Credit
Research
Center

WORKING PAPER No. 28

An Investigation of Sex Discrimination in Commercial Banks' Direct Consumer Lending 1979

Krannert Graduate School of Management – Purdue University

AN INVESTIGATION OF SEX DISCRIMINATION IN COMMERCIAL BANKS' DIRECT CONSUMER LENDING

Richard L. Peterson, Purdue University

Abstract

In this paper, a model of consumer credit market discrimination, analogous to the best-known model of labor-market discrimination was developed and tested to determine if commercial banks behaved as profit-maximizers or discriminated against women before the Equal Credit Opportunity Act was passed. The model tested to see if women defaulted more or less frequently than men on direct bank loans or, once in default, caused greater or lesser losses for the bank. It also tested to see if women or men paid higher rates to obtain similar bank credit.

Statistical analysis showed that no sex-related differences existed either in the probability or amount of loan loss by sex. Further, for six of seven loan categories, no sex-related differences in loan rates were found. In the seventh category (household goods loans) men paid higher rates than women. Thus, the data are consistent with the profit-maximization, not the discrimination, hypothesis as it does not make sense for a profit-maximizing firm to discriminate.

These results suggest that thorough analysis is needed before additional laws are passed that assume firms are not profit-maximizers.

An Investigation of Sex Discrimination in Commercial Banks' Direct Consumer Lending

Richard L. Peterson*

I. Background

In 1974, the U.S. Congress enacted the Equal Credit Opportunity Act (ECOA) which, with subsequent amendments, was intended to eliminate discrimination in the granting of credit based upon a credit applicant's sex, marital status, age, race, national origin, religion, political affiliation, or receipt of welfare benefits. The driving force behind the enactment of ECOA was testimony presented before the National Commission on Consumer Finance (see [6], pp. 153-6, for a summary of that testimony) and the 93rd U.S. Congress [10, 11, 12]. That testimony presented largely anecdotal evidence that women were not treated on an equal basis with men in the credit markets, particularly in the mortgage credit markets. However, the cumulative effect of this testimony was to convince Congress, and even creditors themselves, that discrimination against women existed in the credit markets. For instance, the then President of the American Banking Association, Eugene Adams, was quoted in a reprinted speech ([l], p. 22, col. 3) as saying, "I think we have to acknowledge that banks, along with the rest of the credit industry, do in fact discriminate against women when it comes to granting credit. The question then becomes, is that discrimination justified?"[1]

---

* Senior Research Scholar, Credit Research Center, Krannert Graduate School of Management, Purdue University. The author wishes to acknowledge significant help from his wife, Carol, who cooperated with him on an earlier paper and provided advice on this paper. He also wishes to acknowledge David Bivin for providing valuable computational assistance and Robert W. Johnson, John M. Barron and William C. Dunkelberg for providing helpful comments on earlier drafts of the paper. Any errors and all opinions contained in the paper, are solely his own.

[1] This quotation reflects a semantic confusion that ran throughout the hearings and regulatory proceedings associated with ECOA. Creditors must by their very nature "discriminate" between good and bad credit risks. It is conceivable that credit "discrimination" would fall disproportionately on one sex if that sex were more adversely situated in the job market or exhibited poorer financial payment performance in general. In the context of our model, such "discrimination" could be "rational" and nonprejudical

Clearly, unequal treatment of identically situated individuals constitutes "unjust" discrimination. Similarly, equal treatment of unequally situated individuals may also constitute "unjust" discrimination unless information and transactions costs are sufficiently high relative to the significance of differences between people that creditors cannot profitably identify and treat different individuals independently. In the credit markets, however, as in the insurance markets, a certain amount of "just" discrimination must take place--based on each credit applicant's potential risk. Economically, such discrimination between good and bad risks is essential if a creditor wishes to avoid excessive credit losses. In this paper we note that discrimination is not "unjust" or "uneconomic" unless it systematically causes the expected present value of loans made to members of one group to exceed the expected present value of equivalent loans made to other groups.

The ECOA, as implemented through Regulation B of the Federal Reserve Board, has imposed significant compliance costs on creditors (see [3] and [9]). Also, by reducing the availability of information to credit grantors, ECOA has potentially diminished the efficiency of the entire credit granting process. Further, it has probably caused creditors to allocate credit to women less efficiently than in the past (see Chandler and Ewert [4]).[2]

At the time ECOA was enacted, only anecdotal evidence existed to suggest that sex-discrimination was a serious problem in the credit markets. By random chance, however, since markets do not always work perfectly, one would always expect some members of either sex to be treated unjustly. Thus, one should expect to find anecdotes that show discrimination against either sex. Consequently, because of the potential costliness of ECOA, careful statistical work should have been conducted prior to ECOA's enactment to determine the potential magnitude of the problems to be solved. One purpose of this paper is to show that sufficient data existed before ECOA was enacted that careful tests of discrimination could have been conducted.

Another purpose of this paper is to point out that discriminatory behavior in the credit markets is inconsistent with profit-maximizing behavior. It is often alleged that protection by regulators may shield banks from some of the rigors of competition, thereby enabling them to discriminate if they wish. However, even if it were protected from aggressive competition, a firm (or bank) would still reduce its profits if it unjustly discriminated against one or more groups of potential borrowers.

