Mortgage Redlining Research: A Review and Critical Analysis Discussion

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Redlining as a Subject for Research

The research on mortgage redlining is, perhaps, even a more interesting phenomenon worthy of study than the subject of the research. Allegations of redlining – the refusal of lenders to make mortgages or their imposition of more onerous terms on mortgagors because of (noneconomic) bias related to the location of the property – are of quite recent origin. Before the early 1970s, the term, redlining, was used almost exclusively to describe an alleged practice by insurers of drawing a red line around sections of a city to delineate an area within which they would not write policies. While mortgagees (and others) had been accused of discriminating against borrowers solely because of their race, national origin, sex, and age, the term "redlining" was not employed to describe these deplorable practices. By now the term is used as a general pejorative description of some institution's alleged refusal to serve some area or even group (e.g., "credit card redlining" and "Hispanic redlining").

The extension of the term "redlining" testifies to the remarkable effectiveness with which it has been used to characterize alleged behavior. I believe that the occurrence is due, in large measure, to the effective public presentation of data by community group activists to support their charges. They have succeeded in getting laws of farreaching importance enacted, including the Home Mortgage Disclosure Act of 1975, the Community Reinvestment Act of 1977 and a number of similar state laws and regulations. This may be considered the first phase of redlining research. The second phase began with the entrance of academic researchers. The third phase, blissful forgetfulness, may already have begun. If so, we will have lost an opportunity to examine, scientifically, the empirical basis on which a considerable extension of regulations rests. I consider first some of the conditions that gave rise to the research attempts by community groups, a remarkable phenomenon in itself. Then I review empirical studies on redlining grouped according to the type of question considered.

Community Concerns and Allegations of Redlining

The late 1960s and early 1970s saw many older urban neighborhoods defaced by abandoned, boarded-up and burned-out buildings. The populations of

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many of these neighborhoods also changed as new people purchased or rented the houses of former residents who had moved to the suburbs. Often the newcomers were of a different religion, ethnic background, or race. The world of the remaining residents had changed, and not (as they perceived it) for the better. Not surprisingly, the concerned people in these disrupted communities did not conduct careful, well-reasoned analyses of the reasons for neighborhood change, abandonments, and deterioration. Had they done so, they might have considered the role of population movements, particularly the effect of the movement of increasingly affluent white city people to suburbs and the in-migration of poor, often black people to the older parts of the cities. When the numbers of families who moved out exceeded the numbers who moved in, dwelling units necessarily became vacant and often buildings were abandoned by owners who preferred not to accept negative cash flows.[1] They also might have analyzed the effect of government highway programs that decreased the cost of transportation to and from suburban areas by workers and businesses. The role of the FHA's programs in the late 1960s that made funds available at low and even zero downpayments and below market interest rates to purchasers of houses in older, declining urban areas was particularly important.[2] In approving loans on properties that did not meet ordinary underwriting standards and in encouraging the purchase of homes by poor people who ordinarily would not be considered financially qualified, the FHA was responsible for much of the neighborhood change and for the abandonments that upset the remaining original residents.[3]

Rather than address themselves to these causes, the community activists concentrated on the lending practices of banks and savings and loan associations. One reason for this approach may have been reaction to the FHA's expanded, lower standards lending program. There appeared to be a clear association between the in-migration of newcomers (such as blacks), abandoned housing and FHA loans. In fact, the term "FHAing a neighborhood" was coined and repeated often as a means of describing the presumably conscious destruction of an area by a malevolent force. That force was not identified as the federal government, HUD or the FHA, but as the chartered financial institutions and mortgage bankers that made the FHA-guaranteed mortgages. Though a complete analysis of the reasons for this choice of targets has not been made, to my knowledge, the following explanations may suffice. First, public criticism of the FHA for extending its guarantees to poorer, often black, people who previously were unable to utilize them is not appealing to people, though they profess sympathy and concern for these groups. Rather, demands that financial institutions make

[1] See Berry [1976], who points out that, over the decade 1960-70, 482,000 new units were constructed in the Chicago SMSA, while the number of new households increased by only 285,000.

[2] Section 104 of the Housing and Urban Development Act of 1968 established a Special Risk Fund for interest-subsidized home mortgages, mortgagors eligible for credit assistance, and properties not meeting the requirement of economic soundness which had to be met in the FHA's ordinary section 203(b) mutual mortgage insurance program.

[3] For a somewhate more extensive discussion, see Benston [1977], pp. 63-73.

conventional loans rather than FHA-guaranteed loans is equivalent to having them deny loans to people who would only qualify for FHA mortgages. Second, middle-class people who wanted to move into the older neighborhoods and who preferred conventional mortgages (perhaps because they did not qualify for interest subsidized FHA mortgages) may have been refused by banks, because the banks perceived the neighborhoods to present bad risks, either because the banks approached did not serve the areas (a not uncommon situation in the then unit banking environment of Chicago, where the anti-bank movement was the strongest), or because the bankers they approached were biased. Therefore, these relatively vocal, action-motivated people saw the banks in the role of villains. Finally, chartered financial institutions make very attractive targets. They are regulated by the federal and state governments, and therefore are amenable to political pressure. They appear to have control over a great amount of resources that could be directed in alternative ways. And since they characterize themselves as serving the public, why should they not be required to serve a given neighborhood?[4]

Community Activists' Research on Redlining

Either by chance or design, the community activists enlisted research in their campaign against FHA lending and towards forcing banks and savings and loan associations to make more conventional loans to buyers of property in older urban areas. They sought to prove to the press, the public and the legislators that the lenders were not serving these areas. They were remarkably successful in this endeavor, in part as a consequence of the brilliant organizational and publicity skills of Gail Cincotta, organizer and leader of the National Peoples Action in Housing and the National Training and Information Center. Studies were conducted by community groups in cities around the country, reported to the press and presented before congressional, state and local government committees.[5] As a consequence, laws were passed and regulations promulgated that have resulted in a great amount of data on mortgage activity by chartered financial institutions being made available. These and other data are now being used by community and professional researchers. An assessment of that research follows.

Basic Requirements for a Study of Redlining

For valid conclusions to be drawn, any study of redlining requires the following minimal conditions, at least, to be met:

1. If the focus is on the terms of the mortgage – such as the interest rate charged, the downpayment required or the term to maturity given – economic factors that impose greater costs on the lenders must be accounted

[4] See Benston [1978A] for additional discussion.
[5] See Agelasto and Listokin [1977] for a summary of these efforts.

for. A model that describes the mortgagee's decision function using only variables that provide estimates of economic costs and benefits should be constructed and specified. Its outcome with respect to mortgage terms then can be compared to the actual terms experienced by mortgagors in situations where it is claimed that the terms charged were based on non-economic considerations. If this is not done, there will be no way of concluding whether the terms charged reflect only cost differences among mortgages, in which event income redistribution is the appropriate response (such as direct subsidies to mortgagors and house sellers or forced wealth redistributions from financial institutions and savers to mortgagors and home sellers).

2. If the focus is on the supply of mortgages, either in terms of numbers or dollars, a demand as well as a supply function must be constructed and specified. When demand is not accounted for, there is no way to determine the reason for any given level of supply.
3. Furthermore, if the focus is on the effects of redlining on consumers and on local areas, data from all mortgage lenders must be included in the study. When this is not done, the most that can be demonstrated is that a particular lender (or subset of lenders) serves areas differently, since other lenders not included in the study may be a preferred or equivalent source of funds.

It is not reasonable to expect community activists to develop and specify, formally, the mortgage decision function model required for an analysis of mortgage terms or the supply and demand functions required for an analysis of the supply of mortgages to areas. However, it is reasonable to expect them or those who rely on their presentations to consider the effect on mortgage terms of property characteristics, such as the past variability of house prices and prospects for increases or decreases in value, and the borrower's financial situation, such as wealth, income, job, and credit record. Moreover, consideration of the demand for mortgages is a crucial aspect of any study of the number or dollars of mortgages supplied. If these variables are disregarded or not adequately accounted for in a study, the only conclusion that should be drawn is that the situation may be worth a well-constructed study.[6]

Types of Redlining Research

Research on redlining may be grouped into six categories: (1) analyses of the supply of mortgages in terms of number and dollars; (2) measurement of the relative risk of lending in areas or to borrowers in terms of defaults and foreclosures; (3) estimates of the terms charged to mortgagors; (4) comparison of the ratios of appraisal values of purchase prices of properties; (5) evaluation

[6] I assume (naively, perhaps) that the purpose of the laws and regulations is the removal or mitigation of an inequity rather than the redistribution, via political power, of wealth from banks, savers and the general public to home owners and buyers in older urban neighborhoods.

of the extent and determinants of denials of applications for mortgages; and (6) estimates of the demand for mortgages by actual and potential home buyers. The first type of research (supply) cannot demonstrate or disprove redlining, but may give some insights into lending patterns. The second type (defaults) can indicate whether risk considerations are a factor in the lending patterns observed. The third type (terms) can provide some evidence of discrimination, given that mortgages are made. The fourth (appraisal ratios) examines an alleged method of discrimination. The fifth (denials) seeks to determine whether mortgages were not granted because of discrimination. Finally the sixth (demand) attempts to determine if applications were discouraged by lenders for unacceptable discriminatory reasons or whether supply patterns reflect demand. The studies in each category are reviewed and evaluated briefly in the balance of the paper, and in greater detail in the appendix.

Analyses of the Supply of Mortgages

Research by Community Groups

The principal procedure employed by community groups was to count mortgages made by a subset of lenders to property buyers in a city area compared to a suburban area. The period over which mortgage lending was measured often was quite short, generally a half year to a year and a half. No attempt was made to measure the costs of lending (in particular the expected cost of defaults) on property located in the areas of concern. However, since few of the studies included measurements of mortgage terms, this omission is not too important. Failure to measure or even consider the demand for mortgages is a more serious shortcoming. Absent demand analysis, one cannot conclude from the fact that more mortgages were made in, say, a city area compared to a suburban area, that the lender discriminated against purchasers of city property. Nor can one infer from a finding that relatively more FHA-insured mortgages and fewer conventional mortgages were made on city property than on suburban property that lenders "pushed" FHAs on or denied conventionals to buyers of city property. In addition, almost none of the studies attempted to measure the mortgage activity of more than a subset of lenders, usually savings and loan associations and savings banks. Mortgages made by commercial banks and mortgage bankers almost never were included in the data. Furthermore, the periods over which mortgage lending activity was considered generally were quite short, with no account being taken of the prior lending practices of the institutions studied. Hence, even were demand equal in the areas compared, one cannot conclude that a specific institution was or was not deliberately neglecting some area. Nor can one conclude that an area was under- or over-served (in some sense).

Perhaps the only meaningful data presented in these studies are reports of the experiences of individuals. These case studies may provide evidence that a specific lender or employees of the lender denied mortgages to individuals primarily on the basis of socially unacceptable criteria, such as the applicant's race or sex. However, without some evidence of independent verification, there is no way to tell whether the applicant's perception of discrimination was correct.

Nor can one determine if the practices reported were specific to an individual lending officer, an institution, or to lenders in general. In any event, my reading of the community activists' studies revealed very few reports of individual discrimination. Considering other evidence on the biases held by many white, married, middle-class males who tend to live in suburbs (a group that dominates mortgage lending officers), I was surprised to find so few specific complaints.

The generalizations presented above can be illustrated, in part, by reference to a few of the more prominent studies. In addition to the shortcomings discussed above, some of these studies have presented data and conclusions that can be characterized fairly only as fraudulent. A few of these situations are pointed out in the brief reviews given in the appendix.[7]

Research by Professionals

Since "redlining" often is defined as the non- or reduced-availability of mortgage financing for house purchases in discriminated-against areas (or to persons), some researchers have attempted to use supply and demand analysis (formally or implied) to determine whether a particular area or group received fewer mortgages than would be expected were discriminating practices not present.[8]

The first (to my knowledge) of these studies, Devine [1973], actually only presents an analysis of supply. Indeed, the possibility that the amount of mortgages supplied could be a function of the amount demanded was not even mentioned. This study is much more sophisticated than the community group studies, both in language (a dispassionate discussion of presumed lending behavior is presented at some length) and method (multiple regression analysis). Perhaps as a consequence, it was cited often in the hearings preceding enactment of the Home Mortgage Disclosure Act of 1975. It is seriously deficient, though, even as a supply study. The 14 geographical observations (Community Planning Districts) are too heterogeneous with respect to race, income, housing and other important variables. The data include less than 22 percent of the mortgages in the area. And the regressions indicated that the proportion of minorities in an area was related to mortgages granted only if some observations were dropped and independent variables redefined.

The studies following Devine's effort were much more carefully modeled and specified. Ahlbrandt's [1977, pp. 474-475] paper provides a succinct illustration of the type of model developed. Four equations (slightly changed here) are presented:

(1) mortgages demanded, $M_d = f_d\ (T, P, i)$

[7] See Benston, Horsky and Weingartner [1978], Chapter 1 for a detailed critique of nine studies. Also see King [1979A] for a critical review of 14 studies and papers.

[8] See the appendix for more detailed reviews of the eight studies mentioned that support the conclusions given here.

(2) mortgages supplied, $M_s = f_s (i, C, N, P)$

(3) potential real estate transactions, $T = f_t (i, M_s, P, C, N)$

(4) in equilibrium, $M_d = M_s = M$

where P = price of land and housing

i = loan terms (a vector interest rate, downpayment, and term to maturity)
C = creditworthiness of loan applicant
N = neighborhood characteristics (current and expected change).

The model then is simplified by substitutions to obtain the following reduced form:

(5) $M = f_m (P, C, N)$.

The reduced form then is specified with mortgage flow data (M) from a subset of lenders, aggregated by census tracts, with borrower and neighborhood characteristic variables (C and N) obtained from census data (usually from the 1970 census).

Ahlbrandt [1977] used an expanded version of equation (5) in his study of mortgage lending in Pittsburgh. Mortgages made, by census tracts, was regressed on percent black and other variables. His study is a considerable improvement over earlier supply studies in several important regards. He included mortgages made by all financial institutional lenders (though other sources of funds were excluded). Variables other than race (or area) are included (though the values are four years out of date).

However, the reduced form of equation cannot yield estimates of mortgage over- or under-supply, since demand for mortgages is not accounted for. If census tracts occupied largely by whites are characterized by greater mobility and hence greater demands for mortgages, "percent black" will be negatively associated with the number of mortgages demanded and supplied. Or if blacks are discriminated against by mortgage lenders, they may obtain funds at more onerous terms but these terms will not be revealed by the analysis. Or blacks may prefer to borrow from noninstitutional lenders because the terms offered (such as low downpayments) are less onerous or the service supplied is better. Furthermore, other independent variables (such as family income and the crime rate) are likely to be associated with percent black because of the economic condition of blacks due to past (and present) discrimination in employment and education.[9] In this event, the relationship between race, demand for mortgages, and risk cannot be separated.

Hutchinson, Ostas and Reed [1977] used data provided by Toledo, Ohio savings and loan associations. Though their study is more elaborate than Ahlbrandt's, it suffers from the same serious shortcomings. At most, they find that

[9] See Hauser and Elkhanialy [1978] and Dingemans [1979].

the mortgages made by these lenders in 1975 may have been related to the average percent black in census tracts. Based on an analysis of the data, the researchers conclude: "These results are consistent with the hypothesis that redlining takes place on the basis of risk aversion . . . [rather than] on a taste for discrimination." [p. 469]. In another updated and better paper, (Ostas, Reed and Hutchinson [1979]), they used an improved variable to measure demand – the number of one-to-four family units shown in real estate brokers' multiple listing guides. The results are similar to those found in their earlier paper. But the reduced-form equations cannot provide information as to why or whether more or fewer loans were made in census tracts.

Hauser and Elkhanialy [1978] present data on lending by savings and loan associations in Chicago. They show that relatively fewer loans were made in census tracts that are heavily black, and that "black" is positively correlated with low family income, nonowner occupied, and low home values, variables which explain much of the differences in lending.

Dinglemans [1979] also finds that factors other than minority status explain differences in lending by savings and loan associations. His careful study of Sacramento describes the activities of real estate agents and mortgage bankers in providing mortgages and shows that if their supply is excluded, areas not said to be redlined will appear to be so.

Whalen's [1976] study of Flint, Michigan attempts to separate the effect of variables such as income and quality of housing from race by regressing mortgages made first on these "prudent lending" variables (as he calls them) and then on race and other "discrimination" variables. With respect to race, he finds only that the average price of houses in a census tract (which he mistakenly identifies as the average mortgage amount) is negatively related to the percent black and racial change.

Schafer's [1978, Chapter 5] study of New York City represents the only example of which I am aware of measuring the possible shortfall of mortgage funds rather than simply the relationship between the characteristics of census tracts and the amount of mortgages made (and perhaps demanded). The three counties in New York City studied, Bronx, Kings (Brooklyn) and Queens, were dichotomized into neighborhoods that are alleged to be redlined and neighborhoods that are not. The identifications were based on interviews with people from community organizations and from published reports.[10] A model relating mortgage lending to explanatory variables was estimated for each area separately, and the coefficients compared. The coefficients from the presumably unconstrained (by redlining) data then were multiplied by the values of the independent variables from the alleged redlined observations and then aggregated to predict the expected amount of mortgage funds, were there no redlining. The predicted compared to the actual provides an indication of the extent to which mortgage funds are undersupplied to the alleged redlined neighborhoods.[11] The

[10] This procedure previously was employed by Benston, Horsky and Weingartner [1978] in their study of Rochester, New York.

[11] A similar procedure was followed for mortgage terms by Benston, Horsky and Weingartner [1978], as is discussed below.

data are mortgages made by a subset of savings banks in 1975. Schafer finds no evidence of redlining with respect to conventional one-to-four family mortgages. Indeed, he finds that two of the seven alleged redlined neighborhoods would receive more funds if they were redlined than if they were not. The exercise was also undertaken for FHA and VA one-to-four family mortgages and the multifamily mortgages, with similar results.

Finally, Koebel [1978] presents a very detailed description of all sources of mortgage funds in Louisville, Kentucky, which reveals the considerable extent to which chartered financial institutions are not the sole source of housing finance.

In summary, the reports of differences in the quantity of mortgages made to city compared to suburban areas clearly demonstrate very little and certainly prove nothing about the existence of redlining or are inconsistent with the claim that redlining is practiced. Though professional researchers have attempted to structure theoretically based supply and demand models, with a few exceptions they employed supply models, at best. For the most part, they examined data that are the result of the interaction of supply and demand as reflected in the records of a subset of lenders. A few studies employed better instrumental variables for demand (in particular, the real estate listings used by Ostas, Reed and Hutchinson [1979]), but at best all that can be demonstrated is that some lenders did not serve all markets equally. For this purpose, Schafer's [1978, Chapter 5] procedure of applying a supply function derived from assumed non-redlined data to estimate supply to an allegedly redlined area might be preferable. However, as Dingemans' [1979] and Koebel's [1978] studies show, lenders tend to specialize in serving different areas, which need not disadvantage borrowers. Therefore, other subjects of research must be considered before any knowledge about redlining can be obtained.

The Relative Risk of Lending – Defaults and Foreclosures

The possibility that borrowers may default on their obligations, thereby imposing costs on lenders, is a factor that obviously must be considered in studies of lender performance. Default costs include additional administrative expenses of processing notices when loans become delinquent less late fees collected from delinquent borrowers. When defaults are repaired, the net cost usually is small or there even may be a net benefit. However, when a mortgage must be foreclosed, the costs usually are positive, since if the net market value of the property exceeded the loan balance, the mortgagor could have benefited by selling the property, thereby protecting his or her credit rating as well as gaining directly. The costs to the lender of foreclosed mortgages include legal and other expenses related to processing documents to obtain possession of the property, expenses related to the maintenance of the property until it is sold, legal and other selling expenses, the loan balance owed and interest foregone on funds invested. These costs are reduced by the amount received for the foreclosed

property, either from sale[12] or from an insurance agency, such as the FHA, VA, or private mortgage insurance company.

