

Fannie Mae and Freddie Mac Mortgage Purchases in Low-Income and High-Minority Neighborhoods: 1994–96

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Abstract

This article¹ consists of parallel case studies of intrametropolitan lending and government-sponsored enterprise (GSE) purchases in 10 metropolitan statistical areas (MSAs) across the Nation. All 10 MSAs were large, with 5 representing high-cost areas (as measured by median value of owner-occupied housing) and 5 representing low-cost areas. The studies of lending volumes provide a preliminary indication of whether and to what extent service by the primary market is relatively low in the census tracts designated as underserved by HUD. The studies of GSE purchases indicate whether and to what extent loan purchases by Freddie Mac and Fannie Mae are concentrated outside these census tracts. HUD classifies low-income census tracts and middle-income census tracts with high minority representation as underserved, so the studies contrast activities in these tracts with activity in middle-income tracts with low minority representation. The studies showed that to the extent that there are shortfalls in lending activity and GSE purchases in underserved areas, they are concentrated in low-income census tracts rather than middle-income, high-minority tracts. The shortfalls in GSE purchases are generally larger for Freddie Mac than for Fannie Mae. The shortfalls in primary market activity are found primarily in low-cost MSAs, whereas the shortfalls in GSE purchases are less sharply divided according to the level of housing cost.

The Federal National Mortgage Association (Fannie Mae or FNMA) and the Federal Home Loan Mortgage Corporation (Freddie Mac or FHLMC) are the two dominant institutions in the secondary market for residential mortgage loans in the United States. They are privately owned, federally chartered intermediaries that purchase residential mortgages originated by primary market lenders—banks, thrifts, mortgage companies, and other lenders. They package most of these purchased loans into securities that they sell to private investors. Congress has recognized that their Federal charters provide Fannie Mae and Freddie Mac with advantages relative to their private competitors and, in return, has

required that they address certain public purposes. These include providing stability in the secondary market for residential mortgages and promoting access to mortgage credit to underserved geographic areas such as central cities and rural areas.²

Legislation passed in 1992 refocused the emphasis on public purposes. In light of their public/private structure, Fannie Mae and Freddie Mac are often referred to as government-sponsored enterprises (GSEs). The Federal Housing Enterprises Financial Safety and Soundness Act of 1992 (FHEFSSA), which included a major restructuring of the oversight of the GSEs, reinforced Congress' commitment to having them play a leading role in expanding affordable lending. The legislation also called for public distribution of data on loans purchased by the GSEs. Under FHEFSSA, the Secretary of HUD sets goals for purchases of loans from the affordable subset of the conforming market. Separate goals are identified for individual low-income borrowers and for neighborhoods that are determined to be underserved. Designation of which neighborhoods are underserved is HUD's responsibility.

From the beginning, direct measures of mortgage availability have not been used to identify underserved areas. The interim definition specified in FHEFSSA defines underserved areas as central cities, as defined by the Office of Management and Budget. In 1995 HUD adopted criteria using median family income and minority representation within census tracts to determine which metropolitan neighborhoods should be designated as underserved. HUD selected these proxies because they are associated with low mortgage origination rates and high mortgage denial rates.

The selection of these proxies is based on national lending patterns revealed in analysis of Home Mortgage Disclosure Act (HMDA) data. Although low-income and high-minority representation are on average indicators of low levels of mortgage activity, they may not identify underserved neighborhoods in all metropolitan areas. This article focuses on mortgage market activity within individual metropolitan areas. It consists of parallel case studies of intrametropolitan lending and GSE purchases in 10 metropolitan statistical areas (MSAs) across the Nation. The studies of lending volumes provide a preliminary indication of whether and to what extent service by the primary mortgage market is relatively low in the census tracts designated by HUD as underserved. The studies of GSE purchases indicate whether and to what extent loan purchases by Fannie Mae and Freddie Mac are concentrated outside these underserved census tracts.

The 10 MSAs studied are divided equally between areas of high and low housing cost. The median cost of owner-occupied housing varies widely across the Nation. Homeownership is more difficult for lower income households in areas where homes are more expensive. Thus, it is useful to examine whether the primary market serves high-cost and low-cost areas equally well. Furthermore, the GSEs are confronted with constraints, such as the conforming loan limit and charter-based underwriting standards, and competition from government-insured lending programs and special affordable lending programs by banks and thrifts that may differentially impact GSE purchases across MSAs.

The article has seven sections. The second section briefly reviews research and policy discussions on mortgage lending to inner cities and low-income neighborhoods in major metropolitan areas. The third section introduces the 10 MSAs studied in this article. The fourth section reviews the data available to study geographic distributions of mortgage lending and GSE purchases, and the fifth section presents the analysis of mortgage lending in tracts designated as underserved in the 10 MSAs. The sixth section presents the parallel analysis of GSE purchases, and the final section presents the summary and conclusions.

The analyses of activity in low-income and high-minority tracts use activity in middle-income tracts that are not high minority as a standard of comparison. The studies indicate that mortgage lending activity in low-income tracts is lower than in middle-income tracts in only some of the MSAs studied. Lending in low-income tracts was relatively low more often in low-cost MSAs than in high-cost MSAs. Three of the low-cost MSAs exhibited shortfalls even after controlling for nondiscriminatory factors that arguably could yield lower origination rates in low-cost census tracts.

The analysis indicates that high-minority, middle-income neighborhoods are much less underserved than low-income tracts. In both high-cost and low-cost MSAs, lending activity in middle-income, high-minority tracts was at or near the level of lending activity in other middle-income tracts. After controlling for factors that influence mortgage demand, origination rates in high-minority tracts are below parity with other middle-income tracts in only one MSA (Atlanta).

Although no policy changes should be undertaken without further research on a larger sample of MSAs, these results suggest there may be some benefit to refining the approach to designating which census tracts are to be considered underserved. Even before the passage of the 1992 GSE legislation, an array of State and Federal programs promoting homeownership was in place. These programs have made home mortgages more widely available to low-income households. Consequently, lending activity in some MSAs is rather evenly distributed across low-income and middle-income census tracts. This article suggests that efforts to further equalize access to mortgage credit would have better chances for success if the geographic targets were more concentrated in markets where the geographic distribution of lending activity remains relatively uneven. An alternative would be to assign higher weights to loans secured by properties in the low-income areas of MSAs having the largest geographic imbalances.

The analyses of GSE purchases indicate that purchase rates from low-income tracts are often but not always lower than the rates from middle-income tracts. Shortfalls are smaller for Fannie Mae than for Freddie Mac, particularly for home purchase loans. Purchase rates in high-minority, middle-income tracts are much closer to parity with purchase rates for other middle-income tracts, with Fannie Mae purchase rates at or exceeding parity in most MSAs and Freddie Mac purchase rates at or near parity in most MSAs. Both GSEs had shortfalls in purchase rates in the three low-cost MSAs that exhibited substantial shortfalls in origination rates in low-income tracts.

Background

Issues Underlying the Institution of Affordable Housing Goals

Access to mortgage credit for properties in low-income and minority neighborhoods has been a public policy issue since the late 1960s. Critics of the lending (and insurance) industry claim that minorities and low-income households are subject to bias at both the individual and the neighborhood levels. At the individual level, these households are alleged to be subject to disparate treatment and to qualifying standards that have a disparate impact.³ At the neighborhood level, they are often alleged to be subject to “redlining,” generally defined as bias against accepting business in particular locations without appropriate consideration for the qualifications of the applicant or the condition of the property.⁴ In both types of bias, lenders and insurers are criticized for what might be termed “passive discrimination,” which includes failure to locate branches and advertise in minority neighborhoods as well as active discrimination in setting underwriting standards and processing applications.

In FHEFSSA, Congress states that Fannie Mae and Freddie Mac have “an affirmative obligation to facilitate the financing of affordable housing for low- and moderate-income families.” The legislation establishes an explicit framework for measuring and evaluating GSE performance toward meeting this obligation. This framework places a substantially greater emphasis on GSE support for affordable lending.

The GSEs had not been prominent in the mortgage market in the 1970s when the major pieces of the pre-1992 mortgage regulatory structure were assembled. The Home Mortgage Disclosure Act of 1975 and the Community Reinvestment Act of 1977 (CRA) imposed affordable lending responsibilities on federally insured banks and savings and loans. HMDA required lenders to disclose the geographic distribution of the mortgage loans closed each year. CRA required agencies supervising banks and thrifts to encourage these lenders to meet the credit needs of all the potential borrowers in their service areas, including those desiring mortgages in low- and moderate-income neighborhoods.⁵

The GSEs were under separate regulatory structures. Fannie Mae was regulated by HUD. Beginning in 1978, Fannie Mae was subject to a requirement that 30 percent of its purchases be secured by low- and moderate-income housing; loans secured by homes valued at up to 2.5 times the area median family income were counted toward this requirement. Freddie Mac was under the jurisdiction of the Federal Home Loan Bank Board until 1989, when regulatory authority was transferred to HUD. A rule extending the 30-percent requirement to Freddie Mac was pending when FHEFSSA was passed.

As Avery, Beeson, and Sniderman (1994) point out, the “language and spirit” of FHEFSSA are similar to those of HMDA and CRA. All three statutes share the underlying premise that “some sort of market breakdown exists under which well-qualified borrowers are willing to pay prevailing mortgage rates but cannot secure a mortgage.”⁶ This view led to the passage of HMDA and CRA and the adoption of other State and Federal programs promoting affordable homeownership. The programs other than CRA generally target low-income families individually rather than neighborhoods. Those programs include the mortgage insurance programs of the Federal Housing Administration (FHA), which predates CRA, and the Veterans Administration (VA). Also included are the programs of State housing finance agencies and the Federal Home Loan Banks. Governmental support through these and other programs includes grants, direct loans, guaranties, and interest subsidies. A description of federally supported programs is provided in the General Accounting Office’s (GAO’s) 1996 report on FHA’s role in the mortgage market (U.S. General Accounting Office, 1996).

Pressure for additional intervention in mortgage markets increased in the early 1990s after the release of expanded HMDA data, which contained information on the disposition of individual loan applications and extended coverage to applications for loans by mortgage banking companies. The expanded data showed higher denial rates for African Americans and Hispanics than for Whites. The data also showed that minority and low-income borrowers were less likely to have their loans purchased by Freddie Mac or Fannie Mae than White borrowers.⁷

Regulators, the Department of Justice, and Congress responded to the patterns in the expanded HMDA data. The Justice Department began investigating depositories whose data suggested the possibility of discrimination and redlining. These investigations resulted in a series of highly publicized consent decrees with major regional banks and savings associations. One, with Chevy Chase Federal Savings Bank in the Washington, D.C., area, was based completely on redlining-related charges, in contrast to other settlements deriving from charges of disparate treatment of minority applicants. Banking regulators

approached CRA exams more seriously than before, and Congress passed additional legislation, including FHEFSSA.

The lenders, private mortgage insurance companies, and GSEs also responded, initiating outreach programs to minority and low-income applicants and modifying underwriting criteria that in subtle ways might have had a disparate impact on these applicants. Freddie Mac and Fannie Mae participated in these efforts. Some of their activities are summarized in a 1996 HUD report.

The 1992 GSE Legislation

FHEFSSA directed the Secretary of Housing and Urban Development to establish goals addressing three segments of the mortgage market:

- Loans to low- and moderate-income families (the Low- and Moderate-Income Housing Goal).
- Loans to borrowers in underserved areas (the Geographically Targeted Goal).
- Loans addressing the needs of low-income families in low-income areas and very low-income families (the Special Affordable Housing Goal).

Some of the details, such as the definition of an “underserved area,” were left for HUD to clarify. However, the legislation provided operational definitions and specific goals for a 3-year transition period (1993–95). In 1995 HUD provided its own interpretation of the specialized terms and added goals for 1996–99 (U.S. Department of Housing and Urban Development, 1995). The current operating definitions of some key terms are summarized in exhibit 1.

The goals themselves are summarized in exhibit 2. The goals are specified in terms of percentages of total units financed by GSE purchases. An additional multifamily subgoal expressed in dollars is not shown in exhibit 2. Purchase, home improvement/second mortgage, and refinance loans are treated equally under the goals. (The GSEs purchase very few home improvement loans but their participation in this sector may increase.)

The goal for purchases from underserved areas was 21 percent for 1996 and 24 percent for 1997 through 1999. GSE purchases have generally been above these levels, as shown in exhibit 3. (The goals in 1993–95 were not expressed in the same terms as the goals beginning in 1996. Nevertheless, the review of GSE purchases in the earlier years under the later framework provides a useful perspective.) After 1993, loans purchases by both GSEs from underserved areas have been above the 1997–99 goal of 24 percent. Fannie Mae purchases from underserved areas were 3 to 5 percentage points above Freddie Mac purchases from 1994 to 1996; in 1997 and 1998 this gap narrowed to less than 1 percentage point. In 1993 underserved area purchases for both GSEs’ fell short of 24 percent. The smaller share of underserved area loans in 1993 is likely attributable to the extraordinary number of refinance loans that year.

The Metropolitan Statistical Areas

The housing goals for the GSEs are set on a national basis, and the designation of underserved areas is based on proxies for mortgage activity rather than a direct measure of mortgage activity. The proxies—relative income and minority representation—do not take into account factors that may cause mortgage availability in low-income neighborhoods to vary across States or metropolitan areas. Use of nationally uniform proxies may introduce inefficiencies into the attempt to facilitate homeownership in areas where lack

Exhibit 1

Terms Used in GSE Affordable Housing Goals

Borrower and tract income ranges:	Family (or tract median family) income no greater than:
Very low income	60 percent of area median income (AMI) ^a
Low income	80 percent of AMI
Low or moderate income	100 percent of AMI
High income	In excess of 120 percent of AMI
Geographic area minority population:	Census tract or county where minorities account for:
Low-minority tract or county	No more than 10 percent of the population
High-minority tract or county	At least 30 percent of the population
Underserved areas:	
In metropolitan areas	Census tracts with median family income at or below 90 percent of AMI ^b or high-minority tracts with median family income at or below 120 percent of AMI
Outside metropolitan areas	Counties ^c with median family income at or below 95 percent of AMI ^b or high-minority counties with median family income at or below 120 percent of AMI

^a For purposes of the family and census tract income range definitions, AMI means the median family income of the metropolitan area, or, for properties located outside metropolitan areas, the greater of the median family income of the county or the nonmetropolitan portion of the State.

^b For purposes of the underserved areas definitions, AMI means the median family income of the metropolitan area, or, for properties located outside metropolitan areas, the greater of the median family income of the nonmetropolitan portion of the State or the nonmetropolitan portion of the Nation.

^c For counties partially contained in a metropolitan area in New England, nonmetropolitan portions of counties.

Source: Manchester (1998).

Exhibit 2

GSE Housing Goals

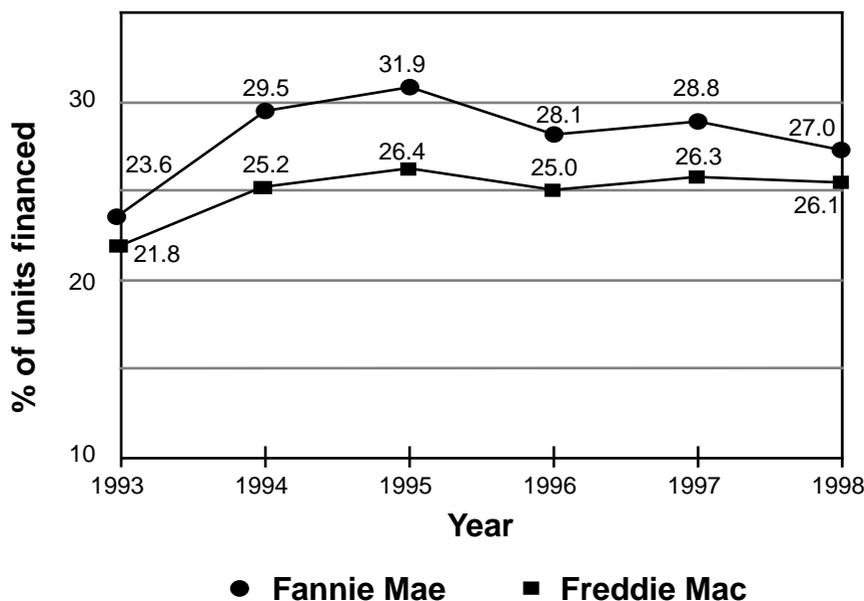
Goal	Characterization	Numeric Values (% of Units Financed)	
		1996	1997-99
Low-Mod	Borrower income \leq AMI	40	42
Geographic (MSA)	Property in tract with (a) TMI \leq 90% of AMI or (b) % Minority \geq 30 & TMI \leq 120% of AMI	21	24
Special Affordable	(a) Borrower income \leq 60% of AMI or (b) Borrower income \leq 80% of AMI and property in tract with TMI \leq 80% of AMI	12	14

AMI: Area Median Income

TMI: Tract Median Income

Exhibit 3

Purchases From Underserved Areas



of credit is seen to be a barrier. The underserved-area goals may be giving GSEs credit for purchasing loans from low-income areas that have mortgage origination rates comparable with those of middle-income neighborhoods.