---

discrimination if it merely reflected underlying reality that affected sex-related default probabilities. In contrast, "prejudicial" discrimination would be evidenced by those who altered their economic behavior because they acted as if they received an economic gain from exhibiting a "taste for discrimination" that did not reflect purely objective factors. Unfortunately, in the testimony preceding enactment of ECOA, the distinction between rational and irrational discrimination was not finely made. Thus, allegations were often made, as in Adam's speech [1], that creditors "discriminated against" women in the granting of credit, even when the basis for such discrimination might have been "economic" rather than "prejudicial."

The ECOA tried to resolve this issue by stating that its purpose was to make credit available to all "creditworthy" borrowers without regard to sex or marital status. Such terminology could have justified the banning of only "prejudicial" discrimination without implying that the credit markets should provide a subsidy to protected classes of individuals to compensate for possible job or social discrimination that affected default probabilities. When this distinction was pointed out to the initial drafters of Regulation B (by the author, among others) they chose to ignore it. As a result, a case can be made that ECOA , as implemented by Regulation B, interferes with the making of efficient credit judgments, with an attendant loss in economic efficiency because it bans the collection of information that might be helpful in making rational credit judgments (see Chandler and Ewert [41).

[2] A number of the costs imposed under ECOA were necessary in order to remedy unequal, and often offensive, treatment of women by some creditors (more quickly than the market would have done -- as most complainants cited in the hearings indicated that they would no longer do business with the offensive creditor). In particular, the provision of dual credit records, upon request, for married men and women provides a symmetric treatment that previously was lacking. Similarly, women often suffered inequities relative to men because changes in their marital status often induced changes in creditor policies because of their change in name-whereas, men were not affected similarly because their name did not change with their marital status.

Because unjust discrimination is inconsistent with profit-maximizing behavior, economic theory strongly implies that systematic sex discrimination should not be pervasive in the credit markets. As a result, another objective of this paper is to suggest that any legislation that assumes, as ECOA did, that individual firms do not act as profit maximizers should be subjected to intense scrutiny and study before passage. This comment applies most directly to proposed extensions of ECOA, that continue to assume, as the initial act did, that unjust discrimination exists in the credit markets.

At present, congressional legislation is under consideration that would ban credit "discrimination" on the basis of residential location (96th Congress, 1st Session, S.15 and H.R. 3553) and occupation (H.R. 3553). Also, the Act could be extended further by pending regulatory interpretations. Such interpretations could apply "effects tests," developed in litigation involving job market discrimination to the credit markets. If so, the use of demographic information that is not explicitly banned by ECOA for use in credit evaluation, could be banned if it were found to be correlated with prohibited factors. Such interpretations potentially could extend the scope of the Act.

Finally, since ECOA has been enacted, there has been some uncertainty as to what practices are or are not considered discriminatory under the Act, Creditors are presently banned from using information in a way that has the "effect" of discriminating against one or another protected class of credit applicant--but credit "effects tests" are not well defined. The analysis presented in this paper provides a methodology that could be used to test for effective discrimination against any given "protected" group, provided that full information on credit applicants' sex and demographic characteristics were retained with all loan records.

II. Organization

The study is organized as follows. First, a model of credit market discrimination analogous to Becker's [2] model of job market discrimination is developed and its implications are derived. Second, it is argued that the discrimination model does not apply to banks, i.e., banks will not tend to discriminate. Finally, data on bank loans are used to test statistically whether the non-discrimination hypothesis, as the null hypothesis, should be rejected in favor of the alternative, credit discrimination, hypothesis.

III. A Model of Bank Credit Discrimination

In the absence of discrimination, we would expect a creditor to make any loan for which the expected present value, PV, was positive. However, if, prior to the enactment of ECOA, a lender were inclined to discriminate prejudicially, the expected present value that he would require to make a loan would be adjusted by a discrimination coefficient. This approach is analogous to Becker's model [2] of labor market discrimination where individuals who have a "taste to discriminate" adjust perceived prices or wages by a "discrimination coefficient." Thus, for a potential discriminator in the credit markets, the decision criterion for granting credit would be that the "adjusted present value," APV, be non-negative in order to grant a loan, where the APV is defined as follows:

(1) $APV_j^i = PV_j^i + DC_j^i = (1-p_j^i)\, G_j^i + p_j^i L_j^i + DC_j^i$ for all homogeneous types of bank consumer loans, j, and all borrower (sex) types, i, where

APV_j^i = the adjusted present value for loan type j made to borrower type i,

PV_j^i = the present value of loan type j to borrower type i,

DC_j^i = the discrimination coefficient for borrower type i on loan type j (DC will be negative if a borrower type is discriminated against),

p_j^i = the probability of default on loan type j by borrower type i,

G_j^i = the expected present value of the gain on loan type j made to borrower type i if no default occurs, and

L_j^i = the expected present value of a loss on loan type j made to borrower type i if a loss does occur.

The case for discrimination in the context of this model[3] rests on the assumption that DC is non-zero. The principal way this result can be explained is by assuming that bank loan officers, either because of ignorance or prejudice, do not treat borrowers of each sex equally when they apply for loans. In particular, supporters of ECOA argued that women had a more difficult time obtaining credit, had to face more embarrassing scrutiny (such as questions regarding their childbearing capacity), or encountered more restrictive collateral or cosigner requirements than would be the case for male borrowers.[4] It is not possible to determine statistically whether embarrassing questions are more frequently asked of women than of men during loan interviews. However, either the act of restricting credit to women or the requirement that women have stricter collateral or cosigner requirements than would otherwise be justified would affect the present value of loans made to females differently than the present value of loans made to males. Thus, by these arguments loans made to women and men are adjusted by different discrimination coefficients.

