Mortgage Redlining: Some New Evidence

by Robert B. Avery and Thomas M. Buynak

Several laws have been passed in the last decade to outlaw discrimination in credit markets and to correct for the perceived failure of the market to distribute credit equitably. At the federal level, the most notable of these acts are the Fair Housing Act of 1968, the Equal Credit Opportunity Act of 1974 (amended in 1976), the Home Mortgage Disclosure Act of 1977, and the Community Reinvestment Act of 1977. Despite this legislation, the regulatory and judicial bodies are still struggling to agree on a precise definition of discrimination and on how it can be prevented. Particular concern has focused on housing and mortgage credit because of the sheer size of these markets. Debate has centered on allegations that financial institutions, particularly in urban areas, have severely limited their mortgage-lending activity in certain poor and/or black neighborhoods, a practice commonly called *redlining.*

One factor that has hampered attempts to establish definitive regulatory procedures regarding discrimination and redlining is the absence of a clear-cut understanding of current lending practices and patterns. Congress recognized the need for empirical study when it passed the Home Mortgage Disclosure Act (HMDA) and the Community Reinvestment Act (CRA). The HMDA requires commercial banks, mutual savings banks, and savings and loan associations in urban areas to disclose data publicly on their mortgage and home-improvement lending by census tract. The CRA requires financial institutions to demonstrate that they adequately serve the credit needs of their communities and provides the opportunity for protestants to challenge such claims (see Buynak 1981 and Canner and Cleaver 1980).

This paper utilizes HMDA data to investigate a number of issues underlying the redlining debate. Although the study focuses on Cleveland, Ohio, the site of a number of recent CRA protests, the findings and methodology may have relevance for other similar areas. The remainder of this paper reports the results of an empirical investigation of mortgage lending in Cleveland from 1977 to 1979. The empirical relationship between mortgage lending and neighborhood racial characteristics is estimated, controlling for demand and risk factors. Although similar in design to several preceding studies, this paper differs from most because of its particularly rich data set. The data include virtually all mortgage loans made during the three-year period in the central county of the Cleveland SMSA, an area characterized by substantial racial and economic heterogeneity. As a proxy for neighborhood credit needs, all residential real-estate title transfers made during the same period were collected and aggregated by census tract (as were the mortgage loans). In addition, court foreclosure filings were collected by tract to control more explicitly for risk factors. The data were utilized to estimate several sets of cross-sectional and inter-temporal regressions relating the mortgage lending of banks, savings and loan associations, and mortgage bankers to neighborhood (tract) racial and demographic factors controlling for measures of credit need and risk. The results are presented in Section III, along with a detailed discussion of the data and methodology. These are preceded by a review of other studies in Section I and a discussion of the empirical setting in Section II. Section IV summarizes and interprets the findings.

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I. Why Redlining?

There are a number of reasons to explain a correlation between neighborhood characteristics, particularly racial, and the type and amount of mortgage lending. It is not the purpose of this paper to argue the positive and negative aspects of these theories or to speculate as to which are the most plausible. However, it may be useful to discuss some of the prevalent theories and to review briefly previous empirical findings. Throughout this paper the word *redlining* denotes a correlation between the racial composition of a neighborhood and the type and amount of mortgage lending resulting from differential lending policies. This definition makes no statement about the explicit lines of causality or legality and thus may differ from the usage of others.

Theories of Redlining

Several arguments have been advanced to explain a possible correlation between neighborhood racial composition and mortgage lending. One argument is that there are lenders who treat borrowers differently, based on factors other than cost or risk. Two sources are suggested for such discrimination. Lenders could practice non-economic or "irrational" discrimination; or, as Barth, Cordes, and Yezer (1979) argue, they simply could dislike lending in certain neighborhoods and thus treat certain borrowers differently. Alternatively, lenders acting either individually or collusively could engage in classical price discrimination. *Price discrimination* occurs when borrowers are charged different prices based on demand rather than cost (or risk) factors. If borrowers have different elasticities of demand, a monopolist lender could earn higher profits if he could charge different prices. If lenders were to discriminate by setting higher credit standards and/or prices for blacks (as individuals) because they think that blacks have less elastic demand for credit, fewer loans to blacks would result (see Masulis 1981). Such price discrimination would have the appearance of redlining—either in loan quantities or mortgage terms—and would be most pronounced in all-black neighborhoods.

Guttentag and Wachter (1980) argue that the discrimination hypotheses are not likely to be appropriate. They assert that the large number of lenders and competitive market conditions make it unlikely that discriminatory conditions would prevail in general, although they might apply to individual lenders. Similarly, they argue that the differential demand elasticities and collusive behavior required for classical price discrimination are unlikely to be present in banking markets.

A second set of explanations for an expected correlation between neighborhood characteristics and mortgage-lending patterns assumes that lenders do differentiate among borrowers, but only on the basis of cost or risk factors. If, for example, low-income applicants were more likely to be black and also were perceived by lenders to be more risky, one would expect a statistical correlation between loan availability and race, even in the absence of discriminatory behavior on the part of lenders. Similarly, borrower-loan demand may be related to other factors, such as income or family stability, that also are correlated with race (see Canner 1979); thus, in the aggregate blacks may appear to demand fewer loans because, on average, they are poorer, not because they are charged different prices. This might also affect the instruments used in lending. Low-income borrowers who purchase cheaper housing, for example, may be more likely to receive home-improvement or installment-loan financing because of the high fixed transactions costs involved in mortgage loans. If blacks were more likely to purchase lower-priced homes, one might draw a correlation between race and the type of lending. In any of these cases, one would expect that neighborhood characteristics, as aggregates of individual characteristics, would also be correlated with loan availability. Guttentag and Wachter (1980) point out that lenders, in recognizing this statistical correlation, may use an applicant's neighborhood as a proxy for risk variables, which for cost purposes are not collected for individual borrowers. These arguments suggest that neighborhood racial characteristics may be used as proxies for individual applicant factors, such as income, associated with loan risk or demand. Thus, when these other factors are properly controlled, the statistical correlation between neighborhood race and loan availability should disappear. If this were the case, then this situation would not constitute redlining as earlier defined.

Although not generally cited in the redlining literature, additional theories argue that there may

be a statistical correlation between the racial composition of a neighborhood and credit availability, even if one properly controls for all individual characteristics. Bailey (1959), Mills (1972), and many others have developed urban-housing "prejudice" models based on the assumption that whites would be willing to pay higher prices to live in all-white neighborhoods rather than live in neighborhoods with blacks. These models generally imply perfectly segregated neighborhoods separated by what Bailey termed a "black border." The willingness of some whites to pay for their prejudice implies that per-unit housing prices would be lower in all-black neighborhoods and in white areas nearest to the black border. Mieszkowski (1979), among others, concludes that these models imply that middle-income blacks would devote a smaller portion of their income to housing. Black borrowers, therefore, should be more attractive to lenders because they would be better risks than middle-income white borrowers.

