	-3.77** (-9.58)	-3.64*** (-9.11)	-3.78*** (-9.62)
FED	-1.50*** (-4.92)	-1.48** (-4.86)	-1.49*** (-4.86)	-1.55*** (-5.08)
Y93-97	-0.78 (-1.51)	-0.68 (-1.33)	-0.83 (-1.61)	-0.66 (-1.31)
F-statistic	19.99***	20.50**	20.38***	20.38***

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

^a CRA Rating equals the ordinal rating, where: 'outstanding'=1; 'satisfactory'=2; 'needs improvement'=3; and 'substantial non-compliance'=4.

^b CRA Binary equals 1 if the rating is less than 'satisfactory', and 0 otherwise.

^c CRA Binary equals 1 if the rating is in the 'satisfactory' category only, and 0 otherwise.

^d CRA Binary equals 1 following a CRA downgrade, until the rating improves, and 0 otherwise.

Inspection of Models 7.A1 through 7.A5 indicates the coefficient estimates are stable as additional variable categories are added to the model. The stability of the parameter estimates indicates there is little multicollinearity among the variables across categories. In the full model, Model 7.A5, which includes all five categories of independent variables, the coefficient on application income is negative and significant at the 1% level. This finding indicates that as mean minority applicant income improves relative to that of white applicants, denial rate disparities decline. The coefficient on the lagged disparity is highly significant, representing a rate of adjustment to the target of roughly 77% in the partial adjustment framework. This result indicates that institutions close 77% of the gap between the target disparity and the prior period disparity in a single quarter.

The factor score measuring neighborhood quality is significant at the 1% level with the expected negative coefficient. This finding indicates that as the quality of the neighborhoods from which minority applicants are drawn improves relative to that of white applicants, disparities diminish. The factor incorporates the combined influence of census tract income, minority population in the tract, the vacancy rate, percent of households that are rentals, headed by females, and on public assistance.³⁴

Economic and bank variables. Among the economic variables, the coefficient on the lagged change in the state-level unemployment rate has the predicted positive sign and is significant at the 1% level. This finding is consistent with H1, which suggests that

³⁴Estimates of the other parameters in the Disparity and Representation models are robust to specifications where each of the neighborhood characteristics is included in lieu of the factor score.

default loss estimates decline as economic conditions improve, leading to lower disparity levels. The decline in default loss probabilities results in improvements in θ for all applicants. As demonstrated in Chapter 3, however, the minority population benefits disproportionately from general improvements in θ due to its over-representation in the lower tail of the credit distribution. While the remaining four economic variables are individually insignificant, the overall effect of the economic variables as measured by the F-test is significant at the 1% level.

The findings for the institution-specific variables indicate that increases in lagged capital levels lead to increases in disparities, significant at the 5% level. This finding contradicts the hypothesis that more aggressive underwriting standards are employed as the capital level improves. The finding for the charge-offs variable, however, is consistent with improvements in historic operating performance leading to lower disparities. The coefficient on this variable is positive and significant at the 10% level. This finding suggests that when the performance of existing loans is deteriorating, more conservative underwriting standards are applied in order to reduce future loan losses, leading to higher disparity levels. The univariate statistics indicate the performance of bank loan portfolios improved significantly after 1992. Mean annual loan charge-offs declined from 2.35% during 1991-1992 to 0.76% during 1993-1997.

The coefficient on the change in minority borrower mortgages sold relative to white borrower mortgages sold has a negative sign, significant at the 5% level. Traditionally, mortgages sold in the secondary market have been required to meet high

standards, resulting in a trade-off in asset quality. These sold loans typically would be of higher quality than those held in the portfolio. However, the recent growth in the use of flexible underwriting standards by secondary market institutions and the deepening of the market for 'sub-prime' mortgages may explain this result.³⁵ The finding also suggests a role for information asymmetry in mortgage sale decisions. If lenders have greater information about the loans they sell than secondary market institutions, then the opportunity to sell riskier loans in the secondary market could lead to more aggressive underwriting as the fraction of loans sold increases. The findings also reveal that institutions experiencing greater asset growth have increasing disparity levels. This finding may reflect increases in information asymmetry as institutions enter new markets, or decreases in applicant quality as institutions market their loan products more heavily. The remaining institution-specific variables are not significant.

The F-statistic indicates that as a group the institution variables are significant at the 1% level. The finding for the charge-offs variable supports H2, however, the positive coefficient on the capital variable contradicts H2.

CRA influence. The results of Model 7.A5 suggest denial rate disparities do not respond to the institution's CRA rating. The t-statistic for this variable is only -0.72. This finding contradicts H3. The coefficient on the binary variable for observations after 1992

³⁵ For example, the Federal Housing Enterprises Financial Safety and Soundness Act of 1992 established specific goals for Fannie Mae and Freddie Mac purchases of loans with underwriting guidelines and terms that do not meet traditional secondary market standards, as well as specific volume goals for purchases of low- and moderate-income loans by these institutions. Both institutions have since announced special

is also insignificant. This finding suggests that any perceived increase in regulatory scrutiny during the 1993-1997 period did not have a significant affect on denial rate disparities, after holding constant the affect of market forces. This result runs contrary to H4.³⁶ On the other hand, both the FDIC and Federal Reserve binaries are significant and negative, indicating declining disparities at institutions for which these agencies are the primary federal regulator, relative to the omitted binary for OCC-regulated institutions. This finding is consistent with the differences in supervisory effectiveness documented by Black, Newman, and Shrieves (1995), who report that FDIC-regulated banks have significantly lower operating costs than Federal Reserve- and OCC-regulated banks, with the OCC-regulated group being the least efficient. Separately, while the F-test for the regulatory variables as a group is significant, this result is attributable to the regulator-specific variables only.³⁷

The effect of CRA on racial disparities is further investigated in Panel B of Table 7. In Model 7.B1 the CRA rating variable is interacted with the lagged disparity variable. A significant and negative interaction term would indicate that institutions with poor CRA ratings respond faster to close the gap between their target disparities and the lagged level of disparity. The coefficient on the interaction term is not significant, however, providing

affordable housing programs under which flexible underwriting standards are employed to support affordable housing initiatives.