In particular, if bank loan officers systematically discriminated against females one would expect to find that $DC^f_j < 0 < DC^m_j$, where f refers to female and m to male borrowers. Since a loan will not be made unless its expected present value to the lender is non-negative, this implies that, on equivalent loans of

[3] Note that' the "taste for discrimination" factor in this model reflects purely "prejudicial" discrimination--as defined in footnote 1. One sex could still be "rationally" discriminated against, in the sense that a lower proportion of credit applicants from that group would obtain credit if a higher proportion of its members had elevated default probabilities. As a result the expected value of loans made to them (at interest rates equivalent to those offered the other sex) would be negative unless the riskier members of that group were denied credit.

[4] Supporters of ECOA, in testimony before Congress and the National Commission on Consumer Finance, alleged that women had more difficulty than men in obtaining or maintaining credit, more frequently were asked embarrassing questions when applying for credit, and more frequently were required to have cosigners or extra collateral. Gates [5] provides an excellent discussion of the case for ECOA. The National Commission on Consumer Finance reports on a small case study where unequal cosigner requirements were imposed ([6], p. 153), and much testimony presented to Congress [10], [11], [12] cites cases of unequal treatment of males and females in the credit market.

type j, female borrowers will have to compensate for their negative discrimination coefficient (DJ^f_j) by showing promise that (i) $L^f_j < L^m_j$,(ii) $p^f_j < p^m_j$, or (iii) $G^f_j > G^m_j$.

Banks may influence L^f_j and L^m_j , the magnitude of credit loss once a borrower defaults, by adjusting down payment, loan maturity, collateral, or cosigner requirements. More restrictive down payment, maturity, collateral, and cosigner requirements also tend to decrease a borrower's probability of default. Banks can adjust the probability of default in their loan portfolios with even greater precision by rejecting credit applicants who appear more likely to default than others. Thus, a bank loan officer who discriminated against women probably would adjust his behavior so that $p^f_j < p^m_j$ and, possibly, $L^f_j < L^m_j$ as well. Alternatively, a loan officer who was inclined to discriminate might raise rates charged on loans to females so that $G^f_j > G^m_j$. If credit rationing were widespread, many women would likely pay the premium rates in order to obtain credit rather than spending resources searching for a rate closer to G^m_j from another lender.

Thus, if lenders discriminated on the basis of sex, one would expect to find systematic evidence that $G^f_j \neq G^m_j$, $L^f_j \neq L^m_j$, or $P^f_j, \neq p^m_j$ in a manner consistent with one of the discriminatory patterns shown in Figure 1. In Figure 1, loan risk, as measured by both p^m_j vs. p^f_j and L^m_j vs. L^f_j is shown on one axis because factors that affect the potential loss on a loan (L) generally will also affect the probability of loss (p)--since most factors that reduce the potential loss to the bank and, concomitantly, increase the potential loss to the consumer from defaulting also reduce the probability that a consumer will ultimately default.

However, credit markets differ from the work environment that Becker [2] envisioned, where contact between prejudicially discriminating parties and recipients of discrimination is frequent. In the credit market the usual contact between the lender (the potential discriminator) and the borrower is limited to the brief period when the loan application is made. Thus, discrimination resulting from employees' aversion to contact with members of another group is likely to be much lower in a credit transaction than in a work environment. Further, banks generally are not sole proprietorships, (where part of the proprietor's returns could potentially be taken in utility derived from discriminating). Bank loan officers typically are supervised by profit-oriented managements that oversee loan officers' performance. They expect their loan officers to generate and maintain loan portfolios that do not generate excessive losses relative to their yields. Bank managements also generally constrain loan officers with regard to the rates and terms that they may negotiate on loans of a given type and maturity.

In such an environment, it does not appear likely that bank loan officers would systematically discriminate against females. Even if they were inclined to do so, they would have trouble justifying rejections of loan applications from good credit risk females--for, regardless of the sex of the borrower, good loans would raise the performance record of the portfolio for which each loan officer was responsible. Even if a loan officer were inclined to discriminate, profit maximizing behavior would call for management to induce loan officers to negotiate and grant all loans possible for which $PV \geq 0$, and to behave as if $DC^f = DC^M = 0$ when doing so.[5]

Thus, in this study we take as our null hypothesis that $DC^f = DC^m_j = 0$ for all loan types j. To support the alternative hypothesis, one must find empirical evidence to support one of the discriminatory lending patterns summarized in Figure 1.

[5] Prior to ECOA, only if a loan officer were willing to take a reduction in pay would a profit-oriented management be willing to tolerate sub par portfolio performance caused by the loan officer's discriminating actions.

IV. Empirical Tests

In this study, empirical tests were conducted to determine if there were any significant sex-related differences in (i) the ratio of losses to the amount of loans (L_j), (ii) the probability of loss (p_j), and (iii) rates of charge (G_j) on (otherwise similar) direct bank consumer loans that were consistent with the various possible patterns of discrimination described in Figure 1.[6] Seven major types of direct loans were considered--auto loans secured by new cars, auto loans secured by used cars, other auto loans, loans to purchase household goods, home improvement loans, debt consolidation loans and all other consumer loans (except those used for business purposes or to purchase a plane, boat, or Mobile home)--as well as the total for all the aforementioned categories.