Most of the applications of the Bailey-Mills model assume a constant proportion of whites to blacks. Very different conclusions about the relative attractiveness of black and white borrowers can be derived by relaxing this assumption. The Bailey-Mills model implies that the relative price of black to white housing is a decreasing function of the proportion of the population that is black. Thus, if the assumption is made that the percentage of black population is rising, this would imply that the relative price of black to white housing would fall. Transition areas near the black border also would have lower relative prices. The relative price of black housing would fall even if the growth of the black population (and the change in prices) were fully anticipated by home buyers.

The implications of this version of the prejudice model are the opposite of those of the simpler models. Since relative home prices in black neighborhoods (even those already 100 percent black) theoretically would fall as the percentage of blacks in the area rises, the value of black houses as collateral would be lower; lenders thus would be willing to lend less. Similarly, relative housing prices in all-white areas far removed from the black border would be expected to rise, offering more attractive lending collateral. In effect, the racial composition of a neighborhood becomes a proxy for expected future price changes and hence for the value of loan collateral.

Previous Empirical Work

Each of the redlining theories has somewhat different empirical implications. The discrimination theories suggest that the number of blacks in a neighborhood should determine the lending policies, even when income and other demographic factors are taken into account. Although gross correlations may exist between race and the volume of mortgage credit, theories based on risk and demand factors imply that this relationship should disappear when other demographics are considered. Finally, some versions of the Bailey-Mills model suggest that it is the change in racial composition, rather than levels, that is relevant—that lending in integrated and all-black neighborhoods would be relatively more attractive in stable areas than in areas where the racial composition is changing.

Although not necessarily designed to discriminate among these hypotheses, there have been a number of empirical redlining studies by both community action groups and researchers (see Benston 1979, 1981 and King 1980). These studies can be divided roughly into two categories: one type utilizes HMDA and census data and deals with aggregate mortgage-lending patterns across neighborhoods, while the second focuses on individual borrowers and differences in specific mortgage terms (e.g., downpayments, interest rates). Nearly 25 cities nationwide have been examined using one or both of these approaches.[1] Since this study builds heavily on these earlier works, a brief discussion of some of the key findings from representative cases may prove useful.

The objective of most of the aggregate HMDA-based studies (and this one as well) has been to estimate not only the gross relationship between race and mortgage credit, but to identify the particular effects stemming from supply, or the actions of the lender. To do this properly requires the specification of both supply and demand equations and a meaningful method of separating their effects. Unfortunately,

1. Areas that have been examined include Boston, New York City, Syracuse, Rochester, Buffalo, Pittsburgh, Toledo, Flint (Mich.), Chicago, Louisville, Miami, San Antonio, Los Angeles, Oakland, and Sacramento.

it is virtually impossible to come up with variables that would affect supply and not demand. For this reason virtually all previous studies (and this one as well) have relied on reduced-form analysis—i.e., regressing measures of mortgage-loan activity against race and all other variables thought to be related to either supply or demand. While unable to provide specific information on supply effects, these equations can show the relationship between race and the type and quantity of mortgage lending while controlling for income, housing stock, and other demographics. This information still may be useful for discriminating among redlining hypotheses; however, since the equations, at best, only crudely identify supply factors, they must be carefully interpreted before drawing any policy conclusions.

The critical differentiating factor among aggregate HMDA-based studies is the quality of the data used to control for factors other than race. One study that stands out was done by Hutchinson, Ostas, and Reed (1977 and Ostas, Reed, and Hutchinson 1979), who examined a subset of Toledo, Ohio, savings and loan associations. They found that racial composition was not correlated with the total number of loans extended within a neighborhood, but it was related to the ratio of conventional to government-insured loans. They concluded that lenders substitute riskless government contracts in those areas perceived to have the greatest risk. Canner (1979) conducted a similar but more comprehensive analysis of mortgage lending in Boston, Massachusetts. Using various indexes of mortgage-loan activity (e.g., the number of conventional loans to total transactions in a census tract), he found that, other things being equal, the racial composition of Boston neighborhoods affected the number of loans issued by institutional lenders. However, he also found that nonbanking businesses and other private individual lenders filled some of the "mortgage gap" in all-black (although not integrated) neighborhoods. These loans were often made with nontraditional instruments such as land-installment contracts.

Schafer's (1978, chap. 5) comprehensive examination of New York City differs in that it explicitly compares two different types of neighborhoods. Neighborhoods were separated into alleged redlined and non-redlined areas, and separate models were estimated for each data set. The coefficients estimated from the non-redlined data were multiplied by the values of the independent variables of the redlined neighborhoods generating predicted funding for the alleged redlined areas. A comparison of the predicted values with the actual loans revealed that fewer loans were made available than predicted in some redlined neighborhoods.

There have been fewer studies that have used individual borrowers as the unit of observation, primarily because of data limitations.[2] One of the better studies is Benston, Horsky, and Weingartner's (1978) examination of three years of individual mortgage terms in two Rochester, New York, neighborhoods. One area was an allegedly redlined (by lenders) area, and the other served as a control (non-redlined) area. After adjusting for housing characteristics, such as age and selling price, they found that the mortgage terms in the two areas were not significantly different. Schafer's (1978, chap. 6) similar study of New York City contains mixed results, but some evidence was found that neighborhood characteristics affect loan terms. King (1980, sect. 6) analyzed mortgage applications of federally insured savings and loan associations for evidence of discrimination related to age, race, sex, marital status, and property location in the SMSAs of Miami, Florida; San Antonio, Texas; and Toledo, Ohio. The results of his study, similar to those of Benston, Horsky, and Weingartner, did not support the hypothesis that lending terms were related to discriminatory factors after adjusting for neighborhood and borrower characteristics.

II. Empirical Setting

The empirical analysis focuses on Cuyahoga County, which is the central county of the Cleveland SMSA. The county encompasses Cleveland and 54 suburban communities divided into 357 census tracts, 335 of which are used in the study.[3] This area was

2. Lending institutions in the states of Massachusetts, New York, and California are required to disclose data on individual loan terms along with other borrower neighborhood and property information.

3. Twenty-two tracts were excluded, because they had a 1970 population of less than 300. Almost all deleted tracts were in Cleveland's sparsely inhabited downtown and industrial flats area.

Table 1 Demographic Characteristics of Cleveland

	Total population, thousands		Black population as a percent of total population		Median family income, dollars	Housing stock, 1-4 family, thousands	Percent of total houses built prior to 1939	Owner-occupancy rate as percent of 1-4 family units
	1970	1980	1970	1980				
Cuyahoga County	1,721	1,498	19.1	22.7	11,309	454	48.9	51.7
City of Cleveland	751	574	38.3	43.8	9,107	206	73.3	40.9
Suburbs	970	924	4.2	9.7	14,643	248	28.4	68.0

NOTE: Unless otherwise noted, the data are for 1970; only 1980 population demographic data have been released to date.

