

Draft - March 3, 1997

**The Community Reinvestment Act and the Profitability of Mortgage-Oriented
Banks**

Glenn Canner and Wayne Passmore¹

Federal Reserve Board

Mail Stop 89

Washington D.C. 20551

¹We wish to thank Lisa Kirch for her excellent research assistance, and Chris James, Steve Oliner, Martha Scanlon and participants in the 1997 NAEFA meetings for their useful comments. The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the Research staffs, by the Board of Governors, and by the Federal Reserve Banks.

The CRA and Bank Profitability

Corresponding Author:

Wayne Passmore
Mail Stop 89
Federal Reserve Board
Washington D.C. 20551
Phone: 202-452-6432
Fax: 202-452-3819
E-Mail: M1SWP00@FRB.GOV

Abstract

The Community Reinvestment Act (CRA) requires 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." For proponents of efficient markets, the CRA is a threat to lender profitability. For others, the CRA has the potential to increase profitability. We examine the relative profitability of commercial banks that specialize in mortgage lending in lower-income neighborhoods or to lower-income borrowers using three different empirical techniques, and find that lenders active in lower-income neighborhoods and with lower-income borrowers appear to be as profitable as other mortgage-oriented commercial banks.

JEL Classification Nos. G21,G28.

The Community Reinvestment Act and the Profitability of Mortgage-Oriented Banking

By most measures, the number of home purchase loans made by commercial banks in lower-income neighborhoods is small compared with the number of such loans in higher-income neighborhoods. To some observers, this pattern of lending is readily understood within the context of the business of banking, where profit-seeking institutions strive to meet the demands of creditworthy borrowers. In this view, the low number of home purchase loans in lower-income neighborhoods reflects the relatively small number of creditworthy borrowers and the relatively small supply of owner-occupied housing. To others, the disparity in such lending results from either discrimination, neighborhood conditions, or both, and leads bankers to erroneously conclude that these areas do not offer good profit opportunities. In these views, the amount of home purchase lending in lower-income areas is too small.

The Community Reinvestment Act (CRA) requires the agencies that supervise commercial banks and savings associations to encourage such 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." For proponents of the efficient markets view, lenders already have ample incentives to seek all profitable lending opportunities and face few barriers to providing such credit everywhere; therefore, such legislation should have little effect on lending because lenders are already doing what the law is encouraging them to do. However, if the CRA forces or encourages lenders to make unprofitable loans, then the efficient markets view would see the CRA as a burden on the banking system (For a review of this literature see Lacker, 1995.)

For proponents of other views, lenders may possibly overlook safe and sound lending opportunities in lower-income or predominately minority neighborhoods; therefore, the CRA has the potential to both increase lending in these neighborhoods

and to increase the profitability of lending institutions. (For an outline of this view combined with the statistical evidence that minority neighborhoods are underserved see Shear, *et. al.*,1995. For the theoretical development of these types of views, see Calomiris, *et. al.*, 1994.)

One way to judge the appropriateness of these different views of lending encouraged by the CRA is to examine the relative profitability of financial institutions that specialize in lending in lower-income neighborhoods or to lower-income borrowers.² In this paper, we examine net operating income for commercial banks who vary by the proportion of home purchase mortgages they extend in lower-income neighborhoods and to lower-income homebuyers. We use three empirical techniques: First, a heuristic analysis, which splits banks into five separate groups based on the bank's orientation toward lending to lower income groups. Our analysis compare the median profitability of four of these groups to a group of banks with average or "common" banking characteristics. Second, a matched pair analysis, which requires that banks within our heuristic groups match "common" banks based on certain characteristics. Again, the median profitability for each specialized group is compared to the common group. Finally, we present a more formal theory of how specialization in lower-income lending might effect bank profitability and use this theory in a regression analysis of bank profitability.

We perform each of the three analyses on separate datasets for 1993, 1994 and 1995. We find no compelling evidence of lower profitability at commercial banks that specialize in home purchase lending in lower-income neighborhoods or to lower-income borrowers.

²Another way to investigate the impact of regulations like the CRA is to compare the relative performance of institutions under different regulatory regimes (Canner and Passmore, 1996).

A Brief History of the Community Reinvestment Act

The Community Reinvestment Act of 1977 is intended to encourage commercial banks and savings associations to help meet the credit needs of the local communities in which they are chartered. In adopting the CRA, the Congress reaffirmed the principle that depository institutions have an obligation under their charters to serve "the convenience and needs" of their communities by extending credit to all parts of those communities.³

The CRA is directed primarily at four federal supervisory agencies-- the Board of Governors of the Federal Reserve System, the Comptroller of the Currency, the Federal Deposit Insurance Corporation, and the Office of Thrift Supervision. The Act calls upon these agencies to (1) use their supervisory authority to encourage each financial institution to help meet local credit needs in a manner consistent with safe and sound operation, (2) assess an institution's record of meeting the credit needs of its entire community, including low- and moderate- income neighborhoods, and (3) consider the institution's CRA performance when assessing an application for a charter, deposit insurance, branch or other deposit facility, office relocation, merger, or acquisition.