³⁶ In a specification where the economic and bank variables are excluded from the model, the regime shift binary variable is negative and significant at the 5% level in the Disparity model. This finding indicates the importance of controlling for market forces when testing for a change in regulatory enforcement pressure.

³⁷ When the regulator-specific variables are excluded from the model, the F-test for the remaining regulatory variables is not significant.

additional evidence that denial rate disparities do not respond directly to CRA ratings. The sign on the CRA rating variable (intercept) remains insignificant in this specification. The combination of these results indicates that neither the target for disparity nor the rate of adjustment to the target is affected by the ordinal CRA rating, and contradicts H3.

In Model 7.B2 a *binary* variable equal to one for those banks in the two CRA rating categories that are less than 'satisfactory' is substituted for the *level* of the CRA rating. This variable is also interacted with the lagged disparity variable to test the rate of adjustment hypothesis. The sign on the binary variable changes to positive and the magnitude is larger, although still not significant. This result reinforces the finding that racial disparities at the lowest rated banks do not respond to CRA ratings in a way that would suggest significant regulatory pressure to reduce these disparities.

It is possible that institutions already rated 'satisfactory' or better have greater incentive to maintain their existing CRA ratings than poorly rated banks have to improve their ratings. For example, this relation may hold if the low-rated institutions are those less likely to engage in expansion activity subject to the institution's CRA record. This hypothesis is tested in Model 7.B3 where the CRA binary variable equals one for those institutions in the satisfactory category only. The negative sign on the binary variable is consistent with the hypothesis, but the variable remains insignificant.

In a final specification I include a binary variable equal to one for observations following a CRA rating downgrade, until such time as the rating improves. There were 66 such downgrades over the sample period. Forty-four of these observations, or two-thirds

of the total, were downgrades from a rating of 'outstanding' to 'satisfactory'. Nineteen were downgrades from 'satisfactory' to 'needs improvement', while only three institutions were downgraded to 'substantial non-compliance'. The results of this specification are reported in Table 7.B4. Once again the binary variable is insignificant. Thus, changes in denial rate disparities for institutions experiencing a CRA rating downgrade do not differ significantly from institutions that either maintain their existing rating or experience an improvement in the rating.

5.3 Minority Representation Model Results

Results from the minority representation model estimation are reported in Panel A of Table 8. Similar to Panel A of Table 7, categories of variables are added sequentially and an F-test of the model restrictions is performed for each variable group. The results reported in Models 8.A1 through 8.A5 again indicate stability of the coefficient estimates as variable categories are added to the model. The coefficient on lagged minority representation indicates an 18% quarterly rate of adjustment toward the target, significant at the 1% level. The variable representing neighborhood quality is negative and significant at the 1% level. The negative coefficient suggests lenders must penetrate lower-quality minority neighborhoods in order to increase the representation of minorities in the applicant pool.

Table 8. Results of two-stage least squares estimation of the Minority Representation equation.
Panel A: The dependent variable is the quarterly change in the percentage of total applicants who are minorities (Δ Minority Representation). Each observation is weighted by the total frequency of applications taken at the Bank-MSA level. Sample size is 10,702 representing quarterly observations on participating banks in each MSA during 1991-1997.

	Model 8.A1	Model 8.A2	Model 8.A3	Model 8.A4	Model 8.A5
Intercept	1.45*** (5.40)	1.44*** (5.38)	1.43*** (4.79)	1.34*** (4.47)	1.08** (2.56)
MINORITY _{t-1}	-0.18*** (-32.98)	-0.18*** (-32.90)	-0.18*** (-32.77)	-0.18*** (-32.82)	-0.18*** (32.78)
Δ DISPARITY _t	0.03*** (5.28)	0.03*** (4.84)	0.03*** (4.95)	0.03*** (5.00)	0.03*** (5.13)
<i>Applicant Variables:</i>					
Δ INCOME	0.01 (0.57)	0.01 (1.31)	0.01 (1.42)	0.01 (1.45)	0.01 (1.46)
Δ LOANINC	0.03 (0.95)	0.03 (1.12)	0.03 (1.10)	0.03 (1.09)	0.03 (1.09)
<i>Quarterly Binaries:</i>					
QUART2	1.00*** (6.26)	1.00*** (6.25)	1.15*** (5.16)	1.20*** (5.34)	1.24*** (5.48)
QUART3	1.33*** (8.17)	1.33*** (8.19)	0.65*** (2.73)	0.70*** (2.91)	0.71*** (2.99)
QUART4	1.45*** (8.40)	1.45*** (8.40)	1.28*** (5.60)	1.30*** (5.65)	1.34*** (5.79)
Δ NEIGHBORHOOD		-0.63*** (-5.93)	-0.62*** (-5.88)	-0.61*** (-5.80)	-0.61*** (-5.75)
<i>Economic Variables:</i>					
Δ GSP			7.67 (1.31)	7.99 (1.36)	9.15 (1.56)
Δ UNEMPL			-0.49*** (-3.51)	-0.44*** (-3.16)	-0.48*** (-3.32)
Δ PRICE			5.67** (2.19)	5.75** (2.22)	5.74** (2.21)
Δ STARTS			0.54*** (3.04)	0.56*** (3.15)	0.56*** (3.12)
Δ INTEREST			-0.21 (-1.42)	-0.20 (-1.36)	-0.17 (-1.15)
<i>Institution Variables:</i>					
Δ CAPITAL				40.13** (2.49)	40.71*** (2.52)
Δ ROA				37.56 (0.53)	33.21 (0.46)
Δ CHARGES				-362.63*** (-3.80)	-374.18*** (-3.89)
Δ MORTGAGE				-0.64 (-0.16)	0.33 (0.08)

