



MINORITY-OWNED BUSINESSES, TRADE CREDIT AND DISCRIMINATION:  
AN EMPIRICAL STUDY OF THE IMPACT OF RACIAL DISCRIMINATION ON ACCESS  
TO TRADE CREDIT FOR MINORITY-OWNED VS. NON-MINORITY-OWNED FIRMS

A DISSERTATION SUBMITTED TO  
THE SCHOOL OF COMMUNITY ECONOMIC DEVELOPMENT  
OF SOUTHERN NEW HAMPSHIRE UNIVERSITY IN PARTIAL  
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY IN COMMUNITY ECONOMIC DEVELOPMENT

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I certify that I have read this dissertation and that, in my opinion, it is fully  
adequate in scope and quality as a dissertation for the degree of Doctor of  
Philosophy.

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## DEDICATION

This work is dedicated to my father and my mother, Mr. Tommy Lee Reese and Mrs. Izora Brady Reese. Both of my parents possessed a tremendous work ethic and I owe all of my accomplishments (modest as they are) to that legacy. My father once said to me, "I only owe you one thing in life, a good example, and that keeps me busy all the time." My father fully met his obligations to me: he lived an exemplary life. My mother was frequently right, occasionally wrong, but never in doubt. She kept her dreams very small to make space for me to dream big.

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## ABSTRACT

### MINORITY-OWNED BUSINESSES, TRADE CREDIT AND DISCRIMINATION: AN EMPIRICAL STUDY OF THE IMPACT OF RACIAL DISCRIMINATION ON ACCESS TO TRADE CREDIT FOR MINORITY-OWNED VS. NON-MINORITY-OWNED FIRMS

T. David Reese, Ph.D.  
Southern New Hampshire University, 2006

Dissertation Chair: Dean Michael Swack

Access to credit in particular and capital in general is a major determinant of the rate of both the formation and survival of small businesses. During the last thirty years a growing body of theoretical and empirical research has developed that explores how a firm's access to credit varies by the business owner's race and/or ethnicity and test specific hypotheses about why these variations might occur. The overwhelming majority of empirical studies show that on average African-American and Hispanic borrowers receive credit in amounts and on terms less favorable than those obtained by non-minority borrowers. Much of this research asks, "*does racial discrimination in part account for the observed disparities in credit outcomes for various racial and ethnic groups?*"

While numerous studies have tested for the existence of discrimination in commercial bank lending to firms, to date, this author has found only two empirical studies that explore how access to trade credit varies with the race and/or ethnicity of a firm's owner. This study begins the process of addressing this gap in the literature. This study explores if and how the amount of trade credit obtained by small businesses varies by the owner's race and/or ethnicity. Our findings clearly shows that firms owned by African-American men, Hispanic white men and Asian-Americans on average receive significantly lower levels of trade credit relative to those owned by non-Hispanic white men. After controlling for industry, the owner's human capital, the creditworthiness of the firm and the firm's owner, this study finds no statistically significant evidence that the race/ethnicity of a firm's owner explains the observed disparity in the levels of trade credit provided to firms owned by Hispanic whites and African-Americans. For firms owned by Asian-Americans, this study does find statistically significant evidence that race explains in part the observed disparities after controlling for industry, the owner's human capital, the creditworthiness of the firm and the firm's owner. This finding is noteworthy because many scholars suggest that Asian-Americans do not experience difficulties in accessing credit comparable to those experienced by other minorities.



## 1. Introduction

The purpose of this study is to determine if and how the amount of trade credit obtained by small businesses varies by the owner's race and/or ethnicity. Trade credit can be defined as the "*credit extended by a seller who does not require immediate payment for delivery of a product*" (Elliehausen and Wolken 1993, pg. 1). "[Both] trade and bank credit are critical sources of funding for small firms because they are primary sources of working capital" (Chant and Walker 1988, pg. 861).

Access to credit in particular and capital in general is a major determinant of the rate of both formation and survival of small businesses (Bates 1993, pg. 41; Bates 1997; Christopher 1998). During the last thirty years a growing body of theoretical and empirical research has developed that explores how access to credit varies by owner's race and/or ethnicity and test specific hypotheses about why these variations might occur. The overwhelming majority of empirical studies show that on average African-American and Hispanic-American borrowers receive credit in amounts and on terms less favorable than those obtained by non-minority borrowers. Much of this research asks, "*does racial discrimination in part account for the observed disparities in credit outcomes for various racial and ethnic groups?*" This widespread interest in discrimination is a direct consequence of the role of race in U.S. history. As recently as the early 1960s (less than fifty years ago), substantially all financial institutions in the South and many in the North, Midwest and West actively discouraged the patronage of Blacks and Hispanics (Lemann 1991, pg. 314).

To date, due to the availability of bank loan data and the interest of both bank regulators and various communities of color in the quantity and type of credit facilities (mortgages, business loans, credit cards, etc.) provided to communities of color, there exists a sizeable body of research examining how access to bank credit varies by owner's race and/or ethnicity. That said, most of the existing studies focus on home mortgages. Up until 1995, banks were only required to collect and publicly disclose details about residential mortgage loans and borrowers in a fashion that allowed researchers to test hypotheses about the existence of racial/ethnic discrimination. Only recently, have lenders begun to provide similarly detailed data for other types of loans (e.g. business loans).

Since 1997, an increasing number of empirical studies have focused on small business lending, a direct outgrowth of changes in the Community Reinvestment Act ("CRA") adopted in 1995. Under the modified CRA provisions adopted in 1995, banks with assets totaling more than \$250 million or affiliated with a holding company with more than \$1 billion in total assets are required to report small business and small farm loans to their primary regulatory agency (e.g. Comptroller of the Currency, Federal Reserve, etc.) commencing in 1996

(Squires and O'Connor 2001, pg. 3). This newly available category of data has allowed researchers to test for the existence of discrimination in small business lending. This new stream of data is important because access to credit (both bank and trade credit) is major determinant of the rate of both formation and survival of small businesses.

While the numerous studies have tested for the existence of discrimination in commercial bank lending, to date, this author has found only two empirical studies that explore how access to trade credit varies with the race and/or ethnicity of a firm's owner (Coleman 2003; Aaronson, Bostic et al. 2004). And, neither of these two studies was designed to determine if any observed disparities in trade credit usage between non-minority- and minority-owned firms was a function of discrimination. This study begins to address this gap in the literature.

Specifically, this study tests for differences in the amount of trade credit obtained by minority-owned<sup>1</sup> versus non minority-owned firms after controlling for creditworthiness.

Trade credit refers to the informal credit extended to a firm when a supplier of a firm provides goods or services and allows payment at a later date. So, if **Maytag** delivers a truckload of washers to **Home Depot** at the beginning of a month and allows **Home Depot** to pay for that delivery thirty days later, **Maytag** has provided trade credit to **Home Depot** for that month.

As the preceding example illustrates, 'trade credit' arises as a result of a supplier providing raw materials, parts, supplies and/or finished goods to another firm (a customer) and allowing the customer to pay at some later date (e.g. 30 days after

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<sup>1</sup> In this publication, the term 'Minority' refers collectively to African-Americans, Hispanics whites and Asian-Americans. While we include observations for American Indians and Native Alaskans, these groups are not of primary interest for the purposes of this study. The results for American Indians and Native Alaskans are not discussed because the dataset used for this research contains too few observations for either group to be statistically useful. While observations for Asian-Americans are included and discussed, several studies argue convincingly that Asian-Americans do not experience difficulties in accessing capital comparable to those experienced by African-Americans and Hispanics Chen, G. M. and J. A. Cole (1988). "The myths, facts, and theories of ethnic, small-scale enterprise financing." Review of Black Political Economy **16**(4): 5-9.

Bates, T. (1989). "The changing nature of minority-owned business: a comparative analysis of Asian, nonminority, and Black-owned businesses." *Ibid.* **18**(2): 25-42.

Bates, T. (1993). Major Studies of Minority Business: A Bibliographic Review. Washington D.C., University Press of America, Inc.

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Christopher, J. E. (1998). "Minority business formation and survival: evidence on business performance and viability." Review of Black Political Economy **26**(Summer (1)): pp. 37-73..

shipment). From the perspective of the firm receiving the goods, the amount of 'trade credit' provided is the purchase price of the shipment and equals the amount of the associated 'Account Payable' due to the supplier. From the perspective of the supplier, the amount of the trade credit extended to the customer is the amount billed for that shipment and equals the amount of the 'Account Receivable' due from the customer.