This research examines the distribution of mortgage lending and GSE purchases within MSAs. The first steps are to select a set of MSAs and develop a framework that can be used to assess the geographic distribution of mortgage lending and GSE purchases in individual MSAs. With such a framework, we can begin to determine whether the national patterns evident in the existing research are uniform across the country or whether they reflect a variety of patterns in individual markets.

The research is exploratory, and the selection of the MSAs to investigate is not a scientific sample. The MSAs were selected from among the larger metropolitan areas but avoided the very largest. Two MSAs from some States or regions were included to expedite data collection. Finally, an equal number of “high-cost” and “low-cost” areas were included, using the MSA-wide median value of owner-occupied housing as the indicator of housing cost.

The 10 MSAs that are the focus of this study are listed in exhibit 4. The MSAs chosen are all large, with 1990 populations in the 2- to 4-million range, but they are not the Nation’s largest. The 1990 median home values in the high-cost areas are generally at least twice as high as the median values in the low-cost areas. Some of these differences in value may reflect differences in the size and quality of homes. The last column shows values of a price index constructed by Malpezzi, Chun, and Green (1998). These index values indicate that the cost differences are still substantial when the characteristics of the housing stocks in the MSAs are held constant. Within the categories, the rankings of the MSAs are somewhat different using this measure, but the gap between the high- and low-cost groups does not decline significantly.

Exhibit 4

Ten MSAs: Housing and Income Statistics

MSA	Population	From 1990 Census			Malpezzi, Chun, and Green
		Median Value of Owner- Occupied Housing	Median Family Income (1989)	Median Home Value/ 1989 Median Income	Housing Price Index
High-cost areas					
Oakland, CA	2,082,914	\$222,400	\$47,516	4.68	\$187,045
Newark, NJ	1,824,321	190,400	50,310	3.78	166,737
San Diego, CA	2,498,016	186,200	39,798	4.68	155,932
Boston, MA	2,870,650	185,400	49,266	3.76	174,392
Washington, D.C.	3,923,574	166,100	59,589	2.79	145,022
Low-cost areas					
Atlanta, GA	2,833,511	89,300	41,618	2.15	74,712
Miami, FL	1,937,094	86,000	31,113	2.76	88,851
Dallas, TX	2,553,362	82,200	39,517	2.08	69,076
Tampa, FL	2,067,959	70,900	31,244	2.27	66,323
Houston, TX	3,301,937	63,400	36,887	1.72	56,025

Another important perspective in assessing housing cost is the value of homes relative to the maximum loan that can be purchased by Fannie Mae and Freddie Mac. This value, referred to as the conforming loan limit, is reviewed each year. In 1994 and 1995 the limit was \$203,150. In 1996 it increased to \$207,000. These values are more than twice the 1990 value of the median home in the low-cost areas, but they are below the 1990 median value in Oakland and only modestly above the 1990 median values in Newark, San Diego, and Boston.

The cost of housing in high-cost areas is not matched by commensurately higher levels of income. Median income is on average only modestly higher in high-cost areas than in low-cost areas. This relationship is reflected in the higher ratios of housing values to incomes, which are above 3.5 in four high-cost areas and below 3.0 in all the low-cost areas. Looking within the groups, the rank orders of housing values and incomes do not match perfectly. Washington, D.C., is lowest among the five high-cost areas in terms of housing value, but it has the highest median income. In the lower cost group, Houston has housing values well below those of other members of the group, but median income in Houston is in the middle of the pack. Washington, D.C., and Miami have nearly identical ratios of housing value to income. Because Washington has the lowest median housing value of the high-cost cities, the decision to include it in that group may not be appropriate. The analysis of lending and GSE purchases may indicate whether the distribution of housing units and mortgage activity in Washington is consistent with patterns found in high-cost or low-cost areas.

Exhibit 5 summarizes the ethnic mixes of the selected MSAs. The representation of African Americans and Hispanics varies in both the high-cost and the low-cost groups. Two of the high-cost areas and one of the low-cost areas have representations of African

Americans below 10 percent, and two areas in each group have African American representations above 20 percent (if Miami’s African American/Hispanics are included). Both groups have a range of Hispanic representation, although the range is wider in the low-cost group.

Exhibit 5

Ethnic Composition (Percentages of Total Population)

MSA	Non-Hispanic			Hispanic, All Races
	White	African American	Other Non-White	
High-Cost Areas				
Oakland	59.73	14.28	13.21	12.78
Newark	64.41	22.51	3.09	9.99
San Diego	65.65	6.03	8.36	19.96
Boston	85.18	6.80	3.73	4.28
Washington, D.C.	62.73	26.25	5.46	5.56
Low-Cost Areas				
Atlanta	70.24	25.85	2.00	1.92
Miami	30.36	19.19	1.43	49.03
Dallas	66.92	15.91	3.10	14.08
Tampa	83.28	8.73	1.40	6.58
Houston	56.62	18.23	4.07	21.08

Lending to minorities and low-income families has been a subject of study and sometimes controversy in some of these MSAs. Boston has been investigated more than once, most recently by the Federal Reserve Bank of Boston in a well-publicized study about loan approval (Munnell, Brown, McEneaney, and Tootell, 1992).⁸ Previously, Boston had been the setting for a redlining study (Bradbury, Case, and Dunham, 1989). Atlanta came under the spotlight in a series of articles in the *Atlanta Journal-Constitution* (Dedman, 1988), and Decatur Federal Savings in Atlanta signed a consent decree with the U.S. Department of Justice over racial disparities in lending (see Goering and Wienk, 1996, Chapters 14–17). Lending in Washington, D.C., was the subject of an investigative series in *The Washington Post* and the home of Chevy Chase Federal Savings Bank, which signed a consent decree over redlining allegations (Goering and Wienk, 1996, Chapter 25).

The cost of housing in a metro area may affect the geographic distribution of lending activity and GSE purchases in several ways, and the ultimate effects are not predictable. As we will see in the section *Patterns in Mortgage Lending*, high-cost areas are likely to have smaller concentrations of owner-occupied housing in low-income neighborhoods, but this does not necessarily imply that mortgages will be more difficult to obtain in these neighborhoods. Conversely, homes in low-income neighborhoods might be unencumbered by mortgages more often in low-cost areas.⁹ If this were the case, low-income neighborhoods might appear to be underserved more often in low-cost markets than in high-cost markets.

Differences between high- and low-cost markets in concentrations of GSE purchases in low-income neighborhoods are also difficult to predict. Homeownership puts heavier

pressure on a family's financial resources in high-cost areas than in low-cost areas, which may lead to heavier reliance on adjustable-rate mortgages (ARMs) in high-cost markets. GSEs purchase rate for ARMs is low relative to their purchase rate for fixed-rate loans, so GSE purchases as a percentage of conforming loans may be relatively low in high-cost markets. But this factor may not affect the relative rates of purchase in low-income and middle-income neighborhoods. Another factor that may play a role is the conforming loan limit, which is a binding constraint more often in high-cost markets. However, if we focus on intrametropolitan differences in GSE purchases as a percentage of the number of conforming loans, it is not clear that any disparity between low-income and middle-income neighborhoods would be greater in high-cost or low-cost markets.

Housing and Mortgage Data

Data to evaluate lending activity and GSE performance in individual MSAs relative to the underserved area housing goal come primarily from three sources:

- Loan-level data collected annually under the expanded HMDA.
- Summary tables at the census tract level from the 1990 census of population and housing.
- Loan-level data on GSE purchases of loans secured by single-family homes, with the census tract identified (hereafter termed the GSE data). (U.S. Department of Housing and Urban Development, 1996).

Information on the numbers of loans originated in each metropolitan area and census tract is available from HMDA. Information on the intrametropolitan distribution of loans purchased by Fannie Mae and Freddie Mac may be obtained from HMDA or the GSE census tract files. Data on the numbers of housing units, properties, minority representation, median income, and other census tract characteristics are available from the Summary Tape File (STF) 3 files from the 1990 census.

HMDA

Under HMDA, mortgage lenders in metropolitan areas are required each year to file with their supervisory agency a report detailing the disposition of all applications they received for mortgage loans. Lenders include information on loans purchased in the year, and information on loans originated in prior years and sold during the reporting period. Lenders report on the applicant/borrower's, income, race, and gender, as well as the loan amount and census tract of the property that would secure the prospective loan. For approved and funded applications, which are the only HMDA records of interest in this study, lenders report whether the loan is sold and, if so, the type of purchaser. Loans sold to Fannie Mae or Freddie Mac are identified in this field.

The HMDA data provide a nearly comprehensive picture of the overall mortgage market in metropolitan areas. HMDA records on loans that are closed and funded can potentially provide the basis for assessing both the adequacy of mortgage lending and GSE purchases in underserved census tracts. However, HMDA files do not have complete information on every loan. Shortcomings in the HMDA data that are potentially relevant for the studies in this article fall into the following categories:

- Some loans in metropolitan areas are unreported.
- The geographic identification of some loans is not reported.

- The disposition of some loans (whether purchased by a GSE, held in portfolio, or sold to another investor) is not accurately reported.

These issues arise because of gaps in HMDA coverage and errors made by lenders in filing reports. The deficiencies in HMDA will not necessarily invalidate use of the data for the purposes of this study. If the deficiencies are small and not related to neighborhood income or racial mix, the data can still yield valid conclusions.

The first two items listed above can affect the assessment of the adequacy of mortgage lending. The last item can affect the assessment of GSE purchases from HMDA even if the first two items do not introduce any bias. The importance of loans that are not reported or are reported but not geocoded can only be partially assessed. The importance of miscoding fields indicating whether a loan was sold to a GSE can be evaluated with the GSE data.

HMDA coverage gaps arise because some lenders do not file HMDA reports. Depositories that have no offices in metropolitan areas, depositories with assets less than \$10 million, and mortgage companies that receive fewer than 100 applications annually are not required to report their mortgage activity. Thus, some loans in metropolitan areas (presumably a small fraction) go unreported for this reason. Additional loans may be unreported because lenders fail to include all applications or because lenders miscode the disposition (approval, withdrawal, or denial) of some applications that were approved and funded. Among loans that are reported, some cannot be assigned to a census tract because depositories are not required to provide geographic identification for loans secured by properties in metropolitan areas in which they have no branches.

The literature contains various estimates of HMDA coverage rates (loans reported in HMDA as a percentage of loans actually made). Scheessele (1998) reports that HMDA includes 83.2 percent of total loans reported in the *Survey of Mortgage Lending*—82.6 percent for the conventional market and 90.5 percent for the FHA market. He also reports coverage estimates for home purchase loans sold to FHA, Fannie Mae, and Freddie Mac. These estimates, based on records from HUD and the GSEs, are of similar magnitude, but they may not isolate coverage shortfalls. The ambiguity arises because the estimates include errors in reporting the purchasers of individual loans and failures to report loans that were closed.

For the purposes of this study, the more important question is whether HMDA coverage depends on neighborhood income. To my knowledge, this question has not been addressed for the broad mortgage market. Scheessele (1998) indicates that coverage of FHA loans is higher than coverage of conventional loans. Because FHA loans are targeted toward low-income homebuyers, coverage of the market as a whole may be somewhat higher in low-income neighborhoods. However, as Canner and Passmore (1995) point out, many low-income borrowers are outside low-income neighborhoods, and many loans in low-income neighborhoods are extended to borrowers whose incomes are not low. Furthermore, loans made directly by nonprofit consortia and State or local housing finance agencies, which are more likely to be in low-income neighborhoods, are not reported in HMDA. HMDA coverage may be more complete in middle- and high-income neighborhoods. In any case, HMDA is the best data source available, and identifying patterns in that data is an important undertaking.

Alternative data exist to help evaluate whether HMDA accurately captures the geographic distribution of loans purchased by the GSEs. Bunce and Scheessele (1996) compare geographic distributions of GSE purchases using HMDA data and data reported by GSEs.

They find that the estimated concentrations of loans purchased from designated underserved census tracts from HMDA in 1994 and 1995 are within 1 percentage point of the concentrations estimated from the GSE data.¹⁰ These results are consistent with the findings of Berkovec and Zorn (1996) that adjusting the 1992 and 1993 HMDA data on loans sold to Freddie Mac for differences in reporting accuracy results in small changes to the percentages of loans purchased from low-income census tracts. Although the HMDA data understate total GSE purchases, the understatement does not appear to be strongly related to neighborhood income or minority representation. Additional evidence supporting this position is provided in the *Patterns in Mortgage Lending* section of this article.

GSE Data

Under FHEFSSA, data on loans purchased by each of the GSEs are made available to the public yearly. These data provide an independent perspective on the distribution of Fannie Mae and Freddie Mac purchases. Like the HMDA data, the GSE data have census tract identifiers, but the two data sources are not perfect matches in other respects. To accommodate GSE concerns about revelation of confidential, proprietary information on business and marketing practices, the data on GSE purchases have been broken into three separate files. Only one file contains census tract identifiers, and that file does not contain information on some important dimensions of the loans purchased. Exhibit 6 summarizes key attributes of the information in the HMDA data and the GSE file that includes census tracts. Both contain information on the race, income, and gender of borrowers. HMDA data differentiate loans secured by multifamily properties from mortgages secured by one-to four-unit properties, and the GSE file contains no multifamily loans, but neither identifies the number of units in the property. The HMDA records identify investor properties but the GSE census tract file does not.

Census Data

The census of population and housing is taken every 10 years. Information is collected on characteristics of individuals, families, households, and housing units. Some information, such as age and race of individuals and whether the housing unit is owned or rented, is obtained about each person or each housing unit for which a census response is completed. Other information, such as the year the householder moved into the housing unit, is asked of only a sample of respondents.

The U.S. Census Bureau provides summary data for geographic areas within the Nation in its STF 3 data files. Data for census tracts are provided in the STF 3A. The variables in these files provide summary data, such as the number of people reporting their race to be White, their ethnicity to be Hispanic, their home to be rented, and their 1989 income to be between \$35,000 and \$49,999. Some fields, such as family income and home value, are reported as medians for the census tract.

The STF files provide the information necessary to classify each census tract according to its median family income and minority representation. Proportions of minority residents can be inferred from the table that summarizes the numbers of people in each of 10 race-by-Hispanic-origin groups, whereas median family income is provided directly. The files provide additional information useful in characterizing census tracts, including the age of the housing stock, the number of owner-occupied housing units, the numbers of units in various types of structures, and the values of owner-occupied homes.

The characteristics from the census can be merged with the loan data from either HMDA or the GSE file. The resulting data can be used to quantify the rate of mortgage originations per owner-occupied housing unit or single-family property and to obtain correlations between origination rates and characteristics of the census tract, such as minority representation, income, and characteristics of the housing stock.

The census data have two shortcomings. One is that the information applies to the year the questionnaire was completed. When the summary information is used to scale loan activity in a tract that has had many changes since 1990, the conclusions may be inaccurate. The risk of this type of error would be high in neighborhoods with new construction or a changing racial mix. The other shortcoming is that nearly all the information is self-reported, and responses are not obtained for residents of all housing units. U.S. Census Bureau staff impute values for nonrespondents, and the accuracy of the imputations cannot be verified. These shortcomings aside, the census data are by far the best information available on neighborhood characteristics and are widely used in studies of this type.

Exhibit 6

Comparison of HMDA Data and GSE Data From the Single-Family Census Tract File

	HMDA	GSE
1 Who reports?	Primary market lenders ^a	Fannie Mae and Freddie Mac
2 Coverage	Loans closed or purchased in the calendar year	Loans purchased in the calendar year
3 Identify loan amount/ unpaid balance, income, race, gender, and location of borrower	Yes	Yes (unpaid balance subject to top coding)
4 Multifamily loans	Included, identified	Not included
5 Loans on condominiums	Included, not identified	Included, not identified
6 Distinguish owner-occupied from investor properties	Yes	No
7 Identify property value	No	No
8 Include purchased loans that were closed in a previous year	Yes	Yes
9 Distinguish purchased loans	Yes	NA
10 Identify whether loan is sold and the type of purchaser	Yes	NA
11 Identify loan purpose (purchase versus refinance)	Yes	No
12 Include subprime, mobile home, and home improve- ment loans	Yes	Minimally
13 Identify lender	Yes	No

^a Small lenders and nonmetropolitan lenders are not required to report. The definition of *small* has varied over time.

Patterns in Mortgage Lending

This section reviews the geographic distribution of mortgage loans in the 10 MSAs selected for analysis. The purpose is to determine whether mortgage lending in the tracts designated as underserved can be objectively regarded as insufficient in each of the 10 MSAs. The results will provide perspective on the validity of the proxies used to classify neighborhoods as underserved or not, and on these mortgage markets for the analysis of GSE purchases.