Table 8. (continued)

Panel A

	Model 8.A1	Model 8.A2	Model 8.A3	Model 8.A4	Model 8.A5
Δ SOLD				-0.01 (-0.01)	0.01 (0.03)
MINOWN				0.12 (1.04)	0.12 (1.00)
Δ SIZE				-0.09 (-0.40)	-0.05 (-0.23)
<i>Regulatory Variables:</i>					
CRA					0.33*** (2.79)
FDIC					-0.22 (-1.16)
FED					0.01 (0.06)
Y93-97					-0.27 (-1.10)
F-statistic		35.17*	7.92*	3.4	2.54**

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 8. Results of two-stage least squares estimation of the Minority Representation equation. Panel B: The dependent variable is the quarterly change in the percentage of total applicants who are minorities (Δ Minority Representation). Each observation is weighted by the total frequency of applications taken at the Bank-MSA level. Sample size is 10,702 representing quarterly observations on participating banks in each MSA during 1991-1997.

	Model 8.B1	Model 8.B2	Model 8.B3	Model 8.B4
Intercept	0.65 (1.37)	1.63*** (4.41)	1.29*** (3.36)	1.69*** (4.56)
MINORITY _{t-1}	-0.16*** (-13.81)	-0.18*** (-32.48)	-0.18*** (-27.69)	-0.18*** (-32.53)
Δ DISPARITY _t	0.03*** (5.10)	0.03*** (5.13)	0.03*** (5.10)	0.03*** (5.22)
<i>Applicant Variables:</i>				
Δ INCOME	0.01 (1.47)	0.01 (1.46)	0.01 (1.45)	0.01 (1.44)
Δ LOANINC	0.03 (1.10)	0.03 (1.09)	0.03 (1.10)	0.03 (1.09)
<i>Quarterly Binaries:</i>				
QUART2	1.25*** (5.51)	1.25*** (5.51)	1.25*** (5.50)	1.23*** (5.39)
QUART3	0.72*** (3.02)	0.71** (2.95)	0.72** (3.01)	0.68** (2.83)
QUART4	1.35*** (5.83)	1.33*** (5.78)	1.34*** (5.83)	1.31*** (5.69)
Δ NEIGHBORHOOD	-0.61*** (-5.70)	-0.61*** (-5.78)	-0.61*** (-5.76)	-0.61*** (-5.76)
<i>Economic Variables:</i>				
Δ GSP	9.16 (1.56)	8.63 (1.47)	9.10 (1.55)	8.17 (1.39)
Δ UNEMPL	-0.48*** (-3.32)	-0.49*** (-3.42)	-0.48*** (-3.33)	-0.50*** (-3.43)
Δ PRICE	5.68** (2.19)	5.65** (2.18)	5.70** (2.19)	5.89** (2.26)
Δ STARTS	0.56*** (3.12)	0.56*** (3.13)	0.56*** (3.11)	0.56*** (3.10)
Δ INTEREST	-0.17 (-1.14)	-0.18 (-1.21)	-0.17 (-1.13)	-0.20 (-1.35)
<i>Institution Variables:</i>				
Δ CAPITAL	38.86** (2.41)	39.11** (2.42)	39.07** (2.42)	39.75** (2.46)
Δ ROA	35.34 (0.49)	39.85 (0.56)	34.59 (0.48)	35.74 (0.50)

Table 8. (continued)
Panel B

	Model 8.B1	Model 8.B2	Model 8.B3	Model 8.B4
Δ CHARGES	-369.00*** (-3.84)	-370.18*** (-3.85)	-366.16*** (-3.81)	-363.64*** (-3.78)
Δ MORTGAGE	0.80 (0.20)	-0.41 (-0.10)	0.72 (0.18)	-0.60 (-0.15)
Δ SOLD	0.00 (0.02)	0.00 (0.01)	0.00 (-0.01)	0.00 (0.01)
MINOWN	0.12 (1.00)	0.13 (1.06)	0.12 (1.00)	0.12 (1.03)
Δ SIZE	-0.05 (-0.24)	-0.08 (-0.36)	-0.05 (-0.25)	-0.10 (-0.47)
<i>Regulatory Variables:</i>				
CRA	0.60*** ^a (3.37)			
CRA Binary		0.93 ^b (0.91)	0.58*** ^c (3.12)	-0.43 ^d (-1.23)
MINORITY _{t-1} * CRA	-0.01* (-2.05)			
MINORITY _{t-1} * CRA Binary		-0.04 (-1.10)	-0.01* (-1.68)	0.01 (0.19)
FDIC	-0.25 (-1.28)	-0.11 (-0.61)	-0.24 (-1.23)	-0.13 (-0.68)
FED	0.01 (0.05)	0.04 (0.25)	-0.01 (-0.01)	0.01 (0.08)
Y93-97	-0.22 (-0.90)	-0.38 (-1.52)	-0.23 (-0.93)	-0.34 (-1.40)
F-statistic	2.87***	0.76	2.65***	2.65***

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

^a CRA Rating equals the ordinal rating, where: 'outstanding'=1; 'satisfactory'=2; 'needs improvement'=3; and 'substantial non-compliance'=4.

^b CRA Binary equals 1 if the rating is less than 'satisfactory', and 0 otherwise.

^c CRA Binary equals 1 if the rating is in the 'satisfactory' category only, and 0 otherwise.