Given limited access to the capital markets, small firms<sup>2</sup> depend heavily on trade and bank credit to meet their credit needs.

"Primary and secondary money and capital markets often pose insurmountable financial and regulatory barriers to small businesses and , therefore, trade and bank credit become primary sources of working capital. . . . Therefore, because traditional capital and money markets are often not accessible to small businesses, small firms have a substantial demand for short-term credit and bank credit" (Chant and Walker 1988, pg. 861).

So, understanding if and how access to trade credit varies with the race of a firm's owner is central to the issue of minority business development.

In the next section, we identify and discuss the specific research questions addressed by this study.

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<sup>2</sup> The U. S. Small Business Administration defines a firm as a small business if it employs less than 500 workers. As of December 31, 2002, there are less than thirty African-American-owned firms that employed 500 or more workers in all of the U.S. Dingle, D. T. (2003). B.E. 100s Overview: Reinvention through Innovation. *Black Enterprise*. **33**: pp. 94 - 106.. In other words, substantially all African-American-owned businesses meet the SBA's definition of a 'small business.'

## 2. The Research Question

While trade credit is an important source of financing for small businesses, little is known about how discrimination might impact access to trade credit for minority-owned firms. This study begins the process of addressing this issue.

This study examines two separate bodies of research and combines them to create a platform for considering a new question that to date has not been addressed: *“Is there empirical evidence of racial discrimination in the extension of trade credit?”*

The first of these two bodies of research seeks to identify the factors that determine who receives trade credit (Emery 1984; Walker 1985; Chant and Walker 1988; Elliehausen and Wolken 1993; Peterson and Rajan 1997; Ng, Smith et al. 1999; Wilson 2002). The second body of research seeks to determine if there is evidence of racial and/or gender discrimination in various credit markets (e.g. mortgage loans, consumer loans, etc.) (Becker 1971; Peterson and Peterson 1981; Handy and Swinton 1984; Ando 1988; Elliehausen and Lawrence 1990; Bates 1993; Dymski 1995; Munnell, Tootell et al. 1996; Bates 1997; Bates 1997; Kijakazi 1997; Blanchflower, Levine et al. 1998; Bostic and Lampani 1999; Immergluck 1999; Coleman 2000; Han 2001; Squires and O'Connor 2001; Cavalluzzo 2002).

### 2.1. Hypotheses

Based on a review of these two bodies of literature, a model has been crafted that allows us to address the basic research question. Specifically, the quantity of trade credit supplied to a firm is a function, **F**, of several characteristics of the firm in question:

(Quantity of Trade Credit supplied to a firm) = **F**(U, I, R).

Where,

- I. Creditworthiness (**U**). To some extent, all credit providers use some combination of quantitative and qualitative data about a prospective borrower to assess the creditworthiness of a prospective borrower. We include variables that measure the following: age of the firm; legal form of organization; the firm's total assets; and, the owner's human capital and creditworthiness.
- II. Industry (**I**): Controlling for creditworthiness, the terms and quantity of trade credit supplied vary significantly from industry to industry (Ng, Smith et al. 1999, pp. 1117-1119). That said, within an industry, the terms of trade credit are generally quite uniform (Chant and Walker 1988, pg. 864; Ng, Smith et al. 1999, pp. 1117-1119).

- III. Race/Ethnicity (**R**). The purpose of this study is to determine if race is a significant factor in determining the quantity of trade credit supplied.

A review of the two bodies of literature suggests that the relationship between the dependent variable and the independent variables can be modeled by a logistic regression model of the following form:

$$\ln\left(\frac{D_i}{1-D_i}\right) = \beta_0 + \beta_1 U_i + \beta_2 R_i + \varepsilon_i \quad \text{where,}$$

- 1)  $D_i$  is dummy variable that identifies the level (high or low) of trade credit supplied to firm "i" at time "t"
- 2)  $\beta_1$  is the coefficient for the creditworthiness vector. It should be noted in the actual model several variables are included to control for creditworthiness. These variables are identified and discussed in some detail in the Methodology section of this paper.
- 3)  $\beta_2$  is the coefficient for the dummy variable used to capture the impact of race. It should be noted that in the actual model two dummy variables are included that we might distinguish between the Hispanics and African-Americans. These various racial/ethnic categories are discussed in more detail in the Methodology section of this paper.
- 4)  $\varepsilon_i$  is the stochastic error term of the ith observations.

Specifically, this study tests two hypotheses:

- 1) Is race a significant determinant of trade credit? In other words, is the coefficient associated with the race variable ( $\beta_2$ ) significant? The study uses the Small Business Finances<sup>3</sup> dataset for 1998 to test this hypotheses. Formally, the Null and Alternative hypotheses would be stated as follows:

$$H_0 : \beta_2 \geq 0$$

$$H_A : \beta_2 < 0$$

- 2) Has the importance of race declined over time? Using the Survey of Small Business Finances datasets for 1993 and 1998, we can generate

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<sup>3</sup> The Survey of Small Business Finances has been co-sponsored by the Board of Governor of the Federal Reserve (the "Federal Reserve") and the U. S. Small Business Administration and each dataset includes data collected from more than 3,000 firms that were selected to provide a representative sample of the population of small businesses in the U.S. To date, there datasets for the years 1987, 1993 and 1998. For a more detailed discussion of these datasets see pages 51 through 58.

estimate logistic regression models for each period. By comparing the results for these two set of cross sectional data, we can see if there is a significant difference in the coefficient associated with the race variable for the two periods. Formally, the Null and Alternative hypotheses would be stated as follows:

$$H_0 : \beta_{2,98} > \beta_{2,93}$$

$$H_A : \beta_{2,98} \leq \beta_{2,93}$$

## 2.2. Limitations

- i. Because of the relatively small number of minority-owned firms included in the various industry sub-samples of the dataset, this study must content itself to examine one sample that includes firms that fall into five broad industry groupings: construction; manufacturing; retail; transportation and, wholesale (Cole and Wolken 1995, pp. 630-633). Observations contained in the dataset for firms in the financial sector and service sector were excluded: services (SIC 7000-8000); and, finance, insurance and real estate (SIC 6000 – 6999). Observations for firms with no industry classification were also excluded.
- ii. Given the 1993 and 1998 SSBF datasets only includes a small number of firms owned by minority women, only observations for male-owned firms were examined for this study.
- iii. Ideally, when testing for decreases in the level of discrimination from 1993 to 1998, it would be preferable to have panel data. Unfortunately, the cross-sectional SSBF datasets were not constructed to ensure that observations for the same firms are included in both the 1993 and 1998 datasets.

### 3. Review of Literature

For more than thirty years, empirical researchers and mainstream microeconomic theorists have debated a question with important public policy implications: “*Does racial discrimination exist in various credit markets?*” The fact that this important question remains unresolved reflects three factors worth noting: (a) the availability of appropriate empirical data; (b) the difficulty of distinguishing between ‘statistical’ discrimination and ‘prejudicial discrimination; and, claims of specification bias (specifically omitted variable bias).

Prior to 1987, the kind of empirical data needed to adequately address this question was not generally publicly available. During the period from 1987 through 1997, several appropriate datasets became publicly available (e.g. CRA, HMDA and SSBF). Since 1987, with increasing frequency, empirical researchers have found substantial disparities in either the quantity and/or terms of credit extended to minorities versus non-minorities. When presented with these disparities, many mainstream theorists have offered one of two explanations for these reported disparities: (a) these disparities could evidence statistical discrimination rather than prejudicial discrimination; or, (b) these disparities reflect the omission of some important independent variable(s).

The increased availability of appropriate datasets since 1987 increased both the fervor and number of scholars engaged in this debate between empirical researchers and theoreticians. Given the central role of data in this debate, it will prove helpful to organize the review of empirical studies by major datasets. That said, in the beginning, before the data, there was theory. And, there we shall begin.

#### 3.1. Theoretical Literature on Discrimination in Credit Markets

The theoretical framework for examining discrimination in various credit markets was derived from the work of Gary Becker. Becker developed theoretical models for studying discrimination in labor markets (Becker 1971).

Today, theoreticians generally acknowledge the existence of two types of discrimination: taste (prejudicial) discrimination and statistical (economic) discrimination. Becker’s initial work focused on prejudicial discrimination. Neoclassical theoreticians in large measure have developed models that explore the possibility of prejudicial discrimination. When we speak of prejudicial discrimination, we mean that individuals or firms have a taste for discrimination (*similar to having a preference for chocolate ice cream rather than vanilla*). Employing conventional neoclassical theoretical logic, theoreticians generally have concluded that prejudicial discrimination will not exist in a competitive market in

equilibrium. In contrast, theorists generally have concluded that statistical discrimination can exist in a competitive market in equilibrium.