Table 2 Distribution of 1977-79 Housing-Related Loans in Cleveland

Financial institutions	Number of institutions, 1979	Conventional mortgage loans, 1977-79		FHA mortgage loans, 1977-79		Total mortgage loans, 1977-79		Home-improvement loans, 1977-79	
		Number	Average	Number	Average	Number	Average	Number	Average
Commercial banks	10	11,582	$42,169	108	$33,703	11,690	$42,091	38,925	$4,828
Savings and loans	27	56,065	37,034	1,625	38,235	57,690	37,068	5,662	7,084
Mortgage bankers[a]	29	–	–	5,425	32,019	5,425	32,019	–	–
All financial institutions	66	67,647	37,913	7,158	33,456	74,805	37,487	44,587	5,114

a. The few conventional loans extended by mortgage bankers do not fall under the reporting requirements of HMDA and, hence, are not included in these figures.

selected for two reasons. First, it is of particular concern to the Fourth Federal Reserve District, as the majority of CRA protests received in this district involve Cleveland-based institutions. Second, it offers a particularly well-suited environment to investigate redlining. The county is a good approximation of the service area of the 37 banks and savings and loan associations included in the study.[4] As a group, these banks and savings and loans make over 80 percent of their mortgage loans within the county. The county also has a large, growing black population that is for the most part segregated. Since most of the SMSA's commuting suburbs are contained within the county, the data set offers the potential to separate the effects of racial patterns from those generated by income or other neighborhood characteristics.

4. During the period of study, Ohio was classified as a limited branch state. Commercial banks were permitted to branch only within the county in which they were headquartered, and savings and loan associations were geographically restricted to branching within a 100-mile radius of their home offices.

The population of the county has declined steadily over the past decade. As shown in table 1, most of the population loss has been from the city. Whereas the county's white population has fallen since 1970, its black population has risen slightly. Although the percentage of blacks within the city has risen, there has been a decline in the actual number of black city residents. The increase in the county's black population has occurred in the suburbs, where the percentage of blacks has more than doubled in the past 10 years.

There are a number of significant differences between the city and its surrounding suburbs. The city was almost completely developed by the 1930s, as nearly 80 percent of its housing stock was built prior to 1939. According to the Department of Housing and Urban Development (HUD) definition, almost 60 percent of the city's 204 census tracts are classified as low-to-moderate income neighborhoods versus only 4 percent of the county's 153 suburban tracts.

Both the city and the suburbs have similar racial patterns (see figure 1). A clear east-west racial split

exists; the city's black population is concentrated in the eastern portion, and most suburban blacks reside in the northeastern and southeastern suburbs. For the county as a whole, 80 percent of the area's white population lives in neighborhoods that are less than 10 percent black; 73 percent of the county's black population lives in neighborhoods that are greater than 90 percent black.

Ten commercial banks and 27 savings and loan associations were headquartered in the county from 1977 through 1979. Twelve of the 37 institutions (six of each lender type) control over $900 million in assets. Virtually all of the roughly 75,000 home mortgages and approximately 45,000 home-improvement loans issued in the county during the three-year period under study were extended by these institutions or one of 29 mortgage bankers. As shown in table 2, savings and loans accounted for the majority of mortgages extended over the three-year period, while commercial banks extended most of the home-improvement loans. The average value of mortgages extended by banks was slightly higher than that for savings and loans and significantly higher than that for mortgage bankers. For home-improvement loans, the average value extended by savings and loans was one and one-half times that extended by banks. Federally insured Federal Housing Act/Veterans' Administration (FHA/VA) loans represented 10 percent of the total number of county-wide mortgage loans over the 1977-79 period, with mortgage bankers accounting for over 75 percent of this total.

III. Empirical Results

This study addresses the empirical issues related to redlining by using two different sets of multivariate regressions. One set relates the levels of six different measures of loan activity to the racial composition of Cleveland neighborhoods (tracts), controlling for income, risk, and other nonracial neighborhood characteristics. The second set relates the change in the same six dependent variables to the change and lagged changes in the racial composition of neighborhoods. Each of these regressions has a similar form, relating different dependent variables to a common set of independent variables. Because the quality of data has been a controversial topic in the redlining literature (see Benston 1979, 1981), the preparation of data is discussed in greater detail than might normally be the case. The actual variables used are listed in table 3, along with variable means and standard deviations for the total sample and seven subsamples.

Dependent Variables

The dependent variables are based primarily on loan data reported under the Home Mortgage Disclosure Act by all Cuyahoga County banks and savings and loan associations for the years 1977-79. Total mortgage and home-improvement loans for the three-year period were aggregated by census tract separately for reporting banks and savings and loans. FHA and VA data also were used to calculate federally insured mortgage loans made by mortgage bankers and also were aggregated by tract for the same period.[5] Although these figures exclude loans made by out-of-county financial institutions, conventional mortgage banker loans, and loans by private individuals, they appear to account for almost all Cuyahoga County mortgages made during this period.

Taken by themselves, raw figures on mortgage lending activity would be misleading indicators of loan availability because of differences in neighborhood turnover rates. As a crude measure of potential "loan needs," the total number of housing deed transfers was aggregated by tract for the three-year period using data collected from the Cuyahoga County Auditor's office. Measures of loan activity (number of loans) were then deflated by deed transfers and multiplied by 100 for each tract. The resulting variables, which formed the actual dependent variables for this study, could be thought of as percentages of the transfers in each tract financed by different institutions. Variables were constructed to reflect mortgage loans issued by (1) banks, (2) savings and loans, (3) mortgage bankers, (4) total mortgage loans, and (5) total home-improvement loans. A sixth dependent variable was constructed by deflating the total dollar value of mortgage and home-improvement loans by the total dollar value of owner-occupied one-to-four unit housing stock as measured in the 1970 census (1977 dollars) and

5. Unfortunately, only the city location of mortgage banker VA loans was available. The distribution of the similar non-subsidized (Section 203) FHA mortgage banker loans, therefore, was used to assign VA loans randomly to census tracts within cities.

multiplying by 100. This variable is a crude measure of the percentage of the value of each neighborhood financed by equity lending each year.

If "loan needs" were accurately measured by the deed-transfer variable, then the first five dependent variables would be constrained to lie between 0 percent and 100 percent. Unfortunately, in many neighborhoods the number of loans exceeded the number of transfers because of widespread issuance of second mortgages. Similarly, although efforts were made to eliminate them, some transfers that generally do not require financing, such as those resulting from divorce or death, still remain in the data. For these reasons, the dependent variables are only approximate measures of the percentage of "loan needs" actually financed.