Lenders may adjust to the expected loss from foreclosures in several ways. The most direct method would be to charge sufficient interest yields to offset the net costs (adjusted for the time of occurrence). But this price adjustment is constrained where state usury ceilings are effective or where the cost of adverse publicity and criticism by regulators makes raising interest rates infeasible. The lender then can reduce the risk of default by requiring higher downpayments and shorter terms to maturity. Borrowers who present a higher probability of default, such as those with lower levels of present and future income and wealth, and those for whom the cost of default in the form of a poor credit rating is low, can be screened out. Similarly, properties which present a relatively high probability of a market value decline below the mortgage balance can be screened out. (Indeed, where neighborhood factors are believed by lenders to offer an efficient means of identifying such properties, the areas may be "redlined," though not in the pejorative discrimination sense of the word.) Therefore, since lenders usually cannot be compensated with higher yields, they will tend to accept only mortgages on which the expected cost of default is equal, given the other terms, etc.[13]

Defaults nevertheless occur because of errors, regulation, and possibly, lenders' biases. The errors could be caused by unexpectedly changed events, such as an unexpected economic decline that reduces borrowers' wealth and the market value of houses. Or the default experience could be caused by regulatory or political agencies that force lenders to make mortgages on properties in particular areas. Alternatively, risk-averse regulators (such as bank examiners before the enactment of the Community Reinvestment Act of 1977) could cause a less than desired level of defaults if they imposed costs on lenders who wanted to make mortgages on properties in certain areas. Or the lenders could be biased against or for persons or neighborhoods despite the expected economic consequences of their lending decisions. Only the last possibility should be considered to be redlining or favoritism in its pejorative sense. But it does not seem possible to distinguish between the bias motive, prediction errors, and regulatory influences by examining data on mortgage defaults.

Therefore, a default study should use data that were not prescreened by lenders. Conventional mortgages made by chartered financial institutions generally do not meet this criterion, particularly in a state (such as New York) that imposes a restrictive usury ceiling on interest rates. FHA insured and VA guaranteed loans would meet the criterion, except that the lenders and the government agencies have incentives to prescreen applicants. The lenders bear costs when mortgagors with FHA and VA loans default because these agencies do not com-

[12] If the property is kept by the lender, this is the equivalent of a sale.

[13] This equality holds across mortgages and is equal, on the margin (on a present value basis), to the revenue from risk premiums charged on mortgages (relative to risk-free alternative investments and net of administrative and transactions costs).

pletely reimburse the lenders for the economic costs incurred.[14] The agencies bear most of the costs of default. They have an even greater incentive to deny risky loans, particularly because the insurance premium charged is the same for all loans. However, they are supposed to disregard general neighborhood factors and such borrower characteristics as race and sex. A particular exception to the usual lending criteria is the FHA's Special Risk Fund loans (e.g., section 235 and 221 (d)(2)) and the post-1968 policy imposed on the agency of accepting loans on properties in declining urban areas that previously would not have been accepted. Data from these loans would be very useful for a study of default experience related to neighborhood characteristics.

Only one of the six studies reviewed very briefly below (Marcis and Hull) meets the full sampling criterion and another (Barth, Cordes and Yezer) meets it partially. Therefore, the relevance of the others to the redlining question is limited. Nevertheless, they provide some information on the actual experience of some lenders.[15]

Characteristics that usually describe older, poorer neighborhoods, with other factors held constant, are found to be positively associated with higher foreclosures in most of the studies. In Williams, Barenek and Kenkel's [1973] study of Pittsburgh, this variable is the unemployment rate in a census tract. Percent black was excluded as an independent variable because it was correlated at .75 with the unemployment rate. (Per capita crimes against persons and median family income also were omitted for that reason.) The unemployment rate is significantly, positively associated with defaults, though it is not as statistically significant as some of the other explanatory variables. In Morton's [1975] study of Connecticut, the neighborhood variable is three-family houses. These generally were converted from older houses in declining neighborhoods. His findings indicate that neighborhood quality, as measured by this variable, affects defaults positively.

Schafer's [1978, Chapter 3] study of foreclosures in alleged redlined and other New York City neighborhoods shows some evidence of greater foreclosures in the former. A multiple regression analysis, which did not include alleged redlined and other neighborhoods as variables, shows statistically significant coefficients indicating higher foreclosures in census tracts with higher percentages of poor condition buildings, multiple-wage earner households, and single-family houses. His studies of four upstate New York cities [Schafer, 1978, Chapter 8] also found some (weak) evidence of relatively greater foreclosure rates in alleged redlined compared to other neighborhoods. The borrowers' race was not included in any of his analyses.

[14] The FHA does not fully reimburse the lender for interest lost on the first 60 days after default, for one third of direct foreclosure and acquisitions costs, or for the lender's own (internal) foreclosure expenses. Furthermore, interest on the lender's investment (after 60 days) is allowed at the FHA's debenture rate. The VA does not reimburse the lender for attorney's fees greater than $250 or for the lender's own expenses. However, the principal balance due is credited at face value, gross of unamortized points. The expected cost is the present value of the increased probability of default times the unreimbursed cost.

[15] See the appendix for detailed reviews of the methodologies and findings of the six studies.

Marcis and Hull [1975] is the only study to use largely unscreened data on FHA section 221(d)(2) and 235 insured mortgages. For the former, they found the zip code area characteristics of higher percentage of female family headship, lower family income, greater instability of occupancy, and lower level of education to be associated with higher foreclosure rates. The percentage differences found are considerable (e.g., a 10 percent increase in the percentage of female heads of households is associated with a 1.5 percentage point increase in foreclosure rates, which averaged about 5.5 percent). This study also did not specify the borrower's race or the racial characteristics of the area.

Finally, Barth, Cordes and Yezer [1979] used nationwide FHA data for regular, section 203(b) insured mortgages. As compared to conventional mortgages, these mortgages are less likely to have been prescreened to reduce defaults. The study also benefits from a large set of carefully sampled data. The authors found that defaults are statistically significantly higher on mortgages made to blacks (1.2 percent), lower to female heads of household (0.3 percent), higher for wood constructed houses (0.2 percent), higher on buildings located in the central city (0.1 percent) and in blighted areas (0.3 percent), compared to an overall average default rate of 1.5 percent.

Thus all the studies report data that are consistent with the conclusion that foreclosures are higher in areas often alleged to be redlined or to some persons alleged to be discriminated against, even though all but two used data that were screened to reduce (if not eliminate) foreclosures, and the least screened of the two used overly aggregated data. (I should note, again, that "black" is likely to be a surrogate for other variables.)

Terms Charged to Mortgagors

The most direct measure of bias against mortgagors is the price paid for the funds they receive compared to the price paid by others, *cet. par.* Two problems must be solved for such an analysis to yield meaningful findings: price must be defined and measured and all the other factors that result in price differences must be accounted for. Price for mortgages essentially is the interest rate paid (including points). However, it also includes other mortgage terms, particularly the downpayment required and the term-to-maturity offered. The others consist primarily of those that affect the expected cost of nonrepayment and noneconomic factors, including possible bias against or for certain mortgagors. The four studies reviewed below represent different attempts at quantifying these variables and measuring their relationship.[16]

The studies reviewed are inconsistent with the hypothesis that buyers of houses in allegedly redlined areas, defined by community groups or as census tracts with a high percentage of blacks, were discriminated against. Schafer's [1978, Chapter 6] study of New York City is the most elaborate. He computed simultaneous equations that included the average mortgage terms, in census tracts, of the interest rate, loan-to-value ratio, and term to maturity. The regres-

[16] See the appendix for more detailed reviews on which the conclusions given here are based.

sions have 45 independent variables, including dummy variables for six alleged redlined neighborhoods, and the percentage nonwhite and change in the percentage nonwhite. The results for conventional one-to-four family mortgages generally are inconsistent with the hypothesis that terms are more onerous for alleged redlined neighborhoods or groups. However, the results are mixed, indeed a bit confusing. Few of the coefficients have statistically significant coefficients and some have the "wrong" sign. These results also are reported for data from a special study and for multifamily houses. However, the quality of the data are so questionable that they limit acceptance of his results severely.

Muth's [1979] study of terms on 1903 conventional one-to-four family mortgages made by state-chartered savings and loan associations in Oakland, California in 1976 and 1977 is very well designed. As he points out:

> For redlining if it exists would imply a reduction in the supply of mortgage loans. Fewer loans might also result from a smaller demand for conventional mortgage loans, either because potential purchasers of homes prefer other methods of finance or because the demand for purchase itself is lower in areas where fewer mortgage loans were made. A reduction in the supply of mortgage loans, given their demand, would lead to higher prices or mortgage yields on such loans. Alternatively, if fewer loans are made because the demand for them is smaller, the yields on loans made would tend to be the same or lower than those on loans made in other areas. In seeking to determine why fewer conventional mortgage loans are made in certain parts of cities, then, the variation of mortgage yields is of critical importance. [pp. 1-2]

Muth calculated the theoretically correct rate of interest (which is not constrained by a usury law) for each mortgage and regressed it on variables that measured borrower and property characteristics. The coefficients calculated indicate very slightly higher interest rates (which averaged 9.3 percent) associated with black male borrowers (on average, .02 higher), other minority males (.03 higher), but lower rates with females (.03 less). Loan-to-value ratios are slightly higher for black than for white male mortgagors (.84 compared to .79) and maturities averaged 5 percent less in all black compared to all white census tracts. However, when variables for the quality of housing and family income were included in the regression, the coefficients for "black" became small and insignificant. Muth concludes: "This suggests to me that the higher riskiness lenders may attach to loans in black neighborhoods is not due to race *per se* but rather to the poorer quality of dwellings and lower borrower income on loans in such areas." [p. 15]

Benston, Horsky and Weingartner's [1978] study of mortgage terms in Rochester, New York is unique in that they obtained data on 712 one-to-four family house mortgages made over a three-year period from all the lenders in an area, including mortgage bankers. They also employed the technique of applying a lending function from a control to an alleged redlined area (as defined by anti-redlining group leaders), and vice versa. Analyzing mortgages by type (conventional, FHA and VA) separately, they found almost no difference in

interest rates between the areas. Loan-to-value ratios, the number of months to maturity and a variable that combined the terms were regressed separately on variables that characterized the borrowers and the properties. Separate regressions were computed for each area and for conventional, FHA, and VA mortgages. The analysis showed that virtually all of the differences between the areas in loan-to-value ratios and most of the differences in months to maturity were due to factors other than area. The combination variable showed almost no difference between the areas, even though account was not taken of area-related risk factors.

Finally, King [1979B] analyzed the terms on mortgages made by savings and loan associations in Miami, San Antonio and Toledo on 1960, 953 and 559 owner-occupied, residential properties made during three months in 1978. For mortgages made in each city he regressed interest rates, term to maturity, loan-to-value ratios, and fees on variables that specified the borrower's characteristics (particularly minority and marital status, sex and age), the age of the structure mortgaged, neighborhood characteristics (particularly the percentage of minority population in census tracts in 1970), the neighborhood in which the property is located (for Toledo only), and the savings and loan association that made the loan. With OLS and simultaneous equations, he found almost no evidence of more onerous terms related to possible discriminatory factors (such as race or sex), particularly with respect to the difference between the requested and granted term to maturity and loan-to-value ratios.

Appraisal Values and Purchase Prices of Properties

Critics of bank lending practices claim that appraisers systematically underappraise properties in some areas and/or on which minorities or others make offers. Consequently, they claim, the potential purchasers either must make larger downpayments or are prevented from purchasing the houses. Alternatively (and perhaps partially) the sellers can reduce the price of the houses.[17] Four studies analyze this situation in various ways. None of them find evidence that supports the biased appraisal hypothesis.[18]

Schafer's [1978, Chapter 4] study of the New York City area used data from a long period (at least 27 years) gathered from savings banks. He regressed the ratios of appraisal to selling price on variables measuring the age of the building, the type of mortgage, the neighborhood in which the building is located (alleged redlined or other in New York City), and the year in which the mortgage was made. The regressions also were computed separately for alleged redlined, other New York City neighborhoods, and three suburban counties. The analyses reveal no evidence that the banks systematically underappraised older houses or properties in the allegedly redlined neighborhoods, either for one-to-four family

[17] It is worth noting that if the selling price of a house were depressed because of underappraisals, the purchasers would benefit at the expense of the sellers, but there is no other necessary effect. See Benston [1978] for an analysis.

[18] See the appendix for details.

or multifamily houses. Schafer [1978, Chapter 9] repeated the analysis for four upstate New York cities and their suburbs for one-to-four family properties, with similar results.

Benston, Horsky and Weingartner's [1978] study of Rochester, New York mortgages compared the ratios to appraisal to selling price in an allegedly redlined area with a presumably favored suburb. Conventional, FHA and VA mortgages were scheduled separately. Virtually no differences were found between the areas for each type of mortgage.

King's [1979B] study of savings and loan associations in Miami, San Antonio and Toledo is unique in that he included mortgages applied for and denied as well as mortgages made. He first reviewed the reasons given for denials and found very few to be "inadequate appraised value" and these few were not related to the borrower's race. Second, he regressed the appraisal ratio on variables representing the type of mortgage, age of property, the borrower's race, sex and age, and neighborhood characteristics that might be associated with redlining. This analysis also found no evidence of discriminatory behavior by the associations; to the contrary, significantly higher ratios were found for blacks in Miami, and Spanish-American and some city neighborhoods in Toledo.

Denials of Mortgage Applications

The studies reviewed to this point present findings that either are not meaningful or that are inconsistent with the hypothesis that mortgage lenders discriminate against areas or minority persons. However, except for King's study of appraisals, they use data that results from a mortgage having been made. It may be that lenders discriminate by denying mortgages applied for by minorities or for houses located in allegedly redlined areas. They also might accept such mortgage applications, but only with modifications that impose harsher terms on those against whom they are biased. But if this practice had occurred, mortgages with harsher terms would have been written and should have been discovered by the studies of mortgage terms reviewed above. Since these studies reach contrary conclusions, the modification method of discriminating does not seem likely as a practice. Two other possibilities remain. Lenders could be so negative that they cause potential borrowers to withdraw their applications. But considering the cost of filing an application (the borrower's time and effort plus application and appraisal fees charged by lenders), it seems much more probable that completed applications were withdrawn because borrowers found superior alternatives. The other possibility, that potential borrowers are discouraged from applying or are turned down before filing an application, seems a much more likely possibility. Research on this possible redlining method is reviewed in the next section.

The studies of mortgage applications seek to determine whether applications are denied for reasons not associated with ordinary economic considerations, but rather with the applicant's race or the location of the property. The possible limitations of this type of analysis are well stated by Schafer [1978, p. 7-4], as follows: "If the discrimination variables [e.g., applicant's race] are not statisti-

cally significant, however, it can be inferred that discrimination is not a factor, provided that the race variable is not correlated to any relevant variable that has been excluded because of inadequate information. If the discrimination variables are statistically significant, it can only be stated that these results are consistent with the existence of discrimination. The extent to which a result is taken to support some form of discrimination depends on how complete the rest of the model is; that is, on how well the model controls for non-discriminatory factors that enter into the decision to lend."

The six studies reviewed apply somewhat different approaches to different sets of data and report somewhat different results.[19] The first study suffers from a paucity of denied mortgages. As is elaborated below, I believe that the Warner and Ingram study is superior to Schafer's two studies. King's study is more comprehensive than the other studies in that it covers three cities. The last study is included for completeness.

Black, Schweitzer and Mandel [1978] used data from a survey of applications filed at 176 banks nationwide (out of 300 asked to participate). Problems with the data reduced the number of observations to less than half the original amount, which limits the conclusions that can be drawn from the study. The data show a denial rate of only 2.7 percent. A probit regression model was employed, from which they found a positive relationship between black race and the probability of denials that is statistically significant, but at the .10 level. Inclusion of the applicant's race in the probit regression, though, improves the fit of the model but slightly. Unfortunately, the authors do not give (nor can the reader compute) the amount of the greater probability of denial associated with the applicant's race.

Schafer [1978, Chapter 7] used data derived from Equal Housing Opportunity Lender forms filed at 27 mutual savings banks in New York City. His study also suffers from missing data, which reduced the number of usable observations considerably. Nine percent of the applications analyzed are denials. From logit and OLS analyses of denials and acceptances, he found statistically significant relationships between the applicant's race and denials which imply that compared to a white applicant, black and other minority applicants have a greater probability of denial of from 9 to 21 percent (depending on the procedure employed). He also found that the location of the property on which a mortgage is desired was *not* a factor in the denial or acceptance of the application.

Schafer [1978, Chapters 11 and 12] also studied applications at savings banks in the Albany-Schenectady-Troy SMSA, Buffalo, Rochester and Syracuse, New York. The denial rates in these areas averaged 8, 8, 3 and 6 percent. The data base also was greatly reduced because of missing information in the forms. His logit regressions lead him to reject the hypothesis that the institutions denied relatively more applications from buyers of properties in alleged redlined areas.

[19] See the appendix for more detailed reviews and analyses on from which these brief synopses are derived.

(The exception is two neighborhoods in Albany, from which five applications were denied.) But he reports strong estimates that blacks faced statistically significantly greater probabilities of having their mortgage applications denied that are about twice those of similar whites in all areas except the Albany SMSA. But these findings are based on only 45 denied applications from blacks in Buffalo, 6 in Rochester and 5 in Syracuse.

King [1979B] analyzed applications recorded at savings and loan associations in Miami, San Antonio and Toledo from September through November 1978. He found evidence of no adverse selection of borrowers or properties, with the exception of Hispanic borrowers in Miami and San Antonio; denial rates for them average about .03 higher than the mean rates of .12 for Miami and .05 for San Antonio.

Warner and Ingram [1979] studied the behavior of almost all the chartered financial institutions in Columbia, South Carolina. These institutions denied about 5 percent of the conventional mortgage applications made. The authors use multiple discriminant analysis to test the hypothesis that the addition of variables that might be used for noneconomic discrimination affected the institutions' denials. They first used a function that includes only economic variables (e.g., applicant's credit rating, loan-to-value ratio requested, and applicant's tenure in current occupation) to distinguish between accepted and rejected applications. Then they added "discrimination" variables, such as the applicants' age, marital status, age of dwelling, sex, and race. They found that the additional variables did not significantly increase the predictive power of the function. Their results were confirmed with a validation sample. Tyree and Yeager [1979, Chapter 10] study of applications for high-risk loans in St. Louis also found no evidence of different denial rates associated with the applicant's race or the location of the property.

Thus all the studies found no evidence of differential denial rates related to the area in which a house is located. These findings, therefore, are inconsistent with the hypothesis that lenders redline by denying prospective mortgagors' applications. However, the studies conducted by Schafer (and possibly by Black, Schweitzer, and Mandel) report evidence of higher denial rates related to the applicants' black race. King finds some evidence of higher denial rates for Hispanics but not for blacks. None of the studies determine whether the results are due to risk-related or other nonobjectionable discriminatory factors. Warner-Ingram and Tyree-Yeager find evidence of no discrimination. The evidence, therefore, is not consistent, except in finding that denials apparently were not a form of area redlining.

The Demand for Mortgages by Actual and Potential Home Buyers

The applications data analyzed may not reveal discrimination by lenders against minorities or people who want to buy property in certain areas if the lenders are able to discourage these people from filing an application. This form of redlining is relatively easy to do. As Dingemans [1979] describes, real estate agents are a major source of information about the availability of mortgage

funds. The agents have a considerable economic incentive (the commission) to "close the deal," for which a mortgage usually is required. Therefore, they are likely to avoid lenders who have let it be known, by word or past actions, that they are unlikely to approve applications from certain types of people on certain properties. Lenders also require an appraisal for which they usually charge a fee. Thus they can discourage a potential mortgagor from filing an application by indicating that the appraisal will be delayed or that the application is likely to be turned down. Since there are no reported data on these discouraged applicants, special studies are required.

Direct analysis of the demand for mortgages also is necessary to determine whether the lower amount supplied to certain areas (as shown by many studies) is due to lack of demand or to lender discrimination. Instrumental variables, such as the stock of existing houses and other census tract data, are unlikely to be effective for this purpose. (Additionally, the census data are now 10 years out of date.) While the number of houses listed for sale with real estate agents (the multiple listing data used by Ostas, Reed and Hutchinson [1979]) are perhaps as good a proxy for demand of this type as one can obtain, it cannot distinguish between demands for conventional as compared to FHA, VA or private mortgages. Nor can its use reveal whether potential home sellers did not list their homes because they believed that buyers could not get mortgages. Hence it is necessary to obtain information directly. This is what the two studies reviewed next attempted.[20]

Benston and Horsky [1979] employed survey methods to determine whether the demand for mortgages and home improvement loans by owners and potential buyers of homes in the allegedly redlined area of the city had been met and whether home buyers received the type of mortgages and service they wanted. The allegedly redlined area was defined by community group leaders and other experts; essentially it is the central city of Rochester, New York. A suburb, suggested by these experts, was chosen as a control area. Because potential home buyers cannot be identified and located, home owners were interviewed, since a potential home buyer necessarily would have to contact the owner before attempting to get a mortgage. The home owners in both areas reported that none of the problems they encountered in selling their homes over the past five years were due to difficulties encountered by prospective buyers in getting mortgages because of the location of the house. However, three times as many central city as suburban home owners (36 percent vs. 13 percent) said that no potential buyer had inspected their homes that were offered for sale. Of the home buyers interviewed, all but 0.4 percent (one person) who bought homes in the central city and wanted a mortgage, got one. Mortgages were obtained predominantly at the first lending institution contacted (84 percent of the central city and 89 percent of the suburban mortgagors). The data also indicate that very few people got FHA insured or conventional mortgages for reasons other than their choice. Nor did home owners in either area experience difficulty in obtaining home improvement loans.