^d CRA Binary equals 1 following a CRA downgrade, until the rating improves, and 0 otherwise.

Economic and bank variables. The results discussed here are those of the full model, Model 8.A5, which includes all three categories of independent variables. The coefficients on the economic variables have the predicted signs, consistent with increasing efforts to attract minority applicants and increasing demand for mortgage loans by minorities in a strengthening economy. The relationship between changes in minority representation and lagged changes in the state-level unemployment rate is negative and significant at the 1% level. Similarly, the coefficient on the MSA-level housing starts variable has the predicted positive sign and also is significant at the 1% percent level. The MSA-level housing price variable is positive and significant at the 5% level. The F-statistic for the economic variables as a group is 7.92, significant at the 1% level. These findings support H1.

Regarding the institution-specific variables, the findings indicate changes in lagged capital have a positive association with changes in minority representation. This finding is consistent with decreasing risk-aversion as the capital level improves. The result lends support to H2, and runs counter to the finding in the disparity model that disparities increase as the capital level improves, holding minority representation constant. The charge-offs variable is significant at the 1% level with the predicted sign. That is, minority representation improves as lagged charge-offs decrease. This result is also consistent with the hypothesis that minority representation increases at institutions exhibiting stronger historic financial performance and condition (H2). The remaining institution-specific

variables are not significant. The F-statistic for the institution-specific variables as a group is 3.43, significant at the 1% level.

CRA influence. The results for the regulation variables suggest a role for CRA ratings in effecting minority representation not found in the disparity model results. The coefficient on the CRA rating variable is positive and significant at the 1% level, suggesting institutions with poorer CRA ratings target higher levels of minority representation. The models reported in Panel B of Table 8 further investigate the impact of CRA ratings on minority representation. In Model 8.B1 the CRA rating variable is interacted with the lagged representation variable. As discussed in the disparity results, the interaction term tests whether institutions with lower CRA ratings respond to their target representation at a rate that is greater than that of institutions with stronger ratings. The interaction term is significant at the 10% level, supporting a role for the CRA rating in effecting minority representation. The coefficient on the CRA rating variable remains positive and significant at the 1% level. These findings lend support to H3 as it relates to minority representation.

In Model 8.B2 a binary variable equal to one for those banks in the two CRA rating categories that are less than satisfactory is employed in lieu of the CRA rating. This binary variable is also interacted with the lagged disparity variable to test the rate of adjustment hypothesis. Surprisingly, despite the previous finding of a highly significant coefficient on the ordinal CRA rating, the coefficient with this binary specification is not significant. The interaction term also is no longer significant. As argued earlier, this

suggests that the effect of the CRA rating may be greatest on institutions seeking to maintain already satisfactory ratings. This hypothesis is tested in Model 8.B3 by including a binary variable coded one only for those institutions with ratings of 'satisfactory'. Here, the binary variable is significant at the 5% level with the predicted positive sign, and the interaction term returns to significance at the 10% level, consistent with the results when the ordinal CRA rating was employed in Model 8.A5. This suggests the finding of a significant CRA effect in Model 8.A5 was attributable solely to the institutions with 'satisfactory' ratings. These findings indicate that institutions that have already achieved satisfactory performance under CRA target improving representation relative to lower-rated peer institutions as a means of maintaining their CRA rating. Lastly, their response to the targeted minority representation occurs at a greater rate than for their lower-rated peer institutions.

In model 8.B4 the binary variable is equal to one for institutions experiencing a ratings downgrade. As was the case in the disparity model, the binary variable is insignificant in this specification. Overall, The findings are consistent with those of the disparity model regarding institutions with unsatisfactory performance under CRA. That is, representation does not respond to CRA ratings at these institutions, contrary to H3. This finding suggests the regulation may not be achieving the outcome policy makers desired.

Endogenous Factors. The results indicate the endogenous variable, Δ Disparity, has a positive and significant association with minority representation. This finding

suggests institutions may target increasing minority representation as a compensating factor in satisfying CRA requirements when disparities are increasing.

Finally, F-tests of the significance of the binary variables representing fixed effects in the MSAs are significant at the 1% level across the various disparity and representation models. This result suggests there may be some combination of economic, demographic and political factors affecting lending outcomes that are unique to each of the MSAs, and these factors are not fully accounted for by the models' explanatory variables.

5.4 Sensitivity Analysis

A sensitivity analysis is performed to measure the economic magnitude of the effect of the independent variables on Δ Disparity and Δ Minority. Specifically, I measure the effect of a one-standard deviation 'shock' to each of the statistically significant independent variables on changes in the denial rate disparity level and minority representation level. The standard deviations of the independent variables are measured for the entire sample period, and are multiplied by the coefficients in the base full models 7.A5 and 8.A5 to measure the effects on Δ Disparity and Δ Minority Representation, respectively.

The results of the sensitivity analysis are reported in Table 9. The change in the dependent variables is reported, along with the associated percentage change in the mean

Table 9. Sensitivity Analysis.

Sensitivity of the dependent variables Δ Disparity and Δ Minority to a one-standard deviation change in the independent variables that are statistically significant at the 5% level, and the associated percentage change in the mean 1997 level of the dependent variables.