Distributions of Housing Units and Mortgage Loans

Mortgage lending activity in each census tract is measured by the numbers of home purchase and refinance mortgages closed and funded between 1994 and 1996 as reported in HMDA data for 1994–96. However, some loans reported in HMDA are not used. Use of HMDA data in this article largely parallels the treatment of Scheessele (1998) and Bunce and Scheessele (1996). Loans reported to have been purchased rather than originated in-house are not included because of the chance that both the seller and the purchaser reported the loan.¹¹ Another exclusion is loans for small amounts. HMDA files contain loans made for relatively small amounts that are coded as purchase or refinance loans, many of which are probably second mortgages or home improvement loans. Loans by lenders who report mainly loans for small amounts have been excluded.¹² In addition, HMDA includes subprime loans and mobile home loans. At this stage of the analysis, the question of whether or not to exclude these loans is debatable. They are not in the mainstream of investment-grade loans that are central to a discussion of GSE purchases, but they are a source of financing for many low-income households. Following Bunce and Scheessele (1996), loans by lenders who primarily make subprime or mobile home loans have been excluded.¹³ Finally, loans secured by rental property have been excluded. This exclusion was motivated by a desire to achieve closer correspondence with the census counts of owner-occupied housing units rather than a deficiency in the data.

Although HMDA data are reported yearly, the analysis will combine loans originated during 1994 to 1996. Combining years may overlook some interesting patterns but it keeps the emphasis on the average level of service to low-income and minority areas. The 3 years are not dissimilar to a large degree, so little is sacrificed by combining them. (The year 1993, with its high volume of refinance loans, was qualitatively different from the subsequent 3 years.) Using 3 years rather than 1 year provides a larger sample of loans for the tracts in which owner-occupied housing is less prevalent.

The number of loans originated in a census tract, normalized using the number of owner-occupied housing units in the 1990 census, is the only measure used of the primary mortgage market's service to neighborhoods across metropolitan areas. Originations per 100 owner-occupied housing units is one of the two service indicators that HUD evaluated in developing the definition for underserved areas. HUD also reviewed geographic patterns in the rate at which loan applications are denied. Support for HUD's approach was drawn from research by HUD staff and other researchers.¹⁴ HUD selected its thresholds for tract median family income and minority representation on the basis of their relationships to denial rates and origination rates for 1993 and 1994.

Given that policy development on this issue is in an early stage and that an analysis of 10 MSAs will be cumbersome, I do not include studies of geographic patterns in denial rates. Differences in origination rates measure differences in the extent to which mortgages flow into neighborhoods of different characteristics. On observing that a neighborhood has a low origination rate, knowing whether the difference is a result of a high denial rate or a low loan application rate does not add substantially to our understanding of whether a market breakdown is curtailing the flow of mortgage credit into that neighborhood.

This position is supported by two lines of argument. First, although available research indicates that denial rates are higher for minority applicants than for White applicants, it does not indicate that the racial composition of the neighborhood has an independent effect on loan approval (Munnell, Brown, McEneaney, and Tootell, 1992; and Avery, Beeson, and Sniderman, 1994).

The Munnell, Brown, McEneaney, and Tootell (1992) study of individual loan applications indicates that poor credit histories of minority applicants account for much of the higher denial rates. Consequently, high denial rates for a census tract may reflect a high incidence of families with a history of credit problems. Observing a low application rate in conjunction with a low denial rate in a high-minority neighborhood would still leave room for suspicion that lenders are not fully serving the community. The observation might be interpreted as reflecting an expectation by prospective homeowners that discrimination makes approval of applications for loans secured by properties in that neighborhood unlikely.

Use of owner-occupied housing units in a tract to scale loan originations follows the approach used by HUD in Appendix B (U.S. Department of Housing and Urban Development, 1995) cited previously. However, it departs slightly from the literature that preceded HUD's evaluation. Both Shear, Berkovec, Dougherty, and Nothaft (1995) and Avery, Beeson, and Sniderman (1994) use the number one-to-four family *properties*. The latter measure has considerable theoretical appeal in that it recognizes the potential for properties to be converted from rental occupancy to owner occupancy. In practice, the two measures yield similar results. This article follows HUD in using owner-occupied housing units for two reasons. It is simpler to implement and it provides a superior measure of the potential depth of the mortgage market when a neighborhood contains condominiums. Owner-occupied condominiums are a potentially important source of mortgage collateral in some markets but not in others, and the HMDA data do not distinguish loans backed by condominiums from loans backed by one-unit structures.

As mentioned in the previous section, the census data on housing units also have some shortcomings. One is that the information on the housing stock is becoming stale. New units were built between 1990 and the sample period, and some existing units were destroyed or taken out of service. Rental units may have become owner occupied and vice versa. Construction was not uniform across census tracts, and the tenure status of housing units can change in some areas but not others. Nevertheless, these changes are not pervasive enough to render the data unusable, and some of the shortcomings can be addressed at least partially in regression analysis.

Exhibit 7 shows distributions of owner-occupied housing units and single-family loans reported in HMDA. The tracts are grouped according to the ratio of tract family median income (TMI) to area (MSA) family median income (AMI). Tracts with ratios between 90 and 120 percent are divided into *high minority* (30 percent or more non-White) and *other*.

The distributions of owner-occupied housing shown in exhibit 7 reflect the differences in the cost of housing. Larger fractions of owner-occupied housing units are in low-income tracts in the low-cost areas. In the five high-cost MSAs, tracts with ratios of tract-to-area income of 90 percent or lower account for 20 to 29 percent of owner-occupied housing units. In the five low-cost MSAs, the corresponding tracts account for 30 to 37 percent of owner-occupied housing units.

The distributions of mortgage loans do not have this same pattern. Indeed, the percentages of loans in low-income tracts (for purposes of this discussion, tracts with TMI \leq 90 percent of AMI) in the high- and low-cost MSAs are very similar. In the high-cost MSAs, tracts

Exhibit 7

Geographic Distributions of Owner-Occupied Housing Units and HMDA Loans

City	TMI as % of AMI	Percentages		Cumulative %	
		Housing units	HMDA loans	Housing units	HMDA loans
Oakland	≤60	6.84	5.45	6.84	5.45
	61–80	10.27	8.24	17.12	13.68
	81–90	11.74	8.92	28.86	22.60
	91–120, High min	15.79	13.26	44.65	35.87
	91–120, Other	18.46	19.04	63.11	54.90
	121+	36.89	45.10	100.00	100.00
Newark	≤60	4.08	2.76	4.08	2.76
	61–80	9.28	6.58	13.35	9.35
	81–90	7.07	5.73	20.42	15.07
	91–120, High min	3.40	2.73	23.82	17.81
	91–120, Other	32.15	29.78	55.97	47.58
	121+	44.03	52.42	100.00	100.00
San Diego	≤60	4.23	3.52	4.23	3.52
	61–80	11.05	8.74	15.28	12.26
	81–90	9.64	8.21	24.92	20.47
	91–120, High min	10.60	9.90	35.52	30.37
	91–120, Other	28.82	25.54	64.35	55.91
	121+	35.65	44.09	100.00	100.00
Boston	≤60	2.76	2.92	2.76	2.92
	61–80	10.09	9.33	12.85	12.25
	81–90	10.41	9.27	23.26	21.52
	91–120, High min	0.51	0.59	23.77	22.11
	91–120, Other	43.00	41.34	66.77	63.45
	121+	33.23	36.55	100.00	100.00
Washington, D.C.	≤60	3.20	2.52	3.20	2.52
	61–80	12.12	10.97	15.32	13.49
	81–90	10.24	7.97	25.57	21.46
	91–120, High min	11.95	12.42	37.52	33.87
	91–120, Other	28.58	28.52	66.10	62.40
	121+	33.90	37.60	100.00	100.00

Exhibit 7 (continued)

Geographic Distributions of Owner-Occupied Housing Units and HMDA Loans

City	TMI as % of AMI	Percentages		Cumulative %	
		Housing units	HMDA loans	Housing units	HMDA loans
Atlanta	≤60	5.78	2.61	5.78	2.61
	61–80	10.91	7.05	16.69	9.66
	81–90	13.92	12.61	30.61	22.27
	91–120, Hi min	4.66	3.21	35.27	25.48
	91–120, Other	27.78	31.39	63.05	56.88
	121+	36.95	43.12	100.00	100.00
Miami	≤60	6.20	4.71	6.20	4.71
	61–80	9.90	7.21	16.11	11.92
	81–90	14.34	11.80	30.44	23.72
	91–120, High min	23.28	19.71	53.72	43.43
	91–120, Other	3.23	3.66	56.95	47.09
	121+	43.05	52.91	100.00	100.00
Dallas	≤60	6.51	2.48	6.51	2.48
	61–80	15.05	8.38	21.56	10.86
	81–90	8.95	6.09	30.51	16.96
	91–120, High min	5.65	3.88	36.16	20.83
	91–120, Other	25.33	22.84	61.50	43.68
	121+	38.50	56.32	100.00	100.00
Tampa	≤60	2.38	1.60	2.38	1.60
	61–80	20.14	14.30	22.52	15.90
	81–90	14.34	11.86	36.86	27.76
	91–120, High min	2.44	2.43	39.30	30.19
	91–120, Other	31.01	30.36	70.31	60.55
	121+	29.69	39.45	100.00	100.00
Houston	≤60	10.24	2.68	10.24	2.68
	61–80	16.59	7.99	26.82	10.67
	81–90	8.58	6.86	35.41	17.53
	91–120, High min	13.84	13.74	49.25	31.27
	91–120, Other	11.80	12.48	61.05	43.75
	121+	38.95	56.25	100.00	100.00

with TMI/AMI ratios of 90 percent and lower account for between 15 and 23 percent of mortgages. In the low-cost MSAs the corresponding percentages range from 17 to 28 percent.

The cumulative percentages show that the concentration of owner-occupied housing units in designated underserved tracts is higher than the concentration of mortgage loans. The disparity exists in both groups of MSAs, but it is larger in the low-cost MSAs. The cumulative percentages of housing units in tracts designated as underserved exceed the comparable percentages of mortgage loans in all markets, in some cases by more than 10 percentage points. Boston is noteworthy in that the cumulative loan percentage (23.77) is within 2 percentage points of the housing unit percentage (22.11). In the other nine MSAs the difference is at least 3.5 percentage points.

These disparities are crude measures of the relationship between lending activity and tract income and minority representation. The next section presents two refinements that enable a better assessment of the level of service to low-income and high-minority areas.

The Framework for Analyzing Origination Levels

The assessment of the geographic distribution of mortgage lending is facilitated by combining lending activity and housing units into an origination rate, defined as the number of originations per 100 owner-occupied housing units. The analysis can then focus on how origination rates vary with tract income and minority representation. Before the analysis is presented, the standard used in this article to assess mortgage activity in low-income and high-minority neighborhoods is introduced. Then this article discusses factors that may account for differences in origination rates across census tracts.

Exhibit 7 compares (indirectly) the origination rates in underserved tracts with origination rates in middle- and high-income tracts. In some MSAs, high-income tracts have high origination rates, and averaging originations in these tracts into the standard for comparison likely results in an overly high standard. Because the middle-income tracts that are not high minority do not receive the *underserved* designation, service in these tracts has apparently been judged to be adequate. Therefore, only if lending activity in these middle-income tracts is higher than activity in low-income and high-minority middle-income tracts can service in the latter two groups be viewed as inadequate. In assessing the level of service in tracts designated as underserved, origination rates will be compared with origination rates in middle-income tracts that are not high minority. Specifically, the statistical analysis will compare origination rates in four groups of census tracts:

- Low income: Tracts with TMI/AMI \leq 90 percent.¹⁵
- High minority: Tracts with 90 percent $<$ TMI/AMI \leq 120 percent and minority representation \geq 30 percent.
- Benchmark: Tracts with 90 percent $<$ TMI/AMI \leq 120 percent and minority representation $<$ 30 percent.
- High income: Tracts with TMI/AMI $>$ 120 percent.

If origination rates for either of the first two groups are less than origination rates for the benchmark group and the difference is statistically significant, then the neighborhoods in that group might be considered to be underserved in fact as well as designation.

The designated underserved tracts are divided into those designated solely on the basis of income and those that owe their designation to a combination of minority representation

and income. This treatment makes it possible to assess activity in the two groups of neighborhoods separately. Separate assessment is warranted because the research preceding HUD's redefinition of underserved neighborhoods found a strong association between income and activity and a small role for race independent of income (Avery, Beeson, and Sniderman, 1994).

The comparisons identified above will provide estimates of gross differences in origination rates. To some degree these differences will reflect the influence of factors affecting the underlying demand for mortgage loans in the census tracts. Differences in origination rates net of these influences can be obtained using a regression analysis that holds these variables constant. Guidance on model development can be obtained from Avery, Beeson, and Sniderman (1994) and Shear, Berkovec, Dougherty, and Nothaft (1995), who analyze mortgage flows into census tracts using the expanded HMDA data. Census tract characteristics used in these papers include median home value, appreciation of home value, and age distribution of homes; age distribution of household heads; and measures of the extent to which the tract housing stock is vacant, rented, and in different property types. Avery and colleagues also include several measures of change in these factors between 1980 and 1990.

The analysis in this article uses fewer factors, because the objectives are more limited and to simplify the analysis and its exposition. The two studies noted above assessed the independent roles of tract racial composition and income on mortgage activity. Here the purpose is only to assess mortgage activity in tracts characterized by HUD regulation as underserved. The tract characteristics used include the amount of recent construction activity, turnover in residents, and home values. To the extent that these characteristics can be quantified, statistical control for them will provide more relevant measures of the service provided to low-income and high-minority tracts relative to benchmark tracts.

Summary statistics for mortgage origination rates and selected census variables are shown in exhibit 8. Origination data are separated into rates for purchase money and refinance loans. Origination rates are lower for refinance loans than for purchase money loans in most MSAs, but the difference is smaller in the high-cost MSAs.

The census variables included in the table reflect factors that influence origination rates. The percentage of owner-occupied homes built between January 1989 and April 1990 (when the census questionnaire was distributed) indicates the amount of construction taking place in the 15 months prior to the census. Within an MSA, tracts in which construction was concentrated in 1989 will likely also be the tracts in which construction was concentrated in the early 1990s. Mortgage originations are expected to have been concentrated in these tracts because they likely had a disproportionate number of home sales. Also, the 1990 census tended to understate the number of owner-occupied homes to a greater degree in these tracts than in others in the MSA. This understatement in these tracts likely raised origination rates of refinance loans as well as home purchase loans.¹⁶

The percentage of April 1990 householders in owner-occupied housing units that moved into their homes in 1989 or early 1990 serves as a measure of the turnover of residents in the tract. Tracts with higher turnover rates may be expected to have higher origination rates for purchase loans but not for refinance loans. Tracts in rural areas having a high percentage of owner-occupied units had room for more post-1990 construction and so may have relatively high origination rates. Property values may affect origination rates because homes with very low values may often be purchased without a mortgage (and the amount of tax-deductible interest will be below, or not far above, the standard deduction on Federal tax returns). Also, the incentive to refinance when interest rates fall may be lower in areas with lower priced homes.

Analysis of Originations

The analysis of origination rates is conducted in two steps. Both involve regression analysis using indicator (or dummy) variables for tracts in the low-income, high-minority, and high-income categories. (All these indicator variables are zero for benchmark tracts. The coefficient on each geographic indicator measures the average difference between origination rates in the tracts identified by the indicator and origination rates in the benchmark tracts.) First the raw differences between groups of census tracts are estimated for each MSA using the three indicator variables alone. Then the differences are estimated using the additional variables from the census that were mentioned in the previous section. In all regressions the observations are weighted by the number of owner-occupied housing units in the census tract.

The variables included in the second step capture within-MSA variation in demand or shortcomings in the census data.¹⁷ For purchase loans, the additional variables are the percentage of owner-occupied housing units built in 1989 or 1990,¹⁸ the percentage of households in owner-occupied housing units that moved in 1989 or 1990,¹⁹ the log of the median value of owner-occupied housing units, and indicators for tracts with high percentages of mobile homes (10 percent or more) and housing units in areas considered rural (25 percent or more). The refinance loan equations include all the variables above except the percentage moved in 1989. Tracts with fewer than 15 owner-occupied housing units were excluded.

This model is a simple reduced form, and it is subject to criticism from critics and defenders of the financial services industry. Critics could argue that some variables, such as home value, the amount of recent construction, and neighborhood turnover, are themselves influenced by access to mortgage credit or the lack thereof. Conversely, the model does not directly capture variance in risk across census tracts, and accounting for variation in demand is crude and incomplete. Nevertheless, policy is being made on the basis of data and analyses such as these, and better data are not available. Since the data do not exist to build a structural model of the distribution of lending activity,²⁰ the reduced form estimates presented below provide useful insight when interpreted with caution.

Exhibit 9 shows the estimated coefficients for the low-income and high-minority indicator variables. The values under the heading *Coefficient* show the differences in average origination rates for low-income and high-minority tracts relative to benchmark tracts. The values under the heading *t-statistic* show the ratios of the coefficients to their standard errors. Model 1 is the equation with only the indicators identifying underserved and high-income tracts. Model 2 includes the additional census variables. The coefficients of the additional variables in model 2, which are presented in the appendix (exhibits A-1 through A-6), have a consistent pattern that conforms broadly to *a priori* expectations.²¹ Thus the results in the appendix exhibits for model 2 may be regarded as differences in origination rates adjusted for differences in a few key factors reflecting demand and construction.