[20] See the appendix for more detailed summaries.

Tyree and Yeager [1979] interviewed all the community leaders in St. Louis, Missouri who could be contacted. Many indicated dissatisfactions with real estate lending institutions, which they considered to be biased against their areas. The leaders also spoke of people's experiences with redlining. When pressed to identify specific people, repeated requests and consultations yielded but seven names. Of these two could not be found, four denied they had the problem, and the seventh appeared to be a case of lack of creditworthiness.

The two studies reviewed used different methods for determining the extent to which the demand for mortgages from allegedly redlined areas was not met. Both provide evidence that this demand was not present and that allegations of redlining were based on misperceptions. Their principal limitation is their use of stated experiences and opinions rather than the hard data that economists prefer (which often are obtained by someone else from interviews). This limitation is particularly important for the Benston-Horsky method of asking home owners about the problems encountered by potential buyers of their homes. Unfortunately, to my knowledge, no one has designed a better method.

Summary and Implications for Further Research

It seems clear that the studies of the supply of mortgages to specific areas and groups by subsets of lenders are of very little value. They cannot be used to determine whether potential borrowers are well served or discriminated against. At the least, data also are required on mortgages made by other lenders. The role played by such usually omitted sources as mortgage bankers and private funds is revealed by Dingemans [1979] and Koebel [1979]. The demand by home buyers for mortgages is an even more important factor that must be considered. Only the Ostas, Reed and Hutchinson [1979] study employed a possibly valid measure of demand – houses for sale as reported in multiple real estate listings. But this approach would be useful only if the activities of all lenders in the area were included. And even then, one could not know whether private or any specific type of financing was used because it was preferred or the only alternative available. Schafer's [1978, Chapter 5] procedure of estimating a supply function for areas acknowledged as nonredlined and applying the coefficients estimated to determine the expected supply to allegedly redlined areas offers some promise. But unless all lenders are included, it cannot begin to speak to the hypothesis that potential borrowers are disadvantaged. Nor can the quality of the activities of a particular lender or group of lenders be determined without knowledge of demand and of the past lending behavior of the institution(s) in question. Therefore, I can see very little, if any, research value in studies that use data such as those made available by the Home Mortgage Disclosure Act.

Studies of the relative risk (actually cost) of lending on properties in allegedly redlined areas or to allegedly discriminated-against persons could be useful for determining whether the terms charged are based on economic or noneconomic factors. But data on loans made in the ordinary course of business are unlikely to provide these estimates because lenders can be expected to avoid loans that offer more than a minimal expectation of default. Rather, studies should use

essentially unscreened or differently screened data, such as the experience from the FHA's programs to make funds available to borrowers and on properties that do not meet ordinary underwriting standards. High-risk lending programs, such as the St. Louis Savings Service Corporation whose denial decisions are analyzed by Tyree and Yeager [1979, Chapter 9], are another source of such data. Only the Marcis and Hull [1975] study used such data; they found significantly higher foreclosures in zip code areas that are characterized by female heads of households, low income and education, and greater instability of occupancy. Barth, Cordes and Yezer [1979] used regular program (203b) FHA insured mortgage data, which are not screened as completely as are conventional mortgages. They found that mortgages made to blacks had almost twice the default rate of the average mortgage, *cet. par.* Considering that the other studies reviewed used data that had been screened by lending officers, it is interesting to note, nevertheless, that they found significantly higher foreclosure rates on mortgages made on properties located in possible or allegedly redlined areas and to allegedly discriminated-against persons.

Comparison of the terms of mortgages between areas and persons offers a better opportunity to determine whether or not redlining is practiced. If it is, the interest rate, downpayment requirement and/or term to maturity should be harsher for the discriminated-against mortgagors than for others, *cet. par.* Schafer's [1978, Chapter 6] study used simultaneous equations; Muth's [1979] study used OLS; Benston, Horsky and Weingartner's [1978] study used a loan offer function estimated for a presumably favored area and then applied to an allegedly redlined area; and King [1979B] compared requested with granted terms and included an analysis of fees. The first study used data from a subset of New York City state-chartered banks, the second Oakland, California state-chartered savings and loan associations, the third all the major institutional lenders (including mortgage bankers) in Rochester, New York, and the fourth savings and loan associations in Miami, San Antonio, and Toledo. The four studies reviewed report that mortgage terms do not differ much (if at all) between mortgages made on properties in allegedly redlined and other areas and by blacks, Hispanics, women, older people or unmarried people. Because higher prices (terms) charged to borrowers provides a meaningful measurement of the presence of discrimination, given that the effect of economic factors is accounted for, the extension of such studies to other areas would be useful.

The allegation that lenders systematically underappraise property located in certain areas or purchased by minority buyers also was studied. Schafer [1978, Chapters 4 and 9] studied appraisals on mortgages granted in New York City and in four upstate New York cities and Benston, Horsky and Weingartner [1978] analyzed appraisals in Rochester, New York. King [1979B] included denied applications in his study of Miami, San Antonio, and Toledo. All the studies find evidence contrary to the underappraisal allegation.

However, analyses of mortgage terms can reflect only mortgages made. Therefore, studies of denials of mortgage applications can provide insight into the possible existence of redlining. Four of the studies reviewed report some evidence of racial discrimination. Black, Schweitzer and Mandel [1978], using nationwide data in a multiple variable probit analysis, found some weak evidence that blacks experienced higher rates of denials, *cet. par.* Schafer [1978, Chapter

7] found strong evidence of this situation in New York City mutual savings banks. His studies of mutual savings banks in four upstate New York cities [Schafer, 1978, Chapter 12] also reports similarly strong evidence, but three of these studies are based on very few observations. All of his studies found little or no evidence of higher denials related to applications for mortgages on properties located in allegedly redlined neighborhoods. However, his analyses suffer from possible collinearity and other serious problems. King [1979B] found evidence of higher denial rates to Hispanics in Miami and San Antonio but no evidence of adverse selection of blacks or other persons or applicants for loans on properties located in possibly redlined areas. Warner and Ingram's [1979] multiple discriminant analysis of most of Columbia, South Carolina banks and savings and loan associations found no evidence of discrimination. Nor did Tyree [1979]. Hence, I conclude that the weight of the evidence is contrary to the hypothesis that lenders discriminate against minority borrowers or areas by denying mortgage applications, but there is also some reason to believe the contrary with respect to some minority borrowers. Clearly, more research on mortgage denials is desirable.

Since lenders might redline by not permitting mortgage seekers even to file applications, studies of the demand for mortgages and of the experiences of possibly discriminated-against home buyers in obtaining financing are necessary. Only one study, by Benston and Horsky [1979], addressed this question. Their interview survey of home owners and home buyers in Rochester, New York provides evidence that mortgage seekers in an allegedly redlined area experienced almost no difficulty in obtaining funds because of the properties' location. (The sample size, however, was small and the information "second hand.") Home buyers in that area and in a presumably favored (control) area equally had little trouble obtaining the type of financing they wanted. Tyree [1978] polled community organization leaders for their beliefs about bank lending practices in their areas. Despite their often negative attitudes and assertions about the prevalence of redlining, they were able to identify only seven instances, none of which was found to have occurred as claimed. More studies like these are needed, however, before one can generalize.

On the whole, then, only two studies of the research reviewed (all that I could find) reveals evidence of possible redlining, and this is only in a higher rate of denial of mortgage applications by blacks or Hispanics. But the second study's findings are not consistent. Another, very well constructed study finds no evidence of bias. Furthermore, foreclosures appear to be more probable in areas characterized as redlined and on mortgages made to blacks. But "black," or "Hispanic" also might be proxy variables for omitted economic factors in the analyses of mortgage denials and foreclosures. Virtually all of the other studies either do not speak meaningfully to the redlining question or provide evidence that is contrary to the redlining hypothesis. The question is still open, however, since this conclusion is based on data from only a few cities. More research on the demand for mortgages, in particular, would be helpful. Studies of why such strong legislation as the Mortgage Disclosure Act of 1975, the Community Reinvestment Act of 1977, state laws and state and federal regulations was enacted on the basis of such poor evidence as is reviewed above also would be interesting.

APPENDIX

Review of Studies Referred to in the Text

Community Group Studies of Mortgage Supply

The following three studies, two of which were presented to the U.S. Senate Committee on Banking, Housing and Urban Affairs' hearings in May, 1975 are representative of the evidence presented by community activists that apparently was instrumental in influencing the Congress to enact the Home Mortgage Disclosure Act of 1975.[21]

Redlining and Disinvestment in Buffalo [1975] is typical of many community activist studies. It was based solely on the number of dollars of mortgages made by commercial banks, savings banks and savings and loan associations in Erie County over an 18-month period (June 1973 through December 1974). Because fewer mortgages were made in the city of Buffalo compared to its suburbs (26 percent in number, 18 percent in dollars), the authors conclude that the city was redlined. They further assert, without any reasoning or evidence, that "The evidence has been amassed, pointing the way powerfully and clearly to a new perspective on the root cause of blight: 'redlining' and 'disinvestment.' For the first time in the City of Buffalo, the blueprint of these bank policies are hereby laid open for public scrutiny." [p. 7]

Where the Money Is: Mortgage Lending, Los Angeles County [1975] presents a more extensive analysis, since it presents data on downpayments and interest rates as well as the number and dollar amount of mortgages, aggregated by census tract. Mortgages on other than single-family houses were included. However, only mortgages made over a five-month period (January through May 1974) by state-chartered savings and loan associations were included. Charts were used to compare mortgage lending terms and activity in the first five months of 1974 with the 1970 values of percent minority population, median family income and median home value in census tracts. No other variables were included to account for differences in mortgage terms, numbers or amounts. Nor was the possible relationship between income, price of house and minority considered. Despite these shortcomings and the limited coverage of the data, the report concludes: "'patterns of discrimination' are shown [and] ... over a million people live in neighborhoods where there is no prospect of lending at all." [p. 5]

Home Ownership and the Baltimore Mortgage Market [1975] employed by far the best data base of any of the studies presented at the hearings. Included were all Baltimore real estate transactions in 1971, and thus mortgage loans made by all lenders. The study finds that different types of lenders tend to specialize in different types of neighborhoods. For example, savings and loan associations and savings banks made relatively more loans in high income, high house price, high home ownership, white areas, while mortgage companies that made FHA insured loans and cash sales dominated the low income, low house price, black areas. The study suggests that FHA insured mortgages are undesirable, primarily because points are charged. However, neither the effective interest rate paid (the annual interest equivalent of points plus interest payments) nor the relatively low downpayment required were considered. In any event, the study essentially is limited to description: redlining and racial discrimination are not charged.

A number of other studies were presented at the 1977 Hearings on Community Credit Needs that preceded enactment of the Community Reinvestment Act of 1977. The following two studies are representative of the papers presented there and elsewhere by community activists.

Take the Money and Run! Redlining in Brooklyn [1976] was prepared by the New York Public Interest Research Group. They analyzed mortgages made in 1975 by seven savings banks according to zip code and census tract areas. The number of mortgages made in one year were related to the number of owner-occupied houses in the areas and the dollar amounts of mortgages made were compared to the total assets of the savings banks. From

[21] See U.S. Senate Committee on Banking, Housing and Urban Affairs. *Hearings on the Home Mortgage Disclosure Act, 1975.*

these relationships, the authors concluded that all except one of the banks studied redlined Brooklyn. The distribution of mortgages made by zip codes is used to suggest that "black neighborhoods fare worse than white neighborhoods." [p. 5] This conclusion is illustrated by reference to four census tracts. Two tracts that are mostly black received zero and three mortgages while two tracts that are mostly white received the highest number and relatively many (65) mortgages. From these data, the study concludes: "All seven of the banks surveyed have discriminated against the black population of Brooklyn by channeling mortgage money to those neighborhoods that are predominately white." [p. 7] The study does not mention that the two predominantly black census tracts cited contain mostly multifamily buildings while the predominantly white tracts contain mostly single-family houses. Nor is mention made of other lenders (including the omission of two major savings banks) nor is any consideration given for the demand for mortgages.

Redlined: A National Survey by National Peoples Action (NPA) of Mortgage Lending Policies in the United States [1976] is perhaps the most extensive study in terms of coverage of cities. Data made available by the Home Mortgage Disclosure Act of 1975 from financial institutions in 25 cities in many states for the year ended September 30, 1976 were used. Specifically, dollars of conventional mortgages plus home improvement loans made by two institutions in two neighborhoods (selected by the NPA) in each city are presented in tables. Nothing is said about possible differences in the demand for mortgages or of other sources of supply. Nevertheless, based only on these tables, the authors incorrectly conclude: "In every case the data supports the existence of redlining – the refusal to make conventional loans."

Professional Studies of Mortgage Supply

Devine [1973] (Bronx, New York). Where the Lender Looks First: A Case Study of Mortgage Disinvestment in Bronx County, 1967-70 is important because of its historical role (particularly in the hearings preceding enactment of the Home Mortgage Disclosure Act of 1975). This monograph (a doctoral dissertation which was prepared for and published by the National Urban League) presents a discussion of the possible relationship between lending by financial institutions and community decline, with particular emphasis on racial discrimination. The empirical work consists of multiple regressions relating the number and dollar amounts of mortgages made per 1,000 occupied housing units in 1960 and 1970 and the change between these dates in 14 Community Planning Districts. The explanatory variables are the proportion of blacks and Puerto Ricans (race, the proportion of one-to-four family homes, and total or median rent in each district). (Other variables were tried but the results are not presented.) The data were obtained from 12 savings banks: these banks made less than 22 percent of the number and less than 18 percent of the amount of mortgages in the Bronx in the years studied. Changes in the amount of mortgages *made* in the Bronx by subsets of the institutions studied also were compared to changes in their *total* savings balances, a curious comparison of a short-term flow with a stock.

The regressions show race not to be a statistically significant explanatory variable, with two exceptions. In the 1970 "number of mortgages per 1,000 occupied units" regression, the coefficient of race is negative and statistically significant when total rent was substituted for median rent and when the proportion of one-to-four family homes variable was omitted. In the 1970 "amount of mortgages per 1,000 occupied units" regression the (negative) coefficient of race is significant when median rent was used instead of total rent, one institution's mortgages in a district were excluded, and the proportion of one-to-four family homes variable was omitted. Nevertheless, after qualifying his conclusions ("Our statistical analysis is neither definitive, nor exhaustive. It does *not* suggest that race is the only or primary variable being considered by mortgage lenders."), Devine concludes: "It does, however, disprove the assertion that race has no significant bearing on mortgage lending." [p. xii] But even this limited conclusion is not supported by the regressions. Nor can any meaningful conclusions be drawn from this study, considering the quality of the data (the community planning districts are very heterogeneous), the lack of a model or other rationale for the inde-

pendent variables, the small fraction of the mortgage lenders included, and the omission of demand and risk considerations.[22]

Ahlbrandt [1977] (Pittsburgh). Ahlbrandt [1977] estimated an expanded version of equation (5) (in the text above) with data from 162 census tracts in Pittsburgh. (Tracts dominated by public housing, business or industry were excluded.) The dependent variables used were the total value and number of residential mortgages made by financial institutions in 1973 and 1974, adjusted for the number of occupied units. Financing by individuals, real estate firms or other organizations or institutions (not otherwise described) was excluded. The independent variables included median family income in 1969, percent of units owner-occupied in 1970, percent of units vacant in 1970, change in percent of black population 1960-70, percent of black population in 1970, and crime rate in 1970. Because an interactive relationship was assumed, the data were transformed to logarithms. Three sets of regressions are presented: the first with all the data (135 observations), the second with census tracts having less than 20 percent black population (100 observations) and the third with census tracts having more than 20 percent black population (28 observations). One variable that possibly might indicate redlining (were demand accounted for and the equation well-specified), the change in percent of black population 1960-70, had statistically significant coefficients only in regressions run with the third set of data – census tracts with black population over 20 percent. Ahlbrandt concludes: "although racial concentration is not statistically significant and racial change is positively associated to mortgage lending, this does not conclusively refute the hypothesis that racial redlining exists." [p. 479]

Although his study is considerably better than the community group's and Devine's study, it still is seriously deficient. In addition to the factors mentioned in the text above (in particular, a reduced-form, equilibrium equation cannot measure shortfalls in demand), the independent variables are likely to be collinear. Family income is likely to be negatively correlated with percent black, while owner-occupied, percent units vacant and crime rate are likely to be positively associated with percent black. Ahlbrandt also warns: "A problem could arise in the interpretation of the results if there is not a reasonably good correspondence between the characteristics of the mortgage applicant and those of the census tract in which the loan is made (or turned down). . . . [In particular], since the race of the applicant is unknown, it is not possible to conclude the degree of racial discrimination against mortgage applicants (sic). The interpretation of race in the regression analysis is thus limited to the racial characteristics of the areas in which the loans are granted." [p. 480] But, considering the other problems with the study, even this interpretation is not warranted.

Hutchinson, Ostas and Reed (HOR) [1977] (Toledo). Reduced-form equations similar to, but more elaborate than, Ahlbrandt's were used by HOR to estimate the determinants of commercial and government-insured mortgage flows and home improvement loans. They used data provided by "the four savings and loan associations which dominate the mortgage loan market in the Toledo, Ohio SMSA." [p. 464] Loan data for 1975 aggregated by 123 census tracts were regressed on independent variables derived from 1970 census data.

The dependent variables are the total number of mortgages on owner-occupied houses, the percentage of conventional mortgages to the total, the number of conventional mortgages, the number of government-insured mortgages, the number of home improvement loans, and the percent of home improvement loan applications accepted, all in 1975. The independent variables are the percent black population (B), its square (B^2), the change in B from 1960 to 1970, the average age of residential structures, the unemployment rate, median years of education, median income, number of owner-occupied one-to-four family dwellings, median property value, percent of population over 55 years of age, average duration of residency, percent of population having moved into the tract from 1968-1970, and

[22] Furthermore, the conclusions given in the introduction to the study, on the importance of "the active presence of institutional lenders such as savings banks and savings and loan associations in a housing market," have been cited in community activist studies and in Congressional hearings as if they were derived from Devine's data, even though they are but assertions that are not otherwise addressed in the monograph.

the number of persons per household, all as of 1970 (except the variables measuring changes, as noted).

The coefficients of the independent variables representing race (percent black, B, and its square) are statistically significant only for the percent conventional (negative B, positive B^2), number of insured mortgages (positive B, negative B^2), and percent of home improvement loan applications accepted (negative B, positive B^2). HOR conclude that "the racial composition of a neighborhood has no significant effect on the total number of loans made in the neighborhood" [pp. 468-469] but "racial composition affects the percentage of loans transacted that are conventional (PC) and the percentage of home improvement loan applications that are accepted (PA). These results suggest that PC and PA are both significantly lower in racially mixed neighborhoods than in racially homogeneous neighborhoods." [p. 469]. However, the interaction of B and B^2 result in estimated minimum values for PC at 45 percent black and PA at 28 percent black. HOR state: "These results are consistent with the hypothesis that redlining takes place on the basis of risk aversion. However, they would not be consistent with a redlining model based on a taste for discrimination. In a model such as this, PC and PA would be expected to decrease as B increases." [p. 469]. The coefficients of the average age of structures variables have significantly negative signs for all except the number of insured mortgages and number of home improvement loans regressions, which, HOR state, "strongly support the hypothesis of redlining on the basis of neighborhood age in the conventional and home improvement loan markets." [p. 470].

Ostas, Reed and Hutchinson (ORH) [1979] (Toledo). The data for Toledo were expanded and updated in another paper by Ostas, Reed and Hutchinson. They re-estimated the relationship between the number of mortgages made and percentage of conventional mortgages made and percentage of conventional mortgages made by savings and loan associations in 1975 and 1977, excluding a few of the independent variables used in their previous paper.[23] For the number of mortgages regression, the percentage of black in 1970, B, and B^2 variables are statistically insignificant in 1977 as in 1975. The average age of house variable still is significantly negative, though its magnitude is -1.039 in the 1977 regression and $-.008$ in the 1975 regression. The greatest difference with respect to the "redlining variables" is the insignificance of the "black" (B and B^2) variables in the 1977 regression. ORH conclude: "In general, the equation appears unstable between the two periods, and suggests little evidence of conventional loan restriction on the basis of racial considerations." [p. 18] However, the average age of house variable is significantly negative and of similar magnitudes in both years' regressions.