Independent Variable	Δ Disparity %	% Δ in 1997 Disparity Level	Δ Minority %	% Δ in 1997 Minority Level
Δ INCOME	0.15	1.36		
Δ NEIGHBORHOOD	1.27	11.55	0.61	3.67
Δ UNEMPL	0.59	5.36	0.29	1.75
Δ PRICE			0.17	1.04
Δ STARTS			0.20	1.17
Δ CAPITAL	0.40	3.61	0.20	1.17
Δ CHARGES	0.26	2.35	0.28	1.71
Δ SIZE	0.08	0.75		
Δ SOLD	0.37	3.37		
Δ CRA			0.17	1.02

1997 level of the variables. For example, a one-standard deviation 'shock' to the application income variable results in a change in the denial rate disparity of 0.15%, which is 1.36% of the mean 1997 level of the disparity (11.0%). The neighborhood quality variable has the largest effect on both dependent variables. Shocks to this variable change the mean levels of Δ Disparity and Δ Minority by 11.55% and 3.67%, respectively. A shock to the unemployment variable results in a 5.36% change in the disparity level, followed in importance by the Δ Capital (3.61%) and Δ Sold (3.37%) variables. The remaining independent variables have less than a 3% effect on the mean denial rate disparity and minority representation variables.

5.5 Tests for Suitability of the Empirical Techniques

This section reports the results of tests performed to examine the suitability of the empirical techniques. The models developed in Chapter 4 are based on the hypothesis that institutions establish targets for denial rate disparities and minority representation simultaneously. As such, the 2SLS method of estimating simultaneous equations was used to estimate equations (3) and (4). The hypothesis of simultaneity among the dependent variables is tested using the method of Hausman (1978). Since the residuals from time-series regression models are often correlated, I also employ Durbin's (1970) method to test for correlation among the residuals in the disparity and minority representation models.

Hausman (1978) develops a method to test for simultaneity among variables. The Hausman method is employed here to examine the hypothesis that the target disparity and minority representation are jointly determined. I regress Δ DISPARITY on Δ MINORITY, the instrumented Δ MINORITY from the reduced form regressions in the first stage of 2SLS, and all of the exogenous variables. The hypothesis of simultaneity is accepted if the coefficient on the instrumented endogenous variable is significantly different from zero. The t-statistic for the instrumented Δ MINORITY is -6.47 , significant at the 1% level. Thus, use of the 2SLS specification is appropriate in this setting.

When the residuals from estimation of a regression model are serially correlated, the parameter estimates are still unbiased and consistent, however, they are not efficient. Moreover, estimates of the variance of the parameter estimates are biased, rendering t -tests and F -tests of significance invalid. Durbin and Watson (1951) provide a commonly used test for detecting serial correlation among the residuals in regression models. The Durbin-Watson test is inappropriate, however, in models containing lagged dependent variables, such as the partial adjustment model employed here. In these cases, the test statistic is biased toward a finding of no serial correlation. Durbin (1970) develops an alternative Lagrange multiplier test, commonly known as the Durbin h -test, for detecting serial correlation in autoregressive models. The test statistic is:

$$h = \hat{\rho} \sqrt{\frac{n}{1 - n[\text{var}(\hat{\beta})]}}$$

where $\hat{\rho} = \frac{\sum \hat{u}_t \hat{u}_{t-1}}{\sum \hat{u}_t^2}$, $[\text{var}(\hat{\beta})]$ is the variance of the parameter estimate for the lagged

endogenous variable, n is the number of observations, and $h \sim \text{AN}(0,1)$. That is, $\hat{\rho}$ is the first order coefficient of autocorrelation among the estimated residuals, \hat{u} , and the h-statistic is asymptotically normal with unit mean and zero variance. Applying the test to the residuals from the 2SLS estimation of the disparity model and representation model yields h-statistics that are statistically insignificant. Thus, the hypothesis of no serial correlation cannot be rejected.

Chapter 6

Summary and Conclusions

6.1 Summary of the Empirical Findings

The empirical results overall are consistent with H1 and H2, but not with H3 and H4. That is, I find that changes in racial disparities in denial rates and minority representation are affected by changes in the relative quality of the applicant pools, changes in the macro-economy (H1), and changes in bank condition and performance (H2) that occurred during the sample period, 1991-1997. These findings are consistent with improvements in the quality of applicants and more accommodating underwriting standards benefiting the minority segment of the applicant pool disproportionately. Neither the disparity or minority representation model provides support for H3 or H4.

Support for H1 and H2 collectively is strongest in the minority representation model. Here, changes in unemployment rates, median house prices and housing starts have significant associations with minority representation with the predicted signs, consistent with the hypothesis that improvements in economic performance lead to increasing minority representation in the applicant pool. The hypothesis that minority representation increases in response to improvements in financial condition and performance of lending institutions (H2) is supported by the significant coefficients on the institution-specific variables representing changes in equity capital and charge-offs. In the

disparity model, H1 is supported by the significant negative association between changes in the unemployment rate and changes in racial disparities in denial rates. The disparity model findings are less clear, however, regarding H2. The significant positive coefficient on the capital level contradicts H2, while the finding for the charge-offs variable lends support to the hypothesis that racial disparities decline in response to improving performance at financial institutions.

Regarding H3 and H4, while there is some evidence to support regulatory influence on minority representation, this effect is isolated to institutions with satisfactory performance ratings under CRA. The results indicate the regulation does significantly influence lending outcomes for institutions with less than satisfactory CRA ratings, contrary to H3. The disparity model results provide no supporting evidence of a regulatory response to CRA ratings. Neither model provides evidence of a regime shift in denial rate disparities or minority representation resulting from a change in regulatory pressure (H4), after controlling for market forces.

6.2 Policy Implications of the Results

Large racial disparities in mortgage denial rates and originations have created concerns that mortgage lenders discriminate against minorities. This dissertation investigates factors that influence changes in these disparities in 25 MSAs in the U.S. during 1991-1997. Some industry observers have suggested the recent declines in disparities are the result of improvements in regulatory enforcement. This study is the first

to formally test the joint affect of market forces, including changes in the economy and lender financial condition and performance, as well as regulatory influence on these outcomes.