Some results for individual areas merit attention. Boston, which has been the focus of some previous research, was the only MSA in exhibit 7 for which the percentage of loans in underserved tracts was within 2 percentage points of the percentage of housing units in underserved tracts. Exhibits 8 and 9 show that this near equality is the result of a relative abundance of purchase loans in high-minority tracts and a significant shortfall of refinance loans in low-income tracts. These results suggest that funds are available for home purchase in low-income and high-minority neighborhoods in Boston. Access to, or information about, funds for refinancing in these Boston neighborhoods may bear some investigation.

Exhibit 8

Loan Originations and Census Tract Characteristics

City	Tract Group	Loans/100 Units		% of Units built after 1988	% of Households moved after 1988	% of Units in rural areas	Median housing value (1000s)
		Purchase	Refinance				
Oakland	Low inc	4.3	3.8	1.6	12.5	1.4	153.9
	High min	4.7	4.6	3.6	13.8	0.1	205.3
	Benchmark	6.2	5.3	5.0	13.9	0.6	216.1
	High inc	6.7	7.3	6.7	13.3	1.6	334.2
Newark	Low inc	3.7	1.8	1.4	9.4	2.7	123.8
	High min	4.0	2.1	0.7	11.0	0.0	153.1
	Benchmark	4.5	2.6	1.4	9.3	16.5	171.4
	High inc	5.8	3.5	1.3	9.3	10.1	260.1
San Diego	Low inc	4.3	3.6	4.0	14.6	4.0	145.2
	High min	5.0	4.7	3.9	15.7	4.5	149.9
	Benchmark	4.7	4.4	5.7	14.8	5.5	198.9
	High inc	6.6	6.3	9.2	15.5	7.8	282.2
Boston	Low inc	5.4	3.0	1.7	9.8	4.3	158.9
	High min	7.2	3.5	2.1	10.2	0.0	168.5
	Benchmark	5.2	4.0	2.2	9.6	14.2	177.0
	High inc	5.5	5.2	1.6	9.4	16.2	274.6
Washington, D.C.	Low inc	5.0	3.4	5.5	13.9	11.2	129.5
	High min	6.3	4.4	5.7	13.1	4.5	146.0
	Benchmark	6.4	3.8	7.1	14.9	14.6	167.7
	High inc	6.7	4.8	6.3	12.9	7.4	278.6
Atlanta	Low inc	6.5	2.8	5.4	12.1	28.1	64.5
	High min	6.3	2.8	6.0	12.5	9.2	82.5
	Benchmark	11.1	3.9	9.7	15.2	32.9	86.6
	High inc	11.4	4.2	8.8	14.5	12.4	145.9
Miami	Low inc	5.0	2.4	1.3	11.5	0.0	73.7
	High min	5.3	2.9	2.5	13.0	0.9	79.0
	Benchmark	7.0	2.5	3.0	10.4	4.2	175.7
	High inc	8.4	3.7	8.8	15.3	2.3	132.4
Dallas	Low inc	4.0	1.1	1.4	12.0	9.9	56.3
	High min	5.0	1.5	1.4	12.6	0.0	81.1
	Benchmark	6.6	2.0	2.7	13.3	15.3	78.3
	High inc	11.3	3.2	5.2	15.0	5.4	140.5
Tampa	Low inc	3.8	2.1	4.2	13.5	14.5	57.1
	High min	5.0	3.1	2.1	10.8	0.0	60.5
	Benchmark	5.3	2.6	4.2	14.2	14.0	75.3
	High inc	7.6	3.3	5.6	14.9	5.3	109.1
Houston	Low inc	3.0	0.7	0.7	10.9	12.7	45.1
	High min	6.0	1.6	1.4	14.0	5.1	57.8
	Benchmark	6.6	1.7	1.5	13.1	30.0	61.6
	High inc	8.7	2.7	8.3	14.8	8.4	117.8

Exhibit 9

Results of Origination Rate Regressions

City	Loan Purpose	Model	Low-Income Tracts		High-Minority Tracts	
			Coefficient	t-Statistic	Coefficient	t-Statistic
Oakland	Purchase	1	-1.886	-3.78	-1.486	-2.59
	Purchase	2	-0.791	-1.62	-1.142	-2.37
	Refinance	1	-1.541	-6.11	-0.706	-2.43
	Refinance	2	-0.195	-0.77	-0.402	-1.59
Newark	Purchase	1	-0.820	-3.36	-0.481	-0.98
	Purchase	2	-0.458	-1.68	-0.423	-0.92
	Refinance	1	-0.841	-8.16	-0.557	-2.68
	Refinance	2	-0.343	-3.23	-0.266	-1.46
San Diego	Purchase	1	-0.384	-0.93	0.276	0.51
	Purchase	2	0.158	0.40	0.187	0.38
	Refinance	1	-0.789	-4.33	0.319	1.33
	Refinance	2	-0.037	-0.21	0.775	3.66
Boston	Purchase	1	0.131	0.61	2.017	1.72
	Purchase	2	0.168	0.81	2.132	2.05
	Refinance	1	-1.048	-8.87	-0.586	-0.91
	Refinance	2	-0.765	-6.41	-0.373	-0.62
Washington, D.C.	Purchase	1	-1.429	-3.07	-0.126	-0.21
	Purchase	2	-0.746	-1.59	0.447	0.80
	Refinance	1	-0.410	-2.25	0.628	2.73
	Refinance	2	0.041	0.22	0.912	4.08
Atlanta	Purchase	1	-4.604	-6.09	-4.826	-3.35
	Purchase	2	-1.973	-2.74	-3.024	-2.50
	Refinance	1	-1.088	-6.63	-1.054	-3.37
	Refinance	2	-0.296	-2.25	-0.578	-2.60
Miami	Purchase	1	-2.001	-1.26	-1.696	-1.05
	Purchase	2	-1.748	-1.43	-2.123	-1.75
	Refinance	1	-0.122	-0.35	0.364	1.03
	Refinance	2	0.343	0.98	0.715	2.05
Dallas	Purchase	1	-2.595	-2.67	-1.653	-0.98
	Purchase	2	-1.100	-1.33	-0.600	-0.46
	Refinance	1	-0.979	-7.18	-0.497	-2.10
	Refinance	2	-0.468	-4.44	-0.294	-1.74
Tampa	Purchase	1	-1.505	-3.91	-0.235	-0.22
	Purchase	2	-1.015	-2.69	0.583	0.63
	Refinance	1	-0.525	-5.44	0.508	1.93
	Refinance	2	-0.393	-3.75	0.565	2.22
Houston	Purchase	1	-3.519	-5.38	-0.533	-0.69
	Purchase	2	-2.346	-3.97	-0.535	-0.79
	Refinance	1	-1.010	-8.60	-0.078	-0.56
	Refinance	2	-0.625	-6.21	-0.012	-0.10

Other MSAs of interest include Atlanta and Washington, D.C. Atlanta, which merits special attention because of the “Color of Money” articles (Dedman, 1988) and the Decatur Federal consent decree, shows significant shortfalls in both low-income and high-minority tracts using both model 1 and model 2. One must be careful not to read too much into these results, but none of the other nine MSAs have such pervasive shortfalls. The pattern for Washington, D.C., also the site of critical newspaper coverage and a landmark consent decree, is more positive. There, significant model 1 shortfalls in low-income tracts for both purchase and refinance loans are eliminated when additional census tract characteristics are included. Washington has no significant shortfalls in high-minority tracts in either specification. The data show significantly higher rates of refinancing in high-minority tracts in both specifications.

Any patterns present in exhibit 9 are difficult to detect. Exhibit 10 summarizes the results in exhibit 9. The values in the columns labeled *Median difference* show the medians of the coefficients in exhibit 9. The columns labeled *Significant shortfalls* show the number of MSAs in which the relevant coefficient is negative and the t-statistic is greater than or equal to 2.0. For purchase money loans, origination rates in low-income tracts are significantly below origination rates in the benchmark tracts in three MSAs in the high-cost group and four MSAs in the low-cost group. The median difference is 0.82 percent in the high-cost group and 2.60 percent in the low-cost group. After adjustment for census tract characteristics, low-income tracts have origination rates significantly below rates in the benchmark tracts in only three MSAs, all in the low-cost group. The size of the differences are sharply lower after the census characteristics, are added.

Disparities between benchmark tracts and low-income tracts are smaller but more common in refinance activity, with low-income tracts having significantly lower origination rates in nine MSAs using model 1 and six MSAs using model 2. The MSAs with

Exhibit 10

Summary of Regression Analysis of Origination Rates

	High-Cost Areas		Low-Cost Areas	
	Median Difference	Significant Shortfalls	Median Difference	Significant Shortfalls
Low-income underserved tracts				
Purchase loans				
Model 1	-0.82	3	-2.60	4
Model 2	-0.46	0	-1.75	3
Refinance loans				
Model 1	-0.84	5	-0.98	4
Model 2	-0.20	2	-0.39	4
High-minority underserved tracts				
Purchase loans				
Model 1	-0.13	1	-1.65	1
Model 2	0.19	1	-0.60	1
Refinance loans				
Model 1	-0.56	2	-0.08	2
Model 2	-0.27	0	-0.01	1

significantly lower origination rates after adjustment for census characteristics are again primarily in the low-cost group.

The values in the lower half of exhibit 10 show that origination rates for the high-minority tracts are generally comparable with origination rates for benchmark tracts. Before adjustment for census characteristics, only two MSAs have low origination rates for purchase loans and four have significantly low origination rates for refinance loans. Adjusting for census characteristics does not change the number of MSAs with significantly low origination rates for purchase money mortgages in high-minority tracts, but lower reduces the number with low rates for refinance mortgages to one. MSAs with low origination rates in high-minority tracts are about equally divided between the high- and low-cost groups.

Separating purchase loans from refinance loans is important in evaluating relative mortgage activity in low-income areas. In exhibit 9, significance levels for shortfalls in low-income tracts are generally higher for refinance loans than for purchase loans. The coefficients are smaller in the refinance equations, but this reflects the generally lower level of refinance activity across all tracts. [Manchester (1998) reports related results in his table 10.] This pattern is consistent with the circumstances underlying the different options available to families seeking funds for the two different reasons. Many of the programs that promote access to credit for low-income families focus on facilitating the purchase of a home, not refinancing the mortgage on a home that a family already owns. Thus, nearly all FHA loans are purchase loans, and nearly all refinance loans are conventional. Families who buy a home with a small downpayment and a loan tailored to low-income first-time buyers will be handicapped in their attempts to obtain conventional financing when interest rates fall.

Summary

Overall, the results indicate that low origination rates in tracts designated as underserved are not a pervasive phenomenon. Once some simple demand variables are incorporated, low-income tracts in the majority of the MSAs studied do not have significantly lower origination rates than middle-income tracts with minority representation below 30 percent. Parity is even more common for high-minority middle-income tracts. Origination rates for those tracts are significantly below those of benchmark tracts in only one MSA after adjustment for demand factors.

The concentration of low-income shortfalls in the low-cost MSAs is a surprise, and there is no obvious explanation. It may or may not reflect a causal relationship between the general level of housing costs in a market and the access to mortgage money in low-income neighborhoods. Whatever the reason, owner-occupied housing still has a larger presence in low-income neighborhoods of low-cost MSAs than of high-cost MSAs.

Patterns in GSE Purchases

This section reviews the geographic distributions of GSE purchases in the 10 MSAs. The distributions are derived from HMDA, although the distributions generated by HMDA and GSE data are compared to show where the two sources differ. The purpose of the analysis is to assess whether, and to what extent, GSE purchases from tracts designated as underserved might be considered insufficient in the individual MSAs studied. The results provide perspective on variation in the GSEs' support for low-income and high-minority neighborhoods across markets.

To evaluate GSE purchases, it is necessary to identify loans in HMDA that are eligible for sale to the GSEs. HMDA-reported conventional mortgage loans for amounts at or below the conforming loan limit (hereafter the *conforming market*) have been used for this purpose. *Conforming* in this context is not intended to imply that these loans conform to GSE underwriting standards in other respects, such as the loan-to-value ratio, payment-to-income ratio, or borrower's credit history. In developing this distribution for each MSA, loans secured by rental property are included, but loans originated by lenders who specialize in subprime loans, manufactured housing loans, or loans that appear to be second mortgages or home improvement loans are excluded.²² Investor loans from HMDA are included because the GSE data include such loans and they are indistinguishable in the GSE data from loans secured by owner-occupied housing. The types of loans excluded from consideration are rarely purchased by the GSEs—in most cases because of restrictions in their charters.

The discussion of GSE purchases largely parallels the discussion of loan originations in the previous section. A detailed comparison of the distributions of conforming loans and GSE purchases includes a comparison of the distributions of GSE loans in two sources of information on GSE purchases. Descriptive statistics on GSE purchase rates and on a set of possibly influential variables obtained from HMDA follow, along with a regression analysis of purchase rates in each MSA. This analysis uses logit regression to compare the probability that loans in tracts designated as underserved will be purchased, relative to loans in the benchmark tracts (non-high-minority tracts with TMI/AMI ratios between 90 percent and 120 percent). The analysis first estimates gross differences, then attempts to estimate net differences after holding constant some factors that help explain differences in purchase probability across tract income and minority concentration.

A point to bear in mind when reviewing GSE performance in individual markets is that neither the GSE data nor the HMDA data indicate the number of units in the property securing the loan. The geographically targeted housing goal is specified in terms of units financed, so this limitation in the data undermines the ability to evaluate performance toward this goal on an individual MSA basis. This limitation introduces a bias if:

(1) GSEs are less likely to purchase mortgages secured by two- to four-unit properties than mortgages secured by one-unit properties, and (2) such properties are numerous and more heavily concentrated in low- and moderate-income neighborhoods.

Data in the Manchester (1998) study and the census suggest this concern may be valid, particularly for high-cost MSAs. Two- to four-unit properties represent a small share of properties securing GSE purchases. Nationally, owner-occupied one-unit properties represent 93 percent of the units in one- to four-unit properties financed by the GSEs in 1996 and 1997.²³

Census data on the housing units in the 10 subject MSAs show that the proportion of units in two- to four-unit properties is considerably higher than their proportion of GSE purchases. In the high-cost MSAs, 18.2 percent of units in one- to four-unit properties are in properties of two or more units. The comparable figure for low-cost MSAs is 9.3 percent. Census data also show that these two- to four-unit properties are disproportionately concentrated in the lower income census tracts. Between 40 and 50 percent of the units in two- to four-unit properties are in census tracts having tract median family income at or below 80 percent of area median family income. These tracts account for 15 percent of one-unit properties in the high-cost MSAs and 24 percent of one-unit properties in low-cost MSAs.

In the absence of the ability to differentiate mortgages on one-unit versus two- to four-unit properties, little can be done to address this issue empirically. This point should be kept in mind when interpreting the results on purchase rates in this section.

Distributions of GSE Purchases in HMDA and GSE Data

Exhibit 11 shows the geographic distributions of the conforming market as reported in HMDA and GSE purchases of single-family loans as reported in HMDA and in the GSE census tract data. The table has a layout similar to exhibit 7.

The concentrations of conforming loans in areas designated as underserved vary widely across MSAs, from a low of 16.27 percent in Newark to a high of 44.42 percent in Oakland.²⁴ The variation does not appear to be related to the level of housing cost. The percentage of conforming loans made in tracts qualifying as underserved varies from 16 to 44 percent in the high-cost MSAs and from 20 to 43 percent in the low-cost MSAs. This parity across the two groups is similar to the pattern observed in exhibit 6 for all single-family mortgage loans.

The distributions of GSE purchases (in the GSE data) and the conforming market are remarkably similar in most of the GSEs. The primary exceptions are Boston, Dallas, Tampa, and Houston. The disparity is largest in Tampa, where GSE purchases in underserved tracts are 8 percentage points lower than conforming loans in these tracts. In the three other MSAs with substantial disparities, the differences are on the order of 4 to 5 percentage points. In five of the other six MSAs, the differences are below 2 percentage points, and in the sixth (Atlanta) the difference is 2.6 percentage points.

The distributions from the two alternative measures of GSE purchases, HMDA and GSE data, are similar in nearly every city. The two largest differences in the percentage of purchases from underserved areas are found in San Diego and Oakland. The HMDA data understate the percentages of purchases from underserved tracts in both cities, by 3.2 percentage points and 2.5 percentage points, respectively. The generally close conformity suggests that the HMDA data are useful for assessing GSE purchases.²⁵

Exhibit 12 shows geographic patterns in Fannie Mae and Freddie Mac purchases as a percentage of the conforming market. The table presents these purchase rates calculated using HMDA data alone and using the GSE data in conjunction with HMDA data. The rates calculated using HMDA data alone show the number of loans in a census tract, with the *Purchaser* field coded to indicate Fannie Mae or Freddie Mac as a percentage of conforming loans in the census tract. The rates calculated using GSE data show the number of purchases identified in the GSE data for a census tract as a percentage of conforming loans reported in HMDA for the tract. Because the numbers of loans purchased in HMDA are considerably less than the corresponding numbers contained in the GSE files, purchases from the GSE data are rescaled to facilitate comparisons. The average purchase rates derived from HMDA alone and from HMDA and GSE data combined are equated for the benchmark tracts.