The new version of their study was improved over the previous one in three important regards: commercial banks were included (presumably all those in the Toledo SMSA); two new variables, the number of one-to-four family units shown in real estate brokers' multiple listing guides (NMLS) and the number of one-to-four family houses constructed in 1977 were included to replace the number of owner-occupied one-to-four family dwellings as a proxy for demand, and dummy variables were added to estimate more complex forms of the relationship between the percentage black and the dependent variables. The new variables (NMLS in particular) improved the fit of the equations considerably. The regressions presented show no statistically significant relationship between the commercial bank data and the "redlining" variables – percentage black in its various forms and average age of house. However, significant coefficients are reported for the savings and loan data. With respect to the percentage black variables, ORH state: "racial composition has a significant effect on the distribution of the total loans and S&L loans. Often this effect conforms to a risk aversion hypothesis based on a "tipping point" argument. However, it should be noted that this result is not apparent unless NMLS data is incorporated into the model. . . . In 1977 race appears to have a negative effect on the percentage of loans which are conventional." [p. 25] Finally, "age of structure is observed to have a negative impact on the percentage of loans which are conventional, but this effect is complicated by an apparent significant quadratic relationship." [p. 26] It also is negatively related to the number of

[23] The percent of population over 55 years of age and the percent of population having moved into the tract from 1968-1970 were excluded.

S&L loans. Calculation of the magnitudes of the possible effects (e.g., the decrease in the number of loans associated with an increase in the percentage black over some range) is not given in the paper.

The first Toledo paper (HOR) suffers from the same shortcomings as Ahlbrandt's Pittsburgh analysis, in that 1970 data were used to explain 1975 lending activity, demand for mortgages was not accounted for and percent black, average age of houses and many of the other independent variables are likely to be correlated. In addition, by including data only from savings and loan associations, at most all that can be considered is the lending activity of these institutions; the availability of mortgage funds to home buyers cannot be estimated from these data. The second Toledo paper (ORH) presents a considerably improved variable that might serve to measure demand – the number of multiple listings (NMLS). This variable is far preferable to the number of owner-occupied dwellings, since there is no reason to believe that the same percentage of houses in all areas are likely to be sold.[24] Inclusion of the number of newly constructed dwellings also improves the specification of demand. The nonlinear forms of the "percent black" variable also are positive aspects of the analysis. However, the reduced-form equations do not permit one to determine whether fewer mortgages were made in census tracts because of racial considerations or because of differences in demand for mortgages available from other lenders (such as mortgage bankers and individuals), or whether race is a surrogate for other variables not related to discrimination (as ORH suspect).

Hauser and Elkhanialy [1978] (Chicago). The lending activities of 22 of the 32 federal savings and loan associations (or 86 percent of total assets) in Chicago for 1977, aggregated by 862 census tracts, were related to 1970 census data on percent black and other variables. When the tracts were grouped according to predominantly white (0 to 9 percent black), racially mixed (10 to 74 percent black), and predominantly black (75 to 100 percent black), the average number and total amount of loans made clearly are negatively related to the percentage black. The average size of mortgages is lower as the percentage black is higher. A correlation analysis reveals the following relationships with the number of loans per tract: median family income, .46; percentage black, –.31; median value of home, .16; percent owner-occupied, .11; built before 1949, .05; and living in the same house, .02. However, percent black is strongly correlated with some of the other variables, as follows: median family income, –.45; owner-occupied, –.13; and median value of home, –.11. In a partial correlation, the correlate between the number of loans made and percentage black drops from –.31 to .12. Similarly, the partial correlation coefficient of percent black with the dollar amount of loans is –.07 compared to –.29 for the simple correlation. The authors also emphasize that the percent of variance jointly explained by the seven variables (R^2) is only 24 and 27. They state: "It is clear, then, that variables other than those considered are involved. Such variables, for which data are not available, undoubtedly include risk of investment, differential market forces, laws and regulations, etc." [p. 31]

The study is valuable primarily because it points out that, in the authors' words, "to conclude that the differential lending practices are interpretable as racially discriminatory is simplistic. In the light of the complexities involved, it is sounder to conclude that the disadvantaged position of blacks with respect to home ownership and financing is among the indications of the disadvantaged economic and social condition of blacks." [p. 16] But the study fails to consider the possibility that differences in demand for single-family house mortgages among census tracts and alternative sources of supply (such as mortgage bankers and commercial banks) might account for (or exacerbate) the differences found. Also not mentioned are risk considerations which are particularly important in Illinois. The state foreclosure law is the most severe in the country. It requires foreclosure by sale in a three-step judicial procedure: filing a complaint, entry of a decree or judgment by the court, and the foreclosure sale. The time between the date a mortgagor stops payments and the lender can acquire the property was found to average 816 days.[25] This compares to 398 days in

[24] Benston and Horsky [1979, p. 76] found an average home ownership duration of 26 years in the central city and 14 years in a suburb of Rochester, New York.

[25] Touche, Ross & Company, 1975, Table 1.

California and 261 days in Texas. The direct cost less revenue per loan averaged $6,031 in Illinois, $61 in California and $25 in Texas.[26] Thus, the risk of default is quite a serious consideration in Chicago, particularly for conventional mortgages.

Dingemans [1979] (Sacramento). Further evidence on the association between mortgage lending patterns and minority status is provided in this very good article, in which the author shows how misleading impressions can be drawn from this correlation.[27] Dingemans recorded data on 8124 single-family homes made in 1976 by the 50 banks and savings and loan associations that serviced the areas, by census tract. (Loans made by mortgage companies were not included, since they are not required by the Home Mortgage Disclosure Act of 1975 or by state regulations to report their activity.) The number of mortgages made per existing single-family housing unit, aggregated into 114 census tracts, were correlated with 13 variables that measured tract characteristics, mostly drawn from a special census conducted during 1975. Statistically significant (at the .01 level) correlates with the number of mortgages made are reported for the following variables: upper status employment (.74), Chicano residents (.73), median household income (.72), blue collar employment (−.68), distance to minority tracts (.64), black residents (−.60), nonminority residents (.60), income change, 1970-75 (.57), age of housing stock (−.51), distance to central business district (.44), and percentage of owned housing units (.35). The only statistically insignificant variables are mobility 1968-70 (−.18) and average household size (.08). Similar correlates were found when these variables were correlated with the number of loans made per owned unit. Loans on used homes only (11 census tracts that received more than 50 new home mortgages, also were excluded) are significantly correlated only with blue collar employment (−.68), Chicano residents (−.47), median household income (.41) and black residents (−.39).

However, Dingemans points out that these correlates can be very misleading. When the number of mortgages made per unit is regressed, stepwise, on the variables, he finds that "sixty percent of the variance is explained, with the major contribution resulting from just one variable, median household income. . . . [The] other significant (.05 level) variables (in order of entry) were household size, distance to CBD [central business district], and no minority population; none of these added more than seven percent to explained variation." [p. 231] When mortgages on used houses were regressed on the variables, the first variable to enter the regression was upper status income, which explained 55 percent of the variance, followed by age of housing, household income, and household size. None of the other variables added more than 5 percent to the 63 percent of the variance explained, [p. 232]. Thus, mortgage lending patterns by financial institutions appear to be related primarily to the income status of an area, which (as Hauser and Elkhanialy also found) can be confused with the area's minority population.[28]

Dingemans attempted to separate the joint influence of income, minority, and locational variables with case studies of four neighborhoods. In 1976, the inner city neighborhood (Old City) received 2.1 loans per single-family unit compared to a region-wide rate for used homes of 2.8 percent. Between 1976 and 1977 the rate increased sharply. Few applicants in 1977 (the first year that these data were available) were turned down (23), though the rate was twice as high as the regional average. An analysis of lending in areas that included a relatively high concentration of minority (black and Chicano) residents revealed lower loans per unit, but few rejected loan applications (in 1977). A comparison of a blue collar, middle income suburb with a white collar, upper income shows a much lower number of loans per unit in the former than the latter. More detailed analysis reveals that mortgage bankers are very active lenders in the blue collar and minority areas. Dingemans explains:

[26] *Ibid.*, Tables 8, 9, and 10. The California net costs were reduced considerably by the increase in market value of the foreclosed properties.

[27] An excellent introduction and overview of writings and studies on mortgage lending and urban change is provided in the second section of the paper.

[28] Similar analyses are presented for home improvement loans. In that regression, distance to the CBD entered the regression first.

"Most homes in Sacramento are bought with the aid of a real estate agent. One of the services that the agent normally performs (in return for the fee . . .) is help in securing a mortgage loan. . . . The agents of mortgage bankers [who are paid commissions rather than the salaries paid to bank employees] are extremely aggressive in maintaining ties with sales persons who work in . . . moderate income neighborhoods. This is because mortgage bankers know that moderate income neighborhoods are the most likely locations for FHA and VA loans, and they issue primarily the federally insured loans for which a ready secondary mortgage market exists." [p. 238]. His final conclusion also deserves quotation: "The lack of data for some major loan sources and the fact that nearly identical patterns [of Home Mortgage Disclosure Act data] are found in Sacramento – a metropolitan area where few complaints about redlining are heard – should act as reminders that the examination of Disclosure Act data above may not be a sufficient basis for making final conclusions about the processes and behaviors that underlie the patterns that are being found." [p. 239] Based on his analysis, he should have said, "is not" rather than "may not" be sufficient.

Whalen [1976] (Flint). "An Analysis of Mortgage Lending Activity in Flint Michigan" represents an interesting attempt to analyze the effect of race on mortgage lending after account was taken of other explanatory variables. It was designed and conducted by the Chief of Informational Services at the Michigan State Housing Development Authority for the Governor's Task Force on Redlining. The number and amounts of mortgages recorded in 47 census tracts over the 18 months from January 1975 through June 1976 were analyzed with respect to the following: prudent lending variables (an occupational income index as a measure of creditworthiness, the percentage of homes reported in a local survey to be well maintained as a measure of the structural condition of housing, and effective demand as measured by owner-occupant mobility and the net change in the number of households), and redlining variables (racial composition as measured by the percent Negro in the 1970 census, racial change as measured by the change in percent black from 1970 to 1975 from a special survey, proximity to racial change as measured by the average racial change in adjoining census tracts, and the relative age of houses from the 1970 census). I believe that two-stage regressions were computed (the text is not clear), with the dependent variables regressed first on the "prudent lending variables" and the residuals regressed on the "redlining variables."

The coverage of the data, the model and method of analysis, and the measurement of the independent variables are greatly superior to many of the studies reviewed above. The only problems are the dependent variables. The text states them to be the number amount and average amount of mortgages made per census tract. From personal inquiry I learned that most of the homes mortgaged were financed with FHA insured mortgages and the dollars (amounts and averages) are the selling prices of the houses, since these almost equal the mortgage amounts but were more readily available. Therefore, the interpretation of the findings is not what it appears to be. In fact, none of the coefficients of the independent variables in the total dollars of mortgages made regression are statistically significant. Only the percentage of housing built 1950-59 in the number of loans made regression is statistically significant, and the percent black in 1975 and racial change variables in the incorrectly described average mortgage amount regression are statistically significant.[29] But since the average mortgage really is average selling price, the regression would appear to indicate that lower house prices, not redlining, were associated with race. In addition, the demand for mortgages is not accounted for.

Schafer [1978, Chapter 5] (New York City). Neighborhoods in three counties in New York City, the Bronx, Kings (Brooklyn) and Queens, were studied. The data used were obtained from reports filed by a subset of state-chartered financial institutions pursuant to a regulation imposed by the New York State Banking Department. Schafer reports, "the lenders in the sample supplied only 13.9 percent of the dollar value of transactions in 1975." [p. 5-10]. Consequently the findings can be interpreted, at most, as applying only to those institutions included and not to the overall borrowing experience of property buyers in the three New York city counties considered.[30]

[29] Standard errors are not given; only the designation "significant at the .05 level."

[30] The model could not be applied to other areas because of data limitations.

Neighborhoods in the three counties were dichotomized into those alleged by community groups to be redlined and others (a procedure similar to that used by Benston, Horsky and Weingartner [1978]). A regression was computed for each area (redlined and other) separately. Each observation is a census tract: 110 in the alleged redlined area and 640 in the other. Conventional mortgage lending (dollars) per existing one-to-four family buildings in allegedly redlined and in other neighborhoods are the dependent variables. The 33 independent variables include: transactions per building (dollars), mortgage prices on conventional mortgages (3 variables – interest rates, maturity, and loan-to-value ratio), the stock of mortgages held by the banks per building (4 variables – conventional and federally insured, one-to-four family and multifamily), neighborhood attributes related to risk of loss (20 variables, including pending and past housing code violations, building vacancies, tax arrearages, structural fires, per capita welfare and change in population), risk of loss in mortgage lending (2 variables – ratios of foreclosure and delinquencies to total loans), percentage of housing stock built before 1939, and racial composition (percent nonwhite in 1974 and change in percent nonwhite, 1974 less 1970).

The computed R^2s are .68 for the alleged redlined sample and .25 for the other neighborhoods sample. Few of the coefficients are statistically significant, which is not surprising considering the great likelihood of collinearity. However, it is interesting to note that the coefficients of the "transactions" variable (a proxy for demand) is significant (at less than the .01 level) and is five times greater for the alleged redlined than the other sample. Also, the stock of conventional one-to-four family mortgages is significant (at less than the .01 level) for the alleged redlined sample but trivial and very insignificant for the other sample.

The coefficients from the alleged redlined census regression were multiplied by the values of the independent variables in each census tract and then aggregated according to neighborhood.[31] The same procedure was followed for the coefficients from the other neighborhoods regression. The aggregates then were used to compute ratios, by neighborhood, of predicted lending from the alleged redlined regression to predicted lending from the other neighborhoods regression. In two of the seven alleged redlined neighborhoods the ratio is greater than a one, indicating, as Schafer put it, "that these neighborhoods would receive more funds if they were redlined than if they were not." [p. 5-29] (The aggregate ratio is .67.) In two of the four other neighborhoods the ratios are slightly greater than one, indicating again that they would receive more funds if they were redlined than if they were not, *cet. par.* (The aggregate ratio is 1.02.) Because the two areas with ratios greater than one may have been incorrectly identified as redlined, data from these areas (34 tracts) were removed and the alleged redlined regression rerun. The ratios computed with the resultant coefficients are below one for all neighborhoods, aggregating .49 for the alleged redlined neighborhoods and .56 for the other neighborhoods.

A similar exercise was undertaken with the amount of federally assisted (FHA and VA) mortgages per building as the dependent variable. The coefficients of the demand proxy variable (transactions per building) are statistically significant in both regressions, but twice as large in the other neighborhoods regression. The ratio of aggregate predicted lending (alleged redlined/other neighborhoods) is 1.28 for the alleged redlined areas and 1.20 for the other areas. However, as was found in the conventional mortgage analysis, one neighborhood[32] of the six alleged redlined areas has a ratio of 3.70, which indicates that it got three times more dollars of federally assisted loans because it was (allegedly) redlined. One of the five other neighborhoods also has a high ratio (2.62). The regressions were recomputed with observations from these neighborhoods omitted. The results were similar to those from the complete data set (aggregate ratios are 1.36 for the redlined areas and 1.43 for the other areas), except that the ratio for the questioned alleged redlined neighborhood is 8.90 and for the other neighborhood is 2.68.

[31] A similar procedure was used previously by Benston, Horsky and Weingartner [1978, Chapter 2] in their analysis of mortgage terms.

[32] This one is a combination of the two problematic neighborhoods in the conventional analysis.

Conventional multifamily mortgages were available for an insufficient number of census tracts to allow application of the two regression technique. Therefore, Schafer computed a single regression, specified similarly to the others, with dummy variables for the census tracts in neighborhoods alleged to be redlined. As Schafer summarizes the findings: "The age of housing stock, racial composition, and neighborhood variables are not statistically significantly related to conventional multifamily mortgage lending at even the 10 percent level. The estimated model ... does not support allegations on redlining on multifamily buildings." [p. 5-69]

Koebel [1978] (Louisville, Kentucky). This study is probably the most complete record of the sources of house purchase financing yet produced (or perhaps producible). All property sales and mortgages recorded in Jefferson County between June 1, 1976 and May 31, 1977 were recorded, including those sales made with a contract for deed that were listed in the *Louisville Daily Record.* Transfers that were not arm's length sales were eliminated. Among the data reported by area of the city and county are the types of property (the 5 percent represented by multifamily houses are located in the city), the types of purchasers and sellers of the properties (mostly individuals to individuals), the prices of the houses sold (lower in the city), the source and type of financing, downpayments and interest rates, the resident status of new owners, and the incidence of second mortgages, all reported by area and, in many instances, by the price of house sold.

The study documents that some 36 percent of city properties were financed by individuals (cash and personal loans) compared to 14 percent in the rest of the county (hereafter called the suburbs). The median priced city home purchased in this manner sold for less than $8,700. Kentucky's usury law specifies an interest rate of 8.5 percent on mortgages of $15,000 or less; at that time the prevailing rate for other loans was between 8.5 and 8.75 percent. (Koebel failed to relate these facts causally.) The median prices of suburban houses sold for cash or financed with personal loans was about $25,000, roughly equal to the median prices of houses otherwise financed. In general, banks (which made very few mortgages) and savings and loan associations financed more expensive houses in areas with rising prices and higher incomes, primarily with conventional loans. Mortgage companies tended to finance the purchase of average priced houses in areas with declining prices and lower incomes, primarily with FHA and VA loans. They also tended to serve areas with predominantly black populations. Among the institutions, downpayments were lowest for mortgage company loans, since they made mostly FHA and VA loans. Much more data are presented, defying a concise summary. Most of these presentations are interesting primarily to someone concerned with the Louisville area.

As Koebel puts it, "And although this study does not prove or disprove prejudicial disinvestment (or redlining), it thoroughly documents housing prices and the availability of financing throughout the county." [p. 9] Actually, it documents the incidence of financing, since nothing is known about demand, except that one can infer that mortgages on low priced houses would be demanded but not supplied when the state usury ceiling is below opportunity cost (market interest rates and transactions costs). However, the complete coverage provided does show the extent to which chartered financial institutions are not the sole source of housing finance, for whatever reason.

The Relative Risk of Lending – Defaults and Foreclosures[33]

Williams, Beranek and Kenkel [1973] (Pittsburgh). The data analyzed were obtained from a savings and loan association. Data on all 125 defaulted mortgages made from 1962

[33] All of the papers except Barth, Cordes and Yezer [1979] include analyses of delinquent mortgages. Since these loans generally do not represent a net cost to lenders, and since the studies find that delinquencies are not highly correlated with foreclosures, the delinquencies findings are not discussed here.

However, a study by Von Furstenberg and Green [1974] of 1236 delinquent single-family mortgages at a Pittsburgh savings and loan association should be mentioned because

to 1972 and a random sample of 1405 good loans were recorded.[34] In addition to variables obtained from the loan files, data from the 1960 and 1970 censuses, by tract, were included in the analysis to account for neighborhood factors. One stage least squares (OLS) analysis was used, where the dependent variable is dichotomous, equal to 1 if a loan is a default and 0 if it is good. The independent variables included measure quality of the loan (loan to value over 90 percent and 85-90 percent, term to maturity, and payment to income over 30 percent, and 22-30 percent), type of loan (VA, FHA, FHA-235, refinanced, and loan with junior financing, all in dummy variable form), characteristics of the borrower (age over 50 or below 30, number of years with employer, number of children, and monthly income – price-level-adjusted), characteristics of the property (price – price-level-adjusted, age, and whether or not multifamily), and neighborhood characteristics (unemployment rate, and per capita changes in crimes against property). Other variables were excluded because of correlations with included variables. For example, the following sample correlations with the unemployment rate are reported: percentage black, .75; per capita crimes against persons, .73; median per capita income, –.78. The correlation between median per capita income and percent black is –.61. Thus the unemployment rate variable carries a lot of freight.

Statistically significant (.10 level) positive coefficients were found for the following independent variables: loan-to-value ratio over 90 percent, payment-to-income over 30 percent, refinanced loan, junior financing, age of mortgagor over 50, and unemployment rate. Significant negative coefficients include FHA insured loan, number of years with employer, and price of the property. To the extent that one can draw inferences from the significance of coefficients, considering the effect of collinearity on measures of significance, the most important determinant of defaults is a high loan-to-value ratio.[35] The unemployment rate variable is the only included measure of neighborhood characteristics – it is positive and positively correlated with percent black and negatively correlated with median per capita income. But in terms of the magnitudes of the t values, at 2.12 it is tied for next to last place among the significant variables.