To enforce the CRA, the regulatory agencies conduct CRA examinations of commercial banks and savings associations and, as required by the statute, evaluate CRA performance during the application process for bank acquisitions, mergers and other actions. The vagueness of the affirmative responsibility placed on lenders by

³For an overview of the history of CRA, see Garwood and Smith (1993). For information on recent debates concerning the focus of CRA, see Canner and Passmore (1995) and Evanoff and Segal (1996).

the Congress has made it difficult for the regulatory agencies to determine compliance with the CRA. Most institutions receive a rating of satisfactory or better on their CRA performance, and few institutions have had their applications for mergers or acquisitions denied. The CRA has, however, prompted institutions to undertake specific actions to enhance their CRA performance before and during the application process.⁴

After more than fifteen years of experience under the CRA, both community organizations and depository institutions expressed frustration with the process of enforcement. Community groups believed that the examination process failed to create meaningful distinctions between depository institutions with good performance and those with poor performance. Depository institutions complained that CRA enforcement was needlessly burdensome because it was focused on process and paperwork, and that the examination standards were unclear and inconsistently applied.⁵

In 1995, the agencies began implementing a new CRA regulation that uses three performance-based measures--a lending test, an investment test, and a service test.⁶ These tests combine quantitative measures of performance, such as the ratio of mortgages extended in lower income neighborhoods to all mortgages, with the

⁴For empirical support that CRA had not change lenders' behavior *on average* relative to non-CRA lenders, see Schill and Wachter, 1994. However, this finding may no longer apply, given the intense interest in CRA during the past several years.

⁵As an example of this debate see Marsico (1993), who concludes that community based organizations will find contesting a bank action's on CRA grounds requires significant effort but can generate "...billions of dollars of CRA lending commitments...", making the return worth the effort. White (1993) retorts that requiring the banking system to provide unprofitable services is "inappropriate, inefficient, and ultimately a recipe for frustration and futility."

⁶See the Federal Reserve Press Release, *Community Reinvestment Act Regulations*, April 24, 1995.

judgment of CRA examiners. When adopting the new regulation, the agencies noted that the examination process is inherently subjective and requires that performance be measured within the context of (1) a community's credit needs and (2) the capability of the lender. These two standards are referred to as the "performance context".

The CRA legislation places a heavy emphasis on the analysis of the geographic distribution of an institution's lending across all of its community. The new CRA regulation implements this legislative intent by classifying neighborhoods in a lender's service area as low-, moderate-, middle-, or upper-income. A low-income area is defined as an area where the median family income is less than 50 percent of the median family income for the broader area (such as a metropolitan statistical area or MSA). In a moderate income area, the median family income is at least 50 percent and less than 80 percent of that for the broader area. In a middle-income area, the percentages range from at least 80 percent up to 120 percent. And in an upper income area, the percentage is at least 120 percent. These income definitions divide the population and the number of census tracts into groups of unequal size, with far fewer people, owner-occupied homes, and census tracts in the lower income groups.⁷ We will refer to borrowers (or neighborhoods) with less than 80 percent of the MSA median family income as lower-income borrowers (or neighborhoods).

The new CRA regulation also extends the evaluation of a bank's lending to encompass the distribution of loans across low-, moderate-, middle-, and upper-income *borrowers*, where the income categories follow the same groupings as neighborhoods but rely on the individual's income relative to that of the borrower's MSA. Thus, while continuing to place a heavy emphasis on the geographic distribution of an institution's lending, the agencies also favorably consider loans made

⁷See Canner and Passmore (1995).

to low- and moderate-income individuals regardless of location.

CRA examinations consider a broad range of loan products, including all types of residential, consumer, and business loans. Our paper is focused only on home purchase lending, an important component of the proposed lending test, because the data available pursuant to the Home Mortgage Disclosure Act (HMDA) allow the empirical investigation of the nature and extent of this type of lending by the mortgage industry to different neighborhoods and different borrowers in all MSAs.⁸

How CRA Affects Profits--A Theory of Bank Profitability and Specialization

For our one year horizon, we assume that the bank's choice of labor, physical capital and financial capital are fixed. The fixed nature of labor and physical capital determines the banks ability to raise core deposits and to process loan applications. In this stylized model, the only discretionary funds for the bank are nondeposit, nonequity sources such as brokered deposits, large CDs, federal funds and repurchase agreements.

