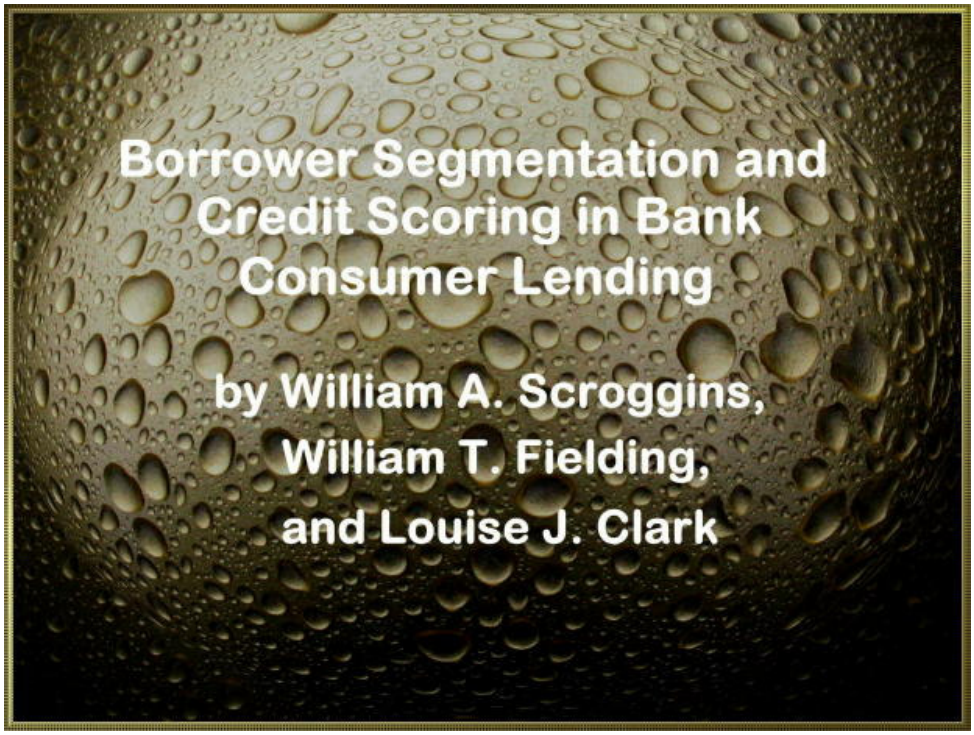

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Peer Reviewed

ABSTRACT

This paper adapts the discriminating monopolist model to consumer lending and provides results of an empirical study pertaining to the implications of this model. The case of second-degree price discrimination is used to illustrate how banks segment consumers into categories and price each category differently in order to increase profits and stockholder wealth. The issue of the asymmetric information problem is examined within the context of credit bureaus and credit scoring. Also, the paper reports the results of a study of 156 banks conducted in the summer of 2004 that examined the extent to

which specific factors are used to segment consumers into categories when making consumer loans. Seventy-eight percent of respondent banks indicated that credit risk is a primary factor used in segmentation. The factor given the highest relative importance rank in segmenting customers was also credit risk, followed by collateral, and the purpose of the loan. Overall, the results are consistent with the model investigated in the paper. By incorporating segmentation into risk-based pricing of consumer loans, banks increase profitability and the wealth of their stockholders.

INTRODUCTION

A body of literature on consumer lending has shown that asymmetric information may prevent the efficient allocation of lending, resulting in credit rationing (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981). According to this literature, because of the existence of informational asymmetries, lenders fail to observe some relevant characteristics of potential borrowers and have no way of learning about them. Were full information available, the volume and distribution of lending would doubtless be very different from the outcome under asymmetric information (deMeza and Webb, 2000).

However, lenders can improve their knowledge about new customers by exchanging information with other lenders through information brokers, who are generally known as "credit bureaus." The latter collect, file, and distribute the information voluntarily supplied by their members and operate on the principle of reciprocity: lenders who do not provide data are denied access to the bureaus' files (Pagano and Jappelli, 1993).

Information sharing through credit bureaus is important for a number of reasons: it may increase the degree of competitiveness within credit markets, improve efficiency in the allocation of credit, and increase the volume of lending (Vives, 1990). This creates the potential for an increase in the size of the credit market that may generate additional information sharing, which may, in turn, lead to more lending activity. According to Pagano and Japelli, a net benefit is derived from the creation and participation in a credit bureau; the gain from reducing the asymmetry of information between borrowers and banks increases as the uncertainty about the quality of applicants decreases.