The data used in the study were obtained from 30 banks in five regions of the country. Each sample region consisted of a major metropolitan area plus surrounding environs. The data were collected by the Federal Reserve System over the period 1966-71. In the Federal Reserve Survey, sample banks reported thorough information on the loan characteristics and the socioeconomic characteristics of the borrower on 100 percent of their charged off loans and on randomly-selected samples of ten percent of their paid-off and new loans. Because the purpose of the Federal Reserve study was to investigate cyclical changes in credit availability, and sex-discrimination in lending was not an issue at the time the data were collected, it was not felt likely that the data would be biased in any manner that would affect studies of sex discrimination in bank lending.

The Federal Reserve data included information on indirect loans (loans made by dealers and purchased by banks) in addition to data on loans made directly by banks. Because returns to dealers can vary with profits on goods sold as well as with credit terms, and dealers often set some or all terms on indirect credit contracts, all data on indirect loans were excluded from this study. Tests conducted on the Federal Reserve data are described below.

A. Tests for differences in loss ratios by sex ($H_o : L^f_j = L^m_m$ vs. $H_A : L^f_j \neq L^m_j$

The sample of charged-off bank loans included approximately 9,000 observations. However, a majority of those observations related to indirect loans rather than loans made directly by the bank to credit applicants. In addition, some loan records lacked information on the sex of borrower, loan type, amount of loan, or amount of loan charged-off. All such loans were eliminated from the sample. Finally to eliminate loan records containing possibly erroneous data, a small number of loans (less than 100) were filtered out of the sample because the amount charged-off exceeded the amount of funds advanced by the bank by 25 percent or more. A 25 percent leeway was used in the edit standard because some banks also sell insurance on consumer loans or record interest charges incurred during delinquency periods as balances due when the loan is ultimately charged-off, Thus, it is conceivable that the amount charged-off could exceed the initial amount of the loan by a small amount. After eliminating indirect loans and all direct loans with bad or missing data, approximately 3,000 loans remained in the sample.

---

[6] This analysis differs significantly from an earlier analysis of the same data base conducted by Peterson and Peterson [8] in that (i) it emphasizes only bank direct loans, where all loan terms and the availability of credit are determined solely by the bank, and excludes consideration of "indirect" bank loans, where loan contracts, and their terms, are generated by dealers (who may expect to receive a portion of their gain through the profits on sales of goods rather than through finance charges per se) and sold to the bank, (ii) it provides a thorough analysis of loan rate data, which previously were not available, and (iii) it uses and analyzes a much more comprehensive set of data on loan losses and charge-offs than was previously available.

The ratio of the amount charged-off to the amount of loan (as measured by the amount of money disbursed by the bank) was tabulated for each *of* the loan types studied plus all bank direct consumer loans for both males and females. The results of those tallies are shown in Table 1. They are presented in two forms. On the left they are presented as averages of charge-off/loan amount ratios for each of the various types of loan. In particular, for all N_j loans of type j, if CO_{ij} equals the amount charged-off and L_{ij} equals the amount of loan for each loan i, the left-hand side statistics are calculated as $[\Sigma_i Co_{ij}] / N_j$.

On the right, the loan-loss ratios are calculated as $\Sigma_i Co_{ij} / \Sigma_i L_{ij}$ for each loan type j. Thus those statistics measure average values of total charge offs for each sex and loan type relative to the total value of loans in each sex and loan type category. Standard deviations were constructed for each statistic and used in t-tests to determine if there were significant differences in mean charge-off rates for loans made to males versus loans made to females. In the left hand columns, variances and standard deviations were calculated on a <u>per loan</u> basis. In the right-hand columns, variances and standard deviations were calculated on a <u>per</u> dollar of loan extensions basis (i.e., in calculating standard deviations the loss ratio for the kth loan was weighted by $L_{kj} / \Sigma_i L_{ij}$, or the size of the loan relative to the total value of all loans in that loan category).

The statistics presented in Table I show that charge-off-to-loan value ratios for males and females are practically identical. Further, even where they are substantially different, as is the case with home improvement loans, the variance in charge-off ratios is sufficiently great that no difference (as measured by t-statistics) is even close to being significant. Thus, these tests provide no evidence that the null hypothesis H_O: $L^f_j = L^m_j$ should be rejected either for any major type of direct bank consumer loan or for direct bank consumer loans in general.

B. Tests for Differences in Credit Availability by Sex ($H_0 : p^f_j = p^m_j$ vs. $H_A: p^f_j \neq p^m_j$.)

These tests are based on the assumption that the best credit applicants of either sex will get credit because of management review of loan officers and their loan portfolios. This assumption rules out the possibility that loan officers discriminate against members of one sex on a purely <u>random</u> basis. For instance, if every tenth applicant of a sex were rejected regardless of their credit qualifications, such random discrimination would be undetectable given the tests described in this section. However, by assuming that management oversight and portfolio profit maximization incentives will induce loan officers to grant loans to the best credit risk applicants (with positive APVs) regardless of sex, purely random discrimination would not be possible.