Morton [1975] (Connecticut). Data on 545 randomly sampled mortgages made by equal numbers of commercial banks, mutual savings banks, and savings and loan associations (24 in all) were analyzed. Multiple discriminant analysis was used to identify the variables associated with a loan being current, delinquent or foreclosed. The variables that are significant in a function distinguishing loans as foreclosed or not foreclosed (current and delinquent), in the order they entered stepwise calculations, are: three-family property (generally large houses converted to rental units), junior financing, five or more dependents, loan amount/appraisal, self-employed, employed as a salesman, borrower has nonreal estate debt, four dependents, and no dependents. The signs of all but the last variable are positive.

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of the superior methodology employed. They classified mortgages into cohorts that relate the year a mortgage is made to the year in which it became delinquent. The percentage delinquent in that year to the number in the year the loan was made originally is the dependent variable. This is the annual delinquency rate. Each loan was identified additionally as being in one of five loan-to-value categories, in one of five borrowers' income classes, a loan in the center city area (Allegheny county) or in the suburbs, and a loan on a new or previously occupied house. The interest rate in each of the 12 years over which the data are drawn also was specified. A logarithmic multiple regression was run ($R^2 = .11$, statistically significant), from which the authors draw the following conclusions: "mortgages on existing homes are 43 percent more risky that those on new homes," significant at the .05 level; and "*Ceteris paribus,* the riskiness of a mortgage declines by over 47 percent . . . when it is on a single-family home located outside rather than inside the center city county of Pittsburgh [significant at the .01 level]. Since Allegheny county includes many high-class residential areas and is by no means confined to deteriorating areas in the inner city, this effect is stronger than expected." [p. 12].

[34] Missing numbers are said to have limited severely the usable data.

[35] This finding is consistent with the conclusions of a large scale study of FHA-insured loans by Von Furstenberg [1969].

Among the insignificant variables, only "one-family property" and "two-family property" are related to area. The race of the borrower was not included. The function correctly classified 74 percent of the original sample and 72 percent of a holdout sample.

Morton identifies the three-family property variable as "a proxy for property and/or neighborhood quality. . . . Many of the three-family dwellings included in this study involved large older homes, in declining neighborhoods, that have been subdivided into apartments." [p. 74] Thus the data are consistent with the hypothesis that neighborhood quality affects defaults.

Schafer [1978, Chapter 3] (New York City). Data from two sources were used in this study. A subset of state-chartered commercial and mutual savings banks and savings and loan associations in Kings (Brooklyn), Bronx, and Queens counties reported the number and dollar values of their loans foreclosed in the past five years, by census tract, to the Banking Department. Additional data were gathered with a special study of New York State mutual savings banks in Kings, Bronx, Queens, and downstate suburban counties, excluding Manhattan. Approximately 100 loans were sampled from each bank: 25 active and current loans, 25 active and delinquent loans, 25 foreclosed loans, and 25 satisfied loans.

The data are presented in tables listing the average foreclosure rate (foreclosures over the past five years divided by outstanding mortgages for the data reported to the Banking Department and foreclosures divided by paid-off plus foreclosed loans for the special study).[36] Average rates are given for individual neighborhoods, identified as those alleged to be redlined and other,[37] and also by type of mortgage – one-to-four conventional, one-to-four family federally assisted, and multifamily conventional. The tables of the Banking Department data show higher than average rates[38] for two of the three alleged redlined neighborhoods for conventional one-to-four family and multifamily loans, and one of the three alleged redlined neighborhoods for the one-to-four family federally assisted loans. At most, only one of the four other neighborhoods had higher than average rates. Schafer's special study yielded relatively few loans for several of the 11 neighborhoods scheduled. With respect to the four allegedly redlined neighborhoods, these limited data show no above-average-foreclosure-rate neighborhoods for the one-to-four family loans and one above-average-rate neighborhood for the other two categories of mortgages. Among the seven other neighborhoods, higher than average rates are as follows: one in the one-to-four conventional category, three in the one-to-four federally assisted category, and none in the multifamily category. Overall, then, there is some evidence of greater foreclosures in the alleged redlined areas.

Schafer also computed a multivariate analysis of one-to-four family (conventional and federally assisted) foreclosures using 113 inactive (98.6 percent paid-off and 1.4 percent foreclosed) loans from his special study.[39] Twenty-six independent variables were included, but a dummy variable for alleged redlined area was not included because there were too few observations. For some unexplained reason the borrower's race was not included, even though it was asked for on the forms.[40] Nor was the racial composition of the census tract in which the mortgaged property is located included. The only statistically significant (at the .05 level or less) coefficients reported are for "poor condition of building" (positive), borrower married (positive), multiple-wage earner household (positive), and "two-to-four-

[36] This procedure does not link the defaults with the portfolio of loans made of which it was a part. See Von Furstenberg [1969] for a careful discussion of the shortcomings of not using the cohort analysis method.

[37] See description of Schafer's mortgage supply study above for details.

[38] Where a rate is within one significant digit above the average, I counted it as not above the average.

[39] A multivariate analysis of the Banking Department data is not presented. See the description of variables used in his analysis of mortgage terms with these data for a list of variables that could have been used for such an analysis.

[40] "Female ," though, is included as a variable in the delinquency analysis and is mentioned in the text on the foreclosure analysis as omitted because of too few observations.

family house" (negative). The presumably unadjusted R^2 is .40. A similar analysis was calculated on 45 multifamily loan foreclosures. Among the 14 independent variables is a dummy for "property located in area alleged to be redlined." The coefficients of this variable and "initial equity" are positive and are the only ones that are statistically significant (but at the .11 level) and the regression is not statistically significant, even at the .34 level.

Schafer [1978, Chapter 8] (Upstate New York). A similar analysis with similar data was conducted with data gathered from state-chartered banks in the Albany-Schenectady-Troy SMSA, Buffalo, Rochester, and Syracuse. The foreclosure rates (dollars of foreclosed mortgages to mortgages outstanding) derived from the data reported to the Banking Department are greater than the regional averages for the following number of alleged redlined (AR) neighborhoods and other neighborhoods (ON) (number with ratios greater than the average/total number of neighborhoods):

	one-to-four conventionals		one-to-four federally assisted		multifamily conventionals	
	AR	ON	AR	ON	AR	ON
Albany SMSA	3/9	7/7	3/9	2/7	1/9	1/7
Buffalo	2/6	1/10	5/6	1/10	0/6	1/10
Rochester	3/3	3/11	3/3	2/11	0/3	1/11
Syracuse	1/2	3/5	2/2	1/5	0/2	1/5

The rates calculated with Schafer's special study data show similar patterns.

Two multiple regressions also were computed with the special study data. The dependent variable equals one if foreclosed and zero if not. One regression for the Albany SMSA used 117 observations and 25 independent variables. The statistically significant (.05 level, one tail) coefficients include downpayment (negative), poor condition of building (negative), four of the six age of structure dummy variables (all less than 39 years, positive), one age of borrower dummy variable (46 to 49 years, negative), multiple wage earner household (positive), FHA mortgage (positive), and property located in area alleged to be redlined (positive, with the largest t value). The presumably unadjusted R^2 is .54. The other regression combined observations from the other cities (150 in all) and included the same types and number (25) of independent variables. The statistically significant coefficients include two age of structure dummies (20-29 years and 40-49 years, both negative), and percent of housing units built before 1940 (positive). The coefficient of the property located in an area alleged to be redlined is positive but not statistically significant. The R^2 is .19.

In sum, all the Schafer studies indicate some weak evidence that foreclosures are relatively greater in allegedly redlined than in other neighborhoods. Variables for the mortgagor's race and for the racial characteristics of census tract were not included in the analysis.

Marcis and Hull [1975] (National FHA inner city subsidized mortgages). The mortgage foreclosures analyzed were those made under the FHA's section 221(d)(2), which provides insurance on low downpayment, single-family property mortgages purchased by low or moderate income families, and section 235, a subsidy program aimed at increasing home ownership for people who otherwise could not afford it. The mortgage data are the Federal National Mortgage Association's 1972 foreclosures to mortgages outstanding, aggregated by zip code area. These foreclosure rates (dependent variables) were associated first with the average weighted family income for zip code areas in each of eight randomly selected cities. Statistically significant negative relationships in simple regressions are reported for six cities (Detroit, Philadelphia, Chicago, Los Angeles, St. Louis and Seattle, the first two at the .01 level, the balance at the .05 level) and negative, but not significant, relationships for two cities (Atlanta and Dallas). Similar results are found when the percent of families with incomes under $600 was used (except that the relationship is positive).

Since family income is only a partial measure of neighborhood quality, multiple regressions were computed with data from 123 zip code areas obtained from the Department

of Commerce's 1970 Census of Population and Housing. The independent variables on which the foreclosure ratio was regressed, listed in order of their importance as measured by beta coefficients, are the number of pending indictments for criminal violations of federal laws related to FHA mortgages, instability of population (percentage of population who moved into the area since 1965), income (weighted average family income), and education (percentage of population with some high school). (Other variables that were correlated at over .7 with an included variable are said to have been discarded. They are not identified.) The R^2 of the section 221(d)(2) foreclosure rate is .44 and all of the coefficients are significant at the .05 level, except for education which is significant at the .10 level. The signs indicate that foreclosures were higher in zip code areas where the average population is less stable, has lower income (a decrease of $1,000 is associated with an increase in the foreclosure rate of 1 percentage point), has a higher percentage of female heads of households (a 10 percent increase is associated with a higher foreclosure rate of 1.5 percentage points), and lower levels of education, given the number of indictments (which are positively associated with foreclosures). For the regression of section 235 foreclosures, the R^2 is only .07 and only the negative coefficient of education is significant (at the .10 level). Considering that zip code areas often are not very homogeneous and that the foreclosures are not directly related to the original portfolio of loans made (as in a cohort analysis), this study indicates that the population characteristics of neighborhoods are important determinants of mortgage foreclosures where the usual lending criteria were relaxed or disregarded.

Barth, Cordes, and Yezer [1979] (National FHA Insured Mortgages). This study is by far the most ambitious analysis of defaults related to the redlining question. The data (about 10,000 observations) are a 100 percent sample of all FHA 203(b) insured mortgages endorsed in 1974 and 1975 that were in default by the end of 1976 and a 10 percent random sample of other mortgages from this period. This sample certainly exceeds any used by the other researchers whose work is reviewed. However, the two year or less horizon is very short – several years less than the three or four years that Von Furstenberg [1969, p. 468] found was the peak for defaults.

The researchers used multiple regression (OLS) analysis. The dependent variable is a dummy equal to 1 if a default occurs, 0 otherwise. The independent variables include the following: loan terms (loan-to-value ratio, term to maturity, and monthly payment-to-income ratio), borrower characteristics (number of years married, and as dummies, Hispanic, black, not married, and female head of household – coded 1 if condition applies, 0 otherwise); property characteristics (structure in fair or poor condition, age of structure, and wood construction – all except "age" are dummy variables), neighborhood characteristics (central city, rural, and blighted – all as dummies), and city characteristics (new single-family starts in 1975-76 to owner-occupied units, pre-1940 housing to all occupied housing, SMSA population in 1974, city population growth 1970-75, city income growth 1970-75, SMSA 1975 per capita income, and percentage black population). Though the choice of variables is said by the authors to be based on a theoretical model (which is developed at length), the variables do not differ much from the variables used by other researchers who were not quite as formal in their presentation. However, the dates of the data used to specify the independent variables are coincident with the dates of the dependent variable, which is a considerable improvement over much other research.

Nine combinations of independent variables are presented. The statistically significant variables (at the two-tail .05 level) that are of interest to the redlining question (and their coefficients adjusted for the sampling proportions of defaulted and not defaulted mortgages to give estimates of the increased or decreased (–) probability of default, the mean of which is .015) are black (+.012), female head of household (–.003), wood construction (+.002), central city (+.001), and blighted (+.003). Hispanic, age of structure and percent of black population in city (given that the borrowers' characteristics are included) have statistically insignificant adjusted coefficients of zero. It also is interesting to note that the other city characteristics variables, which if positive indicate a growing, prosperous area, all have statistically significant, negative signs, with the exception of city income growth.

In sum, as the authors conclude: "Our results indicate that default risk is significantly affected by location based on both neighborhood and city characteristics. This implies that appropriate adjustment of mortgage terms based on location is consistent with profit-

maximization. This type of adjustment would not be redlining in the economic sense." [p. 51] Considering that the FHA interest rate is not adjusted for risk, these data indicate that the FHA and/or lenders, advertently or inadvertently, discriminated *in favor* of some of the areas and people said to have been redlined.

Terms Charged to Mortgagors

Schafer [1978, Chapter 6] (New York City). As is described below, Schafer used data reported to the New York State Banking Department by a subset of state-chartered financial institutions on mortgages made in 1975. These data were aggregated by and averaged over census tracts in the counties of Kings (Brooklyn), Queens and the Bronx that were identified through interviews with and reports by community groups) as allegedly redlined. Three equations were stated and solved simultaneously, with maturity, loan-to-value, and interest rate as the dependent variables. The 45 independent variables include: mortgage prices (two of the three dependent variables predicted from the first state estimates with their equations), neighborhood attributes (six variables on housing code violations, four variables on the fraction of buildings vacant, four variables on tax arrearages, two variables on structural fires per building, two variables on per capita welfare, per capita income, and change in population – most of these variables measure the current level and change from a previous date, usually 1970), risk of loss in mortgage lending (ratio of dollars of foreclosures over past five years to amount outstanding, and ratio of dollars of 60-day delinquencies to amount outstanding), income and assets (1970 per capita income, percent of households in 1970 with incomes less than $15,000, and average 1975 property value), mortgage stocks (four variables, one-to-four family and multifamily mortgages, conventional and federally assisted), transactions predicted from the first stage, age of housing stock (fraction built before 1940), racial change (percent nonwhite in 1974 and change in percent, 1974 less 1970), neighborhoods (six alleged redlined and three others, in dummy variable form with one other – not redlined – neighborhood omitted to avoid overidentification), and the constant.

Simultaneous equations were run with data on conventional one-to-four family mortgages (801 observations).[41] With respect to the variables of interest for the redlining question, the following were found to be statistically significant (at the .05 one-tail level) for the one-to-four family regressions: interest rates – for one alleged redlined neighborhood interest is 1.33 percentage point lower and for one .34 percentage point higher (all of the other coefficients were not significant and less than .26); maturity – lower for fraction built before 1940, higher for increase in nonwhite population, lower by 7 and 10 years for two alleged redlined neighborhoods (the interest rate is significantly lower by –1.33 percentage point for the latter) and by 1.6 and 1.1 years for two other neighborhoods; loan-to-value ratio – higher for fraction built before 1940, lower for percent of population nonwhite (a tract greater by 50 percentage points averages 7 percentage points higher, higher for change in percentage nonwhite (a change by 50 percentage points averages a ratio lower by 11 percentage points), lower for three alleged redlined neighborhoods averaging 4, 29, and 44 percentage points (the latter two have significantly shorter average maturities of 7 and 10 years), and lower for one other neighborhood by an average of 6 percentage points. Few of the coefficients of the other variables are statistically significant, and many have signs the opposite of those expected.

A similar set of two-stage regressions were computed for data on conventional multifamily mortgages (118 observations). The only change was the combination of the neighborhood dummy variables into one for "alleged redlined" and two for "other." Among the variables related to the redlining question, the only statistically significant coefficients show lower interest rates (–1.04 percentage points) and shorter maturities (– six years) in the alleged redlined neighborhoods and lower loan-to-value ratios (–16 percentage points) in one of the other neighborhoods. However, considering that relatively few multifamily houses in a census tract are mortgaged in a year, these findings are of questionable value.

[41] R^2s are given, but how they were calculated for a system of simultaneous equations is not explained.

Simultaneous equations also were computed with data on mortgages made over 25 years and collected in a special survey from a subset of mutual savings banks.[42] The 40 independent variables include mortgage prices (two of the three dependent variables), building characteristics (age and wood construction or not), borrower characteristics (income and wealth), age of housing stock (percent built before 1940), neighborhoods (alleged redlined and six other neighborhoods with the balance omitted to avoid overidentification), year of loan (18 dummy variables), time and location interaction (each neighborhood dummy variable was multiplied by a reciprocal of the average number of years from which loans were made), and the constant.

The conventional one-to-four family regressions used 265 observations. Only two of the "redlining" variables have statistically significant coefficients (at the .05 one-tail level): lower interest rates in one other neighborhood (of −.33 percentage point) and shorter maturity in another neighborhood (− seven years). Similar regressions were run with data on one-to-four family federally assisted mortgages (283 observations), except that two alleged redlined and six other neighborhoods were specified. The only statistically significant coefficients of redlining related variables are: higher interest rates in one other neighborhood (1.39 percentage point), shorter maturity in one alleged redlined neighborhood (− seven years) and longer maturity in another alleged redlined neighborhood (16 years), and lower loan-to-value ratios in two other neighborhoods (−33 and −7 percentage points).

If these results are taken seriously, they indicate little evidence that the alleged redlined neighborhoods are discriminated against with respect to the mortgage terms. However, the often theoretically unexpected signs of many of the variables and their statistical insignificance and the quality of the data used lead to doubts about the validity of the analysis.

Muth [1979] (Oakland, California). Muth's study used data on 1903 conventional loans made by state-chartered savings and loan associations in 1976 and 1977, as reported to the State Commissioner.[43] This limitation of the lenders who provide mortgage funds in Oakland to SLAs is not serious, however, since he primarily analyzed the yields on mortgages in a state where yields are market determined.

Interest on a loan was calculated to include points. It is the internal rate of return that equates the initial loan amount less fees and discounts paid by the borrower to the present value of monthly payments plus an assumed repayment of the unpaid balance after 12 years. This dependent variable was regressed on the following independent variables: term and amount of the loan, borrower characteristics, most of which are related to possible discrimination (black male, other minority male, female, and property not owner-occupied – all as dummy variables), age of building, neighborhood characteristics (percentage of occupied dwellings units black occupied, and percentage of year-round dwellings lacking some plumbing facilities – all by census tract, 1978 pretest data), a dummy variable that equals 1 if a loan was made in 1977, and the constant. The variables were transformed to natural logarithms. Each observation is a loan.[44]

Most of the coefficients are statistically significant at the .05 one-tail level; the R^2 is .34. Before considering the redlining related variables, it is interesting to note that the coefficients of the term to maturity and loan amount variables are negative and highly significant. The former indicates that the shorter maturity and higher interest rates are complements, *ex post,* though they may be substitutes, *ex ante.* When the term to maturity variable was removed from the regression, the coefficients of the loan amount and nonowner-occupied variables increased considerably. With respect to borrower characteristics, the following levels of statistically significant coefficients are reported: black male (.10), other minority male (.04) and female (.04). In terms of signs and magnitudes, with an average

[42] See description given above under "The Relative Risk of Lending – Defaults and Foreclosures."

[43] The data were screened for errors, which eliminated less than 100 mortgages.

[44] Average contract rent of rented dwellings, median value of single-family owner-occupied units, and percent of dwellings built prior to 1940 also were included initially, but later discarded.

interest rate of 9.3 percent, the coefficients indicate that, on average, black male borrowers (who made about 20 percent of the loans analyzed) paid .02 percentage point more, other minority males paid .03 percentage point more, and females (who made 17 percent of the loans) paid .03 percentage point less than others, *cet. par.* The statistically significant coefficient for age of house indicates that a loan on a 40-year old dwelling required a yield of about .10 percentage point more than a loan on a new dwelling. Finally, the statistically significant (.03 level) coefficient of percentage black residents in a census tract indicates that mortgages in all black tracts bore interest rates that were .07 percentage point higher than rates in all white tracts. Thus the estimated effect of possible discrimination on interest rates is very small.

Muth also regressed the debt-to-equity ratio on the independent variables, excluding the term to maturity and loan amount variables; the R^2 is .12. Three variables have coefficients that are statistically significant at the .05 level. They indicate that black male borrowers experienced loan-to-value ratios of .84 compared to .79 for white male borrowers; the ratios for borrowers in all black census tracts were roughly one-fourth less than those of borrowers in all white tracts, and mortgages on 40-year old buildings were about 5 percentage points lower than on new buildings.