The purpose of this paper is to adapt the discriminating monopolist model to consumer lending and provide results of an empirical study pertaining to the implications of this model. The paper utilizes a second-degree price discrimination model to illustrate how banks segment consumers into categories and price each category differently in order to increase profits and stockholder wealth. The following section examines how performance gains in banking are linked to financial innovation that encouraged growth in the use of credit scoring and risk-based pricing.

BANKING INDUSTRY PERFORMANCE

The U.S. banking industry has been substantially deregulated over the last two decades. With geographic and product restrictions greatly relaxed, the industry has undergone a significant consolidation as thousands of banks have disappeared because

of mergers, acquisitions, and failures. Performance gains in the banking industry have also been linked to improvements in financial technologies resulting in the development of more sophisticated and complex credit evaluation models, including the use of advanced statistical techniques. The financial innovation was aided significantly by the remarkable progress during this period in computer and information technologies as well as the relatively new field of artificial intelligence. This raises the obvious question: How have these developments affected the performance of banks? (Berger and Mester, 2003).

Over the ten-year period from 1993 to 2003, the annual return on assets (ROA) for commercial banks in the United States was historically high; the average for the decade was 1.15 percent, while from 1950 to 1985 the average was 0.72 percent. In general, the trend of rising bank ROAs that began in the early 1990s has been relatively uniform across bank size. There are several possible factors that could explain this rise in ROAs. One possibility is there has been an increase in the efficiency by which banks manage their assets. A second possible reason is that banks are engaging in riskier activities that are associated with a higher rate of return. The risk-adjusted asset base used for regulatory purposes grew at a higher rate than unadjusted bank assets in the 1990s. This indicates that banks are taking on more risk, based on the regulatory risk classification of assets. A third possible explanation is the fact that the 1990s was a period of continuous innovation in the banking industry, including ATM technology and credit scoring (Ennis, 2004).

Credit Scoring and Risk-Based Pricing

Credit scoring is the process of assigning a single quantitative measure or score to a potential borrower, representing an estimate of the borrower's future loan performance (Feldman, 1997). The use of credit scoring has grown dramatically. Initially, scoring was limited to the front-end evaluation of a credit application and deciding whether to approve a consumer loan. Creditors now use scoring to devise risk-based pricing for their loans. It is extensively used throughout the banking industry across the spectrum of consumer credit: personal loans and personal lines of credit, direct and indirect auto loans, credit cards, home equity loans, and mortgage loans (Asher, 1994). Increasingly, small and medium-sized banks have joined the large banks taking advantage of this. This trend is part of the technology transformation that has occurred in banking as an abundance of customer data has become available (Barefoot, 1997).

Banks have found they are able to extend more loans under credit scoring than under their judgmental credit approval systems without increasing their default rates. Credit scoring may also encourage more lending because it gives banks a tool for more accurately pricing risk (Asch, 1995). According to Hancock (1999), the main advantages of implementing credit scoring include: objective decision-making, consistency of decisions, and it provides a system to allow customers to be segmented (Hancock, 1999). Today's models are capable of tracking many more customer characteristics than earlier models. For instance, modern models are able to identify marginal population segments and subsets within those segments that might qualify for credit without unduly weakening overall credit quality (Asher, 1994). Credit scoring models, by enabling a lending institution to rank potential customers according to their default risks, can improve the allocation of

resources from a second-best towards the first-best equilibrium (Jacobson and Roszbach, 2003). Credit bureaus, credit scoring, and risk-based pricing represent attempts to deal with asymmetric information and through more complete information, allow segmentation of customers. These developments are consistent with the model presented in this paper, the discriminating monopolist model. The next section describes the use of segmentation in risk-based pricing to generate additional revenue from credit card customers. Credit card lending as a subset of consumer lending provides substantial support to the model applied in this paper.

Segmentation of Credit Card Customers

Banks have been highly effective in segmenting credit card customers to generate additional revenue by differential pricing. By exploiting differences among credit card customers, banks have been able to experience substantial increases in revenue generated from credit card fees. According to cardweb.com, a consulting group that tracks the credit card industry, credit card fees increased to 33.4 percent of total credit card revenue in 2003, up from 27.9 percent in 2000 and only 16.1 percent in 1996. Also, the average monthly late fee rose from $13.30 in May of 1996 to $30.29 in 2003 and then to $32.00 in May of 2004 (Pacelle, 2004). Robert Hammer, an industry consultant, points out that the credit card industry generated $14.8 billion from penalty fees in 2004, representing a 26 percent increase from $11.7 billion in 2003 (Davidson, 2005).