Nonetheless, if top credit risk customers of both sexes received credit, a loan officer with a taste for prejudicial discrimination would grant loans less freely to marginal risk credit applicants against whom he was inclined to discriminate. That is, if a loan's PV were small, the APV could more easily (and less conspicuously) be negative. Further, as the PV became smaller due to higher risk, for a given discrimination coefficient, the probability of rejection would rise with the risk of the loan. As a result, if bank loan officers were to limit credit to only the best credit applicants of one sex, while giving preferential treatment to borderline credit applicants of the other sex, one would expect to find that the probability of default was significantly lower for borrowers of the sex discriminated against than for borrowers of the favored sex.

Systematic discrimination of this type would imply that the proportion of members of the sex discriminated against will be higher among a sample of all "good" loans than among a sample of "bad" loans made by commercial banks. If such a result were to be found, it would be tantamount to showing that the probability of default was lower for accepted members of the less-favored group than for those of the more favored group (see Peterson and Peterson [8] for a proof of this proposition).

In the subsequent analysis, data from the Federal Reserve samples of charged-off and paid-off bank consumer loans were used. The 100 percent sample of charged-off bank direct loans contained nearly 3000 observations. The sample of good paid-off bank direct loans contained approximately 12,000 observations. Exact default probabilities could not be calculated from these samples because they were collected independently (with good loans sampled with approximately a one-tenth chance and all bad loans sampled). However, it is possible to test whether loans to either sex were disproportionately represented in either sample. If either sex were discriminated against, one would expect the percentage representation of that sex in the sample of charged-off loans to be lower than its percentage representation in the sample of good paid-off loans.

Table 2 presents the results of such an analysis for each type of consumer loan considered. For both the good and bad loan samples, the number of loans made to males and females are tabulated and the proportions of loans made to males is recorded. The right hand column presents t-statistics that can be used to test for the significance of differences in the proportions of loans made to males (or females, with a change in sign) in the two samples. The t-statistics were calculated on the assumption that for relatively large numbers of observations (see Ostle [7], pp. 76-78) a binomial distribution can be approximated by a normal distribution.

Analysis of the t-statistics and of the proportions of males and females represented among all "good" and charged-off direct bank consumer loans recorded in Table 2 shows that no significant differences (at the 95 percent, two-tailed level) exists in the proportionate representation of each sex either for any particular type of consumer loan or for all bank direct consumer loans in total.[7] Thus, these results are consistent with the assertion that the credit quality of accepted female applicants was no better, or worse, than that of accepted male applicants. More precisely, these results are consistent with the null hypothesis that for direct bank consumer loans, $p^f_j = p^m_j$ for all j.

C. Tests of Differences in Returns (Loan Rates) by Sex (H_0: $G^m_j = G^f_j$ vs. H_A: $G^m_j \neq G^f_j$)

Sample banks reported very detailed information on the type of loan, loan characteristics, and socio-economic characteristics of borrowers on a random sample of ten percent of all new consumer loans that they made while participating in the study. Reported information included data on the amount of the loan, the number and amount of monthly payments, and the amount of the final payment. That information was then used to calculate the nominal rate of return on the loan, assuming that all data were correct and the loan was repaid as scheduled.

Detailed information on borrowers' demographic characteristics and loan characteristics was less readily available on paid-off than new loans, particularly at some banks. This was so because many banks did not collect all the requested information until after the survey started, and loans were paid-off only several years later (often after the bank had been rotated out of the sample or the study was discontinued). Thus, data on new loans rather than data on paid-off loans, were used to test whether loan rates charged males and females were the same on similar types of loans. This procedure also eliminated any secular bias that could have occurred if loans made to males and females were differentially made at points in time when interest rates were high or low.

In order to eliminate incorrectly calculated rates resulting from erroneous data all loans with the following characteristics were eliminated from the sample of new loans: (i) loans with inadequate information to compute loan rates, (ii) loans with calculated rates below three percent or above 51 percent (as such figures were assumed to be either unrealistically low or high, possibly because of incorrect data), and (iii) loans for any maturity that

[7] To achieve a 95 percent confidence level that no one of n simultaneous tests is statistically significant, the confidence level for each individual test should be set at x so that $x^n = .95$. In this case, no adjustment of this sort was necessary because not even one of the individual tests was, prima facia, significant at the 95 percent (two-tailed) confidence level.

was not an even multiple of six months. The last edit standard was imposed because some banks record three-year loans as 37-month loans, yet their loan rate, in fact, should be calculated in the same manner as for 36-month loans. Further, loans with mispunched data, such as 24-month loans, might be erroneously reported as 34-month loans, with attendant miscalculations in loan rates. Finally, as in the preceding analyses, indirect loans (loans purchased from dealers, who, in turn, set customer loan rates) were also excluded from the sample.

When this process was completed, approximately 13,500 new bank direct loans remained in the sample. These were divided in half by taking every other one. The first half of the sample was used to experiment with alternative specifications that could be used to explain the manner in which loan terms and differences in socio-economic characteristics affected bank loan rates. The second half of the sample was held back and used only to generate the final regression results reported in Table 3.

Four basic models of the determinants of bank loan rates were tested. First, for each major type of consumer loan, the loan rate was regressed solely upon the sex of the borrower. In this construction, Model 1, any differences in loan rates related to differences in loan amounts, maturities, collateral, income, or other attributes potentially related to a borrower's sex would be reflected in the sex coefficient. Thus, this test would be most likely to show a sex-related difference in loan rates even if such a result might be spurious. For instance, women have lower average incomes than men. As a result, they may obtain smaller loans. Since rates tend to be higher on smaller loans, a significant rate difference might reflect differences in job market opportunities and loan sizes by sex, rather than credit discrimination per se.