Exhibit 12 presents information useful in assessing two issues: (1) GSE activity in low-income and high-minority tracts relative to benchmark tracts, and (2) discrepancies between purchase rates derived from the two methods. Although some patterns are apparent with respect to the first issue, further discussion of that topic is deferred to the next two subsections. The consistency of the two sets of purchase rates is important because neither source is ideal for an evaluation of GSE purchases. The GSE data provide a more nearly complete census of loans purchased by the GSEs, but they have disadvantages. First, the

Exhibit 11

Geographic Distributions of Conventional Loans Under the Conforming Limit and GSE Purchases

City	TMI as % of AMI	Percentages			Cumulative Percentages		
		Conforming Market	GSE Purchases		Conforming Market	GSE Purchases	
			Per HMDA	Per GSE		Per HMDA	Per GSE
Oakland	≤60	6.92	5.24	6.42	6.92	5.24	6.42
	61–80	9.89	8.69	9.68	16.81	13.94	16.10
	81–90	10.96	10.27	11.01	27.78	24.20	27.10
	91–120, Hi min	16.64	17.42	17.01	44.42	41.62	44.12
	91–120, Other	21.50	21.95	21.27	65.92	63.57	65.39
	121+	34.08	36.43	34.61	100.00	100.00	100.00
Newark	≤60	2.41	1.84	2.05	2.41	1.84	2.05
	61–80	5.61	5.15	5.63	8.03	6.99	7.68
	81–90	5.62	5.62	6.13	13.65	12.60	13.81
	91–120, Hi min	2.61	2.61	2.96	16.27	15.21	16.77
	91–120, Other	34.05	35.35	35.04	50.31	50.55	51.80
	121+	49.69	49.45	48.20	100.00	100.00	100.00
San Diego	≤60	4.00	2.95	3.92	4.00	2.95	3.92
	61–80	9.19	7.94	9.17	13.20	10.89	13.09
	81–90	8.83	8.26	8.74	22.02	19.15	21.82
	91–120, Hi min	9.21	8.70	9.22	31.24	27.85	31.04
	91–120, Other	27.95	28.29	28.09	59.19	56.14	59.14
	121+	40.81	43.86	40.86	100.00	100.00	100.00
Boston	≤60	3.04	2.45	2.30	3.04	2.45	2.30
	61–80	10.04	8.48	8.24	13.09	10.93	10.53
	81–90	10.17	9.32	8.94	23.25	20.25	19.47
	91–120, Hi min	0.63	0.51	0.47	23.88	20.76	19.94
	91–120, Other	45.25	46.49	46.12	69.13	67.25	66.07
	121+	30.87	32.75	33.93	100.00	100.00	100.00
Washington, D.C.	≤60	2.84	2.63	2.52	2.84	2.63	2.52
	61–80	10.46	9.99	9.41	13.30	12.62	11.94
	81–90	8.15	8.04	9.36	21.45	20.66	21.29
	91–120, Hi min	11.66	11.91	11.20	33.11	32.58	32.49
	91–120, Other	30.49	31.56	31.75	63.60	64.14	64.24
	121+	36.40	35.86	35.76	100.00	100.00	100.00

Exhibit 11 (continued)**Geographic Distributions of Conventional Loans Under the Conforming Limit and GSE Purchases**

City	TMI as % of AMI	Percentages			Cumulative Percentages		
		Conforming Market	GSE purchases		Conforming Market	GSE purchases	
			Per HMDA	Per GSE		Per HMDA	Per GSE
Atlanta	≤60	2.57	1.81	1.69	2.57	1.81	1.69
	61–80	6.62	5.21	5.39	9.19	7.03	7.08
	81–90	11.44	10.65	10.86	20.63	17.68	17.94
	91–120, Hi min	2.36	2.46	2.42	22.99	20.14	20.36
	91–120, Other	31.69	31.83	31.71	54.69	51.97	52.07
	121+	45.31	48.03	47.93	100.00	100.00	100.00
Miami	≤60	5.00	3.98	3.91	5.00	3.98	3.91
	61–80	7.64	6.93	7.10	12.64	10.91	11.01
	81–90	11.30	11.18	12.17	23.95	22.10	23.18
	91–120, Hi m	19.12	17.97	18.44	43.07	40.07	41.62
	91–120, Other	3.94	3.25	3.34	47.01	43.31	44.96
	121+	52.99	56.69	55.04	100.00	100.00	100.00
Dallas	≤60	2.85	2.07	2.00	2.85	2.07	2.00
	61–80	8.38	6.31	6.25	11.23	8.38	8.25
	81–90	5.54	4.85	4.84	16.78	13.24	13.09
	91–120, Hi min	3.20	2.82	2.98	19.97	16.05	16.07
	91–120, Other	20.27	19.74	19.32	40.24	35.79	35.39
	121+	59.76	64.21	64.61	100.00	100.00	100.00
Tampa	≤60	1.60	0.58	0.55	1.60	0.58	0.55
	61–80	14.42	9.80	9.98	16.02	10.38	10.53
	81–90	11.79	8.82	9.27	27.80	19.20	19.81
	91–120, Hi min	2.12	2.24	1.97	29.93	21.45	21.78
	91–120, Other	30.30	30.95	30.46	60.23	52.40	52.24
	121+	39.77	47.60	47.76	100.00	100.00	100.00
Houston	≤60	2.94	1.99	1.80	2.94	1.99	1.80
	61–80	8.72	7.01	6.95	11.67	9.00	8.74
	81–90	7.16	6.20	5.83	18.82	15.20	14.58
	91–120, Hi min	12.88	12.38	11.88	31.70	27.58	26.45
	91–120, Other	11.65	11.45	11.06	43.35	39.03	37.51
	121+	56.65	60.97	62.49	100.00	100.00	100.00

Note: *Conforming* loans are conventional loans for amounts not exceeding the conforming loan limit.

loans identified in the GSE data cannot be matched to records in HMDA, so loan-level comparisons of characteristics of loans purchased by GSEs versus loans that are retained by the lender or sold to other secondary market participants is not possible. Such comparisons are possible with HMDA data. Second, the GSE data do not identify several important characteristics, such as whether the property is owner occupied or whether the loan was used to purchase a home or to refinance a home already owned by the borrower. HMDA data do not have these shortcomings, but they include errors in coding the *Purchaser* field, which is important for the study of GSE purchases. The advantages to using purchase rates calculated from HMDA data alone are considerable if reservations about the quality and completeness of the data can be overcome.

To facilitate assessment of the consistency between the two data sources, exhibit 12 contains columns showing the purchase rates from HMDA alone as a percentage of purchase rates from HMDA/GSE jointly. A value of 100 implies equality; values less than 100 imply lower rates for HMDA relative to the HMDA/GSE combination. Exhibit 13 shows summary statistics for these ratios. Although exhibits 12 and 13 show highly similar geographic patterns in purchase rates derived from the two data sets, the correspondence is not perfect. If the GSE data are regarded as accurate for GSE purchases, the *Purchaser* field in HMDA understates Fannie Mae purchases in low-income tracts (relative to purchases in benchmark tracts), particularly in the high-cost areas. HMDA understates Freddie Mac purchases in low-income tracts in high-cost areas, but to a lesser degree than for Fannie Mae. Conversely, HMDA overstates Freddie Mac purchases from high-minority tracts and from high-income tracts.

In view of the strengths and weaknesses of the alternatives, the HMDA data alone are used in statistical analysis of GSE purchase rates in low-income and high-minority census tracts. The apparent understatement of purchase rates in low-income tracts of some MSAs will be noted in the interpretation of the results.

Loan Characteristics and GSE Purchases

The statistical analysis of GSE purchases will use the same framework as the analysis of loan activity in the previous section on “Patterns in Mortgage Lending.” Disparities between underserved tracts and benchmark tracts will be quantified in two models, one that includes no controls for loan characteristics (other than the year the loan was reported in HMDA) and a second model that holds constant some loan characteristics that might affect the GSEs’ propensity to purchase the loan. Data on loan characteristics are confined to information available in HMDA, such as the loan amount, whether the loan was for home purchase or refinance, and whether the property was owner occupied.

In addition, two variables identify lenders that tend to sell few loans to either GSE. These variables are constructed from national HMDA data for 1994, 1995, and 1996. One variable identifies lenders that report fewer than 150 conforming loan originations in a year. These lenders are called *local* lenders. The second variable classifies each lender in an area according to its activity outside the MSA in question. This variable is a zero-one indicator identifying lenders that report more than 2,500 annual conforming loan originations in other MSAs and combined sales to Fannie Mae and Freddie Mac of less than 10 percent. These lenders are called *large portfolio lenders*.

Exhibit 14 shows summary statistics for GSE purchase rates and for the loan and lender characteristics for each MSA. Purchase rates are shown for the two GSEs combined, but refinance and purchase loans are separated. All figures are based on HMDA data. Loan amounts and the percentages of investor (non-owner-occupied) loans are related to tract

Exhibit 12

GSE Purchase Rates

City	Tract Group	Purchases as Percentage of HMDA Originations					
		Fannie Mae Purchases			Freddie Mac Purchases		
		Per HMDA	Per GSE	HMDA/GSE (%)	Per HMDA	Per GSE	HMDA/GSE (%)
Oakland	Low inc	23.09	27.49	84.0	13.37	14.66	91.2
	High min	27.01	26.86	100.6	16.79	17.30	97.1
	Benchmark	25.95	25.95	100.0	16.79	16.79	100.0
	High inc	27.01	26.38	102.4	17.72	17.48	101.4
Newark	Low inc	20.43	22.75	89.8	13.81	15.14	91.2
	High min	22.03	27.61	79.8	14.93	14.89	100.3
	Benchmark	21.71	21.71	100.0	16.78	16.78	100.0
	High inc	20.82	19.99	104.2	16.08	16.28	98.8
San Diego	Low inc	23.62	28.20	83.8	13.98	15.15	92.3
	High min	25.29	28.07	90.1	15.57	15.67	99.4
	Benchmark	26.44	26.44	100.0	17.32	17.32	100.0
	High inc	28.26	26.66	106.0	18.22	16.97	107.4
Boston	Low inc	22.25	21.67	102.7	11.90	11.36	104.8
	High min	20.02	20.03	100.0	11.60	9.63	120.4
	Benchmark	24.27	24.27	100.0	16.02	16.02	100.0
	High inc	25.14	25.99	96.8	16.46	17.46	94.3
Washington, D.C.	Low inc	24.64	25.60	96.3	15.59	15.66	99.6
	High min	26.55	24.57	108.0	16.12	15.33	105.1
	Benchmark	26.24	26.24	100.0	16.98	16.98	100.0
	High inc	24.99	24.27	103.0	16.15	16.46	98.1
Atlanta	Low inc	17.40	18.38	94.6	14.79	14.38	102.8
	High min	24.42	22.02	110.9	14.76	16.54	89.3
	Benchmark	20.37	20.37	100.0	17.35	17.35	100.0
	High inc	21.76	21.33	102.0	18.05	18.56	97.2
Miami	Low inc	23.30	25.34	92.0	9.50	9.03	105.3
	High min	24.04	25.33	94.9	9.38	8.93	105.0
	Benchmark	18.83	18.83	100.0	10.43	10.43	100.0
	High inc	25.66	25.24	101.6	12.37	11.16	110.8
Dallas	Low inc	26.09	26.08	100.0	11.07	11.63	95.2
	High min	28.47	31.83	89.4	12.99	13.25	98.0
	Benchmark	30.51	30.51	100.0	15.36	15.36	100.0
	High inc	31.70	31.70	100.0	18.90	19.91	94.9
Tampa	Low inc	15.00	15.72	95.4	7.50	7.91	94.8
	High min	22.91	22.62	101.3	11.47	8.50	134.9
	Benchmark	21.75	21.75	100.0	11.51	11.51	100.0
	High inc	24.91	25.79	96.6	14.08	13.92	101.1

Exhibit 12 (continued)

GSE Purchase Rates

City	Tract Group	Purchases as Percentage of HMDA Originations					
		Fannie Mae Purchases			Freddie Mac Purchases		
		Per HMDA	Per GSE	HMDA/GSE (%)	Per HMDA	Per GSE	HMDA/GSE (%)
Houston	Low inc	27.88	28.43	98.0	10.84	10.61	102.1
	High min	33.99	33.64	101.0	12.09	12.82	94.4
	Benchmark	31.67	31.67	100.0	15.46	15.46	100.0
	High inc	33.66	36.00	93.5	17.94	18.58	96.6

Note: GSE purchase rates have been scaled to be consistent with HMDA purchase rates.

Exhibit 13

Relative Purchase Rates: HMDA Versus GSE

	Average HMDA/GSE (%) ^a		
	Low-cost MSAs	High-cost MSAs	Total
Low inc			
Fannie Mae	91.3	96.0	93.7
Freddie Mac	95.8	100.0	97.9
High min			
Fannie Mae	95.7	99.5	97.6
Freddie Mac	104.5	104.3	104.4
Benchmark (100% by definition)			
Fannie Mae	100.0	100.0	100.0
Freddie Mac	100.0	100.0	100.0
High inc			
Fannie Mae	95.7	99.5	97.6
Freddie Mac	104.5	104.3	104.4

^a Averages of figures in exhibit 12.

income in all MSAs. Loan amounts increase with income, and the percentage of investor loans declines. The proportion of loans made by local lenders is higher in low-income tracts, particularly in the low-cost MSAs. The proportion of loans made by large lenders that do not sell to the GSEs is also higher in low-income tracts.

The next subsection reports regression analyses using the variables in exhibit 14. These variables have played a different function from the variables in the origination rate equations in the section *Patterns in Mortgage Lending*. There, the variables reflect influences on the demand for new mortgage loans. They may be regarded as variables that not only explain variance in origination rates but justify higher levels in some tracts than others. For example, mortgage origination rates might be expected to be higher in neighborhoods with high rates of recent construction. In the GSE purchase analyses, the variables may

help explain variance, but they do not necessarily justify lower purchase rates in low-income or high-minority tracts. Instead, they may help identify characteristics of loans that would have to be purchased more frequently to increase the percentage of loans purchased from areas designated as underserved.

Another respect in which interpretation of the analytical framework is less straightforward is in the treatment of the high-income tracts. In the regression analysis that follows, the standard for GSE purchase rates in low-income and high-minority tracts is the average purchase rate in benchmark tracts. The justification for not averaging purchases in high-income tracts with the benchmark tracts is not as clear cut as in the case of origination rates. If actual targets were set only on the basis of performance in benchmark tracts, the GSEs would have the incentive to shift purchases from middle-income to high-income tracts. Parity in purchase rates between underserved and benchmark tracts should be regarded as necessary but not sufficient for regarding GSE purchases from low-income and high-minority tracts as satisfactory.

Statistical Analysis of GSE Purchase Rates

The statistical analysis discussed in this section provides a formal basis for evaluating the geographic distribution of acquisitions of loans by Fannie Mae and Freddie Mac. As in the case of loan activity, any shortfalls that exist may be evaluated on the basis of both their magnitude and statistical significance. The analysis uses loan-level observations on conforming loans from HMDA. Loans with the *Purchase* category (exhibit 15) indicating Fannie Mae or Freddie Mac are interpreted as GSE acquisitions.

Separate logit regressions are estimated for purchase and refinance loans for each GSE in each MSA. Model 1 includes indicator (dummy) variables for low-income tracts, high-minority tracts, and high-income tracts. Model 1 also includes indicators for loans reported in 1994 and 1995, with loans reported in 1993 representing the base group. Model 2 includes model 1 variables plus the log of the loan amount and indicators for investor loans and loans originated by *local* and *large portfolio lenders*, as those terms were defined above.

Exhibits 15 and 16 present estimates for the geographic variables. The structure is similar to exhibit 9. The disparity between the underserved tracts and benchmark tracts is shown in the column titled *Odds ratio*. This column contains the relevant logit coefficient after exponentiation. It reflects the relative likelihood that loans in underserved tracts will be purchased. Thus, a value of 1.000 indicates equal purchase probabilities for loans in benchmark and underserved tracts, and a value of 0.900 indicates that odds ratios ($p/(1-p)$, where p is the purchase rate) in the underserved tracts are 90 percent of the odds ratios in benchmark tracts. Exhibit 15 shows the estimates for low-income tracts. Exhibit 16 shows the results for high-minority tracts.²⁶

The model 1 estimates in exhibit 15 reveal that shortfalls in the purchase rates of low-income underserved tracts relative to benchmark tracts are not universal, and when they exist they vary in size. Tampa has the largest shortfalls. In that city, relative odds ratios are less than 70 percent for both GSEs. Freddie Mac has shortfalls in most MSAs in exhibit 16, but they are much smaller than their counterparts in exhibit 15. These shortfalls, which are evident for both home purchase and refinance loans, have Z-statistics in excess of 10.0, so they are highly significant. Shortfalls in low-income tracts in most other markets are smaller, and they are sometimes nonexistent for Fannie Mae. In exhibit 16, parity (and even odds ratios exceeding 1.0) in purchase rates for high-minority tracts is fairly common for Fannie Mae.