Independent Variables

Independent variables were drawn primarily from the 1970 U.S. Census of Population and Housing. Three variables were used to characterize neighborhood income: (1) median yearly family income; (2) percentage of tract families with income below the official poverty line ($3,743 for a family of four in 1969); and (3) percentage of employed persons within the tract who were professionals or managers. Four census variables were selected to control for neighborhood housing characteristics: (1) median value of owner-occupied one-to-four unit houses; (2) real percentage change in median value of owner-occupied housing from 1970 to 1977;[6] (3) percentage of owner-occupied housing built before 1939; and (4) percentage of one-to-four unit structures that were owner-occupied. Both the income and housing values were expressed in 1977 dollars for comparability with mortgage figures. One particular concern with these variables is that, unlike other variables in the study, they were measured as of 1970 instead of 1977-79. Thus, particularly in changing neighborhoods, they may be inaccurate measures of 1977 conditions.

An eighth independent variable was selected to control for risk differences across neighborhoods. County records of foreclosure filings were collected for the years 1973-79 and aggregated by the census tract of the cited property. This variable then was

6. The 1977 value was estimated from the median price of houses sold in each tract in 1977.

Fig. 1 Racial Composition of Cuyahoga County[a]

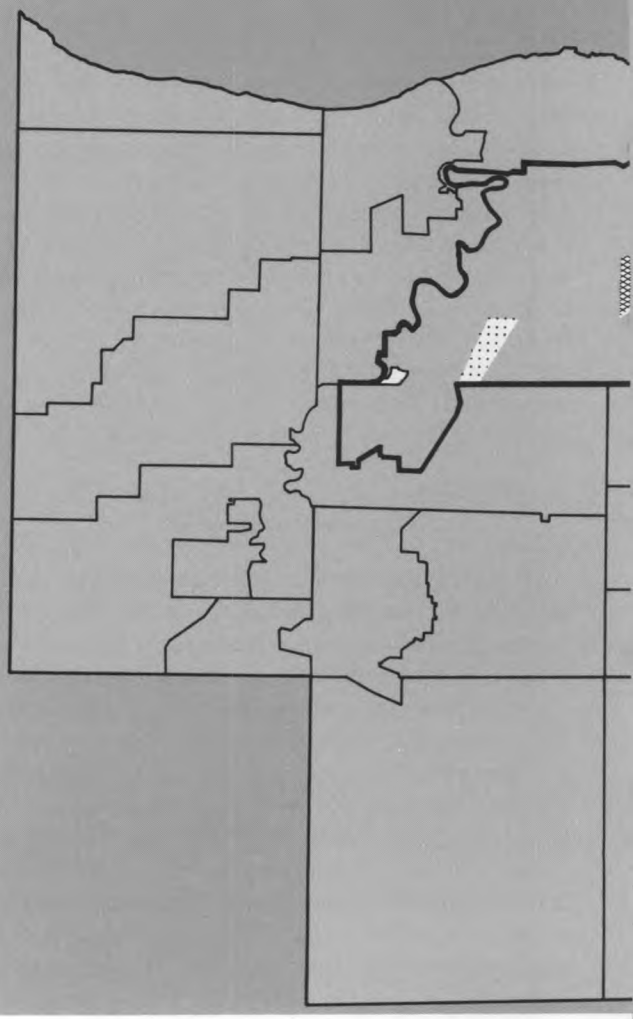
Census tracts excluded.

< 10% black in 1970 and 1977.[b]

< 10% black in 1970; 10% to 50% black in 1977.

10% to 50% black in 1970 and 1977.

a. The heavy black border designates the city of Cleveland.
b. The 1970 data are from U.S. Census of Population and Housing; 1977 data are from the Cuyahoga Plan of Ohio, Inc.