The generic profit function for the bank can be written as:

$$\pi = NOI - w\bar{L} - r_d\bar{D} - r_f F - r_{pk}\bar{PK} \quad (1)$$

where L is labor, PK is physical capital, D is core deposits, which is a function of labor and physical capital and thus fixed, and F is nondeposit funds. The wage is denoted w and r is the effective interest rate paid on the quantity indicated by the subscript.

⁸The Home Mortgage Disclosure Act requires financial institutions with offices in metropolitan areas to provide information on the geographic location of the properties related to the home loans they originate or buy. HMDA also requires lenders to disclose information on the disposition of home loan applications and on the race or national origin, gender, and annual income of loan applications or borrowers.

(Thus, r_d is the interest rate on deposits and r_f is the rate on nondeposit funds.) Net operating income (NOI) is the portion of profits which the bank can influence in the short-term.

We assume that among a group of borrowers there are two risk types: type A households, which have a low probability of default, and type B households, which have a high probability of default. The probabilities of default are denoted by $q_B > q_A > 0$ respectively. Initially, all banks know that the proportion of type A households is p , whereas the proportion of type B households is $(1-p)$, but no one knows the type of any individual applicant. The return on a portfolio of loans is z , the return to a loan extended to a type A borrower is r_A and to a type B borrower is r_B , and the return on a defaulted mortgage is r_D , or:

$$z = pr_A + (1-p)r_B$$

$$\text{where } r_A \equiv (1-q_A)r + q_A r_D \tag{2}$$

$$r_B \equiv (1-q_B)r + q_B r_D$$

To capture the idea that banks can engage in costly screening of loan applicants to determine their risk types, we assume that there are infinitely many customers whose screening costs, αc_i $i=1, \dots, \infty$, are distributed uniformly on the real line interval $[0, \alpha]$, where $c_i \in [0, 1]$. The parameter α represents the screening cost of the most expensive applicant. The type of screens used by mortgage lenders (borrower income, savings, location, etc.) and their relative importance are discussed at length in Zorn (1993).

The only reason a bank screens is to avoid extending loans to type Bs. If the bank does not screen, it must extend the mortgage because it lacks a reason for denial. The bank screens until the costs from screening equal the losses from

granting loans to type Bs. Let c be the critical value of c_i yielding the equality between the expected returns from screening and from not screening.

The bank's average NOI is:

$$NOI = [(1-c)[pr_A + (1-p)r_B] + c(pr_A - \frac{\alpha c}{2})] \bar{M} \quad (3)$$

where M is the capacity of the institution to process loan applications, which is fixed by the choice of labor and physical capital.

The bank operates with an accounting constraint that sets assets equal to liabilities. Thus, the choice of nondeposit funds is determined by this constraint or:

$$\bar{D} + F + \bar{K} = [(1-c) + cp] \bar{M} \quad (4)$$

where K is financial capital.

Substituting the balance sheet constraint into the profit function and using hats (^) to denote equilibrium values, we find that the bank's optimal screening choice is determined by setting the marginal return from screening equal to the marginal return on unscreened loans:

$$p(r_A - r_f) - \alpha c_i = z - r_f \quad (5)$$

and solving for the optimal screening threshold yields:

$$\hat{c} = \frac{(1-p)(r_f - r_B)}{\alpha} \quad (6)$$

Substituting the above equation into the profit function, we find:

$$\pi = [Z + \frac{(1-p)(r_f - r_B)r_f}{\alpha}] \bar{M} - w\bar{L} - r_{pk}\bar{PK} - r_d\bar{D} + r_f(\bar{D} + \bar{K}) \quad (7)$$

For the regression analysis, we represent equation 7 as follows:

$$[\pi + w\bar{L} + r_{pk}\bar{PK} + r_d\bar{D} - r_f(\bar{D} + \bar{K})] = F(r_1, \dots, r_n) + \alpha(X_1, \dots, X_n) + M(\bar{L}, \bar{PK}) \quad (8)$$

where the X's represent the exogenous determinants of screening costs, the r's represent the prices the bank faces in various loan markets, and we use a flexible function form for each component of the right-hand side of the equation. We refer to the left-hand side as the bank's variable net operating income (VNOI).

The bank's initial choice of physical and labor inputs determines the bank's income prior to payments for labor, physical capital, and core deposits. In addition, the bank's choice of labor and physical capital as well as the bank's current holding of financial capital create a necessary "income" or opportunity cost that yields a return equal to the yield on nondeposit funds. In other words, if loans do not exceed the level of core deposits and capital, the surplus funds are invested in securities that yield r_f . Subtracting these "earnings" from a bank's income controls for the possible overinvestment by the bank in capacity relative to its actual loan activity.