The empirical findings suggest that claims of increasing regulatory influence overstate the role of CRA in affecting racial disparities in mortgage lending, and that lending outcomes at non-complying institutions do not respond significantly to the regulation. The latter finding may reflect inadequate enforcement of CRA, a lack of sufficient incentives to comply with its provisions, or both. As such, supervisory agencies should consider whether incentives to comply with the regulation, which currently focus on expansion opportunities, provide sufficient motivation for the lowest-rated institutions to target improved CRA performance. More vigorous enforcement of the regulation might also contribute to a stronger role for CRA.

The finding that market forces influence changes in lending outcomes suggests policy makers should consider the impact of these forces when assessing whether mortgage credit has been successfully provided to all qualified persons in a particular demographic market. The test results also suggest lenders may periodically alter the characteristics of their portfolios in ways that could appear to be discriminatory, when in fact the changes represent rational economic decision-making, rather than insidious behavior. In particular, supervisory agencies might anticipate deteriorating CRA performance in an economic downturn. Finally, the findings reinforce the need to adequately control for lender assessments of credit risk when evaluating compliance with

CRA and the fair lending statutes, recognizing these criteria are adaptive to the prevailing market and economic climate.

6.3 Limitations of the Research

This research has focused on only a portion of the mortgage lending market. The study includes commercial banks and their affiliates only. Other important lending institutions, such as thrifts and non-affiliated mortgage companies, are excluded. Within the commercial banking sector, the research includes only the conventional home purchase product line. Other types of lending covered by CRA, such as refinancings and home improvement loans, are not considered.

The study uses each institution's CRA rating as a proxy for regulatory pressure. To the extent this pressure is exerted in ways other than a low CRA rating, the study may understate the influence of the regulation. Examples of regulatory factors not captured by the model might include adverse publicity resulting from poor minority lending results disclosed in the HMDA data, protests and delay of expansion applications, or more lengthy compliance examinations.

Finally, the revised CRA regulation did not become effective until 1998 for large institutions. Thus, the influence of CRA may have become stronger in the years after the end of the study period.

6.4 Avenues for Future Research

Research should be extended to include data after 1997 to determine whether implementation of the revised CRA requirements has a significant influence on lending outcomes. If the revisions achieve the desired result of making CRA performance evaluation more outcome-based, then disparities may decline at a greater rate after 1997. Other product types should be considered, including home improvement loans and small business loans, which are also subject to CRA. The research should also be extended to non-commercial banking entities to provide a more comprehensive picture of CRA influence. Additionally, the affect of increases in so-called 'sub-prime' lending in recent years warrants investigation. This type of lending is characterized by much weaker approval requirements. As such, expansion of this product might benefit black and Hispanic applicant groups disproportionately, given the weaker average credit characteristics of these groups. Thus, a portion of the observed declines in denial rate disparities may be the result of the growth in sub-prime lending that took place in the latter portion of the sample period.

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Appendices

Appendix A

CRA Tables

Table A1
CRA Technical Regulatory Requirements

CRA statement

The board of directors of each institution must adopt, and at least annually review, a CRA statement which the institution will make available to members of the public upon request. This statement should include a delineation on a map of each local community served by the institution and a list of specific types of credit that the institution is prepared to extend within each local community.

Additional Information

The regulation also encourages each institution to include additional information in its CRA statement such as how its current efforts help meet community credit needs, a periodic report regarding its record of helping to meet community credit needs, and a description of its efforts to ascertain the credit needs of its community, including efforts to communicate with members of its community regarding credit services.

A copy of the CRA Notice

An institution must provide in each office a CRA Notice, the exact wording of which is prescribed in the regulation.

Public File

Each institution must keep a file that is readily available for public inspection consisting of any CRA Statements in effect in the last 2 years, a copy of the public section of the institution's most recent CRA Performance Evaluation, and any written comments, received from the public within the last 2 years, relating to the CRA statement, Performance Evaluation, or the institution's record of helping to meet community credit needs.

CRA performance evaluation

After a CRA examination, each institution will receive from its regulator a written, public CRA evaluation. This evaluation must be kept in the public file. The institution must provide a copy of this evaluation to the public upon request, charging a minimal fee.

Source: U.S. General Accounting Office. Community Reinvestment Act: Challenges Remain to Successfully Implement CRA.

Table A2

Early CRA Performance Categories and Related Assessment Factors

Ascertainment of Community Credit Needs

Assessment Factor A

Activities to ascertain credit needs and efforts to communicate with the community, including the extent of the institution's efforts to communicate with members of its community regarding the credit services being provided by the institution.

Assessment Factor C

The extent of participation by the institution's board of directors in formulating the institution's policies and reviewing its performance related to CRA.

Marketing and types of credit offered and extended

Assessment Factor B

The extent of the institution's marketing and special credit-related programs to make members of the community aware of the credit services offered by the institution.

Assessment Factor I

The institution's origination of residential mortgage loans, housing rehabilitation loans, home improvement loans, and small business or small farm loan within its community, or the purchase of such loans originated in its community.

Assessment Factor J

The institution's participation in governmentally insured guaranteed or subsidized loan programs for housing, small businesses, or small farms.

Geographic distribution and record of opening and closing offices

Assessment Factor E

The geographic distribution of the institution's credit extensions, credit applications, and credit denials.

Assessment Factor G

The institution's record of opening and closing offices and providing services at offices.