The second type of discrimination (statistical) is the primary focus of a newer school of economic thought known as the '*Economics of Information*.' The fundamental insight of this school of economic thought rests on the observation that securing information about market participants entails costs. More specifically, it may be more costly to obtain information about some market participants than others. In such instances, group membership may prove a less costly (albeit imperfect) substitute for elements of information about the performance of some market participants. It then follows from conventional neoclassical theoretical logic that any disparity between groups that might result from such a practice would tend to lower costs of a firm or individual engaged in that practice. Such a practice is referred to as 'statistical discrimination.' Thus, disparities between various groups can exist in a competitive market in equilibrium, even without racial prejudice.

### 3.1.1. Neoclassical Theoreticians and Prejudicial Discrimination

All of the theoretical work that examines the operation of prejudicial discrimination in labor, consumer and credit markets builds on the work of Gary Becker, a Chicago School economist (Becker 1971). Becker's initial work involved the development of theoretical models for studying discrimination in labor markets. Becker reasoned that an individual has a taste for discrimination if she acts as if she were willing to either pay something or forego income to be associated with some people rather than others. Becker attempted to isolate and quantify the cost of the taste for discrimination by defining a '**discrimination coefficient**.' One example of a discrimination coefficient is the factor that quantifies the differential in the wage rate paid to a member of an un-favored group versus a member of a favored group assuming equivalent levels of relevant skills.

Employing conventional neoclassical logic, Becker argues that in competitive markets, eventually market forces will eliminate prejudicial discrimination. Becker outlines in some detail how market forces operate to eliminate discrimination under both perfect and imperfect competition.

One easily can outline how this would occur in practice. Assume there is one non-discriminating employer in a market, that employer will replace white workers with equally qualified (but cheaper) black workers thus lowering the firm's expenses vis-à-vis its competitors.

In a competitive market characterized by decreasing or constant marginal cost, Becker argues that the firm with the smallest discrimination coefficient would have the lowest unit cost, thus, allowing it to undersell firms with a higher discrimination coefficients. Over time, the firm with the least 'taste' for



discrimination would undersell more and more firms and capture more and more market share. Eventually, the firm with the smallest discrimination coefficient in a market would produce the total market output. If one firm has a discrimination coefficient of zero, all other things being equal, the discrimination coefficient for the entire market eventually would shrink to zero.

Becker also argues that at equilibrium the market's discrimination coefficient could also equal zero in an imperfectly competitive market if the following three assumptions hold:

- 1) one or more firms in the market has discrimination coefficient of zero;
- 2) assets can easily be transferred from one market participant to another; and,
- 3) the capital markets are characterized by perfect competition.

All other factors being equal, a firm with a high discrimination coefficient would have higher costs and lower profits relative to other firms. Let us call this firm '**Company D.**' The owners of **Company D** could increase their return on investment by selling the operation to another firm with a lower discrimination coefficient. Further, if the owners of **Company D** do decide to sell, they could maximize their return by selling to the firm with the lowest discrimination coefficient ('**Company A**') because that firm would make the highest offer. **Company A** will make the highest bid because all other things being equal **Company A** will have the lowest costs and the highest return on assets. Thus, whether a labor market is perfectly or imperfectly competitive, if at least one market participant has a discrimination coefficient of zero, then at equilibrium the market discrimination coefficient would also be zero.

While neoclassical theorists uniformly subscribe to Becker's models for perfectly competitive markets, there was and is less coherence regarding the disposition of discrimination in imperfectly competitive markets. The work of Alchian<sup>4</sup> and Kessel is emblematic of the reasoning of those theorists that questioned the applicability of Becker's model to imperfect markets (Alchian and Kessel 1960). Like Becker, Alchian and Kessel reasoned that discrimination is costly, not only for those discriminated against, but also for those who discriminate. Thus, they

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<sup>4</sup> Alchian also used the analysis of property rights to explain the incidence of discrimination. Alchian was himself subject to discrimination as an Armenian. Alchian and Kessel argued that discrimination would be more prevalent in situations where those who discriminate do not bear much of the cost from doing so. Alchian and Kessel used this analysis to explain why regulated utilities discriminated against Jews and why labor unions discriminated against blacks. This analysis explains why Alchian has never trusted government—but has trusted free markets—to reduce discrimination Alchian, A. A. and R. A. Kessel (1960). *Competition, Monopoly, and the Pursuit of Money. Aspects of Labor Economics: a conference of the Universities-National Bureau Committee for Economic Research*. N. B. o. E. Research. Princeton, NJ, Princeton University Press. **14:** pp. 349. Liberty Fund, I. (n.d.). [www.econlib.org/library/Enc/bios/Alchian.html](http://www.econlib.org/library/Enc/bios/Alchian.html), Liberty Fund, Inc. **2003.**

concluded that discrimination would be more prevalent in markets where firms that discriminate do not suffer much of the cost of doing so. Following that logic, Alchian and Kessel reasoned that the government regulation of certain imperfectly competitive product markets may prove conducive to prejudicial discrimination. Like Becker, they argued that a for-profit firm whose profits are subject to government regulation would see the cost of discrimination in the form of lower profits; however, a firm whose profits were limited by rate of return regulations and that was already at the limit would face no cost from discriminating. Government regulation typically protects firms from competition, while simultaneously it set prices at levels designed to preclude excessive rates of return (as cited in Elliehausen and Durkin 1989, pg. 94). Alchian and Kessel suggested that in an imperfectly competitive market subject to public regulations, the constraints on permissible levels of profitability may lower the effective cost of indulging in prejudicial discrimination; and, therefore, encourage the practice.

In the final analysis, Alchian and Kessel reasoned that the constraints on the permissible levels of profitability frequently associated with public regulation may preclude firms with lower discrimination coefficients from making large enough bids to persuade the owners firms with higher discrimination coefficients to sell their firms.

In general, credit markets in the U.S. are highly regulated. Public regulations control the chartering and licensing of most financial institutions (e.g. commercial banks, finance companies and various thrifts). In addition, regulations designating an institution's service area and the size and types of loans that a given institution may provide serve as potent barriers to entry, exit and participation in the various credit markets. Applying Alchian and Kessel's model to credit markets, one might reasonably conclude that given the various imperfections that characterize most credit markets, a creditor with a taste for discrimination might be able to indulge this taste with minimal impact on the firm's profitability and market share; and thus, the discrimination coefficient of a such a firm might not decrease over time as Becker's work would suggest.

"Monopolists who appear to be too profitable are likely to face pressures to reduce prices; and consequently may prefer to take potential excess profits in nonpecuniary forms which can be treated as costs. In the credit area, creditors with even a small taste for discrimination might be induced to ignore profitable loans to disfavored groups and to prefer loans to more marginal risk among favored classes" (Elliehausen and Durkin 1989, pg. 94).

That said, Alchian and Kessel did not focus on credit markets. Richard Peterson and Carol Peterson, were among the first to employ Becker's theoretical model as a framework for investigating possible discrimination in consumer credit markets (Peterson and Peterson 1981; Elliehausen and Durkin 1989). Like Becker, the Petersons focused only on prejudicial discrimination. Building on Becker's work, they argued that a lender with a taste for discrimination would

demand a higher return and/or a lower risk profile from a member of an un-favored group versus a member of a favored group. Specifically, the Petersons reasoned that a discriminating creditor would apply more stringent underwriting criteria and offer less favorable credit terms on loans granted to members of an un-favored group versus members of a favored group. Like Becker, the Petersons reasoned that even if some lenders have a taste for discrimination, market forces would act to shrink or eliminate equilibrium discrimination coefficients of market participants over time.

To summarize, neoclassical theoreticians uniformly agree and argue that even if many firms operating in a 'near-perfectly' competitive market have a taste for discrimination, competition in the market will eliminate prejudicial discrimination over time. This unanimity among neoclassical theoreticians dissolves when the focus shifts to markets characterized by increasing degrees of imperfection. Some neoclassical theoreticians have argued that in highly regulated markets (e.g. credit markets) a firm with a taste for discrimination might be able to indulge this taste with minimal impact on the firm's profitability and market share; and, therefore, the discrimination coefficient of a such a firm might not decrease over time as Becker's work suggest.