One common method of describing the variation of profitability across banks is with only the different prices they face in their markets and the fixed factors, and without screening costs. If banks are competitive, operate in separate markets, and are profit maximizing, then the variation in profit will be completely described by the variation in prices for loans or deposits in these separate markets. If these prices could be observed, then a regression of profits on combinations of these prices would yield both the response of profitability to changes in prices, and a description of the

underlying technology used by the bank.⁹ To the degree that prices incorporate all relevant information about the expected profitability of a bank's portfolio, then characteristics that influence expected profits should be reflected in those prices, including characteristics related to the income of the borrower or neighborhood.

Without screening costs, the profit function (given our assumptions about what factors are fixed) would be written as:

$$\pi = z\bar{M} - w\bar{L} - r_{pk}\bar{PK} - r_d\bar{D} + r_f(\bar{D} + \bar{K}) \quad (9)$$

and would be estimated using a flexible functional form for z (which is a function of prevailing interest rates in various loan markets) and the quantities of the fixed factors or:

$$\pi = F(r_1, \dots, r_n, \bar{L}, \bar{PK}) - w\bar{L} - r_{pk}\bar{PK} - r_d\bar{D} \quad (10)$$

Through screening costs, the bank's specialization in a particular community or a particular group of borrowers enters the profit function through a mechanism other than the effective interest rate charged on the loan. The bank's choice of human and physical capital generates a particular set of applications and allows it to make particular types of loans at a lower or higher cost. Thus, a bank's specialization in say, a lower-income neighborhood, may be reflected directly in the bank's profit through its effect on screening costs. (Of course, this specialization might also influence the interest rates the bank sees in the loan markets it operates within, but the interest rate will reflect this influence.)

⁹For a description of the procedure, see Berger *et. al.* (1993). For an example of using this method to study low-income mortgage lending, see Malmquist *et. al.* (1996).

An Empirical Tests of CRA's Effect on Profit

To analyze the divergent views of CRA's effect on bank profitability, we created a database from three sources: the HMDA data, the 1990 Census data, and the balance sheets and income statements of commercial banks ("Call reports") collected by regulators. The HMDA data include the income of the borrower, the location of the property, the lender's name, the loan type and the loan amount for all home loans originated by depository institutions who have at least \$10 million in assets and an office in a Metropolitan Statistical Area (MSA). From the 1990 Census, we use information about the population, housing and economic well-being of neighborhoods and MSAs. The Call reports provide information on assets, liabilities, income, expenses and profitability for each bank.

The most basic unit of analysis for CRA evaluations is the neighborhood. One common way to define a neighborhood is as a census tract.¹⁰ A few census tracts are primarily commercial or industrial in nature and have few or no residents. Our analysis of home purchase lending excluded census tracts if the 1990 census showed they had either (1) no residents, (2) no owner-occupied housing, or (3) no reported median family income¹¹.

The analysis focuses on commercial banks that were the same entity (they were not purchased by others), and in operation at least at year-end 1993, 1994 or 1995. Very small banks (those with less than \$25 million in assets) were excluded

¹⁰The CRA regulation uses "block numbering areas" when census tracts are unavailable. Since we focus on metropolitan areas, all of the loans used in this analysis have census tract designations.

¹¹The Bureau of the Census does not release income data for census tracts with small populations in order to protect the confidentiality of the respondents.

because they report only a limited amount of Call report information.

We create a profile of each bank's neighborhood and home lending activity by aggregating census and HMDA data. For the neighborhoods, we averaged each census characteristic across census tracts where the bank made home purchase loans, weighing each characteristic by the number of loans the bank made in a census tract. For home lending, we constructed for each bank a "HMDA portfolio" using the bank's home purchase loans.¹² The portfolio included measures of the proportion of loans extended to lower-income borrowers and to borrowers purchasing properties located in lower-income neighborhoods.

The merger of HMDA and Call Report data results in a sample of 4,129 banks for 1995. In 1995, the typical (median) bank made 24 home purchase mortgages, and over 25 percent of the banks made fewer than 8 loans.

These low loan volumes are not surprising, as HMDA requires many non-mortgage-oriented commercial banks to report their home purchase loans. In addition, some commercial banks specialize in home equity lending, not home purchase lending. To focus on home purchase, mortgage-oriented banks, we investigated the effects of a variety of additional screens on the data. These additional screens were also used to judge possible problems associated with the linkage between the HMDA lending and the net income earned by the bank. The net income reported on the Call report is consolidated across all asset types, and does not breakout income and expenses for mortgage lending. Thus, net income for a bank may not be tightly linked

¹²HMDA data cover only about three-fourths of the entire home purchase mortgage market. Many of the excluded loans are outside of metropolitan areas. For additional details about HMDA, see Canner and Passmore (1994). Some questions about the relationship between HMDA coverage and the income of neighborhoods have been raised (Berkovec and Zorn, 1996). But the HMDA coverage of loans extended by the commercial banks studied here receive careful scrutiny from bank regulators during regular examinations, making it less likely that this part of HMDA is systematically biased.

with mortgage lending unless the bank specializes in real-estate lending.