The majority of banks offered only one credit card until the early 1990s. The credit card usually carried an annual interest rate of approximately 18 percent and an annual fee of $25-$30. Cardholders who exceeded their credit limit or paid late were charged only modest fees. To increase market share, banks began eliminating annual fees and began to offer low introductory rates, then subjected customers to a multitude of risk-related fees such as late fees and fees for exceeding credit limits. Card issuers abandoned simple pricing models in favor of more complex models tailored to the customer's risk and behavior. Banks even began offering additional cards to customers with poor credit to generate additional growth in a market that was reaching saturation (Pacelle, 2004).

From a 2004 survey of 140 credit card issuers, the advocacy group Consumer Action found that 85 percent of the respondents make it a standard practice to raise rates for consumers who pay late, usually after just one late payment. Almost half raise rates if they discover that a customer has become delinquent with another creditor (Annual Credit Card Survey, 2004).

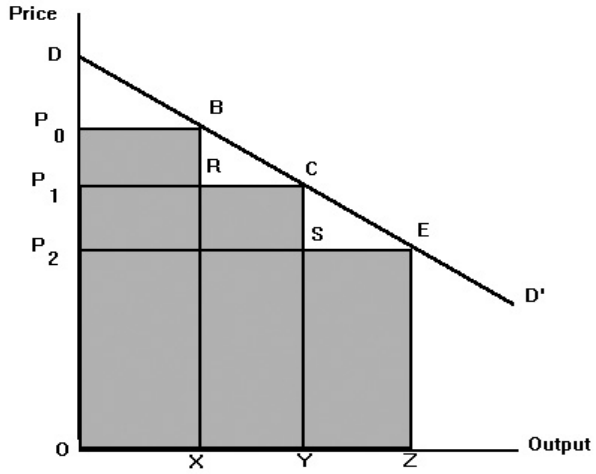
Banks indicate that penalties and fees are a necessary component for new models used to price financial services. The times when banks collected sizable annual fees on all credit cards and charged high rates to all customers are history. Today, banks maintain they must rely on risk-based pricing models. As a result, credit card customers with the riskier credit histories pay higher rates and more fees. The following section illustrates the use of differential pricing in second-degree price discrimination to increase revenue and profits. This section also depicts the commercial bank as a discriminating monopolist.

ECONOMIC PRICING MODELS

In light of asymmetrical information, it is clear that the "banking industry" is not appropriately represented by the model of pure competition. Most authors write of characteristics that suggest some banking markets are monopolistic, while others are monopolistically competitive. But such references aside, little analysis has been done on the implications of the operations of the imperfectly competitive banking industry.

First-degree price discrimination only occurs when a monopolist has a small number of buyers and is able to determine the maximum prices each is willing to accept. In this case the monopolist takes all consumer surplus. In second-degree price discrimination, the monopolist takes part of the buyers' consumer surplus. In the case of a utility company practicing second-degree price discrimination, assume that its customers have the market demand curve, DD^1, shown in Figure 1. The utility company charges a high price OP_0, if the customers purchase OX units of product. For amounts equal to OY units, the company charges OP_1. For purchases beyond OY, the utility company charges OP_2. The company's total revenues are equal to the shaded area in Figure 1

Figure 1
Price Discrimination: Second-Degree



The utility company is able to increase its revenues and profits by differential pricing. If one price was charged and the company wanted to sell OZ units, the firm would charge a price of OP_2. Firm total revenue would equal the rectangle, OP_2EZ, which is considerably less than the shaded area in Figure 1. By charging different prices, the monopolist is able to take much more of the consumer surplus and increase profit. The rates charged by many public utilities - gas, electric, and others can be viewed as second-degree price discrimination (Henderson and Quandt, 1971).