Exhibit 14

GSE Purchases and Conforming Loan Characteristics (from HMDA data)

MSA	Tract Group	Purchase Rates (%)		Mean Loan Amount (thousands)	Investor Loans (%)	Local Lenders (%)	Large Portfolio Lenders (%)
		Purchase Loans	Refinance Loans				
Oakland	Low inc	34.2	38.3	110.5	15.2	2.6	21.8
	High min	37.4	48.9	130.5	7.5	2.2	17.7
	Benchmark	37.7	47.2	135.9	7.5	2.5	17.4
	High inc	40.3	48.0	147.1	5.5	2.1	17.2
Newark	Low inc	34.1	34.4	93.7	8.0	7.9	15.3
	High min	37.7	35.9	103.8	4.9	5.1	13.7
	Benchmark	41.9	33.5	111.0	2.5	7.1	13.0
	High inc	39.3	33.5	133.0	1.6	5.7	12.2
San Diego	Low inc	37.8	37.4	100.6	16.8	3.5	19.3
	High min	40.7	41.0	109.5	9.2	3.2	19.5
	Benchmark	43.5	44.0	122.9	9.4	3.3	16.7
	High inc	46.7	46.3	140.5	7.2	3.1	15.9
Boston	Low inc	29.2	41.7	95.4	9.0	12.9	7.6
	High min	26.6	41.6	97.2	6.0	6.6	11.6
	Benchmark	37.2	43.8	114.3	3.4	13.6	3.2
	High inc	37.8	45.1	134.1	2.9	11.2	3.4
Washington, D.C.	Low inc	39.0	41.3	101.2	8.9	5.6	8.6
	High min	41.5	43.6	119.3	4.7	4.5	8.7
	Benchmark	42.0	44.7	125.0	5.0	4.6	6.3
	High inc	39.8	42.6	137.4	4.0	3.7	7.1
Atlanta	Low inc	32.9	31.2	74.9	9.7	10.5	7.3
	High min	39.8	38.3	80.3	5.6	4.6	7.5
	Benchmark	36.4	40.9	97.5	4.3	5.7	5.2
	High inc	37.4	45.7	118.9	2.6	2.7	5.6
Miami	Low inc	36.6	26.0	66.0	13.9	6.0	18.0
	High min	36.9	27.9	72.2	12.4	6.2	16.2
	Benchmark	29.1	29.9	70.0	24.2	5.0	23.3
	High inc	40.0	33.8	93.5	9.6	5.7	12.1
Dallas	Low inc	39.1	30.9	58.5	14.9	15.0	9.3
	High min	43.6	34.6	68.9	10.6	7.5	9.6
	Benchmark	47.4	41.3	80.2	8.6	10.7	8.0
	High inc	50.2	52.1	116.8	3.4	4.6	6.8
Tampa	Low inc	24.4	19.5	50.3	14.2	5.1	22.8
	High min	38.7	28.9	54.3	9.0	5.5	17.8
	Benchmark	34.4	31.2	68.2	10.4	3.2	17.4
	High inc	39.4	38.0	91.5	8.4	2.6	12.5
Houston	Low inc	39.6	34.8	59.4	9.4	10.6	8.8
	High min	46.9	42.5	62.7	7.8	6.6	7.9
	Benchmark	47.3	46.5	72.8	6.6	6.9	8.3
	High inc	51.6	51.5	100.7	4.4	4.5	6.1

Exhibit 15

Results of GSE Purchase Rate Regressions: Low-Income Tracts

City	Loan Purpose	Model	Fannie Mae		Freddie Mac	
			Odds Ratio	Z-Statistic	Odds Ratio	Z-Statistic
Oakland	Purchase	1	0.989	-0.35	0.748	-7.23
	Purchase	2	1.130	3.74	0.861	-3.59
	Refinance	1	0.768	-9.48	0.753	-8.92
	Refinance	2	0.890	-3.96	0.916	-2.62
Newark	Purchase	1	0.847	-4.20	0.673	-8.32
	Purchase	2	0.930	-1.77	0.760	-5.61
	Refinance	1	1.065	1.31	1.001	0.01
	Refinance	2	1.175	3.16	1.109	1.88
San Diego	Purchase	1	0.923	-2.69	0.709	-8.84
	Purchase	2	1.062	1.93	0.806	-5.37
	Refinance	1	0.815	-7.11	0.811	-6.54
	Refinance	2	0.951	-1.65	0.927	-2.24
Boston	Purchase	1	0.825	-8.71	0.639	-16.33
	Purchase	2	0.957	-1.88	0.751	-10.05
	Refinance	1	1.024	1.03	0.822	-6.74
	Refinance	2	1.093	3.63	0.890	-3.87
Washington, D.C.	Purchase	1	0.957	-1.89	0.849	-5.68
	Purchase	2	1.088	3.46	0.954	-1.60
	Refinance	1	0.887	-5.18	0.955	-1.73
	Refinance	2	1.054	2.17	1.089	3.11
Atlanta	Purchase	1	0.909	-4.59	0.847	-7.09
	Purchase	2	1.011	0.50	0.941	-2.52
	Refinance	1	0.707	-11.72	0.734	-10.81
	Refinance	2	0.862	-4.83	0.907	-3.24
Miami	Purchase	1	1.592	9.07	0.990	-0.15
	Purchase	2	1.301	4.94	0.858	-2.26
	Refinance	1	0.897	-1.13	0.787	-1.87
	Refinance	2	1.064	0.61	0.935	-0.51
Dallas	Purchase	1	0.834	-7.01	0.675	-10.92
	Purchase	2	0.956	-1.63	0.809	-5.64
	Refinance	1	0.677	-7.64	0.737	-5.01
	Refinance	2	0.868	-2.60	0.951	-0.79
Tampa	Purchase	1	0.678	-16.17	0.639	-13.77
	Purchase	2	0.753	-11.27	0.720	-9.81
	Refinance	1	0.568	-16.63	0.604	-11.60
	Refinance	2	0.716	-9.20	0.770	-5.79
Houston	Purchase	1	0.872	-5.29	0.644	-12.25
	Purchase	2	0.929	-2.70	0.717	-9.10
	Refinance	1	0.653	-7.77	0.758	-4.11
	Refinance	2	0.809	-3.63	0.941	-0.87

For low-income tracts, the contrasts between high-cost and low-cost MSAs are less pronounced for GSE purchases than they were for origination rates. Acquisitions of home purchase loans are very similar in high- and low-cost MSAs and, for Freddie Mac, significant shortfalls are more numerous in high-cost areas. The median odds ratios in high- and low-cost MSAs differ by 0.05 or less for both GSEs. Acquisitions of refinance loans are modestly more evenly distributed geographically in high-cost areas for both Fannie Mae and Freddie Mac. Both GSEs exhibit shortfalls in three high-cost MSAs and four high-cost MSAs, and odds ratios for both are somewhat closer to 1.00 in the high-cost areas. The median odds ratios differ by 0.21 for Fannie Mae and 0.08 for Freddie Mac. Overall, the small differences indicate that low-income purchase rates in the 10 high- and low-cost MSAs are indistinguishable for purchase loans and only slightly lower for refinance loans.

The patterns in exhibits 15 and 16 are summarized in exhibit 17. This table combines results across the high- and low-cost MSAs. The *Significant shortfalls* column shows the numbers of MSAs with odds ratios below 1.000 and Z-statistics, with an absolute value greater than 3.00.²⁷ The median odds ratios and significant shortfalls under model 1 indicate that the GSEs' purchase activity in high-minority tracts is at or near parity with purchases in benchmark tracts in most MSAs. The principal exception is Freddie Mac acquisitions of home purchase loans (*High-minority tracts, purchase loans*). Model 1 statistics for *Low-income tracts, purchase loans* and *Low-income underserved tracts, refinance loans* indicate that purchase activity in low-income tracts is lower than in benchmark tracts in most MSAs for both GSEs and both loan types.

Exhibit 17 reveals some interesting relationships between purchases by the two GSEs. The national statistics show that the underserved area share of total purchases is about 3 percentage points higher for Fannie Mae than for Freddie Mac. Fannie Mae's advantage in the underserved areas is evident in the MSAs studied here, but it appears to arise almost entirely from acquisitions of home purchase loans. The patterns of activity in underserved areas for the two GSEs are nearly identical for refinance loans.

The effect of estimating purchase-rate differences using model 2 rather than model 1 is modest overall, but more pronounced on shortfalls in low-income tracts. Compared with the estimates under model 1, the median shortfall declined between 0.3 and 9.0 percentage points in high-minority tracts and between 9.3 and 15.8 percentage points in low-income tracts.²⁸ The reduction in the number of significant shortfalls is also larger for low-income tracts, partly because there are relatively few significant shortfalls in the high-minority tracts. The largest change in the number of shortfalls is found in Fannie Mae's acquisitions of purchase loans, where the number of significant shortfalls declines from 6 to 1. The large number of Fannie Mae low-income shortfalls that become insignificant under model 2 reflects the modest size of the shortfalls estimated under model 1 for Fannie Mae. The changes in the median shortfalls in low-income tracts are larger for Freddie Mac than for Fannie Mae, but the model 1 shortfalls for Freddie Mac are larger. Therefore, holding the additional variables constant does not eliminate the statistical disparity in as many cases.

The existence of a substantial number of shortfalls under model 2 implies that the added variables in model 2 provide only a partial guide to the types of changes required of the GSEs to reach parity in all the markets studied here. Randomly buying more small loans, loans originated by small local lenders or by large lenders that do not sell many loans to either GSE, or loans secured by rental property will contribute substantially toward achieving parity in only some cases. For Freddie Mac's acquisition of purchase loans in high-minority neighborhoods, the answer lies elsewhere.

Exhibit 16

Results of GSE Purchase Rate Regressions: High-Minority Tracts

City	Loan Purpose	Model	Fannie Mae		Freddie Mac	
			Odds Ratio	Z-Statistic	Odds Ratio	Z-Statistic
Oakland	Purchase	1	1.004	0.12	0.975	-0.58
	Purchase	2	1.027	0.72	0.998	-0.05
	Refinance	1	1.092	2.93	0.989	-0.33
	Refinance	2	1.099	3.00	0.992	-0.24
Newark	Purchase	1	0.917	-1.12	0.818	-2.21
	Purchase	2	0.894	-1.42	0.820	-2.15
	Refinance	1	1.195	1.89	0.947	-0.51
	Refinance	2	1.232	2.12	0.958	-0.39
San Diego	Purchase	1	1.041	0.99	0.748	-5.25
	Purchase	2	1.096	2.13	0.774	-4.53
	Refinance	1	0.899	-2.92	0.930	-1.81
	Refinance	2	0.993	-0.18	1.007	0.16
Boston	Purchase	1	0.692	-3.34	0.633	-3.39
	Purchase	2	0.793	-2.05	0.737	-2.23
	Refinance	1	1.030	0.23	0.822	-1.19
	Refinance	2	1.029	0.22	0.835	-1.08
Washington, D.C.	Purchase	1	1.031	1.04	0.931	-2.00
	Purchase	2	1.044	1.43	0.938	-1.78
	Refinance	1	0.999	-0.02	0.933	-2.18
	Refinance	2	1.065	2.23	0.988	-0.37
Atlanta	Purchase	1	1.365	6.77	0.845	-2.88
	Purchase	2	1.432	7.71	0.871	-2.34
	Refinance	1	1.125	1.95	0.736	-4.61
	Refinance	2	1.234	3.37	0.787	-3.51
Miami	Purchase	1	1.689	10.04	0.912	-1.35
	Purchase	2	1.352	5.56	0.755	-4.02
	Refinance	1	0.948	-0.55	0.892	-0.89
	Refinance	2	1.028	0.27	0.991	-0.07
Dallas	Purchase	1	0.938	-1.37	0.826	-2.98
	Purchase	2	0.940	-1.28	0.856	-2.39
	Refinance	1	0.780	-2.68	0.836	-1.63
	Refinance	2	0.863	-1.51	0.910	-0.83
Tampa	Purchase	1	1.243	3.54	1.082	0.97
	Purchase	2	1.244	3.44	1.101	1.17
	Refinance	1	0.917	-1.11	0.908	-0.97
	Refinance	2	1.046	0.54	1.035	0.33
Houston	Purchase	1	1.152	5.15	0.732	-8.11
	Purchase	2	1.144	4.71	0.736	-7.85
	Refinance	1	0.910	-1.63	0.843	-2.36
	Refinance	2	1.097	1.50	0.998	-0.02

Exhibit 17

Summary of Logit Analyses of GSE Purchase Rates

	Fannie Mae		Freddie Mac	
	Median odds ratio	Significant shortfalls	Median odds ratio	Significant shortfalls
Low-income tracts				
Purchase loans				
Model 1	0.891	6	0.692	9
Model 2	0.984	1	0.808	7
Low-income underserved tracts				
Refinance loans				
Model 1	0.792	7	0.773	7
Model 2	0.920	4	0.931	3
High-minority tracts				
Purchase loans				
Model 1	1.036	1	0.835	3
Model 2	1.070	0	0.838	3
High-minority tracts				
Refinance loans				
Model 1	0.974	0	0.900	1
Model 2	1.055	0	0.990	1

Note: Significance threshold is $Z \leq -3.0$.

Interpretation

The model 1 results provide baseline estimates for assessing GSE purchases from underserved tracts. These results indicate that purchases from low-income tracts are short of parity with benchmark tracts in most markets, whereas purchases from high-minority tracts are at or above parity in most markets. Fannie Mae's purchases of home purchase loans are more highly concentrated in underserved tracts than are Freddie Mac's, but the two GSEs perform about the same for refinance loans.

In the section entitled *Distribution of GSE Purchases in HMDA and GSE Data*, comparing purchase rates from HMDA and from the HMDA/GSE files revealed discrepancies in geographic distributions reported in the two sources. Any conclusions about the adequacy of GSE purchases from underserved tracts in the 10 MSAs studied here would not be heavily affected by those discrepancies. The largest examples of apparent underreporting in HMDA were Fannie Mae purchases of loans from low-income tracts in Oakland and San Diego. The model 1 estimates indicate parity between Fannie Mae acquisitions of home purchase loans in low-income and benchmark tracts in those two MSAs, and shortfalls in acquisitions of refinance loans. Accurate data might reduce or eliminate the Fannie Mae shortfalls in acquisitions of refinance loans in these two MSAs, but this difference would not radically alter the qualitative patterns already described. The main effect would be to suggest a greater level of Fannie Mae support for refinance loans originated in low-income tracts than exhibits 15 and 16 show.

The shortfalls in exhibits 15 and 16 are difficult to evaluate without additional information. Conventional loans in HMDA include a wide range of credit products, including

many designed to expand access to mortgage financing to people who experience difficulty obtaining investment-grade conforming loans. These affordable products may be funded by combinations of Federal, State, local, and private entities. They are largely outside the universe of loans that the GSEs can purchase. HMDA files provide no information to differentiate these affordable loans from mainstream loans that involve no subsidy or special considerations. Restrictions in the GSEs' charters limit their flexibility in purchasing most of these loans. Both GSEs have their own programs to expand their affordable lending by relaxing some of the guidelines such as payment-to-income ratios.

A brief example using the Boston MSA can illustrate some of the issues. Exhibit 9 indicates that the overall mortgage market reflects a possible shortfall in lending to low-income tracts for refinance loans but not purchase loans. There are no significant shortfalls indicated in the high-minority tracts. The regression results in exhibits 15 and 16 suggest shortfalls in GSE purchases in both sets of underserved tracts. This combination of results may reflect a strong affordable housing program at the State and local levels that has evolved with limited participation of Fannie Mae or Freddie Mac.

The Federal Reserve Bank of Boston (Boston Fed) study of the 1990 HMDA data (Munnell, Brown, McEneaney, and Tootell, 1992) provides some support for this position. The Boston Fed research staff supplemented the information provided in HMDA with additional data from local lenders. One piece of data they obtained was whether the loan was part of a special program. Tabulation of the publicly released data indicates that approximately 20 percent of minority applications for loans on one-unit, owner-occupied homes were for loans that would be funded through the Massachusetts Housing Finance Agency (MHFA). The corresponding figure for Whites was 3 percent. This agency subsidizes closing costs and provides other types of support for qualified buyers. This pattern in the Boston Fed data suggests that a significant percentage of the loans in designated underserved tracts in Boston may be the result of efforts from the MHFA, and should not be included in the base of loans that could be purchased by the GSEs. However, HMDA provides no way to differentiate these loans.

The indicated shortfalls for both GSEs in some MSAs may simply reflect the presence of strong affordable housing efforts in those markets. These may be special loan programs undertaken by banks and thrifts in response to inducement from the Community Reinvestment Act (CRA) or from programs developed by State and local housing finance agencies. The GSEs have introduced and expanded their own affordable housing programs, and they have participated in joint programs with some lenders, but banks and savings associations have more flexibility in the advantages they can offer potential borrowers. This line of argument suggests that examination of CRA reviews and the records of State housing finance agencies in MSAs such as Boston would be important in evaluating the potential for greater GSE support of affordable housing in these markets.