The results presented here are for banks who originated at least 10 home purchase loans, whose dollar value accounted for at least 10 percent of the bank's single-family mortgage portfolio. In addition, the bank had to have at least 10 percent of their assets in single-family mortgages. For 1993, the resulting dataset had 1,129 commercial banks, for 1994 it had 1,328 banks, and for 1995, 1,333 banks. (Note, these screens have reduced the number of banks who report HMDA data by roughly 3,000 for each year. Thus, relative to other commercial banks, the banks in our sample are more closely tied to real estate lending.)

To analyze this data, we pursued three distinct analyses : "heuristic", matched-pair and regression.

A Heuristic Analysis of Profit Variation

Because of our desire to focus on the financial characteristics of commercial banks who are active in lending in lower-income neighborhoods, or with lower-income borrowers, we segmented the mortgage-oriented commercial banks into five distinct groups, reflecting primarily their involvement in lower-income home purchase lending. The number of institutions in each group varies some from year to year, with the size of most groups is somewhat larger in 1994 and 1995. The five groups are:

(1) *The Common Group* - lenders with a moderate amount of lending (less than 25 percent of their HMDA home purchase loans) in lower-income areas or a moderate amount of lending (less than 50 percent) to lower-income individuals. These lenders also have little or no FHA/VA lending (less than one-third of their HMDA loans is the cut-off, but almost all have close to zero). For each of the three years, this group includes about 800 institutions.

(2) *Lenders Not Active in Lower-Income Neighborhoods* - lenders with moderate

amounts of lending to lower-income individuals, but with *no* lending in lower-income neighborhoods, and with little or no FHA/VA lending. This group includes about 200 institutions.

(3) *Lenders Active in Lending in Lower-Income Neighborhoods* - Any lender with more than 25 percent of their home purchase loans in lower-income neighborhoods, and with little or no FHA/VA lending. This group includes about 130 institutions.

(4) *Lenders Active in Lending to Lower-Income Borrowers* - Lenders who made more than half of their home purchase loans to lower-income borrowers, but less than 25 percent of their loans were made in lower-income neighborhoods. These lenders also had little or no FHA/VA lending. This group includes about 50 institutions.

(5) *FHA/VA Specialists* - Lenders where more than one-third of their home purchase loans were FHA/VA loans. This group includes about 80 institutions.

Characteristics of the Banks in these Five Groups

The five groups have distinct neighborhood and mortgage borrower characteristics, as shown in the top two panels of Table 1. The banks described in columns 1 and 2 are distinctly different in their neighborhood and borrower characteristics compared to the banks described in columns 3 and 4. In particular, the latter group has service areas and customers with lower incomes, lower home values and higher poverty rates. This is not surprising, given the way the lender groups have been constructed. (We show 1995 data in the table, but the results are similar for the other years.)

FHA/VA specialists are active in neighborhoods with high median incomes but relatively high poverty rates and proportions of minority residents, suggesting the FHA/VA oriented-institutions are focused on lending in heterogenous neighborhoods with a wide dispersion of income. The age of the houses in the neighborhoods (not

shown in table) where FHA/VA specialists are active is noticeably younger than the other groups. We conjecture that these banks may be focused on newer developments oriented toward first-time homebuyers on the fringes of metropolitan areas.

As described above, our analysis of profitability focuses on variable net operating income. We compare the median values for each group for each of the three years (table 1, panel titled "Comparison of Bank Performance").¹³ Across the three years, FHA/VA lenders are somewhat more profitable than the other groups. Lenders with no HMDA home purchase lending in lower-income tracts do seem to be slightly less profitable than the common group, as well as less profitable than other lenders. However, this difference is very small in 1995. Over the three years, lenders active in lower-income neighborhoods and lenders active with lower-income borrowers appear similar to banks in the common group, suggesting that any additional lending prompted by CRA to these borrowers or in these areas is not diminishing the profitability of banks that specialize in these areas.

FHA/VA specialists are the only group that consistently appears different (more profitable) than other banks. They tend to have higher interest and non-interest revenues compared to banks in the common group (rows 11 and 13). However, FHA/VA specialists also have substantially higher noninterest expenses (row 14). Average wages paid vary little across banks (not shown). But the FHA/VA specialists have larger numbers of employees for the assets carried than other banks (row 15), suggesting that involvement in FHA/VA programs requires greater levels of staffing.