Bank As A Monopolist

The commercial banking firm can be characterized as a discriminating monopolist using the concept of proximity from organization theory. Paul Joskow (1975) explains that when firms in close proximity to one another produce the same product, use similar

technologies, and are involved in market exchanges; that they may act like a single monopoly firm. Pooling of information through credit bureaus adds to close proximity. Pagano and Jappelli (1993) indicate that information sharing through credit bureaus is a natural monopoly. It is likely that banks act as monopolies in the segmentation and pricing of loan customers. Banks acting as discriminating monopolists may effectively separate customers into different categories and price each separately. The theory of discriminating monopolist is well developed in economics (Shull, 1963). As Milde and Riley (1988) point out, banks are able to exploit differences among applicants by sorting applicants out among different risk classes. Modigliani and Jaffe (1960) suggest that "banks can best exploit their market power, while remaining within the bounds set by prevailing institutions, by classifying customers into a rather small number of classes within each of which a uniform rate is charged."

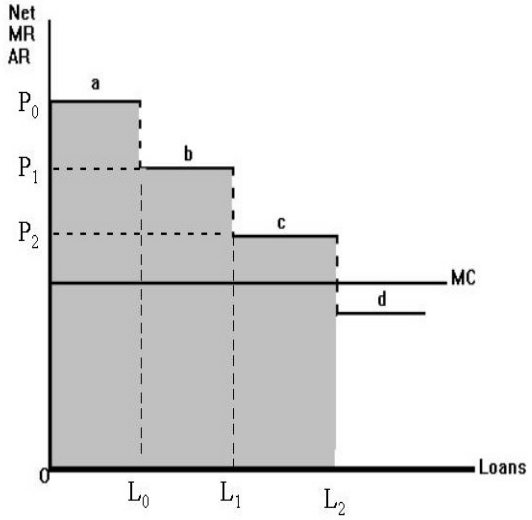
By using credit analysis, a bank may separate customers into homogeneous loan categories and price each category differently. These categories of loans are homogeneous because different banks will tend to put similar customers into similar categories due to proximity. As is shown in the economics literature, differential pricing generates higher profits (Mason, 1979). In the following section consumer banking is analyzed by using the model of the discriminating monopolist.

BANK MODEL FOR PRICING CONSUMER LOANS

The bank discriminating monopolist model for optimization is stated in terms of marginal revenue and marginal cost. When marginal revenue is determined for any category, this return is compared with the marginal cost of funds in order for the bank to determine profitability of a particular set of customers.

The following (Figure 2) is a graphical illustration of the bank discriminating monopolist model. The categories of loan customers are given as a, b, c, and d. Within each category all customers are assumed to be priced the same since they have been determined to have the same risk and other credit characteristics. The result of this is that within a given category, average and marginal revenue are the same. The bank should make loans to all customer categories in which marginal revenue exceeds the marginal cost of funds. The bank loan officers should lend to customers in categories a, b, and c since the marginal and average revenues exceed marginal cost. They should not lend to customers in category d because marginal returns are less than marginal cost. Revenues, using pricing by category, are indicated by the shaded area. If there were only one rate, P_2 for L_2 loans, the revenue would be much less (See Figure 1 for comparison.).

Figure 2
Bank Discriminating Monopolist Model



By using credit scoring, present day consumer lenders are utilizing risk analysis in the process of separating customers into categories. Risk-based pricing is a method of assigning interest rates and other credit terms based on the customer's credit score and history. Customers are charged according to the default risk they present. Proponents of risk-based pricing view it as a tool that enables lenders to reach out to under-served markets, thereby expanding loan volume (Quintana, 2004).

The objective of a credit-scoring model is to estimate the similarity of any individual consumer to other consumers. The credit score provides the benchmarks and feedback needed for rational credit extension and loan pricing (Altman and Haldeman, 1995). Credit scoring models, by enabling a lending institution to rank potential customers according to their default risk, can improve the allocation of resources (Jacobson and Roszbach, 2003).

This paper provides the results of an investigation of consumer lending with regard to the discriminating monopolist model. The primary data generated from this study are used to examine the extent to which banks segment consumer loan customers into categories in order to increase profit or shareholder wealth. This research also investigates any differences which might exist in the way consumer loan customers are separated based on: region of the country, size of assets, the percent of outsiders making up the banks' boards of directors, and whether the bank holds a state or national charter. All banks must be granted a charter before they are able to obtain FDIC insurance, in order to accept deposits and make loans. Generally, banks have a choice of obtaining either a state charter (issued by the state where banking operations are headquartered) or a national charter (issued by the Comptroller of the Currency).