The term to maturity was regressed on the same variables; the R^2 is .21. All the coefficients are statistically significant. The signs are positive (longer terms) only for black male borrowers and female borrowers. The magnitudes, though, are quite small for the borrower characteristics, but indicate 5 percent shorter maturities for mortgages on properties in all black compared to all white census tracts. However, when two additional variables, market value per square foot of living area of the mortgaged property and the borrower's monthly income, were added,[45] the percentage of black residents and the other minority male coefficients became very small and not significant and the R^2 increased to .26. The age of house coefficient also declined to half its former value. Muth concludes: "This suggests to me that the higher riskiness lenders may attach to loans in black neighborhoods is not due to race *per se* but rather to the poorer quality of dwellings and lower borrower income on loans in such areas." [p. 15]

Muth's study thus indicates that the terms on mortgages made by state-chartered savings and loan associations were not significantly worse for possibly discriminated-against people or areas. Though he found, as did other researchers, that the institutions made far fewer conventional, one-to-four family mortgages in census tracts with higher proportions of black residents, his findings with respect to terms lead to the conclusion that either the supply is demand-determined or if it is supply-determined, the demand for conventional mortgages is highly elastic. As he concludes: "on either interpretation, the fact that fewer conventional mortgages are made in black and other inner-city areas would not appear injurious." [p. 17]

Benston, Horsky and Weingartner [1978, Chapter 2] (Rochester, New York). The researchers gathered data on 712 one-to-four family house mortgages made by the principal mortgage lenders in Rochester (three mutual savings banks, two commercial banks, one savings and loan association, and two mortgage companies) over the period September 1973 through September 1976. The mortgages were made in an area of Rochester identified by community activists as redlined (the central city) and in a control area, a suburb. Mortgages were identified as conventional, FHA and VA. Because the terms on mortgages can be demand- as well as supply-determined, loans with downpayments of 50 percent or more or maturities of 10 years or less were excluded. As other researchers have found, conventionals are predominant in the suburb (in terms of numbers, 59 percent of suburban mortgages), but not in the central city (12 percent of central city mortgages). Within each area and type of mortgage, there is virtually no difference in the interest rates charged. In the suburb compared to the central city, the average loan-to-value ratios are higher on conventionals by .027 but lower on FHAs and VAs by .034 and .025. The greatest differences between the areas are in the number of months to maturity, as follows: conventional, 98

[45] Their coefficients are significant at better than the .0001 level.

months; FHA, 96 months; and VA, 80 months. Because a lower loan-to-value ratio and shorter term to maturity are alternative means of reducing the risk to the lender of defaults, a variable that combined their effect was constructed. The accepted risk of decline (ARD) is the complement of the rate at which a house's price could decline before the end-of-period owner's equity would be zero. The higher the loan-to-value ratio and the more the months to maturity, the higher the ARD and hence, given the interest rate, the more risk the lender is accepting in granting the mortgage. For all three types of mortgages, the ARD is slightly higher on average for suburban than for the central city mortgages, which indicates that these mortgages were perceived as less risky or that lenders were biased against central city properties.

To assess whether the differences in loan-to-value ratios, months to maturity, and the ARD were due to the area of the properties or to other characteristics of the borrowers and properties, a mortgage supply function was specified. For each type of loan (conventional, FHA, and VA) in each area (central city and suburb), the loan-to-value ratio, the number of months to maturity, or the ARD was regressed on the following variables: borrower characteristics (family income, age less than 35, married, previously a home owner, co-borrower used, and low or no credit rating – all but the first are dummy variables), property characteristics (price of the house, appraisal/price of the house, built before 1941, built 1941-1960, built after 1960,[46] and private mortgage insurance on conventional mortgages – the latter four are dummy variables), and census tract changes (median house price 1970/1960 and occupancy rate 1976/1970 included for the central city observations only since the suburb, effectively, is a single census tract). Since the observations cover three years, two additional variables were included to adjust for changes over the period – the long-term yield on U.S. bonds and the monthly flow of savings deposits in the area. The statistically significant (.05 level) coefficients varied between the areas, implying different mortgage lending functions for each area. They also differed among the terms analyzed. The regressions were rerun with the nonsignificant variables omitted (which changed the coefficients of the significant variables but little). These coefficients were used to specify the lending functions. The coefficients estimated from, say, the central city mortgages (excluding the census tract changes) then were multiplied by the mean values of the suburban mortgage variables to obtain the terms that these mortgages would have gotten had the suburban lending function been applied. The same procedures was followed for estimating the terms that the suburban mortgages would have obtained had the central city lending function been used.

The exercise leads to the following conclusions, first with respect to loan-to-value ratios. Were the suburban lending function used rather than the central city lending function, the average central city conventional mortgage would have a slightly higher loan-to-value ratio than when the central city function is used (.779 vs. .760). But the average suburban mortgage would have a higher loan-to-value ratio were the central city lending function used rather than the suburban function (.884 vs. .793). Similar predictions were calculated for FHA and VA mortgages. Thus it appears that the loan-to-value ratio for each type of mortgage is not a function of the area in which the property is located.

With respect to the number of months to maturity on conventional mortgages, application of the suburban lending function to the average central city borrower and property characteristics (primarily family income, age under 35, and the price and age of the house) predicts a term of 285 months compared to the actual average of 247 months. When the central city lending function is applied to the suburban borrower and property characteristics (primarily the price and age of the house), 331 is the predicted number of months to maturity, compared to the 345 actually experienced. Thus some 38 or 14 months of the "raw" difference of 98 months are unexplained and appear due to unspecified area-related factors. These fewer months to maturity translate into higher monthly payments by a buyer of the average priced central city house of $5 or $2. Most suburban FHA and VA mortgages carry 30-year mortgages. (The coefficient of variation is only .04.) Hence the suburban

[46] Overidentification was avoided because from 8 to 42 percent of the properties were not identified as to age. These observations were coded 0. Tests indicated that this procedure did not bias the coefficients.

multivariate analysis explains very little, and application of the suburban lending function to the central city values predicts almost the same number of months to maturity as the average suburban loan, due mostly to the constant term. When the central city lending function is applied to the suburban values (primarily the price of the house), the predicted number of months to maturity is 355 compared to the central city average of 258 months. Thus 27 months of the "raw" difference of 96 months appear due to the area. This works out to a higher monthly payment for the average central city home buyer of $4. The VA analysis produced similar findings. It is interesting to note that the results for the conventional and the FHA and VA mortgages are almost the same, which implies that the lenders and the government assessed the area-related characteristics similarly.

The accepted risk of default (ARD) variable provides a measure of the joint effect of the loan-to-value ratio and term to maturity of a mortgage. Application of the mortgage lending functions (as described above) indicates that the average central city mortgage would have slightly better terms were the suburban rather than the central city function used, but the suburban mortgage would have slightly better terms were the central city rather than the suburban function applied. These results are found for all three types of mortgages. The authors conclude: "Thus the data do not reveal any appreciable difference in mortgage terms between the areas, even without accounting directly for differences in risk faced by lenders in granting mortgages in the central city. These findings for Rochester are completely contrary to the allegation of those who assert the existence of 'redlining' by mortgage lenders." [p. 73]

King [1979B] (Miami, San Antonio and Toledo). The data were derived from registers of loan applications made in September, October and November 1978 at all the federal savings and loan associations in the SMSAs studied. The cities studied were chosen to include those with substantial proportions of minorities, allegations of redlining or other forms of discrimination, nonexternal statewide branching, and adequate loan volume and the presence of one or more minority operated associations. The loan terms studied (the dependent variables) are the interest rate, number of months to maturity, loan-to-appraisal value ratio, and fees. Because mortgagors could have demanded the terms they received (particularly downpayments), King also used the difference between each of the terms (with the exception of fees) asked for and received as a dependent variable. In this important regard, his study is unique. The independent variables included the following: mortgage characteristics (FHA-VA and private mortgage insurance as dummy variables, dollar amount of loan, and loan-to-appraisal value of property – except for loan-to-value ratio regression), borrower characteristics (combined gross monthly income and net wealth of applicant and co-applicant, ratio of monthly gross income of co-applicant to total for applicant and co-applicant, age of applicant and age squared, and dummy variables equalling 1 if applicant is black, Hispanic, other minority, female or unmarried), property characteristics (age and its square), neighborhood characteristics (by census tracts, 1970 data – percent black, percent Spanish-American, percent of households having incomes below the poverty level, percent of owner-occupied units, percent owner-occupied units built before 1939, and for Toledo, 29 dummy variables designating defined city neighborhoods compared to the suburbs), the time in days from September 1978 to the approval of the mortgage application to account for the upward trend in mortgage rates, and dummy variables for each savings and loan association, less one. The sample sizes are 1960 in Miami, 559 in San Antonio, and 953 in Toledo. About the same number of applicants had to be omitted because of missing data.

Ordinary least squares regressions were computed, from which the coefficients of the variables that would be considered as measuring discrimination (e.g., the applicants' race) provide estimates of the magnitude of the possibly discriminatory effect. King also used simultaneous equations, but these did not change his conclusions. The regressions indicate that ordinary economic variables, such as the presence of mortgage insurance, other mortgage terms, and the borrowers' income, and the dummy variables representing the individual associations are the most important explanatory variables. With respect to each of the mortgage terms he found that the following are statistically significantly (.05 one-tail level) related to possibly discrimination factors, *cet. par.*:

Interest rates. Miami (R^2 of .28)[47] – Rates averaged 9.59 percent. They were higher for females by 3 basis points and for census tracts with 50 percent more Spanish-Americans by 4 basis points and lower for census tracts with 50 percent more blacks by 3 basis points and for census tracts with 50 percent more of the houses built before 1939 by 6 basis points. San Antonio (R^2 of .58) – none. Toledo (R^2 of .51) – Rates averaged 9.86 percent. They were lower for other minorities by 17 basis points, and for three of the 29 neighborhoods by 13, 27 and 35 basis points.

Number of months to maturity. Miami (R^2 of .10 for level and .02 for difference) – Maturities averaged 344 months. For levels, building age showed longer maturities until age 54, then shorter maturities, and mortgages in census tracts with 50 percent more of the houses built before 1939 were five months shorter; but the coefficients of the later two variables are not significant for the difference between actual and requested maturities. San Antonio (R^2 of .34 for level and .03 for difference) – Maturities averaged 350 months. There were shorter maturities of 10 months for Hispanics, 74 months for mortgages in census tracts with 50 percent more blacks, and 10 months for mortgages in census tracts with 50 percent more houses built before 1939; but only the coefficient of the black census tract variable is significant for the difference between actual and requested maturities, indicating 16 months fewer in tracts with 50 percent more blacks. Toledo (R^2 of .46 for level and .08 for difference) – Maturities averaged 321 months. There were shorter maturities of 22 months for a 50-year old house compared to a new house, of 26 months for Hispanics, of 37 months for other minorities, of 11 months for unmarrieds, of 21 months for applicants age 60 compared to applicants age 40, and of 30 and 87 months for 2 of the 29 neighborhoods specified; but only the coefficient of the age of house and of two of the neighborhood variables are significant for the differences between actual and requested maturities.

Loan-to-value ratio. Miami (R^2 of .28 for level and .01 for difference) – Ratios averaged .79. They were lower by 2 percentage points for females for the level but not significant for the difference between actual and requested. San Antonio – none. Toledo (R^2 of .42 for level and –.01 for difference) – Ratios averaged .75. They were higher for blacks by 4 percentage points and lower by 49 percentage points for census tracts with 50 percent more Spanish-Americans, but neither of these are significant for the difference between actual and requested; only unmarried is significantly lower, by 1 percentage point.

Fees. Miami (R^2 of .68) – Average amount of $1472. They were higher by $136 for blacks and by $106 for other minorities (significant only at .10 level) but lower by $217 in census tracts with 50 percent more blacks (significant at less than the .001 level) and by $93 in census tracts with 50 percent more Spanish-Americans (significant at the .10 level) (these findings appear to cancel each other), and higher by $316 in census tracts with 50 percent more houses built before 1979. San Antonio (R^2 of .79) – Average amount of $421. They were lower for other minorities by $73. Toledo ($R^2$ of .52) – Average amount of $626. They were highest for applicants about 45 years old and in two of the 29 neighborhoods specified, by $90 and $112.

In summary, few statistically significantly more onerous mortgage terms are related to variables that measure possible discrimination. These few are of small magnitudes, with the exception of the percentage black census tracts in San Antonio, a city with relatively few blacks. And, at least as often statistically significant *less* onerous terms are associated with these variables. Thus the findings are inconsistent with the hypothesis that the institutions studied discriminated against borrowers or areas in the form of worse terms.

Appraisal Values and Purchase Prices of Properties

Schafer [1978, Chapter 4] (New York City and Nassau-Suffolk SMSAs). The data were gathered in Schafer's special survey savings banks files that included at least a 27-year period, wherein 100 loans were sampled from each bank. Of these, complete information were ob-

[47] R^2 are adjusted for degrees of freedom.

tained on the 1832 observations of one-to-four family mortgages used for this analysis.[48] The dependent variable is the ratio of the appraisal value to the purchase price. It has a mean value of .98 with two-thirds of the values falling between .90 and 1.06. (Values below .4 and above 1.6 were omitted.) The independent variables include the type of the building (percent of housing stock in census tract built before 1939 per 1970 census, and age of building relative to new construction expressed in six dummy variables), type of mortgage (FHA or VA rather than conventional, expressed as dummy variables), property location (alleged redlined and other city neighborhoods compared to Suffolk County, expressed as dummy variables), year of transaction relative to 1951 (seven dummy variables), and the constant. Schafer also said that he included mortgage terms and the price of the property in the regression, but the coefficients were insignificant or of the "wrong sign."

An OLS regression was computed with the area-wide data, which yielded an R^2 of .16. With respect to areas, the coefficients indicate a statistically significant (at the .05 one-tail level) lower ratio of 5 percentage points for one of the three designated alleged redlined areas and lower ratios of from 2 to 6 percentage points for five of the six designated other (not redlined) neighborhoods. Significantly lower ratios also are shown for the age of buildings only between 10 and 29 years of about 2 percentage points. Thus the data are contrary to the hypothesis that lower appraisals characterize allegedly redlined areas or older properties.

Regressions also were computed for observations in allegedly redlined New York City neighborhoods, other New York City neighborhoods, and three suburban counties. The coefficients of the age of buildings dummy variables are significantly negative, but only in the other (nonredlined) New York City regression. The coefficients of the other variables either are insignificant or are similarly inconsistent with the hypothesis that appraisals are lower than purchase prices in the allegedly redlined areas.

A similar analysis was undertaken for 43 multifamily house mortgages. The coefficient for the alleged redlined areas dummy variable is positive at about the .10 level. Thus as Schafer concludes, "The analysis indicates that appraisal practices as reflected in granted loans do not indicate that lenders systematically under-appraise properties in areas that are alleged to the redlined." [p. 4-46]

Schafer [1978, Chapter 9] (Upstate New York). Regressions were run with data similar to those used in the New York areas. The number of observations on one-to-four family mortgages and R^2s from each of the regressions are as follows: Albany-Schenectady-Troy, 467 and .09; Buffalo, 310 and .16; Rochester, 177 and .22; and Syracuse, 319 and .13. The coefficients for the age of building variables are not significantly different from zero in the Albany-Schenectady-Troy and Buffalo regressions. Older houses average *higher* appraisal-to-selling price ratios in Rochester and Syracuse. The coefficients of the alleged redlined and the other city neighborhoods variables are not significantly different from zero in the Albany-Schenectady-Troy and Syracuse regressions. In Buffalo, one of four alleged redlined neighborhoods and one of seven other city neighborhoods averaged higher appraisal ratios of 4 and 8 percentage points; the other coefficients are not significant. In Rochester, one of three alleged redlined and one of three other city neighborhoods averaged lower appraisal ratios of 4.5 and 3 percentage points; the other coefficients are not significant. Including mortgage terms and the price of the house and running the regressions separately on observations from alleged redlined and other neighborhoods did not alter these conclusions. Thus, these data are inconsistent with the hypothesis that savings banks appraised at lower rates older properties or properties located in allegedly redlined areas.

Benston, Horsky and Weingartner [1978, Chapter 2] (Rochester, New York). As is described above (see terms charged to mortgagors), mortgages made over a three year period at almost all area institutions were sampled. The ratios of appraisals to purchase prices of properties were calculated for conventional, FHA and VA mortgages separately on

[48] In Appendix B, Schafer describes the survey and states that "the total sample size was 2,208 for the Bronx-Kings study area." [p. B-4] He also states that the data cover "either the last 15 years or the period for which the bank had 'complete' files, whichever was shorter." [p. B-3]

properties located in an allegedly redlined area and in a "control" suburb. The ratios for conventionals and VAs in both areas are almost exactly equal to one. The FHA ratios are significantly higher at 1.02, but almost exactly the same in each area. Because of the closeness of the means between areas, a multiple regression analysis was not undertaken.

King [1979B] (Miami, San Antonio, and Toledo). The data were gathered as described above (see mortgage terms). Two types of analyses were conducted. First, the applications rejected because of (stated) inadequate appraisal values were counted and categorized by the race of the applicant and the area of the property. King concludes: "It is evident from these figures that inadequate appraisal value is a relatively infrequent explanation for rejection. Moreover, relatively few of the rejected applications are from minorities, and there is no evidence that the applications are clustered geographically." [p. 11]

Second, OLS regressions were run, with the ratio of appraisal value to property price as the dependent variable. The independent variables include the type of mortgage (private or FHA-VA insured), the age of the property and its square, whether or not the borrower was black, Hispanic, other minority, female, and/or unmarried, the borrower's age and its square, the 1970 percentage in census tracts of blacks, Spanish-Americans, people below the poverty level, houses built before 1939, and owner-occupied houses, and dummy variables for the S&L association and (in Toledo) specified city neighborhoods. The sample sizes (with the percentages they represent of the total number before observations were omitted because of missing data in parentheses) are 2832 (75 percent) in Miami, 765 (53 percent) in San Antonio, and 1234 (69 percent) in Toledo. The means and standard deviations (in parentheses) of the ratios of appraisal value to property price are similar to those found by Benston, Horsky and Weingartner [1978], (the standard deviations are larger because outlyers were included), and are as follows: Miami, .99 (.06); San Antonio, 1.02 (.09); and Toledo, 1.02 (.07). The adjusted R^2s, at .04, .01 and .06, are quite low. Statistically significant variables (at the .05 one-tail level) related to possible discrimination are the following:

Miami – The relationships are contrary to those expected in that blacks average 3 percentage points higher appraisal ratios and the ratios decrease with the age of the house until 22 years, after which they increase. (The most significant variables are the savings and loan association dummies.)

San Antonio – The hypothesis that all coefficients are zero cannot be rejected at the .05 level.

Toledo – The relationships are contrary to those expected: census tracts with higher percentages of Spanish-Americans average higher appraisal ratios, older houses have higher ratios, 8 of the 29 city neighborhoods have higher ratios (2 at the .10 level) than the suburban areas of between 2 and 8 percentage points, and FHA-VA mortgage appraisal ratios average 5 percentage points lower than conventionals.

Thus all of the analyses yield findings that are contrary to the hypothesis that lower appraisals are associated with possibly discriminated-against people or areas.

Denials of Mortgage Applications

Black, Schweitzer and Mandell [1978] (Nationwide). A survey conducted by the Comptroller of the Currency and the FDIC provided data from 176 banks that chose to cooperate of 300 that were asked. Between September 1976 and February 1979, mortgage applicants at the participating banks completed a form that asked for their personal characteristics and mailed it to the FDIC. The banks later sent their forms that reported information about the mortgages, which were matched with the customers' forms. About half of each group could be matched (4895 in all). Missing data reduced the number to 3456. The authors state "There is no indication that banks systematically avoided returning forms that were matched with a group considered a priori as being most likely to suffer discrimination." [p. 187]

The rejection rate overall was 2.7 percent (138 loans), which the authors postulate may be due to prescreening by banks or real estate brokers, among other reasons. The data were analyzed with probit analysis, the dependent variable being equal to 1 for reject, 0 for accept. The independent variables, entered linearly, include loan terms (amount requested,

downpayment, loan origination fee, years to maturity, interest rate, monthly payment, and insurance status), economic variables (total income, net worth, monthly debt, years employed, self-employed, and age of house), and personal variables (male sex, black race, and age 55 years or older), plus the constant term. The dependent variables were regressed on the loan terms first (Model 1). Then the economic variables were added (Model 2), and then the personal variables (Model 3). In all three models the only statistically significant coefficients at the .05 one-tail level (and their signs) are downpayment (–), interest rate (+), self-employed (–) and age of house (+). In Model 3, coefficient of black race is negative but significant only at the .10 level. The authors conclude: "Note, however, that the summary statistics show a large improvement between Models 1 and 2. The change between Models 2 and 3 is not large. Therefore, although the racial variable is statistically significant at the 90 percent level of confidence, one must interpret its overall impact on the lending decision with some caution." [pp. 189, 191] One also should note that 16 black applicants were rejected and 142 were accepted. Since a probit analysis was employed, the estimated quantitative relationship between black race and the probability of denial cannot be determined from the coefficients presented.