¹³ We used the median two-sample test procedure provided in SAS (1990).

A Matched Pair Analysis of Profit Variation

Comparing the median values of the five groups is interesting but fails to control for many exogenous influences on the banks. Thus, we extend our comparison of the groups described above using a matched pair analysis. Matched pair analysis "controls" for variation in profits due to some exogenous factors but does not impose the continuity or distribution assumptions used in standard regression analysis. In studying profit functions, continuity is a significant and often poor assumption because many such functions incorporate binding constraints on profit maximization that lead to discontinuities. The distribution of bank profits might be very different for banks specializing in different niches or lines of business. If this is the case, then regression, which assumes the distribution is the same for all banks in the sample once one accounts for the exogenous parameters, might mismeasure the influence of these parameters.

In regression, the researcher's concern is often the specification of the model, whereas in matched pair analysis, the concern is how well pairs can be formed. If pairs are "well-formed," the discrepancies measured by matched pair analysis can be more robust than those measured with regressions. In addition, the results of matched pair analysis are often more easily interpreted.¹⁴

For each bank in the groups other than the common group we try to find a matching bank in the common group. Banks were stratified by two criteria: MSA location of the bank's headquarters and asset size. A regional matching criteria, such as MSA, is particularly important for mortgage-oriented banks because of the local

¹⁴For a comparison of regression and matched-pair analysis, see Todd (1995). For an extensive application of this type of analysis see, Avery, *et. al.*, (March, 1996).

nature of housing markets, as demonstrated by Blackley and Follain (1991), Schill and Wachter (1993), and Abraham, et. al. (1994). And classifying banks by asset groups is commonplace because banks of different sizes are seen as oriented toward different markets. (Here, bank were classified into three asset groups (less than \$300 million, \$300 million to \$1 billion, and greater than \$1 billion).

Matching is intended to be based on exogenous variables. Strictly speaking, location and asset size are not exogenous. However, these characteristics are all long-run investment decisions that reflect the business strategy or niche pursued by bank management. For the one year horizon used in this analysis, they are unlikely to change much.

To create a matched-pair "observation", a set of banks (for example, the FHA/VA specialists) were stratified by the two matching criteria, and then the variable net operating income for the banks within a particular asset-location cell was averaged.¹⁵ Since there are about 320 MSA and 3 asset categories, we have the potential for a sample of 960 for each year.

The average value of VNOI for each group of banks within a cell counted as one possible observation for our matched-pair analysis. Matched pairs were created for each asset-location cell where both banks in the common group and the comparison group existed. We then tested the median values of these matched-paired samples to determine if they were significantly different.

¹⁵We average the values within a cell to avoid defining a metric for the closeness of banks from the common group and the comparison within a cell. For example, if there are three common banks in the same asset size and location cell, and six comparison group banks in the same cell, then a metric for choosing which common bank matches which comparison bank is needed. Instead of defining such a metric, we use a different approach--we average across the common banks in the cell and the comparison banks within the same cell--and the averaged VNOI value for common banks within a given cell combined with the average VNOI for the comparison banks within the same cell creates one matched pair observation.

For 1993, the matched-pair analysis yields the same result as the heuristic analysis (bottom panel of table 2): FHA/VA lenders are more profitable; HMDA lenders that did not make home purchase loans in lower-income tracts are less profitable; and lenders active in lower-income neighborhoods and those active with lower-income borrowers appear similar to banks in the common group. Aspects of this pattern of relationships persist into 1994 (lenders with no HMDA home purchase lending in lower-income tracts are less profitable) and 1995 (FHA/VA lenders are more profitable). But during these years, none of these differences show up as statistically significant. Thus, again, there is no evidence that banks with high proportions of loans to lower-income borrowers or in lower-income neighborhoods are less profitable relative to other banks.

A Regression Analysis

In an earlier paper, we estimated a series of multivariate, linear, nested regression models of bank profitability. The series of nested regressions were organized by year (1993 and 1994 only), by ratios used to screen the data, and by "blocks" of right-hand side variables added to the regression. As shown in Canner and Passmore (1996), we found that variables measuring the extent of lending to lower-income borrowers or in lower-income neighborhoods had no significant relationship to bank profitability.

In this analysis, we focus on empirically implementing the theory outlined earlier. Using our theoretical framework and our earlier empirical analysis, we propose an empirical model of profits: We then estimate this model.