Further analysis will compare the results of this study with those from a comparable

unpublished survey conducted in 1993 in order to determine if changes are evident in the decision-making practices of banks today compared with those of almost 12 years ago.

Our contention is that commercial banks act as discriminating monopolists as they carry out the consumer lending process. Most models of firm optimizing activity (pure competition, monopolistic competition, monopoly, and oligopoly) are not descriptive of banking. The model presented in this paper of a discriminating monopolist provides a much better fit for explaining bank optimization, and this assumption is supported by empirical results. The discriminating monopolist prices each customer or category of customer individually and is able to increase revenue substantially compared to other optimizing models. Using the discriminating monopolist model (second-degree price discrimination), the banking firm has enough information to place customers in categories based on risk and other factors. This paper tests the concept by asking banks directly if they separate customers into categories. Banks are also asked the reason for separating customers into classes and the results from separation. The questions come directly from the discriminating monopolist model, which concludes that pricing each category separately results in increased revenues. Questions are asked in order to determine if banks discriminate, the basis of this discrimination, and the expected results of pricing by category. The following sections examine the methodology and findings of the study concerning the use of specific factors to segment customers when making consumer loans.

SURVEY METHODOLOGY

In July 2004, a questionnaire was mailed to the Chief Executive Officer of a sample of one thousand U.S. banks, 570 of which are state chartered and 430 nationally chartered. The sample was selected from the nation's largest banks, those having total assets of at least $300 million, since this is the group believed to be most likely to differentiate customers for purposes of making consumer loans. A total of 156 usable responses were received, resulting in a response rate of 15.6 percent.

The survey instrument was designed to gather data concerning the use of market segmentation practices by these banks when categorizing consumer loans. Questions were included pertaining to the specific factors, along with their relative importance, used in separating consumer loan customers; the purpose of separating consumer loan customers into categories; the results of these separations; and how the loan rate is determined for each category of customers. Background information included the respondent's position with the bank and the percentage of outside directors included on the boards of directors of the respondent banks. In addition, banks were identified by the region of the country in which they are located. Each respondent was also asked to provide information on the total assets of the bank and whether the bank has a state or national charter.

One hundred fifty-six bank officers participated in the study. The individuals responding identified themselves as: Chief Executive Officer (18.6 percent), President (16.7 percent), Chief Financial Officer (3.2 percent), Chief Operating Officer (3.2 percent), Chairman of the Board (3.8 percent), Director (4.5 percent), and other banking officer

(65.4 percent). A number of individuals indicated that they held more than one position in the bank. Sixty-four percent of the banks participating in the study indicated that they hold a national charter, while 36 percent hold a state charter.

The 156 banks participating in this study are representative of the U. S. banking industry. The banks are fairly evenly distributed across the four regions of the United States and across asset groupings. In addition,, they are fairly evenly distributed across the groups of percentage of outside directors. Therefore, it is expected that the financial performance of these 156 banks reflects the performance of the banking industry as a whole. For this reason, no attempt was made to determine the actual performance of these 156 banks.

SURVEY RESULTS

Respondents were asked to indicate whether or not their bank separated consumer loan customers into categories based on a number of factors and, if so, the relative importance placed on each particular factor when making these separation decisions. Of the 156 included in the survey, only 6 banks indicated total lack of use of factors to separate consumer customers into categories for the purpose of making loans. Table 1 provides the results for the other 150 banks responding to the survey that indicated the use of at least one segmentation factor in making consumer loan decisions. As indicated, the primary factors used to separate consumer loan customers are collateral, credit risk, and the purpose of the loan. Also cited as factors for differentiation by the majority of the respondents was loan maturity, the customer's relationship with the bank, the size, and profit potential of the loan. Respondents were also asked to rank the relative importance they place on each of the factors used to segment customers into classes. A relative importance mean score, based on the importance rankings provided by the respondents, with a possible range of 1 (most important) to 9 (least important) indicated that credit risk, collateral, purpose of the loan, and the customer's relationship with the bank are the most important factors in making decisions as to the particular category an individual customer will fall within. These results are consistent with the discriminating monopolist model. The implication of this model is that, in the case of second-degree price discrimination, the bank will separate customers into categories and price each category separately, resulting in increased revenue.