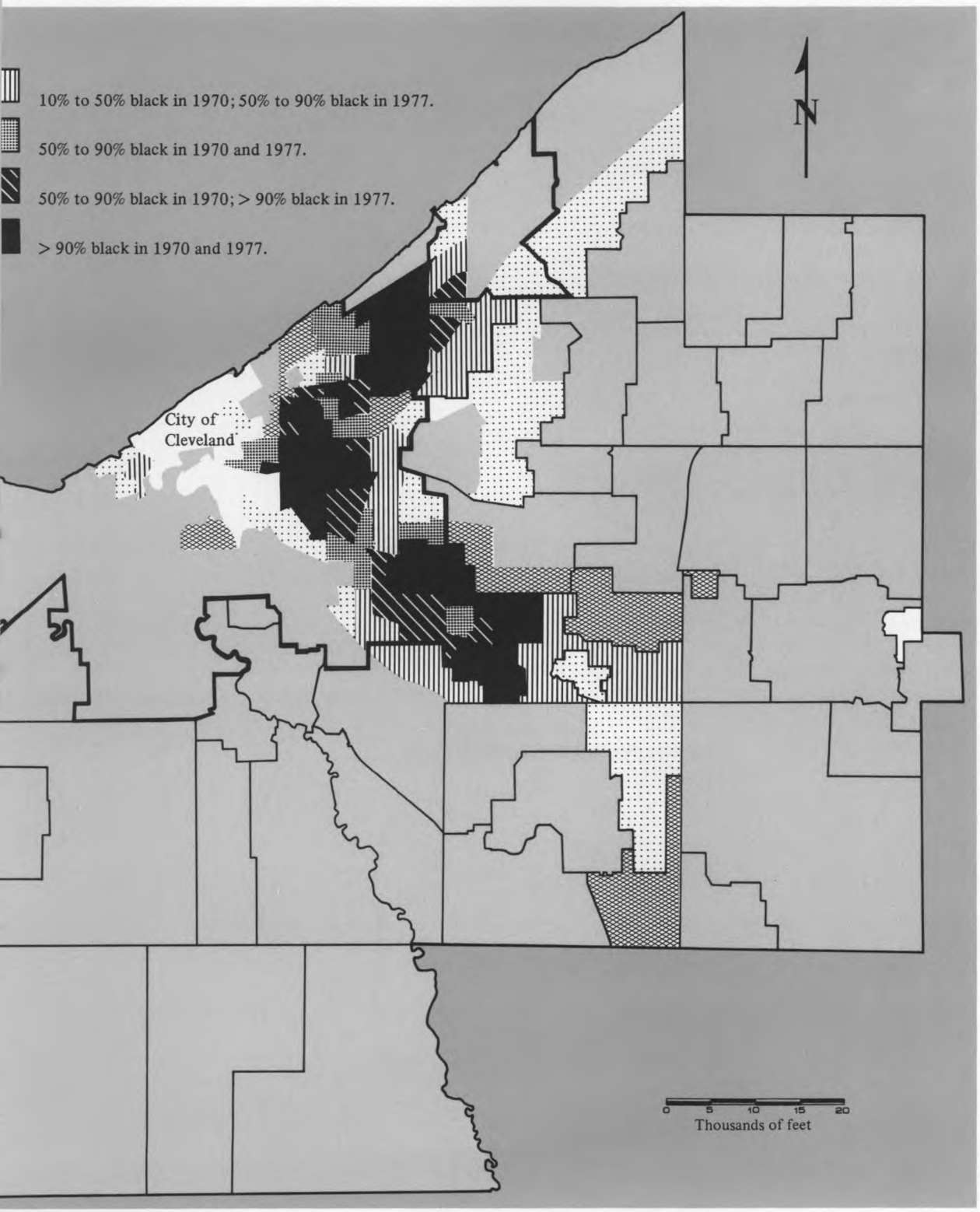


Table 3 Sample Means of Variables
Standard deviations in parentheses

Variables	Symbol	Total sample	Tracts sorted by percent black in 1970 and 1977 (A)	(B)	(C)	(D)	(E)	(F)	(G)
Number of tracts	TRACTS[a]	335	201	29	13	19	14	17	42
Bank mortgage loans to transfers, percent	TOTBNK[a]	14.1 (13.2)	17.7 (14.1)	16.2 (9.7)	14.4 (13.2)	6.7 (4.7)	8.4 (12.4)	3.2 (3.2)	5.2 (5.8)
S&L mortgage loans to transfers, percent	TOTS&L[a]	71.4 (36.2)	89.1 (27.3)	70.2 (27.8)	67.4 (51.8)	44.6 (19.3)	29.6 (20.8)	33.0 (19.1)	30.6 (22.7)
Nonbank mortgage loans to transfers, percent	TOTOTH[a]	11.3 (18.6)	5.5 (10.1)	8.4 (10.6)	8.4 (18.0)	27.7 (21.0)	18.4 (18.7)	38.5 (40.5)	21.4 (21.8)
Total mortgage loans to transfers, percent	TOTALL[a]	96.9 (42.1)	112.3 (32.4)	94.7 (35.9)	90.1 (62.1)	79.1 (26.3)	56.5 (35.5)	74.7 (56.4)	57.2 (40.7)
Total home-improvement loans to transfers, percent	TOTHI[a]	93.6 (73.8)	57.4 (20.3)	63.5 (23.7)	103.8 (72.7)	116.3 (38.2)	161.6 (83.7)	177.2 (85.8)	218.0 (83.6)
Total loan dollars to total value owner-occupied housing, percent	TOTLO$[a]	31.7 (66.6)	34.5 (80.2)	35.7 (43.5)	31.1 (20.5)	53.5 (76.5)	20.4 (13.3)	18.2 (8.0)	15.0 (5.8)
Percent black, 1977	%BLK77[b]	28.9 (38.7)	1.9 (2.1)	22.2 (9.5)	33.2 (10.2)	73.4 (11.3)	83.6 (7.0)	93.2 (1.6)	97.1 (2.6)
Change in black, 1970-77, percent	CNG%BL[b]	6.3 (12.1)	1.5 (2.0)	19.1 (9.5)	4.5 (11.3)	42.4 (11.8)	12.4 (14.9)	12.5 (8.6)	0.1 (2.1)
1970 median family income, thousands of 1977 dollars	MEDINC[c]	18.7 (7.2)	21.1 (7.2)	19.3 (5.7)	17.7 (6.8)	16.0 (3.8)	12.7 (3.6)	13.5 (3.7)	12.2 (4.6)
1970 median value owner-occupied house, thousands of 1977 dollars	MEDVAL[c]	33.7 (15.1)	38.4 (15.9)	33.4 (13.5)	30.7 (14.2)	29.5 (10.1)	21.9 (6.1)	22.8 (5.5)	22.7 (6.8)
Change in median real value of house, 1970-77, percent	CNG%VA[a]	−1.0 (40.1)	12.0 (34.3)	−3.1 (18.8)	−12.1 (30.3)	−0.01 (64.6)	−16.1 (63.8)	−32.9 (20.4)	−40.8 (24.5)
1970 owner-occupied housing built before 1939, percent	%<1939[c]	58.6 (33.3)	52.4 (34.4)	60.9 (35.2)	52.3 (35.7)	69.3 (28.1)	74.3 (21.3)	73.5 (21.9)	72.6 (26.8)
1970 families below poverty income, percent	%<POV[c]	9.9 (11.1)	5.0 (4.3)	7.6 (6.8)	11.8 (12.0)	11.7 (8.6)	22.9 (13.4)	18.6 (11.4)	25.7 (15.0)
1970 workers employed as professionals/managers, percent	%PROF[c]	20.2 (14.6)	23.1 (14.7)	26.3 (16.4)	22.5 (18.4)	22.7 (10.2)	10.3 (5.0)	8.1 (4.1)	8.4 (4.9)
1970 owner-occupied structures, percent	%OWNOC[c]	54.0 (25.4)	62.7 (21.7)	52.1 (24.4)	43.8 (26.7)	37.6 (22.2)	33.3 (22.0)	43.1 (28.1)	35.6 (24.6)
1973-79 foreclosure actions per owner-occupied house, percent	CTYFC[d]	7.8 (13.4)	2.5 (2.8)	5.2 (3.9)	8.6 (6.1)	25.9 (11.9)	24.3 (24.7)	27.3 (36.2)	12.9 (8.2)
1970 population, thousands	POPULA[c]	5.1 (3.5)	5.7 (4.0)	4.1 (3.1)	3.3 (2.8)	4.2 (2.3)	4.7 (2.1)	3.6 (1.7)	4.5 (2.0)

DATA SOURCES:
a. Computed from Cuyahoga County Auditor's records of deed transfers compiled by Northeast Ohio Areawide Coordinating Agency and HMDA data averaged for 1977-79.
b. Estimates from Cuyahoga Plan of Ohio, Inc.
c. 1970 census data.
d. Cuyahoga County Court filings.

KEY:
(A) < 10% black in 1970 and 1977.
(B) < 10% black in 1970; 10% to 50% black in 1977.
(C) 10% to 50% black in 1970 and 1977.
(D) 10% to 50% black in 1970; 50% to 90% black in 1977.
(E) 50% to 90% black in 1970 and 1977.
(F) 50% to 90% black in 1970; > 90% black in 1977.
(G) > 90% black in 1970 and 1977.

deflated by the number of owner-occupied housing units within the tract and multiplied by 100. As most foreclosure actions are settled without a formal trial, this variable vastly overestimates the number of actual legal foreclosures. Foreclosure filings, however, seemed to be a much better indicator of potential mortgage losses than the few cases requiring legal adjudication. Note that this variable reflects foreclosures of loans that actually were granted and thus fails to reflect risk differences already incorporated by institutions into their credit-screening procedures.