Neoclassical models are characterized by two other important limitations that should be noted. First, neoclassical models do not quantify the time period required to eliminate prejudicial discrimination from a market. If the time periods are long because competitive forces work slowly, then firms with a taste for discrimination may survive for a long time before their market share and profitability erode sufficiently to drive them out. Second, neoclassical models do not offer reasons for the existence of prejudicial discrimination which is costly to those who practice it. "*Costly preferences for discrimination are simply postulated for theoretical purposes, and their implications are explored, leading to the conclusions that markets will eliminate such tastes*" (Elliehausen and Durkin 1989, pg. 95). While the neoclassical models do not address the reasons for discrimination, another school of thought does: the information-cost school. The proponents of this school argue that sometimes firms engage in discriminatory practices because it can reduce costs. The next section provides a brief overview of the major findings of the information-cost school.

### 3.1.2. The Economics of Information and Statistical Discrimination

Above, we juxtaposed the 'information-cost' and the 'neoclassical' schools of thought. This is a bit misleading. Information-cost models are best understood as variants of neoclassical thought that have been informed by the framework and logic of game theory (Bierman and Fernandez 1993). All information-cost models attempt two tasks: (1) to characterize the type, timing and quality of information available to various classes of market participants; and, (2) to predict the behavior of these classes of participants as each market participant attempts to optimize his/her risk-adjusted return. While the information-cost models

developed for various credit markets generally acknowledge that there may be significant disparities in the terms and/or quantity of credit extended to various racial/ethnic groups, these models all suggest that these disparities reflect statistical rather than prejudicial discrimination. Statistical discrimination can occur in many different settings and markets (product, labor, etc), but we will confine our discussion to credit markets and offer a description relevant only to those markets. Statistical discrimination, sometimes referred to as economic discrimination, occurs when a creditor uses a credit applicant's race (or some other protected characteristic – age, gender, etc.) as a proxy for measures of creditworthiness that cannot be directly observed.

The information-cost models may be seen as a logical extension of the work of Alchian and Kessel, as opposed to Becker. All of the information-cost models acknowledge that credit markets are characterized by a number of imperfections and thus, may operate stably over long periods of time at interest rates other than the Walrasian equilibrium interest rate<sup>5</sup>. In other words, equilibrium interest rates in credit markets tend to be below the market clearing rate.

Today, many financial markets theorists recognize that credit markets cannot be usefully modeled as '**perfectly competitive markets**.' Credit markets deviate from the specifications of a perfectly competitive market in three important ways.

“Credit is not freely available at the equilibrium rate of interest . . . . [because credit markets are] characterized by non-simultaneous exchange and the existence of imperfect and costly information. . . . In perfectly competitive markets, goods and money are exchanged simultaneously and perfect information exists. However, in financial markets, the required [assumption] of simultaneous exchange is violated by the nature of the transaction itself. When money is borrowed today, it is exchanged for a promise to repay the note in the future” (Nesiba 1996, pg. 60).

As stated by Nesiba (1996), the first of these three imperfections observed in credit markets is that the prevailing interest rate consistently falls below the 'Walrasian' equilibrium interest rate (i.e. the interest rate at which the quantity of loan funds demanded equals the quantity of loanable funds supplied). Therefore,

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<sup>5</sup> A Walrasian Economy is a decentralized market economy characterized by price-taking consumers and firms and the private ownership of capital and labor, which operates in a such a fashion that the following things are true: (1) property rights are well established and costlessly enforced; (2) potentially disruptive behavior such as incorrect expectations, the breaking of contracts, theft, power struggles, and status competition is not permitted; (3) all consumers are maximizing their utility; (4) all firms are maximizing their profits; and, (5) all markets clear. The level of supply and demand for various economic factors where conditions 3, 4, and 5 are true are referred as the Walrasian equilibrium. The Walrasian equilibrium interest rate would be the rate for capital in a credit market in an Walrasian economy where conditions 3, 4 and 5 were true Tesfatsion, L. (2003). Walrasian Equilibrium: A Critique, [www.econ.iastate.edu/tesfatsi/wal604.pdf](http://www.econ.iastate.edu/tesfatsi/wal604.pdf). 2003..

credit markets are characterized by credit rationing because the quantity of loan funds demanded exceeds the quantity of loanable funds supplied. After we discuss the other two imperfections inherent in credit markets, we will return to the topic of credit rationing.

The second imperfection is the lack of simultaneity inherent in a loan transaction. The creditor advances funds to a borrower today in exchange for the borrower's promise to pay in the coming months or years.

The third imperfection of credit market deals with the distribution of information among market participants. In a perfectly competitive market, information is costless and equally available to all participants. Many of the proponents of the information-cost school begin "*with a particular assumption of asymmetric information (i.e. borrowers have better information about the value of the property being purchased and their likelihood of repayment than do lenders)*" (Nesiba 1996, pp. 60-61)."

The existence of asymmetric information gives rise to two concerns that ultimately explain why credit is rationed (i.e. why prevailing interest rates in credit markets fall short of Walrasian equilibrium interest rates). The two concerns are adverse selection and adverse incentives. Adverse selection impacts which credit applicants are in the loan portfolio (composition), whereas, adverse incentives (moral hazard) influences the behavior of those already in the loan portfolio (Nesiba 1996, pg. 61). The concept of adverse incentives is linked to the notion of 'moral hazard.' An example of the type of action that invites moral hazard is the rescue operation carried out by U.S. Government to address the 1994-1995 Mexican currency crises. Such actions can encourage risky lending, if lenders know that in case of serious problems they will not have to take losses.

Having introduced the concepts of adverse selection and adverse incentive, let us return to the topic of credit rationing (the first credit market imperfections). Jaffee and Stiglitz (1990) offer an explanation for the existence of credit rationing by examining the relationship between adverse selection, adverse incentives, interest rates and underwriting risk (Jaffee and Stiglitz 1990). Ultimately, Jaffee and Stiglitz show that a credit market in equilibrium may be characterized by credit rationing. Their argument can be summarized as follows: A lender providing a loan cares about the interest rate he/she receives on the loan and the riskiness of the loan. However, the interest charged may itself affect the riskiness of a lender's loan portfolio by either: 1) sorting potential debtors (adverse selection); or, 2) affecting the actions of debtors (the incentive effect). The relationship between adverse selection and the interest rates charged rests primarily on one assumption: *those willing to pay high interest rates may, on average, be either involved in or proposing riskier transactions*. In other words, as the interest rate rises, the average riskiness of transactions increases, possibly lowering the bank's profits (Stiglitz and Weiss 1981, pp. 408-409).

Now, let us turn our attention to adverse incentives. Another way of talking about the 'incentive effect' is 'moral hazard.' Moral hazard occurs when party "A" (one of two parties to an agreement) can and does engage in reckless behavior unobserved by the other party (Party "B") to the agreement and that behavior can significantly and negatively impact the payoff of party "B." The authors argue that the risk of moral hazard increases as the interest rates charged increase. For example, raising the interest rate on debt employed to finance a project reduces the borrower's net return on a project ceteris paribus, thereby encouraging borrowers to undertake projects with higher returns on investment (if they succeed) but a lower likelihood of success (Stiglitz and Weiss 1981, 408-409; Jaffee and Stiglitz 1990, pp. 858-859).

Jaffee and Stiglitz built on a model that Stiglitz & Weiss developed and described in 1981. Specifically, Stiglitz & Weiss crafted a model that explains racial disparities in the mortgage markets as a function of statistical discrimination as opposed to prejudicial discrimination. The model begins with seven specific assumptions:

- 1) The credit market is characterized by asymmetric information (the borrowers know the expected return and risk of their project, whereas the lender knows only the expected return and risk of the average project associated with a particular group).
- 2) Racial prejudice by bankers does not exist (i.e. no banker has a 'taste' for discrimination).
- 3) The market contains an array of deals with varying risks and expected rates of return.
- 4) All projects associated with a group have the same expected rate of return; however, the risk may vary (and the risk can be quantified).
- 5) Lenders have a "bank optimal" interest rate ( $r^*$ ) at which they maximize their return. Exceeding this bank optimal rate exposes the lender to increased losses as result of adverse selection and moral hazard, thus reducing the bank's rate of return.
- 6) There are  $n$  distinguishable groups of borrowers each characterized by different expected return functions.
- 7) Even if two or more groups of borrowers have equal expected rates of return, the average variance of returns (measure of risk) of the projects for each group is unique.