The block of right-side variables that is of primary interest comprises nine measures. First, the ratio of home purchase loans extended to lower-income borrowers to total home purchase loans for each bank, the ratio of home purchase

loans extended in lower-income neighborhoods to total home purchase loans, and the ratio of FHA/VA home purchase loans to total home purchase loans are included. In addition, a "spline" for each of these variables broken at the median value of the variable is included. That is, for a variable X , an additional variable $Z = X - \alpha$ is created where α is the median value of the variable X , and Z is set equal to zero if $X - \alpha < 0$. This spline allows us to capture the effects on profitability of specialization in a particular type of lending because lenders with high proportions of loans in a specialty are treated differently than lenders with low proportions of that specialty. Finally, three dummy variables are included to describe lenders that make no loans to lower-income borrowers, no loans in lower-income neighborhoods, and no FHA/VA loans respectively. These nine variables provide a description of bank lending similar to that provided by the five groups of banks described earlier. The linear regression approach, however, imposes the assumption that profitability varies continuously and proportionally (except at zero and at the spline break) by the ratios that are the focus of our attention.

As argued earlier, these variables describing loans extended to lower-income borrowers or in lower-income neighborhoods can be included in a profit function because they influence screening costs. Along these same lines, we also include two measures of the nature and extent of bank activity: the number of home purchase mortgages made by the bank, and the total number of HMDA mortgages made in census tracts reported by all lenders where the bank made mortgages.

Arguably, screening costs would fall as the number of mortgages rises because the bank would become more familiar with lending in the particular areas and products. The number of loans made by all banks in the census tracts where a particular bank made loans provides a gauge of market share of that particular bank because if the number of loans made by the bank is held constant in the regression,

then higher levels of this variable represents a smaller market share for the bank. Higher market share may result in lower screening costs because the bank's relatively greater presence in the community would provide it with lower cost information. However, if higher aggregate lending in a community implied lower screening costs for all banks in the community, then the influence of market share on the screening costs *for a given bank* might be offset somewhat.

Prices are the main ingredient in a profit function. Prices offered by individual banks for homogenous products in separate markets are difficult to observe. As is common practice in the literature on estimating bank profit functions, we calculate for each bank the average revenues and average expenses for a small number of highly aggregated products offered by these banks (consumer loans, real estate loans, and commercial and industrial loans) as a proxy for the prices of a bank's products. In addition, we assume the bank has unlimited access to nondeposit funds at market prices which we approximate by the average cost of nondeposit funds (for example, large CDs and repos).

We treat labor and capital (the bank's premises and equipment) as fixed factors. Core deposits, which are often included in bank profit regressions, are not included on the right-hand side of our regression. In our model, core deposits are fixed and generate a given amount of funding that may or may not be used to fund loans; they are not necessarily an input into lending. The bank is not compelled to put all core deposits into loans; instead it can purchase assets with a yield equal to its nondeposit funding costs. As outlined earlier, variable net operating income includes an adjustment to account for the effect of income generated by "fixed" core deposits on profits.

For the prices and fixed factors in our model, we adopt a Fuss quadratic normalized restricted profit function and impose the conditions for price convexity, as

described by Diewert and Fuss (1988). We normalize loan prices using the price (average interest cost) of nondeposit funds and normalize the fixed factors (here, only the number of employees) using the bank's dollar amount of premises and equipment. The square and cross-product for each price, along with the restrictions imposing convexity, are included in the profit regressions. We also include regional dummy variables representing each of the twelve Federal Reserve Districts to control for differences in regional economic conditions not captured by prices.

Regression Results

We run our regressions using both weighted and unweighted data, where the weights are the dollar amount of HMDA loans over total assets. The weighted method gives greater representation to banks where HMDA lending accounts for a relatively larger proportion of the bank's business, perhaps providing a stronger link between a bank's HMDA activity and its performance.

The variables of interest were not consistently statistically significant (table 3)¹⁶. The proportion of mortgages extended to lower-income borrowers was not statistically significant in the unweighted regressions, but was significant in the 1994 and 1995 weighted regressions. The coefficients in the 1995 weighted regression suggest that relative to banks without loans to lower-income borrowers, banks with loans to these borrowers had higher profits if they had a relatively small or large proportion of such lending. Figure 1 charts how the profits of banks extending lower-income loans changes relative to banks with no such loans as the proportion of lower-income loans increases as a percentage of the lender's portfolio. Profits are higher at banks with small proportions of lower-income borrowers and at banks where such lending

¹⁶The means and medians for variables used in the regression analysis are in appendix table 1.

exceeded 60 percent of a bank's HMDA lending relative to profits at banks with no such lending. Specialists in lending to lower-income borrowers, which were defined in the heuristic analysis to include only banks extending more than 50 percent of their loans to lower-income borrowers, were either slightly less or slightly more profitable than other banks.