The final and most important explanatory variable is the characterization of the racial composition of neighborhoods. A number of different specifications of this critical variable were considered. Canner (1979), for example, used the change in percent black as well as a cubic polynomial for the level of racial composition. However, the small number of integrated tracts resulting from the severe nature of Cleveland segregation made such a specification unattractive for purposes of this study. As an alternative, it was decided to characterize race by seven mutually exclusive neighborhood groupings that differentiated tracts by both their levels and changes in racial composition. Racial composition was measured in 1970 (census figures) and again in 1977 (estimates from the Cuyahoga Plan of Ohio, Inc.),[7] and tracts were sorted into the following seven categories:

(1) the percent black was less than 10 percent in both 1970 and 1977;
(2) the percent black was less than 10 percent in 1970 and between 10 percent and 50 percent in 1977;
(3) the percent black was between 10 percent and 50 percent in both 1970 and 1977;
(4) the percent black was between 10 percent and 50 percent in 1970 and between 50 percent and 90 percent in 1977;
(5) the percent black was between 50 percent and 90 percent in both 1970 and 1977;
(6) the percent black was between 50 percent and 90 percent in 1970 and over 90 percent in 1977;
(7) the percent black was over 90 percent in both 1970 and 1977.

Before discussing the regression results, the superficial evidence suggested by the gross variable means in table 3 should be noted. Reading columns from left to right, commercial bank, savings and loan, and total mortgage loans as a percent of transfers each show a significant decline from all-white to all-black neighborhoods. These gross relationships, however, might be very misleading, as median income, median housing value, change in housing value, age of housing structures, and foreclosure actions all show very similar patterns. Without controlling for these other factors, it is impossible to tell whether it is the racial composition of neighborhoods that affects loan availability or other factors correlated with race, such as income.

Regression Results

Results of the first set of regressions are summarized in table 4. Columns denote dependent variables, and rows indicate independent variables, which are identical for each regression. Except for the results reported in column 7, each regression was estimated with ordinary least squares using the entire sample of 335 census tracts. Coefficient estimates are presented as well as their standard errors (precision of estimation). Coefficients that are significantly different from zero at the 1 percent or 10 percent levels are indicated with asterisks. Note that, because of the form of the dependent variables, the coefficients of regressions 1, 2, and 3 always sum to the coefficients of regression 4.

Coefficients for the control variables are listed in the first nine rows and for the most part conform to prior expectations, with some glaring exceptions. As a general rule, older, poverty-stricken, nonprofessional, rental-dominated neighborhoods appear to be significantly less likely to receive loans of any type. Although these general results hold true, there are conflicting, inconsistent coefficient signs in almost every regression. Similarly, median family income, housing values, and foreclosure rates—vari-

7. At the time the study was done, information on racial composition was available from the 1980 census. However, it was decided not to use these data, since they might have been affected by the actions of lenders during the 1977-79 period. The accuracy of the Cuyahoga Plan data can be attested to by the fact that its 1977 racial figures differed from the 1980 census figures by an average absolute deviation of only 3.4 percent, a number consistent with the 7.6 percent average absolute deviation between the 1970 and 1980 censuses.

Table 4 Coefficient Estimates of Static Regressions
Standard errors in parentheses

Independent variables	Dependent variables						
	TOTBNK	TOTS&L	TOTOTH	TOTALL	TOTHI	TOTLO$	TOTALL[a]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CONSTANT	−17.38**	102.70**	7.07	92.39**	32.90*	154.17**	133.20**
	(2.93)	(8.83)	(5.87)	(11.00)	(17.05)	(25.36)	(12.18)
MEDINC	0.78**	−2.00**	0.31	−0.91*	−0.51	1.54	−0.75
	(0.15)	(0.44)	(0.29)	(0.55)	(0.85)	(1.26)	(0.47)
MEDVAL	0.34**	0.14	−0.17	0.30	0.18	−2.04**	−0.19
	(0.08)	(0.25)	(0.17)	(0.31)	(0.49)	(0.73)	(0.30)
CNG%VA	0.016	0.037	−0.016	0.037	−0.134*	0.468**	0.179*
	(0.011)	(0.034)	(0.023)	(0.042)	(0.065)	(0.097)	(0.088)
%<1939	0.026	−0.160**	0.062*	−0.072	0.368**	−0.587**	−0.127*
	(0.018)	(0.053)	(0.036)	(0.067)	(0.103)	(0.153)	(0.067)
%<POV	0.31**	−1.17**	−0.89**	−1.75**	−1.96**	−1.11*	−2.06**
	(0.06)	(0.19)	(0.13)	(0.24)	(0.37)	(0.56)	(0.40)
%PROF	0.19**	0.71**	−0.35**	0.55*	−0.31	1.51**	0.71**
	(0.06)	(0.18)	(0.12)	(0.22)	(0.35)	(0.52)	(0.21)
%OWNOC	−0.032	0.332**	0.128*	0.428**	0.465**	−1.261**	0.071
	(0.027)	(0.082)	(0.054)	(0.102)	(0.158)	(0.234)	(0.112)
CTYFC	0.042	−0.021	−0.005	0.016	−0.531*	0.336	−0.657
	(0.039)	(0.118)	(0.078)	(0.147)	(0.228)	(0.339)	(0.499)
D<10, 10-50[b]	−0.29	−15.45**	6.61*	−9.13*	13.29	−10.42	−6.80
	(1.44)	(4.35)	(2.89)	(5.42)	(8.40)	(12.49)	(5.79)
D10-50, 10-50	−0.53	−11.72*	10.55*	−1.71	68.02**	−19.74	−1.22
	(2.06)	(6.21)	(4.13)	(7.74)	(11.99)	(17.84)	(9.35)
D10-50, 50-90	−8.01**	−33.30**	30.15**	−11.16	87.10**	−7.21	1.74
	(1.89)	(5.71)	(3.80)	(7.12)	(11.02)	(16.40)	(11.91)
D50-90, 50-90	−2.13	−29.24**	26.21**	−5.15	147.31**	−13.85	8.36
	(2.19)	(6.60)	(4.39)	(8.23)	(12.75)	(18.96)	(10.66)
D50-90, >90	−6.10**	−30.57**	40.16**	3.49	149.10**	2.03	29.59**
	(2.10)	(6.33)	(4.21)	(7.89)	(12.22)	(18.18)	(10.99)
D>90, >90	−4.75**	−25.19**	30.61**	0.68	198.28**	6.49	9.61
	(1.61)	(4.86)	(3.23)	(6.06)	(9.39)	(13.96)	(7.67)
R^2	0.74	0.69	0.47	0.64	0.72	0.23	0.84

* Significant at the 10 percent level.
** Significant at the 1 percent level.

a. Weighted by the number of owner-occupied units.
b. These last six independent variables are dummy variables representing different neighborhood racial classifications. As shown in the key to table 3, the first number represents the percentage black in 1970; the second number represents the percentage black in 1977.

ables that *a priori* one would expect to be important—have insignificant coefficients in all but a few regressions.