TABLE 1.
FACTORS ON WHICH CONSUMER LOAN CUSTOMERS ARE SEGMENTED
INCLUDING THE RELATIVE IMPORTANCE OF EACH FACTOR

Factor	Number of Banks who Segment Based on Factor	Percentage of Banks Segmenting on Factor	Relative Importance (Mean Score)
Credit Risk	117	78.5	1.32
Collateral	127	84.1	2.61
Purpose of loan	96	64.0	3.74
Relationship with bank	64	42.7	3.99
Potential profitability	52	34.9	4.51
Size of loan	55	36.7	4.70
Maturity	68	45.6	5.33
Competition for new customers	24	16.2	6.95
Likelihood of losing customer to a competitor	26	17.5	7.31

Segmentation Policies Based on Region of Country, Size of Assets, Percentage of Outside Directors, and Type of Charter

A secondary purpose of the study was to investigate differences in banking practices relative to consumer loan segmentation by region of the country; bank size measured by total assets of the bank; percentage of outside directors making up the banks' boards,;and whether the bank holds a state or national charter. Analyses involved investigating 1) differences based on frequency of usage of factors using the chi-square test of independence and 2) differences in relative-importance rankings using the one-way analysis of variance test and the two-sample t-test.

The four regions used for grouping the respondent banks based on location, along with the number responding from each region, were: Midwest (35), Northeast (33), Southeast (48), and West (37). Three banks were not identified by their location. First, an analysis was conducted to investigate the relationships between region of the country and policies used by these banks for segmenting consumer loan customers. The chi-square test of independence was performed for each of the nine factors in order to determine whether a significant relationship exists relative to bank location. Only one of the factors, potential profitability, was significantly related to region of the country (p-value = .033; df = 3). Banks located in the southeast region were much more likely to use profit potential as a discriminating factor, while banks located in the northeast were much less likely to discriminate between consumer customers based on potential profitability of the loan. Second, regarding the relative importance placed on the nine factors, a one-way analysis of variance model was used to determine if differences existed among regions. The only factor testing to be significant was collateral (F=3.24; p-value = .025), with those banks located in the southeast indicating collateral to be of less relative importance in

segmenting customers than those banks located in the other three regions of the country All tests were performed at the .05 level of significance. For banks located in the southeastern region, a possible explanation is the more aggressive banking practices of the larger southeastern banks may be that these banks appear to place less relative importance on collateral and are more likely to segment customers based on potential profitability. The relationship between these outcomes, although not a focus of this study, could be the basis for future research.

Responding banks were categorized based on total assets, using the following ranges, with the number in each group indicated in parentheses: less than $400 million (33), $400 million to $749 million (39), $750 million to $2.49 billion (44), and $2.5 billion or greater (35). Five banks did not report this information. First, total assets were compared with each of the nine segmentation factors, again using the chi-square test of independence and testing at the .05 level of significance. As with region of the country, only one of the nine factors, size of the loan, tested to have a significant relationship with total bank assets (p-value = .006; df = 3). The size of the loan is much less likely to be a factor for banks having total assets of less than $400 million than for the larger banks. Second, an investigation of differences comparing total asset size and the relative importance of factors used to segment customers indicated also that size of the loan was the only one of the nine factors which tested significantly different relative to total bank assets. Results based on the one-way analysis of variance model (F=4.21; p-value = .008) indicated that the larger the bank, the more relative importance it placed on the size of the loan for segmenting customers into lending categories. The ability to meet demand for large loans is a function of total bank assets. Larger banks generally make a greater number of larger loans than do smaller banks. Larger loans present greater profit potential and risk exposure than do smaller loans. With the greater profit potential, large banks are extremely competitive with each other in the larger loan market. Consequently, larger banks could be expected to place greater importance on the size of the loan as compared to smaller banks.

An analysis was also performed in order to determine if customer segmentation decisions were related to the percentage of outside directors on the bank's board of directors. The respondent banks were classified according to percentage of outside directors; the percentage ranges used in the breakdown, along with the number in each group are: 70 percent or less (46), 71 percent to 80 percent (34), and 81 percent or more (68). Eight respondent banks did not provide this information. As with region of the country and total assets, chi-square tests of independence were performed comparing percentage of outside board members with each of the nine segmentation factors. None of the tests (at the .05 level of significance) indicated a significant relationship. However, one-way analysis of variance F-test revealed that the greater the percentage of outside directors on a bank's board, the more relative importance it placed on credit risk when segmenting customers (F=3.63; p-value = .030) One might infer from these results that decisions made concerning segmentation of consumer loan customers into groups for making loans appears to be affected by the make-up of the board. It is likely that a greater proportion of outside directors on a bank's board results in greater awareness of aversion to risk. Such boards may benefit in helping to ensure appropriate returns relative to credit risk exposure.