Schafer [1978, Chapter 7] (New York City Area). The sample used was derived from Equal Housing Opportunity Lender forms which provide data on applicants for new conventional owner-occupied mortgages on one-to-four family houses. These forms were filed at and completed by 27 mutual savings banks in New York City and nearby counties, between May 1976 and October 1977. Of the 11,799 applications filed for these loans, 22 percent could not be used because of missing data that could not otherwise be obtained or estimated, leaving 9149 observations. Since he was aware of the effect of missing observations on the analysis, Schafer was careful in conducting many tests to determine whether the exclusion of data introduced biases, such as a relatively larger number of applications from black than white applicants, or from alleged redlined vs. other neighborhoods, and exclusion of applications by blacks with relatively different incomes than those whose applications were not excluded. Unfortunately, all of the test results are presented as comparisons of the sample with the total number of applications filed for *all* one-to-four family mortgages, which total includes applications for government-assisted mortgages, refinancing, nonowner-occupied houses, etc. These excluded applications comprise an additional 22 percent of the universe of 11,799 applications. Therefore, one cannot be sure that the sample is as representative as it seems.[49]

The applications analyzed were categorized as accepted as applied for (69 percent), accepted after modifications of terms (18 percent), withdrawn (4 percent), and denied, (9 percent). The probability of being in one group rather than in any of the other was estimated with OLS regressions, with the dependent variable coded 1 if the application was denied, 0 if it was accepted with or without modification or withdrawn.[50] The independent variables include the following: the applicant's financial characteristics (five dummy variables representing categories of income and wealth and two dummy variables for years at present occupation), loan characteristics (a dummy variable equalling one if the loan requested exceeds two times income and the requested loan-to-value ratio), neighborhood characteristics (percent of households with income $15,000+ in 1969, change in household income 1976 less 1969, change in population 1977 less 1960, and percent of housing built before 1940 – all by census tract), property locations (five New York City counties), race of applicant (black and other minority), percentage black population in census tract 1970, and the constant. The regressions are highly statistically significant.[51] The nonquestionable characteris-

[49] The tests conducted, however, are quite thorough and imaginative.

[50] Two other dependent variables, accepted with modification and withdrawn, were specified similarly. The findings are not summarized here because these events are not likely to be related to redlining practices, as is explained in the text above.

[51] Since the dependent variables is 0 or 1, the R^2 is of limited meaning. Multinomial logit estimates also were calculated, with essentially similar findings for the signs and significance of the variables' coefficients.

tics show up as one would expect (e.g., higher income applicants are less likely to be denied). Overall, 9 percent of the applications analyzed were denied.

The coefficients of the applicant's race variables, black and other minority, are positive and statistically significant.[52] They imply that the probability that an application for a mortgage was denied is greater by 6.6 percentage points for a black and 2.9 percentage points for an other minority person than a white. These findings were cross checked in several ways, most importantly by dividing the sample into black (552 observations), other minority (861 observations), and white (7736 observations). The regressions were rerun to determine whether the coefficients differed significantly. The regressions do, at the .01 level. So do several of the coefficients, indicating that low-income blacks have a higher probability of denial than low-income whites, more time on the job is a significantly positive factor for blacks but not for whites, and blacks have a much higher probability of denial when the loan requested exceeds two times their income. (None of the coefficients of the location variables were significant.) Schafer considers the possibility that these findings of apparent racial bias could be due to correlations of race with omitted variables, in particular socioeconomic factors, two-worker families and the applicant's poor credit rating. He rejects these explanations because he finds that income and wealth and two-worker applicants do not differ substantially by race, and poor credit rating is stated by the banks as a reason for denial more for whites than for blacks. Thus he calculates and concludes that "Blacks have a 13- to 22-percent chance of having their applications denied compared to the 9- to 21-percent chance for similarly selected whites [depending on the regression used for the calculations]. Applications from similarly situated other minorities, a group composed mostly of Hispanic and Asian families, have a 14-percent chance of having their applications denied." [p. 7-114]

Alleged area redlining was tested with the five New York City counties dummy variables (applications on suburban properties were coded zero). Only the coefficient of suburban NYC county (Richmond) of −.03 is significant. Since these are crude proxies for alleged redlining, regressions were run with 3336 observations from Bronx, Kings, and Queens counties. The regressions run for the entire sample were modified as follows. The five county dummy variables were replaced by 20 variables measuring specific neighborhood problems (six measures of housing code violation, four measures of vacancies, four measures of tax arrearages, two measures of welfare) and 10 neighborhood dummy variables (seven alleged redlined and three others). The only coefficient of the alleged and other neighborhood variables that is statistically significant is for an alleged redlined neighborhood (Park Slope). It indicates that applicants in this neighborhood are *less* likely to be denied than applicants in nonspecified, presumably favored neighborhoods by 8.9 percentage points. The coefficients of the percent black in census tract variables are not statistically significant, but the coefficients of the black and other minority variables are significant, and at +.04 and +.05 are similar to those described above. The coefficients of percent of housing built before 1940 variables also are significant, and indicate that an applicant for a mortgage on a house in a census tract where 50 percent of the houses were built before 1940 compared to one with no old houses would have a probability of denial that is 2 percentage points greater. Schafer concludes that while "the race of the applicant is crucial . . . geographic location, however, does not increase the likelihood that an application will be denied although there are some areas in which applications are more likely to be modified. In fact, if geography is a major consideration in lending decisions, it is probably used as a surrogate measure for actual risks of loss associated with the subject property because of the condition of its surroundings." [p. 7-112]

Schafer [1978, Chapters 11, 12] (Upstate New York). Multinomial logit estimates were used for analysis of data from the Albany-Schenectady-Troy SMSA, Buffalo, Rochester and Syracuse. The source of the data and method of checking for the effect of

[52] Denials as percentages of the total number of applicants are 12 percent for whites, 18 percent for blacks, and 12 percent for other minorities. The number of denials are 627 whites, 97 blacks, and 106 other minorities.

excluded observations are similar to those described above for Schafer's New York City analysis. The equations specified are similar to the Bronx, King, and Queens counties regressions, except that the 20 variables measuring specific neighborhood problems could not be included. The equations are statistically significant.

For the Albany-Schenectady-Troy SMSA 6173 applications were analyzed, 74 percent of the universe of 8322.[53] Eight percent of the applications were denied. With respect to race, there were 450 denials of whites (8 percent of their total), 20 of blacks (17 percent), and 19 of other minorities (9 percent). The coefficients of two of the eight neighborhoods alleged to be redlined are significant and positive, indicating that applicants for mortgages on these properties have a higher probability of denial than suburban residents.[54] The estimated probabilities are 81 and 73 percent compared to 10 percent for a similar average suburban application. The only other statistically significant property location coefficient is for the nonalleged-redlined City of Troy, for which denials are estimated to be 6 percent higher than a similar average suburban applicant.[55] The coefficients of the other variables of interest (race and areas with old houses) are not significant.

The Buffalo SMSA analysis used 7404 applications, 87 percent of the universe.[56] Eight percent of the applications analyzed are denials. In terms of race, there are 520 denials of whites (8 percent of their total), 45 of blacks (19 percent), and 24 of other minorities (7 percent). Six of the city areas have significant negative coefficients, indicating lower probabilities of denial in these city areas than in the suburbs. Of these, one is alleged to be redlined and three others are said to be redlined by some community organizations. The coefficient of the old house tract variable (percent of housing built before 1940) is significant and positive but has a very small effect on the probability of denial. The coefficient of the percent black census tract is not significant. Finally, black, but not other minorities, have a significantly greater probability of denial. Compared to similar average white applicants, the probability of denial is 12 percentage points greater.

The Rochester SMSA sample of 2951 applications is 84 percent of the universe.[57] Rochester mutual savings banks denied 3 percent of the applications. With respect to the applicant's race, 72 white applicants were denied (3 percent of their total), 6 blacks (10 percent), and 4 other minorities (4 percent). None of the city neighborhood dummy variables (alleged redlined and other) have significant coefficients, though the signs of all but one are negative, indicating some smaller probability of denial than applications for mortgages on suburban properties. The coefficient of the old house tract variable is significant and positive. The racial composition of a census tract is not significant. But the average black applicant was computed to have a significantly greater probability of denial of 9 percentage points compared to a similar white applicant.

The Syracuse sample of 2563 applications is 82 percent of the universe.[58] The mutual savings banks denied 6 percent of the applications. In terms of the applicant's race, 147 white applicants were denied (6 percent of their total), 5 blacks (14 percent), and 5 other minorities (7 percent). Neither of the two alleged redlined neighborhoods has statistically significant coefficients (though both are negative). Only a county area has a significant

[53] Tests for noninclusion bias included an additional 51 percent of the universe, comprised of definitionally excluded applications. Hence the apparent absence of noninclusion bias cannot be determined.

[54] One neighborhood (Hudson/Park) is in Albany. For the three alleged Albany neighborhoods there are 15 denied applications. The other neighborhood (Hillside) is in Troy. For the three alleged redlined neighborhoods in Troy there are five denied applications.

[55] Sixteen denied applications came from this area.

[56] Test for noninclusion bias include 3635 other applications in addition to the 1082 excluded because of incomplete information.

[57] As is discussed above, the tests presented for estimating noninclusion bias include an additional 2032 applications, 56 percent of the universe.

[58] The noninclusion bias analysis includes 2579 other applications in addition to the 609 that were excluded because of missing information.

positive coefficient. The coefficients of the age of housing and percentage black population are not statistically significant. But the coefficient of black is significant and positive, indicating that an average black applicant would have a 15 percent chance of denial compared to a 7 percent chance for a similar white applicant.

With respect to the upstate areas studied, Schafer concludes: "In general, objective lending criteria, such as applicant income, net wealth, and requested loan-to-value ratio, are major determinants in the lending decision in all four areas. The race of the applicant is also crucial in three of the four metropolitan areas (Buffalo, Rochester, and Syracuse). Property location in an alleged redlined neighborhood is a significant impediment to a favorable decision in only one metropolitan area (Albany-Schenectady-Troy)." [p. 12-155]

Evaluation of the Schafer Studies. These studies of five municipal areas are done with considerable care and imagination. The validity of the findings, though, are in doubt for the following reasons. First, though considerable effort was given to checking for noninclusion bias, the inclusion of a relatively large number of applications for mortgages not in the universe (e.g., FHA mortgages and mortgages on nonowner-occupied buildings) in the tests destroyed their usefulness.[59] (Nevertheless, the data used need not be biased with respect to the hypotheses tested.) Second, despite the large number of observations available, a validation sample was not used. Third, it is likely that many of the variables (such as the many measures of neighborhood quality and the applicant's income) are related to the variables of interest, property location and the applicant's race. Consequently, there is no way of determining the statistical significance of the coefficients. This problem is particularly acute for the New York City property location data. Fourth, the omitted variable problem may be particularly important to the measured relationship between the applicant's race and the probability of denial (as Schafer acknowledges in the quotation given in the introduction to this section in the text above). In particular, race may be a determinant of foreclosures, given an applicant's income, etc., if blacks are discriminated against in employment or are more likely to suffer from illness or marital problems and hence are more likely to default on their mortgages.[60] Should this be the case, society rather than lenders bears much, if not all, of the responsibility for the higher denial rates for black applicants reported. Fifth, the number of blacks whose applications were denied are small: 97 in the New York City area, 45 in Buffalo, 6 in Rochester and 5 in Syracuse. Based on these numbers, Schafer concludes: "The race of the applicant as opposed to the racial composition of the neighborhood surrounding the property, is a crucial factor in the lending decisions of all but one of the metropolitan areas . . . [This finding is] consistent with allegations of discrimination against black applicants." [p. 13-111]. In any event, "black" could be a proxy for other, risk-related variables and not a discriminator, as such, with reasoning similar to interpretations of the positive relationship between "black" and high defaults. Finally, because all the data were obtained from mutual savings banks, the alternative hypotheses that they discriminate against blacks or tend to favor blacks cannot be distinguished, if it is the case that the other variables used in the model are inadequate measures of the quality of the factor specified. For example, the quality of earnings may be lower for blacks because they are discriminated against in employment. But if real estate agents know that mutual savings banks (or the ones sampled which, it should be noted, were willing to give Schafer their data) tend to favor blacks, these banks will get a disproportionate number of applications (relative to other lenders). In this event, though the probability of a black being accepted is higher at the subject banks than at other lenders, the regression analysis will indicate the reverse.

[59] In total, over the five municipalities, applications excluded because of missing data are 20 percent of the universe (conventional mortgages on owner-occupied houses) and applications included in the tests that are definitionally not part of the universe are 38 percent of the universe.

[60] Barth, Cordes, and Yezer [1979] report a statistically significantly higher probability of defaults on FHA loans by blacks of 1.2 percentage points. (The overall average default is 1.5 percent.) As they state, this finding does not mean that blacks necessarily are poorer risks but that "black" may be associated with other, omitted variables that are positively related to defaults.

Warner and Ingram [1979] (Columbia, South Carolina). The data on conventional mortgages applied for were obtained from all four of the savings and loan associations and three of the four commercial banks with headquarters in the area. (One bank was excluded because it concentrated its conventional mortgage lending outside the area.) Over the period studied (1976 and 1977) all the 250 denied applications were analyzed and a randomly selected sample of 500 accepted applications was drawn from a population of about 4600. (The denial rate of 5.4 percent is lower than found in the New York mutual savings banks data. No mention is made by Warner and Ingram of modifications.) A validation sample was derived by selecting every other observation of each group.

A multiple discriminant model was used first to estimate only those factors that were considered to represent ordinary, nondiscriminating risk and return considerations (step I). Then the function was reestimated with a set of factors defined as discriminatory added to the first set (step II). As the authors explain: "While neither function may be a very effective model of the loan offer function, the key to the discrimination analysis rests in the fact that unless there is a significant improvement in discriminating power moving from Step I to Step II the discrimination variables representing particular categories of borrowers are eliminated as possible residual variables (with respect to the first discriminant function)." [p. 4]

The first (step I) discriminant function includes the following variables (listed in the order of the relative discriminating power estimated): applicant's credit rating, loan-to-value ratio requested, annual percentage (Regulation Z) interest rate, applicant's tenure in current occupation, applicant's total monthly payments-to-income ratio, applicant's occupation (percentage of income earned from sales commissions), term of mortgage applied for, and co-borrower's tenure in current occupation (0 if no co-borrower).[61] It is statistically significant at the .01 level. The additional, "discrimination" variables include the following (listed in the order of relative discrimination power estimated): applicant's age, neighborhood median family income in 1970, marital status (unmarried or separated = 1, married = 0), age of the dwelling, applicant's sex (1 for female or other than married couple applying jointly, 0 otherwise), applicant's race (1 for non-Caucasian, 0 otherwise), and co-applicant's income as a percentage of total income.[62] A comparison of the discriminating power of the step I and step II functions reveals no significant difference at the .01 level. (Quadratic discriminant functions also were computed, leading to the same conclusion.) Furthermore, the coefficients estimated were used to classify the validation sample. The step I linear model classified 68 percent correctly, as did the linear step II model which included the "discrimination" variables. The quadratic step I model classified 76 percent correctly, compared to 66 percent for the quadratic step II model. Thus, as the authors' conclude, "... there is no evidence of mortgage lending discrimination in the data." [p. 30]

King [1979B] (Miami, San Antonio, and Toledo). The data were obtained from registers of loan applications kept at 45 savings and loan associations for the months of September through November, 1978. The sample sizes are 2397 for Miami, 546 for San Antonio and 831 for Toledo. About half as many observations had to be omitted because of missing data in the San Antonio and Toledo samples and about a fourth as many in the Miami sample; however, a comparison of the means of some variables of the used and omitted samples indicates no evidence of bias. The dependent variable equals 0 if an application was accepted and 1 if it was rejected. Ordinary least squares and logit analyses were used, with little sub-

[61] The applicant's net worth was specified by the model but the data could not be obtained.

[62] Data limitations precluded inclusion of four discrimination variables specified: applicant's religion, applicant's national origin, public assistance income, and applicant's previous exercise of consumer protection rights. The following are the means of the "discrimination" variables in the accepted and rejected applications samples: age, 37 and 34 years; unmarried or separated, 11 and 12 percent; building age, 7 and 10 years; female or other than married, 21 and 11 percent; non-Caucasian, 11 and 20 percent; and co-applicant's income percentage, 9 and 8 percent.

stantive difference. The independent variables included the following: mortgage characteristics (FHA-VA and private mortgage insurance as dummy variables, and the ratio of the requested loan amount to appraisal value), borrower characteristics (the applicant's credit rating, ratio of monthly payment to the applicant's gross monthly income and the ratio squared, ratio of the purchase price of the house to the applicant's gross monthly income and the ratio squared, ratio of the requested mortgage loan to the applicant's net worth, ratio of applicants' existing monthly debt to their gross monthly income, the applicant's age and age squared, ratio of second income to total income of applicants, and dummy variables equaling 1 if the applicant is black, Hispanic, other minority, female, or unmarried), property characteristics (age of house and age squared), neighborhood characteristics (by census tracts, 1970 data – percent black, percent Spanish-American, percent of households having income below the poverty level, percent owner-occupied units, percent owner-occupied units built before 1939 and, for Toledo, 29 dummy variables designating defined neighborhoods), and dummy variables for each savings and loan association, less one.

The most important variables generally are those representing the mortgage characteristics, the borrowers' characteristics of bad credit rating, other debt to income, payments to income (except for San Antonio and some savings and loan dummy variables).

Because the applicant's credit rating variable was recorded only for declined applications, all accepted applications were considered to be from applicants with good credit ratings. But, since this coding may not be correct, King reports regressions including and excluding this variable. The statistically significant coefficients of the variables that may measure discrimination (e.g., black, Hispanic, other minority, female, unmarried, census tract black, Spanish-American, and units built before 1939) found are as follows:

Miami – The denial rate averaged 12 percent. Including bad credit rating (R^2 of .22), the average Hispanic applicant had a higher denial rate of 3 percentage points and census tracts with 50 percent more Spanish-Americans are associated with denial rates averaging 6 percentage points higher; excluding bad credit rating (R^2 of .11), the two variables were not changed much but blacks also averaged high denial rates of 7 percentage points (significant at the .10 level).

San Antonio – The denial rate averaged 5 percent. Including bad credit rating (R^2 of .30), the average Hispanic applicant had a higher denial rate of 3 percentage points, which increased to 5 percentage points when the bad credit rating variable was omitted (R^2 of .11).

Toledo – The denial rate averaged 7 percent. Including bad credit rating (R^2 of .23) the probability of denial declines until houses are 21 years of age and then increases, and 2 of the 29 city neighborhoods have lower denial rates of 22 and 19 percentage points; excluding bad credit rating (R^2 of .15), the age of house and neighborhood coefficients are largely unchanged and the average Hispanic applicant had a higher denial rate of 20 percentage points, but this finding is based on only five observations.

In summary, the findings show evidence of adverse selection only for Hispanic borrowers in Miami and San Antonio averaging about 3 percentage points higher rates of denial (relative to average rates of 12 and 5 percent). The data show no evidence of discrimination against black, other minorities, females, old, or unmarried applicants, applicants for mortgages on older houses or in neighborhoods occupied by blacks, Spanish-Americans, or in Toledo, city versus suburb.

Tyree and Yeager [1979, Chapter 10] (St. Louis). All 194 loans referred in 1978 to the St. Louis Savings Service Corporation, an organization established and financed by area saving and loan associations to consider "high risk" residential mortgage applications that previously were reviewed and rejected, were analyzed. Multiple discriminant analysis was employed to determine whether use of possible "discrimination" factors played a role in the corporation's rejection of 34 percent of the applications. These factors include location of the property, and the applicant's race, marital status, age, and sex as well as other factors, such as the price of the house and housing expense. The authors conclude: "The most important conclusion from this analysis is the insignificance of the entire model. The 18 factors, when considered as a group, provide no improvement over pure chance in determining the likelihood of an application being accepted or rejected. . . . The conclusion from this analysis is that decisions by the Savings Service Corporation are primarily influenced by other factors, and not by factors relating to discrimination, particularly redlining." [pp.

119-120] This finding is gratifying, but considering the purpose for which the Corporation was established, not surprising.

The Demand for Mortgages by Actual and Potential Home Buyers

Benston and Horsky [1979] (Rochester, New York). Surveys of present (1976) homeowners and buyers of houses within the previous three years were undertaken to determine the mortgage-related difficulties they encountered in selling and buying their homes and in obtaining home improvement loans. The experiences of people in the allegedly redlined area (identified by anti-redlining community group leaders, essentially as the central city) were contrasted with those of people in a control, suburban area. Based on a pilot study, 500 central city and 400 suburb homeowners were selected randomly for interviews. The interviews were conducted by a professional market research firm to reduce the possibility of bias. The homeowners were asked whether they had attempted to sell their homes within the last five years and/or currently were trying to sell their homes. Twelve percent of the central city owners (45 people) and 5 percent of the suburban owners (16 people) contacted said yes.[63] Of these, no potential buyer had inspected the homes of 36 percent of the central city owners and 13 percent of the suburban owners. The owners reported that, of those potential buyers who had inspected the house, a somewhat greater proportion of those in the central city than in the suburb said they encountered mortgage problems (28 vs. 21 percent). However, none of these problems was stated to be related to the area of the house.