Stiglitz and Weiss' major findings follow:

If the risk-adjusted interest rate for a particular (racial) group's projects exceeds the bank optimal interest rate, credit rationing may occur such that member of that group will not receive access to credit until another group's credit needs are first met. In the most extreme case, a bank may set a 'bank optimal' interest rate, which prohibits lending to a particular group because the interest rate is set lower than the bank's required return for that particular group. In short, loaning to

member of that group is too risky given the "bank optimal" interest rate (Stiglitz and Weiss 1981).

In contrast to models of Stiglitz and Weiss, Stiglitz and Jaffee, and Becker, the work of Guttentag and Wachter and of Lang and Nakamura focus on the spatial manifestation of discrimination, redlining. Strictly speaking, '**redlining**' refers to the practice by mortgage lenders of identifying an area within which they would not extend credit. In the past, some mortgage lenders traced on a map the boundaries of an area within which they would not lend with a red crayon or pen, giving rise to the term 'redlining' (Guttentag and Wachter 1980, pg. 11).

In current parlance, the term (redlining) is used to describe the practice by mortgage lenders of penalizing mortgage applicants from a designated area, without regard to an individual applicant's creditworthiness. The importance of redlining is a direct result of the persistence of de facto residential and social segregation between non-minorities and minorities. Dymski offers a more precise formulation:

"[Imagine that a lender serves two communities **X** and **Y**; the occupants of **X** are primarily African-American and the occupants of **Y** are primarily White.] . . . redlining occurs when the probability of financing a residential transaction in **X** is lower than in **Y**, with all economic factors held constant, or when borrowers face more stringent terms on a residential transaction in **X** than if the same transaction were made in **Y**" (Dymski 1995, pg. 40).

Guttentag and Wachter (1980) developed an argument that attempts to explain how redlining might persist in a credit market. At the onset of their argument, they divide redlining into two broad categories: irrational and rational redlining. Irrational redlining is synonymous with prejudicial discrimination, and Guttentag and Wachter assume that the combination of competitive market forces (per Becker) and activism on the part of affected communities would eliminate irrational discriminatory redlining. Given that assumption, they focus their energy on trying to explain how 'rational' redlining might persist in credit markets. Rational redlining is synonymous with statistical discrimination.

Guttentag and Wachter argue that redlining results from coordination failures among lenders (Guttentag and Wachter 1980, pg. 1). Their argument rests in part on two related observations:

- In part, the value of housing in a given area is a function of the collective willingness of lenders to provide mortgages in that area.
- The riskiness of any given loan held by a lender is a function in part of the willingness of other lenders to provide mortgages in the area where that particular borrower resides.

Thus, it can be said that lenders are engaged in a ‘**coordination game**,’ where their payoffs (returns) depend in part on their success in anticipating and adopting the same strategy as the other ‘players’ in the game (Bierman and Fernandez 1993, pp.202-204). The Guttentag and Wachter model can be summarized as follows. There are two neighborhoods, **X** and **Y**, and there is a lender with no information about the actual risks and returns of providing credit in either neighborhood. This lender will gather “*information [about credit applications] up to the point at which its anticipated marginal gain from information-gathering equals its marginal cost*” (Dymski 1995, pg. 48). If this lender anticipates that other lenders will be more inclined to provide loans for transactions in neighborhood **Y** versus neighborhood **X**, then the lender might reason that the risk of lending in neighborhood **Y** might be lower than that associated with neighborhood **X**, ceteris paribus. As this kind of reasoning repeats itself, it becomes a self-fulfilling prophecy. As a result, neighborhood **X** is redlined (Guttentag and Wachter 1980, pp. 7-9).

Like Guttentag and Wachter, Lang and Nakamura also offer a theory that attempts to explain how redlining might persist in a credit market.

The model developed by Lang and Nakamura (1993) begins with two specific assumptions: 1) asymmetric information results from the home appraisal process; and, 2) racial prejudice by bankers does not exist (i.e. no banker has a ‘taste’ for discrimination).

Like Guttentag and Wachter, Lang and Nakamura’s model rests in part on two related observations:

- In part, the value of housing in a given area is a function of the collective willingness of lenders to provide mortgages in that area.
- The riskiness of any given loan held by a lender is a function in part of the willingness of other lenders to provide mortgages in the area where that particular borrower resides.

Lenders are continually engaged in the process of determining the true values of the homes that serve as collateral for mortgages. Estimates of values must be made. Since estimates are noisy, the more transactions (housing sales) in a particular neighborhood ceteris paribus, the more accurate a lender’s estimates of true home values in that neighborhood. Thus the Lang and Nakamura argue that: if there have been more housing sales in neighborhood **Y** compared with neighborhood **X**, the estimates of value (housing appraisals) for neighborhood **Y** will be more accurate than those for neighborhood **X** ceteris paribus. As a result, a lender will require higher down payments to compensate them for the greater risk (lower quality estimates) associated with mortgage requests from neighborhood **X**, ceteris paribus. This, in turn decreases the number of sales in the neighborhood **X** and further reinforces the lending bias toward neighborhood **Y** which is perceived as lower risk because of the higher quality of collateral estimates (Lang and Nakamura 1993, pp. 225-231).



To summarize, if banks do little lending in low-income and minority neighborhoods, their estimates of housing values in these areas will be less accurate. As a result, they will require higher down payments and/or higher interest rates to compensate them for the greater risk (lower quality estimates) associated with mortgage requests from those neighborhoods. This in turn will decrease the number of sales in the low-income and minority neighborhoods and further reinforce the lending bias toward neighborhoods that already receive credit and are perceived as lower risk because of the higher quality of collateral estimates.

Table 1 (page 20) summarizes the three Information-Cost school models of discrimination that were discussed in the preceding pages and the major elements of each of the models.

Dymski outlines a unified model that explains both discrimination against applicants based on race or ethnicity and redlining. Thus, this model intends to supercede the models of Becker, Stiglitz and Jaffee, Stiglitz and Weiss, Guttentag and Wachter, and Lang and Nakamura. Ultimately, Dymski's model rests on the observation that labor markets, credit markets and the process of wealth accumulation are inextricably intertwined<sup>6</sup>. According to Dymski, labor markets, credit markets and the process of wealth accumulation are interdependent because "*creditworthiness rests on borrowers' overall economic capacity, and hence depends on outcomes in all other markets*" (Dymski 1995, pg. 50).

Dymski's model can be summarized as follows: we have a population that consists of blacks and whites, where most of the whites reside in area **Y** and most of the blacks reside in area **X**. Let us assume the blacks are subjected to prejudicial discrimination in labor markets or in the markets that they engage in as entrepreneurs; and this discrimination impinges on their ability to earn income in any of the following ways:

- a) Blacks earn lower wages than whites in the labor market;
- b) Blacks receive lower earnings than whites when they are self-employed;
- c) More black than whites work as entrepreneurs, and the variance for entrepreneurial earnings is greater than that for wages.

Collectively, these forms of earned-income discrimination indicate that on average blacks have poorer prospects for future earnings than whites. One implication of this differential in future earnings prospects is that likelihood of

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<sup>6</sup> It should be noted that Becker recognized the interdependence of labor and capital markets and employs that relationship to explain how market forces would eliminate prejudicial discrimination over time in an imperfect competitive market Becker, G. S. (1971). The economics of discrimination. Chicago, University of Chicago.  
Elliehausen, G., E. and T. A. Durkin (1989). "Theory and Evidence of Impact of Equal Credit Opportunity: An Agnostic Review of the Literature." Journal of Financial Services Research(2): pp. 89-114..

default on a mortgage loan is higher for blacks than whites with identical earnings levels and employment histories. That said, even if lenders do not engage in prejudicial discrimination, they may engage in statistical discrimination which constrains the amount credit available to blacks relative whites, due to prejudicial discrimination in other markets like the labor markets. To 'equalize' the risk-adjusted return between black and white borrowers, lenders may require higher interest rates and/or downpayments from blacks relative to whites (Dymski 1995, pp. 50-52).

Over time, the higher interest rates and/or downpayments will reduce demand for mortgage loans, constrain the number of homes sold and limit the appreciation of home values in area **X**, where most of the blacks reside, relative to area **Y**, where white reside, *ceteris paribus*. The sale of a home is one of the principal means by which individuals realize wealth. So, over time, discrimination in the mortgage markets can contribute to differentials in wealth between blacks and whites.