The most important coefficients for the purposes of this study are the estimated effects of neighborhood racial composition. Coefficients for the six integrated and all-black areas of the seven neighborhood classifications are listed in the last six rows of table 4. These neighborhood coefficients represent mean shifts (intercept) in the dependent variables measured against the all-white neighborhoods (less than 10 percent black in both 1970 and 1977). The coefficients thus can be directly interpreted as differences in the percentage of transfers financed. One would expect integrated neighborhoods (D10-50, 10-50), for example, to have 11.72 percent less of their transfers financed by savings and loans than comparable all-white neighborhoods.

Although less significant than the raw figures presented in table 3, it appears that, controlling for other demographic variables, banks and savings and loans are still less likely to extend mortgage credit in integrated and all-black areas (regressions 1 and 2). Interestingly, changing neighborhoods fare worse than comparable stable areas, a fact consistent with arguments suggested earlier. The least attractive neighborhoods appear to be those shifting from a majority white in 1970 to a majority black in 1977 (D10-50, 50-90). Note that the magnitude of these differences, particularly for savings and loans, is quite large. The average intercept shift of –30 between all-white and predominantly black neighborhoods represents a drop of one-third in the approximately 90 percent of all-white neighborhood transfers financed by savings and loans.

Mortgage bankers appear to have exactly the opposite pattern as banks and savings and loans (regression 3). Black neighborhoods appear to be more, rather than less, likely to receive broker financing with most of these FHA/VA government-insured loans (75 percent of FHA/VA loans in the county originated from mortgage bankers). Thus, looking at total mortgage lending (regression 4), the attractiveness of black neighborhoods to mortgage bankers offsets most of the absence of bank and savings and loan lending in these areas. Thus, on net, only the transitional neighborhoods (D<10, 10-50 and D10-50, 50-90) fare significantly worse than all-white neighborhoods, and these effects are modest.

Home-improvement loans appear to show similar patterns to mortgage-banker lending (regression 5). Black neighborhoods appear to be significantly more likely to receive home-improvement loans than all-white neighborhoods (most of these loans are issued by banks at rates higher than those for first mortgages, with shorter maturities, and are collateralized by housing liens). This is particularly true for stable all-black neighborhoods (D>90, >90). Aggregating all sources of equity financing, total loan dollars (regression 6) exhibit a similar pattern to total mortgages (regression 4). Total funds flowing to the six categories of integrated and all-black neighborhoods do not appear to be significantly different from those flowing to comparable all-white neighborhoods.

The 335 census tracts used in the study were weighted equally in the six regressions. Because neighborhoods represent aggregates of different sizes, however, a case can be made for weighting observations by various measures of tract size. A formal basis for this argument is that aggregation makes it likely that regression errors will be heteroskedastically, rather than identically, distributed. An attempt was made to correct for this by weighting observations by the number of one-to-four unit owner-occupied houses as a representative measure of tract size. The regression for total mortgage loans was then re-run using the weighted observations (regression 7). With one exception, coefficient signs and significance levels are similar to the unweighted regression. Interestingly, however, some transitional neighborhoods (D50-90, >90) now appear to be significantly more likely to receive funding than comparable all-white areas.

Unfortunately, the first set of regressions, which form the basis for most of the analysis, fails to capitalize on the temporal features of the data base. Although three years is a relatively short time in the slowly changing world of mortgage lending, some simple dynamic relationships were examined in a second set of regressions. In particular, yearly changes in the six measures of loan activity were compared with changes in neighborhood racial composition (the only variables for which there were measures for each year). The contemporaneous change in racial composition and lagged changes for three

Table 5 Coefficient Estimates of Dynamic Regressions
Standard errors in parentheses

Independent variables[a]	Dependent variables						
	ΔTOTBNK (1)	ΔTOTS&L (2)	ΔTOTOTH (3)	ΔTOTALL (4)	ΔTOTHI (5)	ΔTOTLO$ (6)	ΔTOTALL[b] (7)
CONSTANT	1.47*	−0.086	−0.73	0.651	−8.61*	1.41	0.03
	(0.86)	(1.888)	(0.80)	(2.37)	(4.45)	(0.908)	(6.69)
Lagged 3 Δ%BLACK	−0.047	0.284	−0.175	0.062	0.084	0.041	0.094
	(0.152)	(0.334)	(0.142)	(0.418)	(0.786)	(0.160)	(0.607)
Lagged 2 Δ%BLACK	−0.178	−0.319	−0.051	−0.548	−0.758	−0.322*	−0.852
	(0.164)	(0.359)	(0.153)	(0.450)	(0.846)	(0.173)	(0.671)
Lagged 1 Δ%BLACK	−0.077	−0.914**	−0.260	−1.252**	−1.089	−0.287*	−1.860**
	(0.152)	(0.334)	(0.142)	(0.418)	(0.786)	(0.160)	(0.638)
Δ%BLACK	0.071	0.225	0.029	0.325	1.017	−0.084	0.756
	(0.130)	(0.286)	(0.122)	(0.359)	(0.674)	(0.138)	(0.532)
D1979	−2.89*	1.42	0.81	−0.66	−6.83	−0.74	2.30
	(1.16)	(2.55)	(1.08)	(3.19)	(6.00)	(1.22)	(7.89)
R^2	0.01	0.02	0.01	0.02	0.01	0.01	0.10

* Significant at the 10 percent level.
** Significant at the 1 percent level.

a. The percentage change in black variables represents the change in the percentage black for the contemporaneous year and the change in the percentage black for one, two, or three years earlier. The dummy variable represents changes in 1979.
b. Sample uses the 75 integrated census tracts, excluding all tracts below 10 percent or above 90 percent black in both 1970 and 1977.

years were chosen as independent variables. Dependent variable changes were measured from 1977 to 1978 and from 1978 to 1979. Thus, each tract provided two observations, for a total of 670. A dummy intercept shift differentiated 1978 from 1979 observations. Results for the dynamic regressions are shown in table 5. Columns again denote dependent variables, and rows designate independent variables. The few significant coefficients are indicated with asterisks.

The dynamic regression fits are not terribly impressive. The R^2s are not significantly greater than chance. There is some mild evidence, however, of a modest pattern. Lending of all types appears to decline one year after a rise in the percentage black in a neighborhood. This effect is significant for savings and loans and total lending and is echoed by more modest declines for two-year lags. Because the data are dominated by all-white and all-black tracts, the total lending regression was re-run, using only the 75 integrated tracts most likely to undergo racial change (regression 7). Though more significant, results were similar to those obtained using all the tracts. In all cases, the evidence shows some support for the contention that changing neighborhoods would be the ones more susceptible to limitations in mortgage lending and that lenders might react to changes in relatively short periods of time.

IV. Conclusions

Controlling for income and other demographic variables, it appears that neighborhood racial composition has little impact on the total number of deed transfers financed by mortgage loans and on total housing-related financing. However, it also appears that the portion of mortgage financing provided by banks and savings and loans is significantly lower in integrated and all-black neighborhoods than in all-white neighborhoods. This is particularly

prevalent in changing neighborhoods where the percentage of blacks is rising. On the other hand, black and racially mixed areas are significantly more likely to be served by mortgage bankers offering FHA/VA financing. Similarly, banks and savings and loans are much more likely to make home-improvement loans in these areas.