Discrimination and other illegal credit practices

Assessment Factor D

Any practices intended to discourage applications for types of credit set forth in the institution's CRA Statement(s)

Assessment Factor F

Evidence of prohibited discriminatory or other illegal credit practices

Community Development

Assessment Factor H

The institution's participation, including investments, in local community development and redevelopment projects or programs

Table A2 (continued)

Assessment Factor K

The institution's ability to meet various community credit needs based on its financial condition and size, legal impediments, local economic conditions, and other factors

Assessment Factor L

Any other factors that, in the regulatory authority's judgment, reasonably bear upon the extent to which an institution is helping meet the credit needs of its entire community

Table A3

CRA Rating Criteria

Component Test Rating Matrix

Component Test Ratings	Lending	Investment	Service
Outstanding	10, 11, or 12	5 or 6	5 or 6
High Satisfactory	7, 8, or 9	4	4
Low Satisfactory	4, 5, or 6	2 or 3	2 or 3
Needs to Improve	1, 2, or 3	1	1
Substantial Non-compliance	0	0	0

Composite Test Rating Matrix

Composite Test Ratings	Points
Outstanding	20-24
Satisfactory	11-19
Needs to Improve	5-10
Substantial Non-compliance	0-4

Note: The component ratings under the three tests are summed to determine the composite rating. The composite score cannot exceed three times the rating under the lending test. Thus, a bank cannot receive a satisfactory composite rating if it receives a component rating below satisfactory on the lending test.
 Source: Thomas (1998).

Table A4

CRA Ratings by Regulator 1991-1997

Agency	Ratings	1991 Percent	1992 Percent	1993 Percent	1994 Percent	1995 Percent	1996 Percent	1997 Percent
OCC	O	10.0	12.2	14.4	24.5	32.4	19.3	14.9
	S	77.2	74.5	77.4	72.0	66.3	79.9	84.3
	NI	11.8	13.1	7.9	3.6	1.1	0.8	0.5
	SN	1.0	0.0	0.3	0.0	0.0	0.0	0.3
FED	O	11.1	12.7	19.4	22.5	24.5	29.8	22.9
	S	80.5	78.4	75.2	75.0	73.9	68.8	75.8
	NI	7.7	7.8	4.4	1.8	1.2	1.3	1.1
	SN	0.7	1.1	0.9	0.7	0.3	0.2	0.2
FDIC	O	8.3	13.2	13.9	17.2	24.1	29.5	24.7
	S	82.7	81.3	80.7	77.4	74.1	68.4	74.0
	NI	8.0	5.2	5.0	5.2	1.7	1.9	1.2
	SN	1.0	0.4	0.4	0.2	0.1	0.2	0.1
OTS	O	8.3	9.9	15.0	15.6	25.5	18.8	18.5
	S	73.6	74.0	76.4	77.1	71.3	75.7	76.7
	NI	15.9	15.6	8.3	7.0	3.3	4.6	3.6
	SN	2.2	0.6	0.3	0.3	0.0	0.8	1.1

Table A5

Indicators of Discrimination in Mortgage Lending

Panel A: Indicators of Potential Disparate Treatment in *Underwriting*

1. Substantial *disparities* among the *approval/denial* rates for applicants by monitored prohibited basis characteristic (especially within income categories)
2. Substantial *disparities* among the *application processing times* for applicants by monitored prohibited basis characteristic (especially within denial reason groups)
3. Substantially *higher proportion of withdrawn/incomplete applications* from prohibited basis group applicants than from other applicants
4. *Vague* or unduly subjective *underwriting criteria*
5. Lack of clear guidance on making *exceptions to underwriting criteria*, including credit scoring overrides
6. Lack of clear loan file *documentation* regarding reasons for *any exceptions* to normal underwriting standards, including credit scoring overrides
7. Relatively *high percentage* of either *exceptions* to underwriting criteria or overrides of credit score cutoffs
8. Loan officer or broker *compensation based on loan volume* (especially loans approved per period of time)
9. *Consumer complaints* alleging discrimination in loan processing or in approving/denying residential loans

Panel B: Indicators of Potential Disparate Treatment in *Pricing*

1. Relationship between loan pricing and compensation of loan officers or brokers
2. Presence of discretion in pricing or other transaction costs
3. Use of a system of risk-based pricing that is not empirically based and statistically sound
4. Substantial disparities among prices being quoted or charged to applicants who differ as to their monitored prohibited basis characteristics
5. Consumer complaints alleging discrimination in residential loan pricing

Table A5 (continued)

Panel C: Indicators of Potential Disparate Treatment by *Steering*

1. For an institution that has one or more sub-prime mortgage subsidiaries or affiliates, any significant differences, by loan product, in the percentage of prohibited basis applicants of the institution compared with the percentage of prohibited basis applicants of the subsidiaries or affiliates
2. Lack of clear, objective standards for (i) referring applicants to subsidiaries or affiliates, (ii) classifying applicants as “prime” or “subprime” borrowers, or (iii) deciding what kinds of alternative loan products should be offered or recommended to applicants
3. For an institution that makes both conventional and FHA mortgages, any significant differences in percentages of prohibited basis group applicants in each of these two loan products, particularly with respect to loan amounts of \$100,000 or more
4. For an institution that makes both prime and subprime loans for the same purpose, any significant differences in percentages of prohibited basis group borrowers in each of the alternative loan product categories
5. *Consumer complaints* alleging discrimination in residential loan pricing
6. A lender subprime mortgage company subsidiary or affiliate integrates loan application processing for both entities
7. Loan officers have broad discretion regarding whether to promote conventional or FHA loans, or both, to applicants and the lender has not issued guidelines regarding the exercise of this discretion
8. A lender has most of its branches in predominantly white neighborhoods. The lender’s subprime mortgage subsidiary has branches which are located primarily in predominantly minority neighborhoods