Although local affordable housing program strength may be consistent with the results for Boston, the results for Tampa do not fit this pattern. Tampa's overall mortgage market reflects apparent shortfalls in originations for low-income tracts for both purchase and refinance loans (exhibit 9). The GSE purchase rates suggest shortfalls in low-income tracts for both Fannie Mae and Freddie Mac (exhibit 15). The results for Dallas and Houston also show this pattern to a lesser degree.

Summary

This report investigated mortgage lending and GSE purchases in 10 large metropolitan areas from 1994 to 1996. The purpose was to provide perspective on the "Central Cities,

Rural Areas, and Other Underserved Areas Housing Goal” (the geographically targeted goal) established under the 1992 Federal Housing Enterprises Financial Safety and Soundness Act (FHEFSSA). The geographically targeted goal requires that loans purchased by the GSEs finance a minimum percentage of properties in underserved areas. Under FHEFSSA, HUD establishes the criteria for identifying targeted neighborhoods and sets goals for the percentage of units financed by the GSEs that are from those neighborhoods. In regulations finalized in 1995, HUD specified characteristics of urban and rural areas that are targeted under this goal, and it set goals of 21 percent for 1996 and 24 percent for 1997 through 1999. Urban areas targeted under the 1995 regulations are census tracts with low median family income (at or below 90 percent of the MSA median income) and census tracts with high minority representation and median income between 90 percent and 120 percent of the MSA median.

The studies in this report use a consistent framework that explicitly incorporates HUD’s criteria for designating targeted census tracts. They provide evidence on a number of propositions. Because the sample of MSAs is small and not randomly selected, the data on some propositions do not provide evidence on nationwide patterns, but they suggest fruitful areas for further research.

The results must be interpreted within the limitations of the HMDA/census database and the well-documented inability to classify influential variables as clearly affecting demand and not supply or vice versa. Nevertheless, HMDA is the most comprehensive available source of data on mortgage lending and secondary market activity, and analysis of the type presented in this report has shaped current policy toward GSE support of affordable lending. Policymakers in Congress and HUD have interpreted the low levels of mortgage originations in low-income and high-minority, middle-income census tracts as an indication that markets are not fully meeting the demand from qualified potential borrowers in these tracts. Consequently, in this report the geographic patterns in mortgage originations and GSE purchases (U.S. Department of Housing and Urban Development, 1995) are interpreted as reflections of the availability of mortgage supply and GSE demand.

The article addresses the following issues with respect to the availability of mortgage credit in low-income and high-minority, middle-income neighborhoods and the purchases of mortgages from those neighborhoods by the GSEs.

- Whether mortgage lending and GSE purchases are low in low-income and high-minority, middle-income neighborhoods in some or all MSAs.
- Whether mortgage originations and GSE purchases in an MSA’s low-income and high-minority neighborhoods are affected by overall housing costs in the MSA.
- Whether shortfalls in mortgage availability and GSE purchases are equally common and acute in low-income neighborhoods and in high-minority, middle-income neighborhoods.
- Whether the statistical patterns of originations and GSE purchases in low-income and high-minority neighborhoods are different for home purchase loans than for refinance loans.
- Whether the difference at the national level between Fannie Mae and Freddie Mac in their loans purchases from targeted census tracts is evident in the 10 MSAs studied in this report.

These issues are all investigated using a common framework that has the following characteristics.

- It uses the experience of middle-income, low-minority neighborhoods in an MSA as the standard for evaluating activity in low-income and high-minority, middle-income tracts in that MSA.
- It evaluates activity in low-income tracts and high-minority, middle-income tracts separately in each MSA to determine whether the shortfalls are as large or pervasive for high-minority tracts as for low-income tracts.
- It uses regression analysis to quantify both the magnitude and statistical significance of any shortfalls in service to low-income or high-minority neighborhoods.
- The shortfalls are estimated in two models, one that includes additional variables that may help account for shortfalls in some MSAs.
- The shortfalls are estimated separately for home purchase loans and refinance loans.

The evidence indicates that the levels of primary mortgage lending and GSE purchases in low-income and high-minority neighborhoods vary across MSAs. In some MSAs, lending shortfalls in low-income and high-minority neighborhoods appear to be nonexistent or small; in others the shortfalls are more substantial. The same is true with respect to GSE purchases. Studies and public policies that redirect attention and resources toward the markets that exhibit the largest disparities between low- and middle-income neighborhoods will increase the effectiveness of resources devoted to affordable lending.

The evidence is not clear cut concerning whether originations in the primary mortgage market and GSE purchases from an MSA's low-income and high-minority neighborhoods are affected by overall housing costs in the MSA. Although the sample of MSAs investigated is small and not chosen randomly, the evidence suggests that shortfalls in overall lending may be more severe and more common in low-cost MSAs. GSE support of these neighborhoods does not appear to be related to the cost of housing in the MSA, but the low-cost MSAs that exhibit the largest shortfalls in primary market lending to low-income neighborhoods also exhibit shortfalls in GSE purchases. The question of restricted access to credit in low-income neighborhoods of low-cost MSAs bears further investigation with a larger sample of markets.

The evidence indicates that activity in high-minority, middle-income tracts is not comparable to activity in low-income tracts. Shortfalls in originations and GSE purchases are more common for low-income tracts than for high-minority, middle-income tracts. Parity between high-minority and benchmark tracts is evident in mortgage lending activity and GSE acquisitions of both purchase and refinance loans in the majority of MSAs. The evidence for the two GSEs separately is mixed. In most MSAs, Fannie Mae acquisitions from high-minority tracts are higher than from benchmark tracts, whereas Freddie Mac acquisitions from high-minority tracts are somewhat below acquisitions from benchmark tracts in nearly all MSAs.

Evidence indicates that purchase and refinance loans should be considered separately. In many MSAs low-income tracts exhibit shortfalls in lending activity or GSE purchases for refinance loans but not for purchase loans, and in other MSAs the reverse is true. Overall, shortfalls in mortgage origination rates appear to be more prevalent in refinance loans, particularly in low-income neighborhoods. GSE acquisitions from low-income neighborhoods show similar numbers of shortfalls in purchase and refinance loans.

The relative positions in national underserved area purchases of Fannie Mae and Freddie Mac are observed in the MSA-level data. Fannie Mae, which has a higher national percentage of units financed in underserved areas, exhibits fewer shortfalls and more cases in

which purchase rates in underserved tracts are higher than in benchmark tracts. However, the differences between the performances of the two firms are confined to acquisitions of home purchase loans. The numbers and sizes of shortfalls for the two enterprises are about the same for acquisitions of refinance loans from underserved areas.

Conclusions

In FHEFSSA Congress specified that during a 2-year transition period, the targeted urban areas would be central cities as defined by the Office of Management and Budget (OMB). The Secretary of HUD was directed to expand the definition to include rural areas and other underserved areas for goals to become effective after the transition period. In the 1995 regulations, HUD changed the approach to specifying targeted urban areas. Instead of continuing to target the OMB's central cities, HUD defined underserved urban areas as census tracts with low incomes or high minority representation, characteristics commonly associated with low mortgage origination rates and high mortgage denial rates. HUD argued that this change in philosophy focused the geographic incentive more precisely on neighborhoods that exhibit symptoms of mortgage market imperfections (U.S. Department of Housing and Urban Development, 1995). In particular, HUD rejected further reliance on whether a property was within an OMB-designated central city, citing research showing that location inside a central city had little independent influence on mortgage credit flows.

Although HUD is probably justified in claiming that its targeting criteria represent an improvement in isolating urban neighborhoods with symptoms of mortgage access problems, the studies in this report suggest that room for further progress remains. In identifying targeted tracts, HUD:

- Uses proxies (tract income and minority representation) rather than direct measures of mortgage lending activity.
- Does not take factors other than tract income and minority representation into account.
- Assigns properties in all qualifying tracts equal weight.
- Does not distinguish between home purchase loans and refinance loans.

Although these choices simplify the establishment of goals and the monitoring of GSE performance, the results in the studies presented in this report suggest that HUD's choices in these dimensions may continue to direct funds into urban neighborhoods in which symptoms of market failure are not acute.

The studies suggest that research into use of differential weights across metropolitan areas might be warranted if HUD plans to continue using proxies to identify targeted urban neighborhoods. The studies indicate that underserved-area shortfalls in both origination rates and GSE purchase rates are found in some but not all MSAs. Thus a system that assigned higher weights to targeted tracts in MSAs exhibiting the greatest shortfalls would merit consideration. A comprehensive analysis of geographic patterns in origination rates and GSE purchase rates in all large MSAs could provide guidance toward developing such weights.²⁹

If such a course were to be pursued, the studies in this report suggest that assessments of mortgage availability in targeted urban neighborhoods take into account important characteristics of housing markets in the tracts. Furthermore, the studies indicate that separate goals may be appropriate for home refinance loans and home purchase loans. Finally, the

studies suggest that properties in high-minority, middle-income tracts be assigned lower weights than properties in low-income tracts.

The research in this report does not address whether the geographic patterns in mortgage originations and GSE purchases reflect market failures or are, the result of a fair and neutral market process. The results are interpreted within the perspective underlying the 1992 FHEFSSA and HUD's revised regulation, which views shortfalls in low-income census tracts as reflections of imperfections in primary and secondary mortgage markets (U.S. Department of Housing and Urban Development, 1995, p. 61, 926). Thus, the studies of mortgage markets in the 10 MSAs are designed to provide guidance on the efficiency of the targeting criteria within the perspective underlying current policy. The studies are not intended either to support or to challenge the validity of attempting to increase mortgage flows into targeted urban areas.

Acknowledgments

I am grateful to Paul Manchester and John Gardner for helpful comments.

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Notes

1. Preliminary versions of this article were presented in seminars at Texas A&M University and at HUD.
2. See U.S. Department of Housing and Urban Development (1996b), particularly Chapters I and VII, for a complete description, citations, and extensive discussion of the "public purpose" dimension of the charters of Fannie Mae and Freddie Mac.
3. Galster (1992), Wienk (1992), and Yinger (1996) provide summaries of the literature that existed at the time. These studies are contained in conference proceedings that contain numerous other studies addressing lending discrimination.
4. Benston (1979) summarizes early research on redlining, focusing on the decline of inner-city neighborhoods and the emergence of public criticism of lenders as contributors to that decline.
5. For a brief overview of CRA, see Canner and Passmore (1995). For a fuller discussion, see Garwood and Smith (1993).
6. Although CRA/HMDA and FHEFSSA may have had a similar premise, they did not share a common regulatory approach.
7. See, for example, Canner and Smith (1991) and Canner and Gabriel (1992).
8. A revised version of this study was published by Munnell, Tootell, Brown, and McEneaney (1996).

9. In middle-income neighborhoods, the deductibility of mortgage interest would encourage some homeowners to keep mortgage balances outstanding even if they could pay off the loans. This incentive would be smaller for lower income homeowners.
10. Two lenders, Prudential and Countrywide, misreported the *loan purchaser* field for 1995 and later submitted revised data. The Bunce and Scheessele (1996) analysis is based on the revised data, which are available on tape but not on CD-ROM.
11. HMDA includes loans purchased during a year as well as loans originated. If both the purchaser and originator report the loan, it will be included twice in the data. Sales and purchases arise primarily in third-party, or wholesale, originations involving a mortgage broker or correspondent. Scheessele (1998) describes and examines HMDA's coverage of third-party originations. He concludes that "counting purchased loans as originations leads to double-counting." Therefore, loans classified as *purchased* by the reporting institution are not included.
12. *Small* is identified as a loan amount less than 25 percent of the tract median housing value. All loans made by lenders for whom the ratio of small loans to total loans was 50 percent or higher were excluded. None of these lenders sold loans to GSEs. The loans excluded in this manner are probably second mortgages or home improvement loans. Lenders have the option of reporting home improvement loans secured by a first mortgage as a purchase loan. Bunce and Scheessele (1996) excluded loans for amounts below \$15,000 on a similar basis. I have chosen this alternative because it isolates loans originated by lenders with unusual patterns rather than excluding all small loans. This approach allows for the possibility that small loan amounts may reflect random errors in reporting. The small loans I exclude are found disproportionately in medium- and high-income tracts.
13. I am grateful to Randy Scheessele of HUD for providing his list of these lenders. Three of the lenders on his list sold significant percentages of their loans to GSEs in some years. Loans originated by these lenders were not excluded.
14. Reports cited prominently in Appendix B (U.S. Housing Department of Housing and Urban Development, 1995) are Shear, Berkovec, Dougherty, and Nothaft (1995) and Avery, Beeson, and Sniderman (1994). Avery, Beeson, and Sniderman report regression analyses of both loan denial and the flow of loan originations in metropolitan census tracts. Shear, Berkovec, Dougherty, and Nothaft report regressions on origination flow only.
15. Note that the income cutoff here does not correspond exactly to the official definition of *low income* used by HUD (see exhibit 1).
16. This relationship should hold even in markets in which construction dropped sharply, such as southern California. Though construction in such markets presumably continued at a much reduced rate after 1990, the tracts in which construction took place are likely to have been those tracts that had the highest rates of construction in 1989.
17. See Avery, Beeson, and Sniderman (1994) and Shear, Berkovec, Dougherty, and Nothaft (1995), who estimate models of mortgage flows with measures of race, income, and demographic variables similar to those used here. Avery, Beeson, and Sniderman estimate separate equations for purchase and refinance loans; Shear, Berkovec, Dougherty, and Nothaft do not. Their models aggregate across MSAs, and

they use more variables than the model used in this article does. The model in this article controls for fewer factors to keep the analysis simple.

18. To allow for a nonlinear relationship, this factor is specified as a series of indicator variables. Tracts are divided into five groups based on PB89 (the percentage built in 1989 or later): $PB89=0$; $0 < PB89 \leq 1$; $1 < PB89 \leq 4$; $4 < PB89 \leq 12$; and $PB89 > 12$.
19. To allow for nonlinearity in functional form, this factor is specified as a series of indicator variables. Tracts are divided into four groups based on PM89 (the percentage who moved in 1989 or later): $PM89 \leq 2.5$; $2.5 < PM89 \leq 8.5$; $8.5 < PM89 \leq 15$; and $PM89 > 15$.
20. Pearle, Lynch, and Horner (1993) discuss the implications of the inability to identify a structural model.
21. The effect of the percentage built in 1989 is strongly positive, particularly in the purchase equations. The effect of the percentage moved in 1989 is smaller and sometimes insignificant. The median housing value has a positive coefficient that is consistently larger and more significant in the refinance equation than the purchase equation. The mobile home indicator is negative but not always significant, whereas the rural indicator is usually positive but sometimes insignificant.
22. The lenders specializing in subprime and manufactured homes are from the same list as identified in note 14. Here, as with the analysis of lending activity, the three lenders that sold loans to the GSEs were not excluded from the data.
23. Calculations using Manchester (1998), table 2.
24. Nationally, the concentration for 1995 was 24 percent (Manchester, Neal, and Bunce, 1998). The definition of the *conforming market* used by these researchers is slightly different from the definition in this article.
25. HMDA loan originations, however, do not accurately reflect the numbers of loans purchased by GSE. The HMDA loans used here, which do not include loans purchased from other lenders, understate GSE purchases by 40 to 50 percent. Not including HMDA's purchased loans accounts for some of this undercount.
26. This approach adopts equality of purchase rates between low-income or high-minority tracts and benchmark tracts as the standard to which the GSEs should be held. This choice makes sense in a preliminary undertaking such as this study. Further research or a reconsideration of the priorities of the GSEs might argue for an expectation that the standard should imply a target odds ratio different from 1.000. The framework can easily accommodate that modification.
27. In light of the very large numbers of observations, a Z-statistic of 3.0 is a more appropriate threshold for significance than 2.0. Holding the significance level fixed as the number of observations rises increasingly favors rejecting the null hypothesis. Making the significance level a decreasing function of sample size is a solution to this problem (See Leamer, 1978). The selection of 3.0 is arbitrary, but the general pattern of significant shortfalls is not sensitive to the threshold chosen.
28. The 0.3-percentage point change is for Freddie Mac acquisitions of purchase loans in high-minority tracts, where the odds ratio moved from 83.5 to 83.8 percent.

29. HUD also relied on geographic patterns in denial rates to develop its criteria for underserved areas. Resource limitations prevented inclusion of denial rates in the studies of the 10 MSAs, but analyses similar to those performed here or in Avery, Beeson, and Sniderman (1994) could be incorporated into the weighting system.

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Appendix

The tables on the following pages show complete Model 2 regression results for origination rates and GSE purchase rates.