When comparing banks chartered by the state with those holding a national charter, no significant differences were found based either on use of the nine separation factors or the relative importance of the factors. As with the previous analyses, the chi-square test of independence was used to investigate differences between usage and the two-sample t-test was used to test for significant differences between relative importance of the nine factors when comparing the state vs. national chartered banks. All tests, again, were performed at the .05 level of significance. Consequently, it appears that loan pricing is not related to the type of bank charter held.

Results of Current Study vs. 1993 Study Relative to Segmentation Factors

Results from a previous similar study of a sample of 1000 banks by the same authors conducted in 1993 were compared with those of the current study in order to determine if responses showed significant changes over this time period relative to reasons for segmenting customers when making consumer loans. A usable sample of 183 banks provided the basis for the analysis presented below in Table 2.

The factors showing significant changes between the two studies are noted and are as follows: credit risk; potential profitability of the loan; the likelihood of losing customers to another bank, the customer's relationship with the bank; and collateral. All of these factors are reported as being used significantly more in the current study than in the previous 1993 study. No significant differences were found regarding segmentation based on the purpose of the loan, the size of the loan, or the loan maturity. As previously mentioned, credit risk was found to be significantly greater in the current study as compared to the 1993 study, and the percentage of banks reporting potential profitability as a segmentation factor more than doubled between 1993 and 2004. Both factors are major determinants of shareholder wealth.

TABLE 2.
FACTORS ON WHICH CONSUMER LOAN CUSTOMERS ARE SEGMENTED:
Current Study Compared with 1993 Study
(all tests conducted using the .05 level of significance)

Factor	Current Survey Results (N=150)		1993 Survey Results (N=183)		Z-test score	p-value
	N of Banks who Segment Based on Factor	% of Banks Segmenting on Factor	N of Banks who Segment Based on Factor	% of Banks Segmenting on Factor		
Credit risk	117	78.5	85	46.4	6.31	.000*
Potential profitability	52	34.9	25	13.7	4.53	.000*
Likelihood of losing customer to a competitor	26	17.5	11	6.0	3.18	.001*
Relationship with bank	64	42.7	50	27.3	2.94	.002*
Collateral	127	84.1	134	73.2	2.60	.005*
Competition for new customers	24	16.2	14	7.7	2.33	.010*
Size of loan	55	36.7	57	31.1	1.06	.145
Maturity	68	45.6	93	50.8	-1.00	.159
Purpose of loan	96	64.0	125	68.3	-0.83	.204

* Significantly greater in current study than in 1993 study

Further Analyses Concerning Segmentation of Consumer Loan Customers

Those banks indicating the use of at least one of the nine segmentation factors were asked to also indicate the purpose(s) of separating loan customers into categories, the result(s) of the separation, and how the loan rate is determined for each category of separation. Shown below in Table 3 provides these responses.

As these results indicate, the primary reason that banks separate customers into categories for loan decisions is in order to determine loan rates. This finding is consistent with second-degree price discrimination as developed in the model. The model suggests that customers will be separated into classes and priced accordingly in order to increase revenue and profits**.** Other important reasons for this segmentation are to determine loan terms and to meet regulatory requirements. The primary result of this segmentation is lower portfolio risk. Most often loan rates are determined by mark-up over the cost of funds and/or the New York Prime rate. As indicated, the major reason that banks separate consumers into categories for loan decisions is in order to determine loan rates. Loan rates directly impact profitability, which along with lower portfolio risk, contribute to wealth maximization. Commercial banks do report actions consistent with those of discriminating monopolists in their consumer lending practices. In order to maximize bank profits and increase the wealth of stockholders, banks report separating customers into categories

and pricing consumer loans for each of these categories.