Finally, Dymski also considers a scenario in which racial income prospects are assumed to be the same for both blacks and whites; however, on average, whites inherit more wealth than blacks do.<sup>7</sup> One implication of this differential in wealth holdings is that likelihood of default on a mortgage loan is higher for blacks than whites who have identical earnings levels and employment histories. Ultimately, the effects of differential wealth holdings on blacks in the credit market are the same as those of differential earned income. To 'equalize' the risk-adjusted return between black and white borrowers, lenders may require higher interest rates and/or downpayments from blacks relative to whites (Dymski 1995, pp. 53-54).

To summarize, Dymski's model addresses both prejudicial and statistical discrimination. His model predicts that if either lenders or white homeowners have a 'taste' for discrimination, discrimination may appear and persist in credit markets. Turning to statistical discrimination, the Dymski model suggests that if there are racial differentials in either income or wealth, discrimination may appear and persist in credit markets (Dymski 1995, pp.57-61).

### 3.1.3. Summary of Theoretical Literature on Discrimination

Before we begin our discussion of empirical research, a brief summary of the theoretical literature might be helpful. Theoreticians generally acknowledge the existence of two types of discrimination: taste (prejudicial) discrimination and statistical (economic) discrimination. When we speak of prejudicial

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<sup>7</sup> Both Conley and Oliver and Shapiro present compelling quantitative data that on average whites inherit more wealth than blacks do Oliver, M. L. and T. M. Shapiro (1997). Black Wealth / White Wealth: A New Perspective on Racial Inequality. New York, Routledge.  
Conley, D. (1999). Being Black, living in the red: race, wealth, and social policy in America. Berkeley, CA, University of California Press..

discrimination, we mean that individuals or firms have a taste for discrimination. Employing conventional neoclassical theoretical logic, theoreticians generally have concluded that prejudicial discrimination will not exist in a competitive market in equilibrium. The second type of discrimination (statistical) is the primary focus of a newer school of economic thought known as the '*Economics of Information*.' The fundamental insight of this school of economic thought rests on the observation that securing information about market participants entails costs. More specifically, the cost of obtaining information about market participants may vary from one person to another or one group to another. In such instances, group membership may prove a less costly (albeit imperfect) substitute for elements of information about the performance of some market participants. It then follows from conventional neoclassical theoretical logic that a firm or individual engaged in the practice of using group membership as a proxy for types of information that might be costly to obtain otherwise would tend to lower their costs compared with those who do not engage in this practice. Such a practice is referred to as 'statistical discrimination.' Thus, disparities between various groups can exist in a competitive market in equilibrium, even if no market participant engages in prejudicial discrimination.

Finally, many financial markets theorists acknowledge that credit markets cannot not be usefully modeled as '**perfectly competitive markets**,' thus, allowing for the possibility of prejudicial and/or statistical discrimination at equilibrium. Credit markets deviate from the specifications of a perfectly competitive market in three important ways: the prevailing interest rate consistently falls below the 'Walrasian' equilibrium interest rate; lack of simultaneous exchanges; and, asymmetric information. And, these deviations from the specifications of a perfectly competitive market give rise to credit rationing in credit markets, allowing for the possibility of prejudicial and/or statistical discrimination at equilibrium.

In our study, we test for the existence of prejudicial discrimination in the provision of trade credit. Our methodology is discussed more fully in the "Research Methodology and Result" chapter which begins on page 51.

In the next section, a synopsis of major empirical research is presented.

**Table 1. Major Theoretical Research on Discrimination in Mortgage Lending**

<b>A Summary of Major Theoretical Research on Discrimination in Mortgage Lending<sup>8</sup> by Proponents of the Information-Cost School</b>		
<b>Theorist(s) [discrimination type modeled]</b>	<b>Major Assumptions</b>	<b>Major Findings</b>
<b>Stiglitz &amp; Weiss</b> [Statistical discrimination] (Stiglitz and Weiss 1981)	<ol style="list-style-type: none"> <li>1) The market is characterized by asymmetric information.</li> <li>2) Lender has no 'taste' for discrimination.</li> <li>3) The market contains an array of projects with varying risks and expected rates of return.</li> <li>4) All projects associated with a group have the same expected rate of return; however, the risk may vary (and can be quantified).</li> <li>5) Given adverse selection and moral hazard, lenders have a "bank optimal" interest rate (<math>r^*</math>) at which they maximize their return. <math>r^*</math> is always below the Walrasian equilibrium interest rate.</li> <li>6) There are <math>n</math> distinguishable groups</li> </ol>	<p>If the risk-adjusted interest rate for Group "X's" projects exceeds the bank optimal interest rate, credit rationing may occur such that members of Group X will not receive access to credit until another group's credit need are first met. In the most extreme case, a bank may set a "bank optimal" interest rate, which prohibits lending to a particular group because the interest rate is set lower than the bank's required return for that particular group. In short, lending to a member of that group is too risky given the "bank optimal" interest rate.</p>
<b>Guttentag and Wachter</b> [Statistical discrimination] (Guttentag and Wachter 1980)	<ol style="list-style-type: none"> <li>1) The market is characterized by asymmetric information.</li> <li>2) No Lender has a 'taste' for discrimination.</li> <li>3) Lenders fail to coordinate information gathering and lending activities.</li> </ol>	<p>Two types of redlining are possible: neighborhood effects and social discrimination. The failure of lenders to pool resources in gathering underwriting information in certain communities may result in neighborhood effects redlining. Rational social discrimination redlining occurs when protected borrower characteristics are: (a) correlated with risk and (b) employed in the lender's underwriting process. Establishing social discrimination (s.d.) redlining is difficult because s.d. redlining variables are closely correlated with neighborhood effects redlining (given the spatial segregation of various racial and ethnic populations).</p>

<sup>8</sup> The format and contents of this table benefits significantly from a table included in an excellent article by Reynold Nesiba Nesiba, R. F. (1996). "Racial Discrimination in Residential Lending Markets: Why Empirical Researchers always see it and Economic Theorists never do." Journal of Economic Issues XXX(1): pp. 51 - 77.. The Prejudicial and Statistical discrimination are synonymous with Non-economic and Economic discrimination, respectively.

<p><b>Lang and Nakamura</b> [Statistical discrimination] (Lang and Nakamura 1993)</p>	<p>1) The market is characterized by asymmetric information. 2) No Lender has a 'taste' for discrimination, however, in the past, there was prejudicial discrimination. 3) Home appraisals are imperfect estimates of true value. 4) The accuracy of a lender's underwriting in a given area is positively correlated with the number of real estate transactions previously completed in that neighborhood, ceteris paribus.</p>	<p>As the number of home sales in a given neighborhood increases, the accuracy of appraisals improve and lenders are better able to assess risk, ceteris paribus. If lenders have historically done little lending in a neighborhood of color and few transactions have occurred, appraisals for that neighborhood will be less accurate compared with those for other neighborhoods. Thus, lenders will perceive more risk, and seek higher down payments which will discourage transactions in that area</p>
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### 3.2. Empirical Research on Discrimination in Credit Markets

While there has been much empirical research on discrimination in home mortgage markets and a growing body of empirical research on discrimination in bank loans to small businesses, this author has found no empirical research that tests for discrimination in provision of trade credit. And, only two empirical studies were found that address (even tangentially) the primary research questions that motivate our study (Coleman 2003; Aaronson, Bostic et al. 2004). Given the preceding, in this section, we will briefly outline some major findings for discrimination in home mortgage lending and some major findings for discrimination in business lending. Then we will discuss in more detail the findings of Aaronson *et. al.* and Coleman *et. al.*

Before reviewing and discussing the various empirical studies, one area of controversy demands our attention. This area of contention is how best to detect discrimination, if it exists. In other words, *what method of analysis is appropriate*. The majority of the empirical studies can be grouped into three broad categories: (1) various types of *Rejection Rate Analyses*<sup>9</sup>, (2) Fair Share Analyses, and (3) Loan Performance Analyses.

#### 3.2.1. Principal Research Methods Employed

One of the three broad categories of analysis is *Rejection Rate Analyses*. Essentially, all of the methods that fall into this category quantify and compare the likelihood of rejection or approval of a credit request by a member of a minority group versus a non-minority group. Underlying this approach is the assumption that a higher rejection rate (however calculated) for minorities versus non-minorities implies the existence of discrimination (Nesiba 1996, pg. 56).

The specific methods of analysis that fall into this category vary in sophistication.