Exhibit A-1

Model 2 Regression Results, Purchase Money Origination Rates (t-statistics below coefficients)

	Oakland	Newark	San Diego	Boston	Washington, D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Underserved area designations										
Low income	-0.791	-0.458	0.158	0.168	-0.746	-1.973	-1.748	-1.100	-1.015	-2.346
High minority	-1.62	-1.68	0.40	0.81	-1.59	-2.74	-1.43	-1.33	-2.69	-3.97
High income	-1.142	-0.423	0.187	2.132	0.447	-3.024	-2.123	-0.600	0.583	-0.535
	-2.37	-0.92	0.38	2.05	0.80	-2.50	-1.75	-0.46	0.63	-0.79
	-0.073	0.740	0.530	-0.131	0.301	-0.362	-0.981	1.914	1.435	-0.391
	-0.15	3.13	1.35	-0.58	0.61	-0.49	-0.87	2.19	3.39	-0.59
% homes built 1989 or 1990 (PB89)										
PB89 > 0	-0.091	-0.085	-0.329	0.189	0.407	-0.864	-0.450	0.568	-0.299	0.198
PB89 ≤ 1	-0.20	-0.39	-0.75	0.94	0.85	-0.87	-0.79	0.64	-0.74	0.41
PB89 > 1	0.033	0.766	0.608	0.226	1.654	-0.932	0.068	1.123	0.438	0.437
PB89 ≤ 4	0.08	3.44	1.58	1.13	3.39	-1.13	0.13	1.37	1.11	0.89
PB89 > 4	1.514	2.809	1.525	1.053	1.854	1.608	1.608	4.567	0.824	3.524
PB89 ≤ 12	2.87	4.33	3.23	2.47	3.32	1.67	2.00	3.74	1.52	4.39
PB89 > 12	5.371	6.092	3.640	-0.852	6.360	10.127	12.003	37.393	4.986	9.370
	6.07	2.56	5.34	-0.41	7.56	6.35	9.80	14.25	4.11	8.51
% home-owners moved in 1989 or 1990 (PM89)										
PM89 > 2.5	-0.148	-0.753	-0.899	-0.027	0.621	1.142	1.587	0.204	0.544	0.556
PM89 ≤ 8.5	-0.13	-2.15	-0.40	-0.08	0.58	0.66	1.04	0.10	0.39	0.51
PM89 > 8.5	0.668	0.381	0.240	1.495	1.056	3.044	3.450	1.344	1.347	2.008
PM89 ≤ 15	0.59	0.96	0.11	3.93	0.97	1.70	2.23	0.64	0.96	1.81
PM89 > 15	2.757	-0.683	1.491	4.304	2.259	4.401	5.735	5.230	4.016	4.123
	2.31	-0.93	0.67	6.78	1.97	2.30	3.48	2.32	2.72	3.35
Indicator										
% mob home ≤ 10	0.975	-0.269	-1.483	-0.975	-2.752	-0.454	1.289	0.994	-0.377	-1.468
	1.90	-0.21	-4.29	-2.03	-3.26	-0.66	2.32	1.04	-1.18	-2.87
Natural log										
Med. Home val	1.523	1.496	1.191	1.084	0.540	3.213	0.401	1.528	1.213	0.894
	2.46	3.99	2.16	2.96	0.99	3.52	0.72	1.74	1.98	1.91
Indicator										
% rural ≥ 25	3.325	-0.196	-1.829	0.597	-0.459	2.080	-3.631	0.279	0.788	2.592
Constant	2.39	-0.67	-3.23	2.69	-0.84	3.14	-1.86	0.23	1.77	4.34
	-14.018	-13.159	-9.881	-8.396	-2.517	-30.075	-0.475	-13.465	-10.005	-5.313
	-1.83	-2.91	-1.44	-1.89	-0.39	-2.93	-0.07	-1.33	-1.45	-1.02
Tracts	442	420	420	592	869	456	257	514	400	659
Adj R ²	0.3633	0.3095	0.3341	0.2208	0.1587	0.4079	0.5978	0.4856	0.4133	0.4249

Exhibit A-2

Model 2 Regression Coefficients, Refinance Origination Rates (t-statistics below coefficients)

	Oakland	Newark	San Diego	Boston	Washington, D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Underserved area designations										
Low income	-0.195	-0.343	-0.037	-0.765	0.041	-0.296	0.343	-0.468	-0.393	-0.625
High minority	-0.77	-3.23	-0.21	-6.41	0.22	-2.25	0.98	-4.44	-3.75	-6.21
High income	-0.402	-0.266	0.775	-0.373	0.912	-0.578	0.715	-0.294	0.565	-0.012
High income	-1.59	-1.46	3.66	-0.62	4.08	-2.60	2.05	-1.74	2.22	-0.10
High income	0.676	0.467	0.842	0.546	0.679	-0.021	1.033	0.390	0.448	0.118
High income	2.70	4.94	5.00	4.19	3.52	-0.15	3.19	3.50	3.81	1.04
% homes built 1989 or 1990 (PB89)										
1989 >0 & ≤1	0.089	-0.013	0.224	0.198	0.373	-0.156	-0.223	0.283	-0.058	0.264
1989 >1 & ≤4	0.37	0.16	1.19	1.17	1.95	-0.86	-1.36	2.49	-0.52	3.25
1989 >4 & ≤12	0.413	0.285	0.596	0.323	0.880	0.069	0.114	0.586	0.148	0.462
1989 >12	1.97	3.24	3.74	2.83	4.68	0.49	0.78	5.87	1.40	5.69
1989 >12	1.466	0.459	1.033	1.150	0.674	0.806	0.433	1.596	0.336	1.351
1989 >12	6.37	1.92	5.87	4.91	3.58	5.21	2.24	12.84	2.54	11.30
1989 >12	3.208	2.300	1.851	3.803	1.995	1.721	2.083	5.599	1.294	2.011
1989 >12	8.11	2.51	7.10	3.26	7.08	6.80	7.00	17.67	4.25	12.54
Indicator										
% mob home ≥10	-0.432	-0.356	-0.918	-0.497	-1.637	-0.053	0.061	-0.017	-0.259	-0.247
% mob home ≥10	-1.65	-0.70	-6.23	-1.83	-4.83	-0.42	.038	-0.14	-2.93	-2.87
Natural log										
Med. Home val	2.635	1.137	1.827	1.432	0.707	1.610	0.562	0.906	0.319	0.779
Med. Home val	8.21	7.61	7.79	6.88	3.27	9.68	3.58	8.01	1.89	9.75
Indicator										
% rural ≥25	0.328	0.687	0.243	0.563	0.450	1.281	0.207	0.270	0.198	0.306
% rural ≥25	0.451	5.976	0.996	4.390	2.088	10.516	0.365	1.766	1.615	2.990
Constant	-27.43	-11.28	-17.962	-13.538	-5.257	-15.379	-4.244	-8.587	-0.970	-7.048
Constant	-6.96	-6.25	-6.32	-5.35	-2.02	-8.12	-2.20	-6.72	-0.51	-7.98
Tracts	442	420	420	592	869	456	257	514	400	659
Adj R ²	0.56	0.585	0.5789	0.4349	0.162	0.6019	0.408	0.689	0.3396	0.666

Exhibit A-3

Model 2 Logit Coefficients, Fannie Mae Home Purchase Loans (Z-statistics below coefficients)

	Oakland	Newark	San Diego	Boston	Washington, D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Low income	0.122 3.74	-0.073 -1.77	0.06 1.93	-0.044 -1.88	0.084 3.46	0.011 0.50	0.263 4.94	-0.045 -1.63	-0.284 -11.27	-0.073 -2.70
High minority	0.026 0.72	-0.112 -1.42	0.091 2.13	-0.231 -2.05	0.043 1.43	0.359 7.71	0.302 5.55	-0.062 -1.28	0.219 3.44	0.135 4.71
High income	0.005 0.16	-0.132 -4.79	0.013 0.49	-0.029 -1.37	-0.098 -4.86	-0.021 -1.29	0.251 4.86	-0.168 -7.84	0.083 3.98	0.01 0.44
Investor loan	-0.471 -8.77	-0.003 -0.04	-0.487 -11.14	0.044 0.89	-0.502 -8.36	-0.507 -10.14	-0.787 -22.97	-1.226 -21.38	-0.476 -14.88	-1.039 -18.95
Log loan amount	0.325 11.61	0.147 4.64	0.325 12.63	0.226 11.29	0.483 24.48	0.241 15.27	0.048 2.46	0.173 9.63	0.007 0.39	0.056 3.77
Local lender	-0.749 -7.71	-1.984 -19.62	-2.248 -17.03	-2.114 -36.84	-2.364 -22.89	-0.674 -14.37	-0.774 -17.05	-1.264 -28.18	-2.654 -20.25	-2.558 -34.9
National portfolio lender	3.208 8.11	2.300 2.51	1.851 7.10	3.803 3.26	1.995 7.08	1.721 6.80	2.083 7.00	5.599 17.67	1.294 4.25	2.011 12.54
1995	0.587 20.60	0.33 11.33	0.396 14.99	0.06 12.90	0.266 12.90	0.214 12.15	0.444 19.43	0.251 12.76	0.386 17.59	0.069 3.87
1996	0.155 5.50	-0.225 -7.38	0.219 8.48	-0.262 -12.01	0.039 1.19	0.004 0.21	0.135 5.79	0.027 1.42	0.276 12.71	-0.152 -8.74
Loans	46,553	39,511	47,606	77,611	78,595	127,667	62,047	79,634	80,881	95,447
Pseudo R ²	0.079	0.0614	0.0853	0.0579	0.0541	0.0287	0.0654	0.0589	0.0822	0.0658

Exhibit A-4

Model 2 Logit Coefficients, Fannie Mae Refinance Loans (Z-statistics below coefficients)

	Washington, D.C.									
	Oakland	Newark	San Diego	Boston	D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Low income	-0.117 -3.96	0.161 3.16	-0.05 -1.65	0.089 3.63	0.053 2.17	-0.148 -4.83	0.062 0.61	-0.142 -2.6	-0.334 -9.2	-0.212 -3.63
High minority	0.094 3.00	0.209 2.11	-0.007 -0.18	0.029 0.22	0.063 2.23	0.210 3.37	0.027 0.27	-0.147 -1.51	0.045 0.54	0.093 1.50
High income	0.023 0.85	-0.195 -5.27	0.008 0.3	-0.071 -3.48	-0.156 -7.26	0.06 2.35	-0.022 -0.23	-0.064 -1.57	-0.067 -2.14	-0.174 -3.72
Investor loan	-0.234 -6.84	0.014 0.16	-0.272 -7.71	-0.143 -3.40	-0.286 -8.01	-0.392 -7.55	-0.608 -10.49	-0.843 -11.98	-0.368 -6.37	-0.847 -13.16
Log loan amount	0.29 14.05	0.694 18.98	0.512 21.93	0.354 18.33	0.506 28.09	0.359 16.99	0.395 14.14	0.339 11.13	0.649 27.85	0.374 14.03
Local lender	-1.7 -18.51	-2.457 -17.81	-3.1 -19.82	-2.167 -45.62	-2.656 -27.32	-1.291 -21.57	-1.161 -14.47	-1.52 -18.71	-2.368 -15.88	-2.43 -19.10
National portfolio lender	-2.763 -48.97	-2.555 -24.01	-3.210 -42.46	-3.418 -18.86	-4.062 -27.7	-4.000 -19.1	-3.620 -28.52	-3.996 -16.36	-4.108 -29.38	-3.600 -20.73
1995	0.210 8.59	0.243 5.83	0.379 14.60	0.024 1.02	0.046 2.03	-0.098 -3.60	0.110 2.95	0.025 0.30	0.390 11.65	-0.184 -4.66
1996	-0.06 -2.60	-0.069 -1.84	0.258 10.67	-0.197 -9.58	-0.118 -6.05	-0.211 -8.64	-0.346 -9.96	-0.01 -0.29	0.06 1.95	-0.238 -7.14
Loans	458,564	27,866	56,136	67,387	77,152	59,072	31,304	23,126	43,407	25,547
Pseudo R ²	0.0975	0.0989	0.1234	0.072	0.0767	0.0625	0.1254	0.1003	0.1604	0.1125

Exhibit A-5

Model 2 Logit Coefficients, Freddie Mac Home Purchases (Z-statistics below coefficients)

	Washington, D.C.									
	Oakland	Newark	San Diego	Boston	D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Low income	-0.15 -3.59	-0.274 -5.61	-0.216 -5.37	-0.287 -10.05	-0.047 -1.60	-0.06 -2.52	-0.153 -2.26	-0.211 -5.64	-0.329 -9.81	-0.333 -9.10
High minority	-0.002 -0.05	-0.198 -2.15	-0.256 -4.53	-0.305 -2.23	-0.064 -1.78	-0.138 -2.34	-0.281 -4.02	-0.156 -2.39	0.097 1.17	-0.306 -7.85
High income	0.115 3.12	-0.157 -5.12	0.073 2.33	-0.056 -2.28	-0.110 -4.63	0.000 -0.02	-0.022 -0.35	0.019 0.71	0.134 5.09	0.005 0.16
Investor loan	-0.436 -6.12	-0.345 -2.94	-0.614 -10.05	-0.166 -2.56	-0.092 -1.39	-0.466 -8.03	-0.185 -4.32	-0.514 -7.48	-0.23 -5.76	-0.091 -1.44
Log loan amount	0.421 11.10	0.353 9.38	0.302 9.19	0.306 12.52	0.505 20.59	0.186 10.59	0.218 8.01	0.343 14.50	0.101 4.67	0.301 15.07
Local lender	-1.478 -8.27	-2.632 -15.16	-1.009 -8.98	-1.973 -28.13	-2.556 -16.59	-1.908 -20.73	-2.046 -16.96	-1.638 -20.79	-3.861 -10.9	-4.879 -12.88
National portfolio lender	-3.061 -26.13	-1.769 -21.00	-3.043 -25.48	-3.784 -15.09	-2.496 -20.49	-3.328 -22.21	-2.575 -22.40	-3.406 -20.60	-2.776 -26.41	-3.162 -21.07
1995	-0.338 -9.39	0.045 1.28	-0.259 -7.88	0.062 2.33	0.035 1.36	0.196 9.73	0.22 6.70	-0.115 -4.49	0.08 2.82	-0.09 -3.68
1996	-0.137 -4.19	0.325 9.91	-0.107 -3.47	0.127 5.04	0.202 8.42	0.206 10.73	0.447 14.26	0.250 10.76	0.188 6.96	0.278 12.56
Loans	46,553	39,511	47,606	77,611	78,595	127,667	62,047	79,634	80,881	95,447
Pseudo R ²	0.0699	0.0457	0.0621	0.0491	0.0369	0.0291	0.0489	0.053	0.0556	0.0565

Exhibit A-6

Model 2 Logit Coefficients, Freddie Mac Refinance Loans (Z-statistics below coefficients)

	Oakland	Newark	San Diego	Boston	Washington, D.C.	Atlanta	Miami	Dallas	Tampa	Houston
Low income	-0.088 -2.62	0.103 1.88	-0.076 -2.24	-0.116 -3.87	0.085 3.11	-0.097 -3.24	-0.0567 -0.51	-0.05 -0.79	-0.262 -5.79	-0.061 -0.87
High minority	-0.008 -0.24	-0.043 -0.39	0.007 0.16	-0.180 -1.08	-0.012 -0.37	-0.239 -3.51	-0.009 -0.07	-0.095 -0.83	0.034 0.33	-0.002 -0.02
High income	-0.064 -2.10	-0.217 -5.50	-0.036 -1.28	-0.107 -4.48	-0.127 -5.19	-0.113 -4.45	0.038 0.30	0.028 0.59	-0.012 -0.33	0.035 0.63
Investor loan	-0.372 -9.09	-0.180 -1.77	-0.482 -11.85	-0.208 -3.95	0.199 5.46	-0.418 -8.03	-0.203 -2.87	-0.392 -5.06	0.051 0.79	-0.255 -3.63
Log loan amount	0.459 17.94	0.698 17.12	0.361 13.85	0.540 22.12	0.452 21.64	0.372 17.52	0.446 12.34	0.433 11.87	0.647 22.37	0.375 11.6
Local lender	-1.628 -14.63	-2.092 -15.40	-0.772 -10.81	-2.001 -32.72	-1.66 -20.90	-2.052 -25.28	-1.755 -11.50	-2.279 -15.83	-2.907 -10.80	-5.359 -7.57
National portfolio lender	-3.573 -34.40	-2.474 -21.70	-3.936 -32.39	-3.177 -14.12	-2.903 -26.46	-3.733 -20.67	-2.21 -21.86	-4.265 -12.01	-3.265 -24.56	-6.482 -6.48
1995	-0.835 -27.15	-0.759 -14.66	-0.906 -29.26	-0.341 -11.67	0.564 -20.34	-0.32 -11.31	-0.242 -4.65	-0.427 -8.34	-0.468 -10.51	-0.349 -7.00
1996	-0.43 -16.91	-0.366 -9.28	-0.688 -25.74	-0.085 -3.59	-0.204 -9.46	-0.061 -2.55	0.022 0.50	0.129 3.29	-0.022 -0.61	0.276 7.43
Loans	58,564	27,866	56,136	67,387	77,152	59,072	31,304	23,126	43,407	25,547
Pseudo R ²	0.1085	0.1000	0.1135	0.0608	0.0537	0.0705	0.0756	0.0988	0.1218	0.1032