It should be stressed that these findings, like those of previous redlining studies, are based on reduced-form regressions. It is difficult to know whether there have been sufficient controls for demand and risk factors such that strong inferences can be drawn about supply. There is also a concern that the seven-year to nine-year gap between the lending data and 1970 census tract demographics may have caused distortions, particularly in changing neighborhoods. Despite these misgivings, however, the strong correlation between neighborhood racial composition and the type of lending warrants some discussion.

On the surface, it appears that banks and savings and loans are not serving the "credit needs" of black neighborhoods if the word *serve* is interpreted to mean conventional mortgage lending. Indeed, controlling for income and other neighborhood characteristics, financial institutions are significantly less likely to finance title transfers with conventional mortgages in black and racially mixed neighborhoods. This finding would constitute redlining under the definition used earlier. On the other hand, it appears that funds are being made available to these neighborhoods either through FHA/VA mortgage-banker financing or home-improvement loans.

One explanation for this pattern is that, as argued earlier, financial institutions may feel that all-black and/or integrated neighborhoods are more risky than comparable all-white neighborhoods. Because of this higher perceived risk, banks and savings and loans may reason that they cannot offer conventional mortgage loans in these areas at the same rates as in white areas or at rates that can compete with government-insured and sometimes subsidized loans. They could, of course, offer conventional financing but at higher rates. However, there seems to be a reluctance to offer differential interest rates by neighborhood. A more likely alternative would be to offer the same rate but set higher credit standards in risky neighborhoods, thus relegating a higher fraction of the mortgage business to other lenders. Over time, real-estate brokers, recognizing this fact and knowing the high transactions costs involved in mortgage applications, would steer high-risk neighborhood clients to FHA/VA-insured mortgage bankers where applications more likely would be accepted.

The pattern observed in black neighborhoods with home-improvement loans is consistent with this scenario. Home-improvement loans offer a method of housing-related financing at higher rates and shorter maturities than first mortgages. If houses are renovated after, rather than before, their sale, home-improvement loans allow part of the equity to be financed at higher rates and also reduce the need for first-mortgage financing.

Even if it is true that redlining is more a matter of lender type and price than restrictions on credit availability, there may still be a case for regulatory concern. Although houses that change hands in black areas appear to be as likely to receive financing as those in comparable white neighborhoods, the long-term absence of conventional bank and savings and loan lending in these areas may mean that fewer houses change hands or that selling prices are lower. Some also have argued that widespread FHA/VA financing may lead to more rapid neighborhood deterioration (see King 1980). However, there has been little or no legal guidance as to which actions constitute discriminatory mortgage lending. It is still not clear, for example, whether differential lending policies in white and black neighborhoods by themselves constitute violations of any federal discrimination law. In the absence of clear-cut judicial decisions, it is difficult for regulatory bodies to enforce existing laws that have yet to be tested.

References

Bailey, Martin J. "A Note on the Economics of Residential Zoning and Urban Renewal," *Land Economics,* vol. 35, no. 3 (August 1959), pp. 288-92.

Barth, James R., Joseph J. Cordes, and Anthony M. J. Yezer. "Financial Institution Regulations, Redlining and Mortgage Markets," in *The Regulation of Financial Institutions.* Conference Series No. 21. Federal Reserve Bank of Boston and National Science Foundation, October 1979, pp. 101-43.

Benston, George J. "Mortgage Redlining Research: A Review and Critical Analysis Discussion," in *The Regulation of Financial Institutions.* Conference Series No. 21. Federal Reserve Bank of Boston and National Science Foundation, October 1979, pp. 144-95.

———. "Mortgage Redlining Research: A Review and Critical Analysis," *Journal of Bank Research,* vol. 12, no. 1 (Spring 1981), pp. 8-23.

———, Dan Horsky, and H. Martin Weingartner. "An Empirical Study of Mortgage Redlining," *Monograph Series in Finance and Economics,* No. 5. New York: Salomon Brothers Center for the Study of Financial Institutions, 1978.

Buynak, Thomas M. "The Community Reinvestment Act: Early Experience and Problems," *Economic Commentary,* Federal Reserve Bank of Cleveland, April 20, 1981.

Canner, Glenn Brian. "Redlining and Mortgage Lending Practices." Unpublished Ph.D. dissertation, Brown University, June 1979.

———, and Joe M. Cleaver. "The Community Reinvestment Act: A Progress Report," *Federal Reserve Bulletin,* vol. 66, no. 2 (February 1980), pp. 87-96.

Cuyahoga Plan of Ohio, Inc. *A Report on Population and Race: Estimates of the Racial Composition of Census Tracts.* Cleveland: Cuyahoga Plan, December 1980.

Guttentag, Jack M., and Susan M. Wachter. "Redlining and Public Policy," *Monograph Series on Finance and Economics,* No. 1. New York: Salomon Brothers Center for the Study of Financial Institutions, 1980.

Hutchinson, Peter M., James R. Ostas, and J. David Reed. "A Survey and Comparison of Redlining Influences in Urban Mortgage Lending Markets," *Journal of the American Real Estate and Urban Economics Association,* vol. 5, no. 4 (Winter 1977), pp. 463-72.

Kain, John F. "Race, Ethnicity, and Residential Location." Discussion Paper D75-3. Department of City and Regional Planning, Harvard University, June 1975.

King, A. Thomas. "Redlining: A Critical Review of the Literature with Suggested Research." Research Working Paper No. 82. Office of Policy and Economic Research, Federal Home Loan Bank Board, February 1979.

———. "Discrimination in Mortgage Lending: A Study of Three Cities." Working Paper No. 91. Office of Policy and Economic Research, Federal Home Loan Bank Board, February 1980.

Masulis, Ronald W. "The Economics of Redlining." Manuscript. Federal Home Loan Bank Board, January 22, 1981.

Mieszkowski, Peter. "Studies of Prejudice and Discrimination in Urban Housing Markets." Special Study. Federal Reserve Bank of Boston, December 1979.

Mills, Edwin S. *Urban Economics.* Glenview, Illinois: Scott, Foresman and Company, 1972.

Ostas, James R., J. David Reed, and Peter M. Hutchinson. "An Inter-temporal Comparison of Urban Mortgage Lending Patterns in the Toledo, Ohio, SMSA: 1977 vs. 1975." Unpublished Paper. Bowling Green State University, 1979.

Schafer, Robert. *Mortgage Lending Decisions: Criteria and Constraints.* Two volumes. Cambridge, Mass.: Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University, 1978.

Taeuber, Karl E. "The Effect of Income Redistribution on Racial Residential Segregation." *Urban Affairs Quarterly,* vol. 4 (September 1968), pp. 5-14.