The simplest form of Rejection Rate Analysis entails the calculation of a “simple rejection rate” for minority credit applicants and the comparison of the minority simple rejection rate to that for non-minority credit applicants (Ross and Yinger 2002, pp. 94-106). The simple rejection rate for minority credit applicants would be calculated as follows: (1) Determine the total number of credit requests submitted to an institution from minority group members during some period of time. (2) Determine how many of those requests were denied. (3) Divide the number obtained in Step #2 by the number obtained in Step #1 to determine the simple rejection rate for minority credit applicants. By following an analogous process, the simple rejection rate for non-minority applicants can be determined. With both the minority and non-minority simple rejection rates in hand, they can be compared. If simple rejection rate for minorities exceeds that observed for

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<sup>9</sup> Approval rates analyses and *Rejection Rate Analyses* are essentially one and the same: one is the mirror image of the other.

non-minorities then discrimination is a possible explanation of the observed disparity. That said, any observed disparities may reflect other factors (e.g. differences in average income levels, wealth, employment stability, etc.).

The apparent limitations of simple Rejection Rate Analysis led empirical researchers to develop more sophisticated methods that allow a researcher to account for (control) some of the other factors that may account for observed disparities in simple rejection rates across racial/ethnic groups.

At the other end of the spectrum of sophistication are those studies that employ binomial logit (and/or probit) regression models. Typically, the dependent variable in these studies is the probability<sup>10</sup> of a credit request being denied. In the most straightforward applications of binomial logit models, the independent variables typically include various measures of creditworthiness and demographic descriptors including race. If a race variable coded to identify minority applicants proves statistically significant, it suggests that discrimination is a possibility.

Another common application of the binomial logit models entails estimating separate regression models and denial rates for non-minority and minority credit applicants. This allows a researcher to quantify the influence of the differences in credit applicants' endowments on differences in denial rates for minority and non-minority group members (Cavalluzzo 2002, pg. 15). The term 'endowments' refers to various creditworthiness-related characteristics of a credit applicant (e.g. credit history, net worth, etc.) Ultimately, this procedure allows the researcher to decompose the differences in denial rates between minority and non-minority applicants into two components, one component due to differences in endowments between minority and non-minority applicants, and, a second component due to differences in the treatment of applicants given those endowments (Cavalluzzo 2002, pg. 15).

The procedure requires that the sample of credit applicants be divided (*at minimum*) into two sub-samples: a minority sub-sample and a non-minority sub-sample. Then a separate regression model and denial rate is calculated for non-minority and minority credit applicants, respectively. Frequently, the denial rate for the sub-sample of minority credit applicants is higher than that estimated for the non-minority sub-sample. Then the mean values of the independent variables for the minority credit applicants sub-sample are plugged into the non-minority regression model to determine the denial rate for minority credit applicants in a world that is '*color-blind*.' The resulting '*color-blind*' denial rate for the minority credit applicants sub-sample typically is lower than the original denial rate for the sub-sample of minority credit applicants but higher than the non-minority denial rate, reflecting differences in the average level of

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<sup>10</sup> Specifically, the dependent variable in a binomial logit regression model is the log of the odds that a credit request will be denied Studenmund, A. H. (2001). Using Econometrics: a practical guide. New York, Addison Wesley Longman, Inc..



creditworthiness of minorities versus non-minorities (the 'endowment effect'). The results of this procedure are best illustrated by looking at an actual example. Table 2 is based on a table included in a 2002 study by Cavalluzzo *et al.* (see Table 6 2002, pg. 32).

**Table 2. Total Endowment Effect**

Total Endowment Effect					
Row		White	African-American	Hispanic	Asian
1	Actual Denial Rates <sup>a</sup> for sub-samples	0.241	0.618	0.497	0.524
2	Differences in Denial Rates <sup>a</sup> for Minorities versus Whites	0.000	0.377	0.256	0.283
3	"Color Blind" Denial Rates <sup>a</sup> 0.241		0.367	0.317	0.317
4	Differences in Denial Rates <sup>a</sup> (explained by differences in endowments)	n/a	0.126	0.076	0.076
5	% Differences in Denial Rates <sup>a</sup> (explained by differences in endowments)	n/a	33.5%	29.7%	27.0%

Notes:

- a) Point estimate for sub-sample means of independent variables.
- b) Source: (Table 6 in Cavalluzzo 2002, pg. 32)

In this study, Cavalluzzo *et al.* divided their sample of credit applicants into four sub-samples: White credit applicants; African-American credit applicants; Hispanic credit applicants; and, Asian credit applicants. For each sub-sample a separate regression model was calculated. Then the mean values for each independent variable for given sub-sample were plugged into the corresponding regression model to determine the mean denial rate for each sub-sample (the 'Actual' denial rates). The resulting 'Actual' denial rates for each racial/ethnic group are shown in Row #1. In Row #2, the numerical difference in the denial rate relative to 'Whites' is calculated for each minority group. Row #3 shows the denial rates for each minority group if the mean independent variable values for each minority sub-sample are plugged into the 'White' regression model. (the "Color Blind" denial rates) Row #4 contains the difference between the Color Blind denial rate for each minority group and the 'White' denial rate. Finally, using the figures in Row # 2 and #4, the portion of the difference between the 'White' denial rate and the 'Actual' denial rate for each minority group that can be explained by differences in endowment can be calculated. Row #5 shows, for each minority group, the percentage of the difference between the 'White' denial rate and the 'Actual' denial rate for the minority group that can be explained by differences in endowments. For example, the actual denial rate for African-American is more than two and one-half times higher than the actual denial rates for Whites. Clearly, a portion reflects differences in average levels of

endowments between African-Americans and Whites. Cavalluzzo *et al.* estimate that these differences in average levels of endowments account for approximately one-third of the observed disparity in loan denial rates between Whites and African-Americans. The remaining two-thirds of the disparity in denial rates between African-Americans and Whites result from other causes. Cavalluzzo *et al.* argue that primary among those other causes is discrimination.

The analysis by Cavalluzzo *et al.* discussed in the preceding paragraphs is representative of the more sophisticated versions of rejection analyses. Essentially, all Rejection Rate Analyses methods quantify and compare the likelihood of rejection or approval of a credit request by a member of a minority group versus a non-minority group. Underlying this approach is the assumption that a higher rejection rate (however calculated) for minorities versus non-minorities implies the existence of discrimination (Nesiba 1996, pg. 56).

The second of the three broad categories of analysis is "Fair Share Analyses." Broadly speaking, all of the various methods of Fair Share Analyses quantify and compare the distribution of outstanding credit across either racial/ethnic groups or geographic space (e.g. census tracts). The methods of Fair Share Analyses range along two dimensions: (a) the extent to which the study tries to control for differences in endowments, and (b) the applicable unit of analysis which may consist of individuals, firms or census tracts.

Fair Share Analyses range in sophistication. To illustrate Fair Share Analyses in its most elementary form, it would be helpful to look at the home mortgage market. A study might focus on a metropolitan area (MSA), identifying the number and proportion of mortgages made in each census tract in that MSA controlling for income, the number of mortgageable housing units and race/ethnicity. The number and the proportion of mortgages for various census tracts are compared to each other and the average for the MSA (Nesiba 1996, pg. 57).

After controlling for income, the number of mortgageable housing units and race/ethnicity, if there are a smaller number and/or proportion of mortgages in census tracts with high levels of minorities (relative to the average for the MSA) then discrimination may be a possible explanation of the observed disparity.

In its most sophisticated form, a Fair Share analysis might look like the 1997 empirical study by Bates where he presents a regression model to explain the loan amounts extended to start-up firms by financial institutions. (Bates 1997) In this study, the dependent variable is "***the dollar amount of debt used to start or become owner of the business***" (see Table 1 in Bates 1997, pg. 489). The unit of analysis is the firm and the sample includes firms owned by Blacks and Whites. The regression model includes four types of independent variables: "(1) *owner equity capital investment*, (2) *owner human capital traits*, (3) *loan source*, and (4) *owner demographic traits*" (Bates 1997, pg. 489). Ultimately, Bates found that "***Black-***

***owned businesses received [significantly] smaller loans than white-owned firms with identical measured characteristics***” (Bates 1997, pg. 487 and 491).