Buyers of homes in both areas over the three years 1974 through 1976 were identified by sampling sales reported in the Rochester *Daily Record;* 260 people in the central city and 273 people in the suburb who had purchased homes for their own use were interviewed and asked about their experiences in obtaining financing. Mortgages were obtained by 92 percent of the central city buyers and 99 percent of the suburban buyers. All but 0.4 percent (one person) who wanted a mortgage did not get one; the balance said that they did not want a mortgage. Relatively more suburban buyers than central city buyers obtained a mortgage from a financial institution (99 vs. 87 percent). Of these, a mortgage was obtained from the first institution contacted by 84 percent of the central city and 89 percent of the suburban mortgagors. Most of the balance chose to use another institution. Mortgages were refused by a lending institution to 2 percent of the central city buyers (four people) and none of the suburban buyers. One of the four buyers said that the area of the home was the reason for refusal.

The buyers' reasons for obtaining conventional or FHA mortgages also were ascertained. (Conventionals were held by 29 percent of the central city and 62 percent of the suburban home buyers; FHAs were held by 55 percent of the central city and 18 percent of the suburban home buyers.) The principal reason given for obtaining FHA mortgages was lower downpayment and the principal reason for the choice of conventional mortgage was lower interest rate. The only reason that might indicate a forced choice, "only type available," was given for FHAs by the same percentage in each area (2 percent). Conventionals were said to be the only type available by 3 percent of the central city and 7 percent of the suburban home buyers. Finally, all but 3 percent of the central city and 2 percent of the suburban buyers said they were dissatisfied with the financing they obtained. Also no area-related problems with respect to home improvement loans were reported.

Tyree and Yeager [1979, Chapter 8] (St. Louis, Missouri). This study was based on interviews with leaders of neighborhood organizations and follow-ups of their allegations of redlining. All of the leaders of the 194 organizations listed by the city's Community Development Agency that were still in existence were contacted. Repeated attempts to obtain interviews resulted in 104 interviews. The interviews were standardized and controlled to minimize bias. The real estate practices of real estate lending institutions were said to have

[63] When adjusted for the total estimated number of selling attempts over the five-year period, no buyers inspected the house in 14 percent of the central city attempts and 2 percent of the suburban attempts.

a negative effect by 38 percent of the community leaders, and a positive or neutral effect by 58 percent (4 percent replied "don't know"). The agreement by community leaders who thought that lenders had a negative effect compared to those who said the institutions had a neutral or positive effect to the following series of statements provides insight into the basis for their belief. "An applicant who would be able to obtain financing on property outside the city of St. Louis would find financing for St. Louis property quite difficult or nearly impossible," 30 vs. 5 percent. "Interest terms in this neighborhood are less favorable than terms in other parts of the city," 38 vs. 16 percent, "and other parts of the county," 54 vs. 33 percent. "The general attitude of lenders regarding real estate financing in their neighborhood is discouraging," 46 vs. 14 percent, and "is less favorable than five years ago," 20 vs. 14 percent. When asked if they knew of any lending institutions that actively tried to get real estate loan business in the neighborhood during the last three years, "yes" was given by 41 percent of the "negative" leaders vs. 61 percent of the "positive and neutral" lenders.

The interviewers also asked questions about redlining. When asked whether they knew of "any specific cases of lending institutions not approving loan applications because of the location of the property," 41 percent of the community leaders who said that lending institutions have a negative effect replied "yes" compared to 18 percent of those who said the institutions have a positive or neutral effect. When asked "Do you know of any specific cases of lending institutions purposely discouraging applicants from buying in this neighborhood," yes was answered by 16 percent of the first (negative) group and 4 percent of the second group. When asked about the institutions' discouraging applications, 8 percent of the both groups said they knew of specific cases. In all instances where the respondent answered "yes" to these three questions, the interviewers asked for the number of instances and the names and addresses of the people involved. (One person expressed knowledge of 25 cases.) Repeated attempts were made to obtain this information. The researchers report: "In general, neighborhood association leaders were cooperative and attempted to assist in [the] search for redlined parties. Many discussed our search during their neighborhood organization meetings and went so far as to contact individuals who may have had difficulties in seeking financing." [p. 99] However, only seven alleged cases could be found. Two cases included people who could not be located; one was said to have been denied a mortgage five years earlier and one a year earlier. In four cases the people denied they had had a problem and in one case the problem appeared to be lack of creditworthiness because of the husband's low income, though the people got financing elsewhere and then divorced. (Details are provided in the study.) Thus little evidence of actual redlining in St. Louis was reported and none was documented.

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Discussion

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It is important to emphasize that the profitability of a particular approach to evaluating credit risk is not an appropriate test of whether the society, through its government, is justified in regulating the credit evaluation process. Private property is an aggregate of rights created by society, and society has always placed limits on its use. Similarly, society can add a requirement of equal treatment of similarly situated applicants as a constraint on the market. Such rules define the context within which business must be conducted. They can, and frequently do, alter the profitability of business. Society need only believe reasonably that the extra cost of doing business within the new constraints is less than the social benefits resulting from the fair and equal treatment of applicants.

In essence, the fair housing regulations require lenders to use objective measures of risk of loss for each application and prevent them from attributing the average behavior of some group to the individual. These rules are merely the reflection of an American ideal: each person should be judged on his or her *own* merits. In particular, fair housing laws prohibit discrimination on the basis of race, color, national origin, sex, marital status, age, receipt of income from public assistance programs, and good faith exercise of rights under the Consumer Protection Act. As a result, a black applicant for a mortgage must receive the same treatment and have the same chance of success as a white applicant who has the same income, net wealth, credit history and value of other objective measures of creditworthiness. Other regulations place restrictions on the use of neighborhood. For example, the Federal Home Loan Bank Board (FHLBB) prohibits "arbitrary decisions based on age or location of the dwelling."[1] Although the Community Reinvestment Act does not place direct constraints on the lending process, it requires the federal financial regulatory agencies to encourage lenders "to help meet the credit needs of the local communities in which they are chartered consistent with the safe and sound operation of such institutions."

It should be no surprise that these regulations might increase the costs of evaluating credit applications. Using the average risk of loss for various groups

[1] 12 CFR §531.8(c)(6), 43 *Federal Register* 22339 (May 25, 1978).

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of applicants is usually less expensive than researching each applicant's credit history.

The next section presents my comments on the Barth, Cordes and Yezer paper. The following section discusses the Benston literature survey.

Barth-Cordes-Yezer

The Barth-Cordes-Yezer paper's distinctions between a legal and economic definition of redlining are misleading. Any differences that do exist are considerably less than they suggest, especially regarding the anti-redlining regulations.

The most important way in which the Barth-Cordes-Yezer paper misleads its readers is the suggestion that the fair housing regulations require lenders to make loans that are unsafe. This follows from their economic definition of redlining: differential treatment of neighborhoods that does not correspond to differences in costs and risks. Increased costs due to a more individualized credit evaluation process should not be a part of the definition of redlining. It is not clear why the costs of processing and servicing should vary across mortgages that have equal risk of loss. Then, the major question turns on the implications of fair housing laws for the ability of lenders to use risk of loss. None of the fair housing regulations restrict a lender's ability to use risk of loss in deciding whether and on what terms to approve a mortgage application. These laws only require that lenders use objective measures of each application's risk of loss. Such measures must have a causal relationship with risk, and not just a correlation. In this sense, the laws can be credited with keeping economists honest; that is, requiring the models to be specified correctly. Anti-redlining laws even allow some aggregate neighborhood measures to be employed. For example, the FHLBB regulations only prohibit the *arbitrary* use of location. These conditional rules recognize the role of housing market externalities; for example, the condition of neighboring buildings is likely to affect the risk of loss on the property that is securing a mortgage.

Although the fair housing laws contain unconditional prohibitions on the use of race, sex and other personal characteristics, the anti-redlining laws can be read as asking for help in defining what is an unfair use of neighborhood factors. Here is a clear opportunity for economists to make a valuable contribution. Anti-redlining laws are begging for a workable definition of the "arbitrary" use of neighborhood. How can property externalities be reasonably used in the lending process? What should regulators do to determine what is arbitrary and what is not? What data are needed and what techniques are appropriate for its analysis? Lenders need to know what neighborhood factors are legitimate credit evaluation criteria and how they can incorporate them into an effective and legally defensible credit evaluation process.

It is relatively easy to delineate some neighborhood factors that cannot be utilized. These are the aggregate measures of the personal characteristics which the fair housing laws prohibit unconditionally. For example, the racial composition of a neighborhood is clearly prohibited. The laws tell lenders to find objective measures of risk which are reasonably related in a causal sense with risk of loss. Racial composition may be correlated with risk of loss but

society has correctly stated that any such relationship is spurious and not founded on a causal link. Economists can and should develop the causal relationships for use by lenders and regulators. A very likely candidate for a causal link with risk of loss is the incidence of housing code violations and vacant buildings. A useful study would be an assessment of the relative strengths of various measures of housing condition (e.g., census tract, census block, and adjacent property) as indicators of risk of loss in mortgage lending. The results would provide a firm foundation for defining the area impacted by housing market externalities.

It is also unfortunate that Barth, Cordes and Yezer misinterpret a clause of the Community Reinvestment Act that requires federal financial regulatory agencies to "assess the institution's record of meeting the credit needs of its entire community, including low- and moderate-income neighborhoods, consistent with the safe and sound operation of such institution" in reviewing applications for deposit facilities. The authors imply that this provision of the CRA might prevent lenders from using neighborhood income as a criterion. Their interpretation is uncalled for and unfounded. It is far more reasonable to read this section of the CRA as requiring lenders to participate in appropriate public programs to assist low-income neighborhoods. These programs would provide the risk adjustment necessary to make the ventures safe and sound for the lender. Thus, the statute would be consistent with economic reality.

Furthermore, Barth, Cordes and Yezer suggest that the economic but not the legal definition provides a standard against which lender behavior can be compared. I cannot agree. The law defines the boundaries of economic activity. Economic activity is not possible without some agreement about the procedures for conducting activity involving more than one party. This is the essence of law. In this case the law requires equal treatment of similarly situated applications. Economics has a role to play in defining the objective measures that need to be held constant to assess whether or not there is discrimination as defined by the law.

Barth, Cordes and Yezer also mislead the reader by incorrectly claiming that the law views redlining as occurring when local lenders export deposit funds. Many community organizations espouse this view, but it is not the law. The closest these groups have come to incorporating this view into the law is the Home Mortgage Disclosure Act of 1975, but it only requires disclosure of lending activity. It is only a source of data for use in evaluating whether lenders treat all neighborhoods equally. The problem is that the data are wholly inadequate for the task. Another problem is that economists, especially those working for regulatory agencies have not provided sufficiently strong backing for the appropriate data source: namely, detailed information on all serious mortgage inquiries. These data should be even more detailed than the information available under California and New York law. The Home Mortgage Disclosure Act of 1975 should be repealed and replaced with a law requiring the maintenance of detailed records on all serious inquiries about mortgages. Then, all parties will have access to data capable of answering the basic empirical question: Does discrimination occur and, if so, who are adversely affected?

In the area of methodology, I have several points on the Barth-Cordes-Yezer paper. First, a logit model is preferred to the OLS technique used because the logit has the appropriate functional form. This choice is not a matter to be resolved on the basis of sample size. Of course, the simultaneous equation model has less econometrical foundation in the logit formulation because there is no known way of introducing an error term into the logit function. It should be noted that under certain assumptions the binomial choice OLS coefficients can be transformed into consistent logit coefficients.

Second, the specification of the models is bothersome. The housing expenditure equation appears to be a confusing mixture of a consumption function and a hedonic price index. The maturity equation does not include the age of the borrower which would seem to be a relevant and important preference variable. Similarly, the loan-to-value equation excludes two relevant and important preference variables: net wealth and age of borrower.

Third, I believe that the authors misinterpret the coefficients of variables which are unconditionally prohibited as lending criteria. A positive and significant coefficient on such a variable (e.g., race) indicates that defaults are higher for this type of person but is not a defense against or a valid basis for objecting to regulations prohibiting discrimination. Instead, it is an indication that objective measures of default have been excluded from the model. In an appropriately specified default model, it should be unnecessary to brand an individual with the average behavior of a group.

Fourth, city characteristics are an inappropriate level of aggregation to study redlining. If lenders redline, they do it at the neighborhood level. In other words, redlining occurs, if at all, across neighborhoods within one metropolitan area and not across metropolitan areas. This is a serious weakness.

Finally, I believe that their discussion of a sample selection bias is incomplete. They argue that sample selection bias exists because the observed defaults are drawn from a population with an *ex ante* default which is less than a critical value. This is not true because lenders do not know the *ex ante* default probabilities; instead, lenders use estimates, or predicted values, of default probabilities. I believe this results in less efficient but not biased estimates when the dependent variable is *ex post*.

The Barth-Cordes-Yezer paper makes several valuable contributions:

First, it tests defenses against marginally discriminatory factors such as age of neighborhood. Community organizations argue that older neighborhoods are redlined, that is, receive less funds than other neighborhoods with equal risk of loss. Lenders have responded that such variations are spurious because neighborhood age is highly correlated with risk of loss. The Barth-Cordes-Yezer results indicate that this defense is invalid; they find that default is significantly less likely in older neighborhoods.

Second, it allays lenders' fears concerning the impact of fair housing laws. For example, any lender who may have relied on the age of the building or the racial composition of the neighborhood should not be concerned by their prohibition as lending factors; the Barth-Cordes-Yezer results indicate that they do not have a significant impact on default once other factors are taken into account.

In fact, other more objective measures of risk (e.g., the structural condition of the building and of nearby buildings) are even better and not subject to charges of discrimination.

Third, it contributes to the growing literature that provides a foundation for the development of a credit evaluation system to make lending decisions and to systematically adjust the terms (e.g., interest rate) for risk differentials. These models must be based on default models that exclude all variables that measure prohibited lending criteria.

Benston

Benston has tried to summarize the empirical literature available on the issue of redlining. This is a tremendous task requiring careful reading of many studies using widely different approaches. One valuable improvement would be a table summarizing the results of each study with respect to redlining; it is very difficult to assimilate these findings across the textual summary of the studies. Persons interested in literature reviews of these studies should also consult the excellent one by Thomas King of the Federal Home Loan Bank Board.

Benston asserts three conditions that studies of redlining must meet to have valid conclusions. He does not require each study to meet all three conditions. One of these conditions is plainly incorrect. He asserts that if the focus of the study is on the effects of redlining on consumers or neighborhoods, data from all mortgage lenders must be included. While this appears reasonable on its face, it is inconsistent with the requirements of fair housing laws. These laws do not require that on average a particular group of consumers such as blacks receive adequate mortgage funds. They require that no lender discriminate against them in the lending process. A lender that discriminates against a black applicant or some other protected group will not find a successful defense in the fact that another nondiscriminating lender granted that person a loan.

Bank specific studies are precisely the type necessary for regulators to make determinations relevant to the requirements of fair housing laws. Economists should assist them by developing pragmatic and sound methodological approaches. These analyses should also assist lenders by providing them with credit evaluation systems that are based on objective factors with causal links to risk of loss. The most difficult part of this challenge lies in developing a workable definition of redlining. Redlining based on the racial composition of the neighborhood or some other neighborhood aggregate measure of an individually protected status would have to pass the same standards as the discrimination against a member of one of these protected groups. However, redlining based on the age of the neighborhood or the geographic boundaries presents a more complex case. Yet even here, fair housing laws will probably be read as requiring lending rules based on a causal link between the variables and risk of loss for any areas within each lender's reasonable lending market. The definition of this market area is another place for economists to assist the lawyers.

It is true, however, that studies of the aggregate supply and demand for mortgages should include most if not all sources of mortgage funds. This does not, however, eliminate the usefulness of models based on aggregate data. In my

own study of three counties in New York City, I went to great lengths to point out the importance of interpreting my results as only applying to those institutions covered by the data set.[2]

In his discussion of default models, Benston argues that meaningful findings are only possible if the data were not prescreened by lenders. This is incorrect because, as I have already pointed out in my discussion of the Barth-Cordes-Yezer paper, lenders are making decisions on the basis of estimated and not the known probabilities of default. As a result, econometric procedures can provide valid estimates of the effect of variables on default. There is a similar, but unrelated issue that should be mentioned. In any econometric technique, the predictions weaken the further the situation is from the range of values of the independent variables available in the data used to estimate the model.

In discussing default studies, Benston concentrates on foreclosures. The wide variation in bank policies towards the institution of foreclosure proceedings suggests that delinquency may be a better measure of risk of loss. In my own studies the crude foreclosure and delinquency rates suggested that risk was higher in areas alleged to be redlined, but the multivariate analyses indicated that many factors other than location may be responsible for the higher default rates in these areas and that lenders can develop credit evaluation systems using information specific to the property and applicant without recourse to crude neighborhood-level rules of thumb.[3]

In discussing the studies of the lender decisions on applications for mortgages, Benston states that "all of the [se] studies found no evidence of differential denial rates related to" the property's location. This is incorrect. My own study of the Albany-Schenectady-Troy metropolitan area found strong evidence that two neighborhoods were redlined by savings banks.[4]

In his summary, he makes the further statement that "the weight of the evidence is contrary to the hypothesis that lenders discriminate against minority borrowers or areas by denying mortgage applications." This clearly incorrect statement could seriously mislead the reader and reveals a bias that runs through-

[2] Unfortunately, Benston's summary is written so that the reader may have the misunderstanding that this is his caveat while it is, in fact, my own. In addition, Benston states that my study of the quantity of mortgage money provided by reporting institutions (Chapter 5) found "no evidence of redlining." This is incorrect. The report concluded with respect to the analysis of Chapter 5 that "the community organizations may be incorrect about the existence of redlining in [the Central Brooklyn and Park Slope] neighborhoods, while they may be correct in their allegations concerning the South Bronx, Crown Heights, East Flatbush and Southeast Queens." (p. 5-78).

[3] My delinquency models include variables that identify whether or not the property is located in a neighborhood that is alleged to be redlined. Benston also points out that the borrower's race and the racial composition of the neighborhood were absent from my default models. The reasons are that the race of the borrower was not available (even though we sought it) from the banks' records and the racial composition is only available for 2 years of the 27-year period covered by the mortgages in the samples used to study default.

[4] In addition, the chances of modification of the requested terms prior to approval were significantly higher in the allegedly redlined Park Slope neighborhood in New York City.

out the literature review. Although the evidence indicates that redlining exists in only some metropolitan areas, the same studies find that minority applicants, especially blacks, are twice as likely to be denied a mortgage as are similarly situated white applicants. These findings are very statistically significant, and the differentials are large. And contrary to Benston's assertions, the studies are not beset by problems of multicollinearity and the models are specified so as to control for risk-related and other objective lending criteria.[5] These findings cannot be swept aside so easily. Lenders and society must address these findings honestly and forthrightly. We need to develop lending procedures and a lending officer training process that eliminates racial discrimination.

A bias against findings consistent with allegations of discrimination is evident to anyone familiar with the studies being reviewed. If the care that was devoted to identifying deficiencies in the studies with findings consistent with discrimination had also been devoted to the other studies, the latter would have been found to be seriously flawed relative to the former. For example, the Muth study of mortgage terms analyzes an obvious simultaneous equation system with an entirely inappropriate econometric tool. Another example is the differential insertion of the effect of potential multicollinearity. This criticism appears in the discussion of findings consistent with discrimination allegations whether or not it is appropriate. However, it is absent from other studies even though appropriate. The Warner-Ingram two-step procedure, for example, is entirely inappropriate and invalid in the presence of multicollinearity.

None of the research adequately deals with the question of whether lenders discriminate illegally in their response to initial inquiries, the prescreening process. Homeowner or borrower surveys shed no meaningful light on this issue. Some agency should conduct an audit study of this portion of the lending process. Such a study would have matched pairs of applicants that differ on only one characteristic such as race make inquiries of the same lender. Comparison of their respective treatment would be a significant addition to the literature. Among other things, such a study would assist financial regulatory agencies in deciding whether or not to make such audits a regular feature of their equal credit opportunity enforcement efforts.

[5] For example, Benston suggests that race may be a determinant of foreclosure. Of course, that could not be a causal relationship. In any case, the models he is criticizing at that point include a direct measure of the foreclosure rate as well as the delinquency rate.