TABLE 3.
PURPOSE, RESULT, AND LOAN RATE DETERMINATION
FOR BANKS WHO SEGMENT CONSUMER LOAN CUSTOMERS

	Number of Banks Reporting	Percentage of Banks Reporting
Purpose of segmenting into categories:		
To determine loan rate	91	60.7
To determine loan terms	83	55.3
To meet regulatory requirements	78	52.0
To determine dollar amount of loan	40	26.7
Results of the segmentations:		
Lower portfolio risk	104	68.4
Regulatory compliance	85	55.9
Increased profits	73	48.0
How loan rate is determined:		
Mark-up over Cost of Funds	64	42.7
Mark-up over New York Prime rate	58	38.7
Mark-up over money market rates	8	5.3
Mark-up over LIBOR	6	4.0

CONCLUSION

In this paper the discriminating monopolist model is applied to consumer lending, and it provides the results of an empirical study regarding the implications of this model. The model utilizes the case of second-degree discrimination to show how banks may exploit differences among consumer borrowers. Banks separate loan customers into categories and price each category differently in order to increase profit and/or shareholder wealth. In addition, the paper reports the results of a study of 156 banks conducted in summer 2004 that examined the extent to which banks use specific factors to separate loan customers into categories in the process of making consumer loans. The study also investigates the purpose and results of separating consumer loan customers into categories. A final analysis compares the results of the current study with a similar study conducted in 1993 to determine if differences are evident in current decision-making processes compared with those of almost 12 years earlier.

The results from the survey of the 156 respondent U.S. banks are consistent with the discriminating monopolist model: that businesses can increase profits significantly by differential pricing. In this case, by separating customers into categories and pricing each differently, profitability is increased. Respondent banks report the use of nine factors to

separate consumer customers into categories for purposes of making consumer loans. The factor given the greatest relative importance when used to segment consumer loan customers into lending groups is credit risk. While credit risk represents only one component of risk, it is a major component of total risk of a bank. Credit risk and potential profit affect shareholder wealth significantly. Reductions of risk or increases in profit are both consistent with wealth maximization. Furthermore, a comparison of the results of the current study with the one in 1993 shows a substantial increase in the importance of credit risk in the segmentation of consumer loans. Thus, the use of these factors to separate customers into categories is consistent with the concept of shareholder wealth maximization.

Based on research results, it appears that banks are segmenting consumer loan customers based on objective criteria. The literature reflects that U.S. banks are increasingly using credit scoring as a method of segmenting consumer loan customers. By segmenting customers, it appears that banks are able to increase their profitability. An economic model consistent with this approach is the discriminating monopolist model.

Due to technological developments and other innovations, banks have developed enhanced credit scoring models that separate consumer loan customers into categories and establish interest rates and other credit terms based on risk. Credit scoring models are based on the application of statistical classification techniques to relevant loan customer attributes in order to assign customers to various risk groups, thereby reflecting their relative creditworthiness. In essence, these models provide predictions of default probabilities based on customer attributes, which are then used to develop credit decision rules for the lenders. Credit scoring and risk-based pricing allow banks to make additional loans, increase market share, and maximize revenue consistent with the discriminating monopolist model.

An increasingly competitive and volatile financial environment, coupled with new advances in information technology and artificial intelligence, should continue to provide a strong impetus for future research directed at improving the existing discriminating monopolist model as well as developing new approaches in credit evaluation.

In summary, financial innovation and technological developments of the past two decades have allowed more widespread use of credit bureaus and credit scoring. This has enhanced the ability of banks to segment their customers, consistent with the discriminating monopolist model. As a result, banks have been able to generate additional revenue by charging higher rates and fees on consumer loans and earning higher ROAs over the ten-year period from 1993 to 2003.

The most significant contribution of this paper to the academic literature is the development of the relationship between a conceptual model of firm optimizing behavior and the bank's behavior in the normal conduct of business as indicated by the responses to the questionnaire. The questionnaire was developed consistent with the theory, classifications of customers, and pricing by class.

The implication for managers is that revenues, profits, and stockholder value can be

increased by following the practices presented in the paper. Customers should be segmented and each segment priced in order to increase revenues. However, managers should be responsible in granting credit; they should not extend more credit than is appropriate for unsophisticated borrowers.

Legislators may be concerned with the effects this pricing policy has on customers. High risk customers will suffer from higher rates as well as from an array of fees and penalties. However, if legislators are concerned with economic efficiency in the allocation of financial resources, they should restrain their actions. In addition, the adoption of the model presented in this paper eliminates the potential for discrimination based on race as well as other protected characteristics.

Bank customers would be well served to maintain a high credit score. This will result in much lower financing costs. They should pay bills on time and limit their use of credit.

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