The pattern suggested by the weighted 1994 regression was quite different. Profits at banks with little lending to lower-income borrowers were far below that of other banks (but note that the dummy variable that measures this is never statistically significantly different than zero), whereas profits at banks with moderate amounts of such lending were only somewhat below other banks. However, specialists in extending loans to lower-income borrowers were also substantially less profitable

Read literally, the 1994 and 1995 regressions might suggest that profits at banks with substantial lending to lower-income borrowers is no greater than that at other banks, and might even provide some evidence of lower profitability if the patterns for the coefficients had been consistent over time. But the inconsistency of these patterns, along with the lack of statistical significance for the lower-income borrower dummy variables in the 1994 and 1995 regression and the insignificance of all variables in the other regressions, causes us to have little confidence in the substance of these results. Thus, we read these regressions as being consistent with our heuristic and matched-pair analysis: there is not much difference in the profits of banks based on their proportion of loans to lower-income borrowers.

The proportion of mortgages extended to borrowers in lower-income tracts was significant only in 1993, for both the weighted and unweighted regressions. The coefficients suggest that profits were less for banks with small amounts of lending in lower-income tracts. Profits were slightly higher for banks that extend at least 7 percent of their HMDA loans to borrowers located in lower-income tracts. On average,

banks making such loans were more profitable than banks not making such loans in 1993. Our regressions for the three years suggest that the profitability of banks seems unrelated to, or perhaps slightly positively related to, the proportion of lending they extended in lower-income tracts.¹⁷

In sum, the regression analysis is consistent with the results of our heuristic and matched pair analysis: if CRA is pushing banks to make unprofitable loans, there is no compelling evidence that the extent of CRA-related lending, as measured here, has significantly lowered banks' overall profits. Our results are consistent with our earlier studies of bank profitability, which also found no consistent, significant correlation between borrower and neighborhood income characteristics and bank profitability (see Canner and Passmore, 1996, and Board of Governors, 1993).

However, like the heuristic and matched-pair analysis, the regression results provide some evidence that FHA/VA lending may be more profitable. The proportion of loans extended to FHA/VA borrowers was statistically significant in the 1994 unweighted regression and in all of the weighted regressions. However, the pattern of profits for banks with FHA/VA lending relative to other banks was different for each year. On net, the 1993 and 1994 regressions imply that a bank specializing in FHA/VA lending was substantially more profitable than one that did not. But in 1995, FHA/VA specialists earned less than banks with no FHA/VA loans.

As for the other variables included in the regressions, the number of HMDA mortgages made by the institution (Loan Count) had a strong, positive relation to profits in all regressions. In our model, this variable represents a factor influencing

¹⁷ However, profit maximization behavior may be adequately represented only by part of our model. Profit maximization implies that profits are convex in prices and concave in fixed factors. We imposed price convexity restrictions on our regressions. These restrictions were not rejected for 1994 and 1995, but for the 1993 regressions (both weighted and unweighted) they were rejected. The test for concavity in fixed factors is rejected only in the 1995 weighted regression.

screening costs, and the sign of the coefficient suggests that such costs fall as the number of loans increases, holding capital and labor fixed.

The other notable variable is the number of loans made by all banks in census tracts where a bank made loans. As described earlier, this variable could have either a negative or positive coefficient. It would have a negative coefficient, if higher market share translated into lower screening costs. It would have a positive coefficient if higher aggregate lending in a community implied lower screening costs for all banks in the community, and offset the influence of market share on the screening costs at a given bank. This variable was negative and statistically significant in some regressions, but was positive and statistically significant in other regressions, leaving the issue unresolved.

Conclusion

Our analysis of commercial bank profitability over the 1993-1995 period, and its relationship to home purchase lending in lower-income neighborhoods, or to lower-income borrowers, suggests that lenders active in lower-income neighborhoods and with lower-income borrowers appear to be as profitable as other home purchase lenders. However, we encountered numerous limitations in constructing our database and in measuring lending and profitability. In addition, this study was not designed to address the question of whether the profitability of all banks is being uniformly affected by CRA, or the question of whether profitability can be maintained if more lending is targeted toward lower-income neighborhoods or to lower-income borrowers. Furthermore, the "CRA effect" may be too small to currently detect in a bank's profits.¹⁸ But for 1993, 1994, and 1995, we find no compelling evidence of lower

¹⁸ But large enough to raise concerns among bankers about the long-run performance of such lending, particularly if the current higher rate of delinquencies portend higher rates of

profitability at commercial banks that specialize in home purchase lending in lower-income neighborhoods or to lower-income borrowers.

foreclosure. See Avery, *et. al*, (July 1996). Also, CRA protests against individual institutions might generate significant losses for those institutions, as suggested by Johnson and Sarkar (1996).

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