The second model for loan rate determination used all objective factors relating to the terms of a loan (its size, maturity, collateral, year and metropolitan region in which it was originated, trade-in, cosigner, and down payment requirements) in addition to a sex-related dummy variable in an attempt to determine bank loan rates. This model was designed to test whether members of one sex paid more or less to borrow once all objective factors related to the characteristics of the loan had been taken into account. This model excluded all socio-economic data related to the borrower except for the single variable, sex.

As a variation of the second model, the third model recognized certain cross-elasticity of demand considerations exist that might affect loan rates in addition to the objective factors related to a loan. Such factors, which frequently are taken into account by banks in establishing their loan policies, include: (i) whether a loan customer is a depositor of the bank, (ii) whether the loan customer is an employee of the bank, and (iii) whether a loan customer has engaged in previous financial transactions with the bank. In general, one would expect rates to be lower if any of these circumstances existed. Reportedly, many banks give preferred loan terms to depositors and customers, while less uncertainty would exist about the potential credit performance of previous customers.

The final model, Model 4, used all available socio-economic information, including data on the borrower's sex, age, occupation, employment source, job longevity, address stability, marital status, number of dependents, home ownership, phone ownership, debt ratio, income, and credit references in addition to all independent variables used in Models 2 and 3 in order to explain bank loan rates. In this model it was felt that possible colinearity among variables would tend to reduce the significance of the sex related dummy variable. Hence, were that variable to remain significant in Model 4, it would provide strong evidence that the sex-variable was significantly related to rates charged by banks on new loans. Table 3 summarizes the results of these tests for all major types of consumer loans.[8]

[8] Greater detail on these regressions can be obtained from the author upon request.

The data summarized in Table 3 show that in only one case, household goods loans, was the sex variable significant in both the weakest (Model 1) and the strongest (Model 4) tests of its impact on loan rates. The negative sign of the sex variable (which equaled one for loans made to females) indicates that women paid significantly less for household goods credit at banks than men. Hence, if anything, it shows rate discrimination against men. In all other cases--with the sole exception of Model 2 for the "all other" loan category, where women again paid less--there was no significant difference between rates charged males and females on any type of consumer loan in any of the models tested.

Overall, the results of our tests show that the null hypothesis (H_0: $G^m_j = G^f_j$) is rejected for only one of seven types of consumer loans. That type was household goods loans, for which men apparently paid significantly higher rates than women. This finding could have resulted from a loan composition problem. For instance, men may typically purchase different types of household goods on credit than women, and rates may vary with the types of goods financed. However, insufficient information exists to test this hypothesis.

V. Summary and Conclusions

Data on 3,000 charged-off, 12,000 good paid-off, and 13,500 new bank direct consumer loans were analyzed to see if commercial banks systematically discriminated against one sex or another in granting consumer credit by (i) over-securing loans, thereby reducing loss ratios and probabilities, (ii) credit-rationing to reduce loss probabilities, or (iii) charging higher rates to certain borrowers based on sex. In every case but one, the profit-maximization (null) hypothesis that commercial banks did not discriminate on the basis of sex was supported by the empirical evidence. The sole exception involved rates paid on household goods loans, where males apparently paid higher rates than females.

Overall, these findings provide strong evidence that, prior to enactment of ECOA, commercial banks did not systematically discriminate against potential borrowers based upon their sex. If women found it more difficult than men to obtain credit, the root cause apparently was not due to prejudicial credit rationing, as was frequently alleged.

Since this study indicated that bankers' present value calculations on consumer loans apparently were not biased by a "taste for discrimination," if women in general (and not just outlying observations drawn selectively from the credit-experience distribution) found it more difficult than men to obtain credit, that fact would have to be ascribed to socio-economic differences in job stability and renumeration and child-care responsibilities that affect the relative probability of default of men vs. women, rather than by bankers' tastes for credit discrimination, per se.

These findings are important because they suggest that legislation based on anecdotal evidence may well be misdirected. That is particularly likely to be the case if the legislation is based on the premise (as both ECOA and proposed extensions to ECOA are) that firms are not profit maximizing institutions.

If the assumption underlying a legislative proposal is that firms are not profit maximizers,[9] these results suggest that careful statistical studies should be conducted to highlight actual problem areas in detail before the legislation is enacted. For instance, before ECOA was enacted it was alleged that offensive and unequal treatment of women in the consumer credit application and record-keeping process systematically occurred. If so, such behavior most likely was severely reduced by sanctions imposed by ECOA. Thus, aspects of ECOA

[9] In the case of commercial banks, it is often alleged that they are insulated from competition by regulators who do not wish them to fail. Thus, they can afford to discriminate prejudicially if they wish. However, regardless of whether they operate in competitive markets or not, it is not in their interest as profit-maximizers to discriminate.

that were designed to remove arbitrary and unequal treatment in the consumer credit markets could be well justified if the practices they remedied (including a failure of creditors to allow married women to obtain or maintain credit and credit records in their own name, or creditors' probing of one sex of borrower, but not the other, with sensitive questions--such as questions relating to the fertility of potential women borrowers) were sufficiently widespread and socially reprehensive as to justify the costs of regulation. However, this study suggests that aspects of ECOA that were intended to stop credit discrimination against women were unnecessary--as prejudicial discrimination did not exist in bank consumer credit markets.