Panel D: Indicators of Potential Discriminatory *Redlining*

1. Significant differences, as revealed in HMDA data, in the *number of loans originated* in those areas in the lender’s market that have relatively high concentrations of minority group residents compared with areas with relatively low concentrations of minority group residents
2. Significant differences between *approval/denial rates* for all applicants (minority or non-minority) in the number of loans originated in those areas in the lender’s market that have relatively high concentrations of minority group residents compared with areas with relatively low concentrations of minority group residents
3. Significant differences between *denial rates based on insufficient collateral* for applicants from areas that have relatively high concentrations of minority group residents compared with areas with relatively low concentrations of minority group residents

Table A5 (continued)

Panel D (Continued)

4. Other patterns of lending identified during the most recent CRA examination that differ by the concentration of minority residents
5. Explicit demarcation of credit product markets that excludes MSAs, political subdivisions, census tracts, or other geographic areas within the institution's lending market having relatively high concentrations of minority residents
6. Policies on receipt and processing of applications, pricing, conditions, or appraisals and valuation that vary between areas with relatively high concentrations of minority residents and those with relatively low concentrations of minority residents
7. Employee statements that reflect an aversion to doing business in areas with relatively high concentrations of minority residents
8. Complaints or other allegations that the lender excludes or restricts access to credit for areas with relatively high concentrations of minority residents
9. A lender has most of its branches in predominantly white neighborhoods. The lender's subprime mortgage subsidiary has branches which are located primarily in predominantly minority neighborhoods

Panel E: Indicators of Potential Disparate Treatment in *Marketing* of products

1. Advertising patterns or practices that a reasonable person would believe indicate prohibited basis customers are less desirable
2. Advertising only in media serving non-minority areas of the market
3. Marketing through brokers or agents that the lender knows would serve only one racial or ethnic group in the market
4. Use of marketing programs or procedures that exclude one or more regions or geographies within the lender's assessment or marketing area that have significantly higher percentages of minority group residents than does the remainder of the assessment area or marketing area
5. Using mailing or other distribution lists or other marketing techniques for pre-screened or other offerings of residential loan products that: (i) explicitly exclude groups of borrowers on a prohibited basis; (ii) exclude geographies within the lender's marketing area that have significantly higher percentages of minority group residents than does the remainder of the marketing area
6. Proportion of monitored prohibited basis applicants is significantly lower than that group's representation in the total population of the market area
7. Consumer complaints alleging discrimination in advertising or marketing loans

Table A6

Applications and CRA-Related Denials by Regulator

Year	FDIC		FED		OCC		OTS	
	Applications	Denials	Applications	Denials	Applications	Denials	Applications	Denials
1989	2,056	0	761	1	2,782	2	939	1
1990	2,099	1	696	0	3,049	2	893	0
1991	1,839	1	551	1	2,630	0	573	0
1992	1,891	0	619	1	2,610	4	837	1
1993	2,181	1	821	2	3,612	0	785	0
1994	2,883	0	826	0	4,368	0	1,010	5
1995	3,382	0	898	1	6,490	0	1,603	0
1/1/96-6/30/96	1,636	0	447	0	3,235	0	745	0
Total	17,967	3	5,619	6	28,776	8	7,385	7

Source: Thomas (1998).

Table A7

Applications Approved with CRA-Related Commitments or Conditions by Regulator

Year	FDIC	FED	OCC	OTS
1989	0	5	15	2
1990	0	6	26	1
1991	0	7	18	1
1992	0	4	20	0
1993	0	9	18	0
1994	1	22	11	1
1995	0	6	10	0
1/1/96-6/30/96	0	3	0	0
Total	1	62	118	5

Note: FED and FDIC approved with commitments; OCC and OTS approved with conditions.
 Source: Thomas (1998).

Table A8

Applications with CRA-Related Protests and Denials by Regulator

Year	FDIC		FED		OCC		OTS		All Regulators	
	Protest	Denied	Protest	Denied	Protest	Denied	Protest	Denied	Protest	Denied
1989	7	0	16	1	8	0	10	1	41	2
1990	7	0	27	0	6	0	7	0	47	0
1991	4	0	24	1	5	0	3	0	36	1
1992	0	0	28	0	9	1	7	0	44	1
1993	16	0	58	1	14	0	3	0	91	1
1994	13	0	55	0	28	0	5	0	101	0
1995	10	0	58	0	20	0	5	0	93	0
1/1/96-6/30/96	1	0	23	0	9	0	5	0	38	0
Total	58	0	289	3	99	1	45	1	491	5

Source: Thomas (1998).

Appendix B
Sample Metropolitan Statistical Areas

Table B1

Metropolitan Statistical Areas

520	Atlanta
720	Baltimore PMSA
1600	Chicago PMSA
1920	Dallas PMSA
2080	Denver PMSA
2680	Ft. Lauderdale PMSA
3360	Houston PMSA
3760	Kansas City MO-KS
4480	Los Angeles-Long Beach PMSA
5000	Miami PMSA
5120	Minneapolis-St. Paul MN-WI
5560	New Orleans
5600	New York PMSA
5720	Norfolk-Virginia Beach-Newport News VA-NC
5945	Orange County PMSA
5960	Orlando
6200	Phoenix-Mesa
6780	Riverside-San Bernardino
6920	Sacramento
7240	San Antonio
7320	San Diego
7600	Seattle-Bellevue-Everett
7040	St. Louis MO-IL
8280	Tampa-St. Pete-Clearwater
8840	Washington DC-MD-VA-WV PMSA

Vita

Keith Harvey was born and grew up in Kansas City, Missouri. He is a Chartered Financial Analyst, and holds B.S. and M.S. degrees in Finance. He worked for eight years at Texas Commerce Bank in Houston, Texas prior to entering the doctoral program in Finance at the University of Tennessee, Knoxville. He received the Doctor of Philosophy degree in Business Administration with a major in Finance and a minor in Economics in August 2000, at which time he joined the faculty of Boise State University as Assistant Professor of Finance.