REFERENCES

1. Adams, Eugene, "Speech before the Florida Bankers Association," reprinted in The American Banker, June 25, 1973. (p.22, col. 3)

2. Becker, Gary S., The Economics of Discrimination, The University of Chicago Press, 2nd Edition, 1971.

3. Board of Governors of the Federal Reserve System, "Exercise of Consumer Rights Under the Equal Credit Opportunity and Fair Credit Billing Acts," Federal Reserve Bulletin, May 1978, pp. 363-66.

4. Chandler, Gary S. and David C. Ewert, "Discrimination on the Basis of Sex Under the Equal Credit Opportunity Act," Working Paper No. 8, Credit Research Center, Purdue University, West Lafayette, Indiana, 1976.

5. Gates, Margaret J., "Credit Discrimination Against Women: Causes and Solution," Vanderbilt Law Review, Vol. 27, No. 3 (April 1974).

6. National Commission on Consumer Finance, Consumer Credit in the United States: Report of the National Commission on Consumer Finance, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 1972.

7. Ostle, Bernard, Statistics in Research, 2nd Edition, Iowa State .University Press, Ames, Iowa, 1963.

8. Peterson, Richard L. and Carol M. Peterson, "Testing for Sex Discrimination in Commercial Bank Consumer Lending," in proceedings of a conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, 1978.

9. Smith, James F., "The Equal Credit Opportunity Act of 1974: A Cost/ Benefit Analysis," The Journal of Finance, May 1977.

10. U.S. 93rd Congress, 2nd session, Committee on Banking and Currency, Credit Discrimination: Hearings before the Subcommittee on Consumer Affairs on H.R. 14856 and H.R. 14908, Parts 1, 2, and 3, 1974.

11. U.S. 93rd Congress, 1st session, Economic Problems of Women: Hearings before the Joint Economic Committee, Part -1, 1973.

12. U.S. 93rd Congress, lst session, Senate Committee on ' Banking, Housing, and Urban Affairs, Truth in Lending Act Amendments, S. Rep. No. 278, 1973.

Figure 1: Possible Patterns of Discrimination

Conditions	$L_j^f < L_j^m$ or $p_j^f < p_j^m$	$L_j^f = L_j^m$ and $p_j^f = p_j^m$	$L_j^f > L_j^m$ or $p_j^f > p_j^m$
$G_j^f > G_j^m$	I: Strong Discrimination Against Females	II: Discrimination Against Females on the basis of rates but not on the basis of credit availability, collateral, or cosigner requirements.	III: Ambiguous Case: Higher rates paid by females may merely compensate for higher risks of loss on their loans.
$G_j^f = G_j^m$	IV: Discrimination Against Females on the basis of credit availability, collateral, or cosigner requirements, but not on rates.	V: No Evidence of Discrimination	VI: Discrimination Against Males on the basis of credit availability, collateral, or cosigner requirements, but not on rates.
$G_j^f < G_j^m$	VII: Ambiguous Case: Lower rates paid by females may counterbalance lower risks of loss on loans made to them.	VIII: Discrimination Against Males on the basis of rates but not on the basis of credit availability, collateral, or cosignor requirements.	IX: Strong Discrimination Against Males

Table 1: Charge-off Ratios and Standard Deviations by Sex and Type of Loan, for Bank Direct Consumer Loans

Type of Loan	Number of loans, charged-off ratios and (standard deviations)based on numbers	Number of loans, charged-off ratios and (standard deviations)based on numbers	Differences and (t-test value)	Number of loans, charged-off ratios and (standard deviations)based on numbers	Number of loans, charged-off ratios and (standard deviations)based on numbers	Differences and (t-test value)
	Males	**Females**		**Males**	**Females**	
New Auto secured loan	136	24		136	24	
	.400	.350	050	.388	.372	.016
	(.276)	(.287)	(.126)	(.274)	(.302)	(.039)
Used auto secured loan	387	45		387	45	
	.484	.462	022	.461	.421	.040
	(.295)	(.287)	(.053)	(.289)	(.274)	(.100)
Other auto loans	67	9		67	9	
	.656	.632	.024	.610	.575	.035
	(.344)	(.333)	(.050)	(.367)	(.299)	(.074)
Household goods loans	119	13		119	13	
	.630	.646	-.016	.623	.579	.044
	(.306)	(.326)	(-.036)	(.315)	(.318)	(.098)
Home improvement loans	153	7		153	7	
	.437	.628	-.191	.411	.525	-11.4
	(.348)	(.367)	(-.378)	(.345)	(.391)	(-.218)
Debt consolidation loans	512	75		512	75	
	.640	.665	-.025	.640	.631	.009
	(.322)	(.328)	(-.054)	(.317)	(.359)	(.019)
All other consumer loans (except plane, boat, mob. Home and business loans)	1018	141		1018	141	
	.666	.627	-.039	.681	.641	.040
	(.328)	(.325)	(.084)	(.337)	(.348)	(.083)
All bank direct loans	2475	328		2475	328	
	.599	.601	-.002	.565	.539	.026
	(.332)	(.330)	(-.004)	(.336)	(.349)	(0.054)

Table 2: Performance on Bank Loans by Sex

	Good Loans # Male	Good Loans # Female	% Male	Charged-off loans # Male	Charged-off loans # Female	% Male	t-Test for differences in percentages
New auto	1,717	184	90.3%	141	25	84.9%	+1.88
Used auto	1,579	171	90.2	408	49	89.3	.59
Other auto	388	45	89.6	75 +	11 +	87.2	.61 +
Total auto	3,684,	400	90.2	624	85	88.0	+1.68
Furn & appliances	622	74	89.4	118	13	90.1	- .25
Radio,TV,HiFi	125	14	89.9	12 +	I +	92.3	- .29 +
Total household goods	747	88	89.5	130	14	90.3	- .30
Home improvement	1,236	116	91.4	179	10	94.7	-1.83
Consolidate bills	1,425	211	87.1	561	77	87.9	-.54
All other (except plane, boat, mobile home, and business loans)	3,378	550	86.0	1,057	151	87.5	-1.36
Grand Total	10,470	1,365	88.5	2,551	337	88.3	.20

+ In these cases, insufficient observations exist for the normal approximation to be reliable. In particular, Ostle ([7], p. 78) notes that "we should realize that, for a given n, the normal curve gives a better approximation when p is close to 1/2 than when p is close to 0 or 1. On the other hand, if n is large enough (say 100 or more), the [normal] approximation will be satisfactory for most values of p." Ostle goes on to note that, when the sample size exceeds 100, only when p is very close to 0 or 1, as in "reliability work," the normal approximation may not be satisfactory.

Table 3:Significance of Sex Variable in Explaining Bank Direct Loan rates (When Differing Amounts of Data on Loan and Borrower Characteristics are Taken into Account)+

		Coefficient for "female" variable			Full regression characteristics			
Type of loan	**Number of loans**	**Value**	**Standard error**	**(1-significance) based on partial F**	**R^2**	**R^{-2}**	**F**	**(1- significance) of F value**
New auto	1171							
Model 1		-.51	.28	.069	.003	.002	3.31	.069*
Model 2		-.45	.28	.100	.074	.056	3.99	000*
Model 3		-.26	.28	.346	.095	.074	4.60	.000*
Model 4		-.48	.32	.137	.156	.113	3.60	.000
Used auto	1084							
Model 1		18	.40	.656	.000	.000	0.20	.656
Model 2		-.01	.38	.977	.110	.090	5.68	.000*
Model 3		.14	.39	.712	.119	.097	5.47	.000
Model 4		.08	.47	.857	.177	.131	3.86	.000
Other auto	253							
Model 1		- .35	.91	.703	.001	.000	0.15	.703*
Model 2		-1.32	.88	.133	.288	.201	3.51	.000
Model 3		-1.17	.87	.182	.312	.223	3.49	.000*
Model 4		-1.16	1.11	.297	.445	.276	2.62	000*
Household goods	407							
Model 1		-2.04	.65	.002*	.023	.021	9.68	.002*
Model 2		-2.51	.62	.000*	.232	.179	4.41	. 000*
Model 3		-2.21	.64	.001*	.248	.190	4.29	. 000*
Model 4		-2.75	.80	.001*	.356	.244	3.18	. 000*
Home improvement	708							
Model 1		.72	.50	.145	.003	.002	2.13	.145

Model 2		.28	.47	.551	.239	.211	8.56	. 000*
Model 3		.32	.47	.497	.251	.220	8.11	. 000*
Model 4		.48	.61	.430	.284	.219	4.36	. 000*
Debt consolidation	830							
Model 1		- .22	.38	.559	.000	.000	0.34	.559
Model 2		- .29	.36	.432	.150	.123	5.45	. 000*
Model 3		- .15	.36	.678	.164	.134	5.42	. 000*
Model 4		.21	.47	.649	.222	.161	3.65	. 000*
All other loans++	2235							
Model 1		- .26	.31	.389	.000	.000	0.74	.389
Model 2		- .65	.30	.031*	.091	.080	8.20	. 000*
Model 3		- .49	.30	.103	.098	.086	7.96	. 000*
Model 4		- .63	.37	.093	.129	.105	5.28	. 000*

Table 3: Continued

+Model 1 used only sex as an independent variable.

Model 2 used sex, the amount and term to maturity of the loan, information on trade-in and down payment values and the nature of collateral used on a loan, information on whether there was a cosigner on the note, and data on the year and region of the country in which the loan was made as independent variables.

Model 3 was identical to Model 2 except it added three independent variables that could be associated with joint-product considerations that could affect loan pricing. In particular, it included

(i) a variable that indicated if consumers either did not have, or the bank did not know if they had, checking and savings accounts--as often banks give preferred rates to their own depositors,

(ii) a variable that indicated if the borrower were employed in "banking, finance, or real estate," as often banks give preferred rates to their own employees, and

(iii) a variable that indicated if the borrower had borrowed at the bank before, as that fact could reflect an ongoing relationship that could affect the loan rate. Model 3 therefore, included all objective factors related to the nature of the loan that conceivably could affect loan rates.

Model 4 was identical to Model 3, but also included fairly complete socio-economic information on the borrowers--including data on occupation, source of employment, marital status, dependents, income, debt-to-income ratio, years-on-the-job, years-at-current address, and credit references. In addition, it included home ownership and phone ownership data--as such information is often used in credit scoring models.

++ "All other" consumer loans, include other loans made by bank consumer loan departments with the exception of loans made to purchase "planes, boats, or mobile homes" or "business" loans

*Significant at the 95 percent (two-tailed) confidence level.