Underlying this approach are two important assumptions: (a) discrimination may exist if, after controlling for differences in endowments across demographic groups, the distribution of outstanding credit does not closely mirror the distribution of the relevant population across racial/ethnic groups; and (b) the demand among various racial/ethnic groups is the same. If the analysis focuses on the spatial distribution of outstanding credit within an MSA, then the preceding assumptions would be restated as follows: (a) discrimination may exist if, after controlling for three types of independent variables (measures of mean income for the appropriate unit of observation (e.g. individuals, firms, families, etc.), the number of potential borrowers and demographics measures including race), the race variable is statistically significant in explaining the aggregate amount of outstanding credit in an area; and, (b) the demand among various areas (e.g. census tracts) within an MSA is the same (Nesiba 1996, pp. 57-58).

The third broad categories of analysis is ‘Loan Performance Analyses.’ Essentially, all of the methods that fall into this category attempt to quantify the profitability of loans and/or the incidence and cost of defaults for minority and non-minority borrowers (Ross and Yinger 2002, pp. 235-239). Underlying this approach is the assumption that either a higher average level of profitability or a lower average frequency of default for minority borrowers compared with non-minority borrower is symptomatic of taste-based discrimination.

“The commonly held view has been that if there exists taste-based discrimination, loans approved to minority borrowers would have higher expected profitability than to majorities with comparable credit background. . . . We also show that there must exist taste-based discrimination if loans to minority borrowers have higher expected rate[s] of return or lower expected rate[s] of default loss than to majorities with the same exogenous characteristics observed at the time of loan origination” (see the abstract of Han 2001).

Loan Performance Analyses vary in sophistication. To illustrate Loan Performance Analyses in its most elementary form, it would be helpful to look at the home mortgage market. Loan Performance Analyses might entail the estimation of the interest rate paid on an outstanding mortgage after controlling for difference in endowments, etc. The sample for such a study would include data for both minority and non-minority borrowers covering at least six classes of independent variables: (1) measures of creditworthiness, (2) neighborhood descriptors, (3) collateral descriptors (single-family, two-family dwelling, etc.), (4) non-interest credit terms, (5) prevailing interest rates at the time of origination, and (6) a borrower’s demographic traits.

Underlying this approach is the assumption that a higher average interest rate (after controlling for creditworthiness, etc.) for minorities versus non-minorities implies the existence of discrimination.

More complex versions of Loan Performance Analyses employ multivariate analysis that includes multiple dependent variables (e.g. measures of profitability, and rates and cost of default - For an example, see Han 2001).

To summarize, the majority of the empirical studies can be grouped into three broad categories: (1) Rejection Rate Analyses<sup>11</sup>, (2) Fair Share Analyses, and (3) Loan Performance Analyses.

Having outlined this catalogue of methodological approaches, we can describe and discuss several of the significant empirical studies.

The increased availability of appropriate datasets has increased both the fervor and the ranks of scholars engaged in the debate between empirical researchers and theoreticians. Given the central role of data in fueling this debate, it will prove helpful to organize the review of empirical studies by major datasets.

### 3.2.2. Availability of Empirical Data

Prior to 1987, the work of theoreticians stood largely unvetted by empirical data. In 1987, the first of several major datasets that would allow researchers to test for discrimination in credit markets became widely available: the **1982 Characteristics of Business Owners** (the “**CBO**”) survey. By 1989, the results of several empirical studies employing the **1982 CBO** dataset had been published. It was the publication in 1989 of these empirical studies that ignited the debate regarding the existence or non-existence of discrimination in credit markets that continues to this day. The following table identifies five major datasets and indicates the year during which each became widely available.

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<sup>11</sup> Approval rates analyses and *Rejection Rate Analyses* are essentially one and the same: one is the mirror image of the other.

**Table 3. Availability of Major Empirical Datasets for the study of Discrimination**

<b>Availability of Major Empirical Datasets for the Study of Discrimination in various Credit Markets</b>				
<b>Credit Market</b>	<b>The Year the Dataset became widely available</b>			
	<b>1987</b>	<b>1991</b>	<b>1997</b>	<b>2001</b>
Home Mortgage		HMDA		
Small business loans	CBO	NSSBF	CRA	SSBF

Notes:

**CBO** (Characteristics of Business Owners) datasets were generated for the years 1982, 1987 and 1992 by the U.S. Census Bureau (Yazdipour 1991, pg. 173).

**CRA** (Community Reinvestment Act): Under the modified CRA provisions adopted in 1995, banks with assets totaling more than \$250 million or affiliated with a holding company with more than \$1 billion in total assets are required to report small business and small farm loans to their primary regulatory agency. Datasets are generated annually (Squires and O'Connor 1999, pp. 85-88).

**HMDA** (Home Mortgage Disclosure Act of 1975): Pursuant to the 1989 amendments to HMDA per certain provisions of the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA), all mortgage lenders located in urban areas with assets totaling at least \$10 million in total assets are required to track and report data about mortgage loans applications received and mortgage loans provided, including the location of each property associated with an application, the ultimate disposition of an application and loan denial rates broken down by race/ethnicity, as well as location. HMDA data captures more than 80 percent of the residential mortgage lending in the country (Ross and Yinger 2002, pp. 3-4). Datasets are generated annually.

**NSSBF** (National Survey of Small Business Finances) was co-sponsored by the Board of Governor of the Federal Reserve and the Small Business Administration. There are datasets for the years 1987 and 1993 (Yazdipour 1991, pg. 172).

**SSBF** (Survey of Small Business Finances): Prior to 1998, this survey was known as, the **NSSBF**. While the name has changed, the survey instrument and methodology remains largely unchanged (Bitler, Robb et al. 2001). Datasets are generated on a five-year cycle. Currently, the 1998, 1993 and 1987 datasets are publicly available.

As Table 3 illustrates, all but one of these major datasets focus on business lending. Only the HMDA dataset examines the home mortgage market. We will look at one major study that employs HMDA data and then identify and discuss various studies that have used the datasets that focus on small business lending. Specifically, studies employing **CBO** datasets will be discussed second; research employing **CRA** datasets will be discussed third; and studies employing **SSBF** datasets will be discussed last.

### 3.2.3. Home Mortgage Disclosure Act of 1975 (HMDA) Data

In the late 1960s, concerns about redlining and discrimination against communities of color by mortgage lenders gave rise to grassroots groups in urban communities across the country that advocated for increased access to mortgage credit for low-income communities and communities of color (Williams

and Nesiba 1997, pp. 74-75). Among other things, these grassroots community groups pushed for the passage of two acts of legislation that became law in the 1970s: the Community Reinvestment Act of 1977; and, the Home Mortgage Disclosure Act of 1975.

The Community Reinvestment Act (CRA) as amended over the intervening years has been instrumental in providing researchers with empirical data about small business and consumer lending activity around the country. However, in the case of both the CRA and HMDA, the amendments that would transform these laws into effective regulatory tools came more than a decade after the initial legislation. The CRA data is discussed at more length later in this section of the paper.

Pursuant to the 1989 amendments to HMDA per certain provisions of the *Financial Institutions Reform, Recovery, and Enforcement Act* (FIRREA) and various other amendments in 1980, 1988, 1999 and 2000, most mortgage lenders located in urban areas are required to track and report data about mortgage loans applications received (FFIEC n.d.).

HMDA captures information about mortgage lending by a range of financial institutions, including banks, savings associations, credit unions, and other mortgage lending institutions. All depository institutions with at least \$33 million in total assets located in urban areas and all non-depository institutions with at least \$10 million in total assets located in urban areas are required to track and submit HMDA data (FFIEC n.d.). The datasets for the years 1991 through 2004 are largely comparable and contain the range of information including the location of each property associated with an application, the income of applicants, the ultimate disposition of an application, the amount of the mortgage provided (if an application is approved) and loan denial rates broken down by race/ethnicity, gender and location (FFIEC n.d.).

HMDA data captures more than 80 percent of the residential mortgage lending in the country (Ross and Yinger 2002, pp. 3-4). Datasets are generated annually. The latest publicly available dataset contains information for the year 2004.

One of the most widely-cited studies employing HMDA data is the so called 'Boston Fed Study' (Munnell, Tootell et al. 1996). Munnell *et al.* estimate a regression model for the probability of being denied a mortgage (the loan denial rate), minimizing omitted-variable bias, to determine the principal source(s) of the significant disparities in loan denial rates for various ethnic groups as reported by the HMDA data. The study's research methodology falls into the "Rejection Rate Analyses" category.

Ultimately, Munnell *et al.* (1996) concluded that Black and Hispanic applicants were about 80 percent more likely to be turned down than were white applicants

who had comparable property and personal characteristics (Munnell, Tootell et al. 1996, pg. 26).

The strength of this study is that it minimizes the likelihood of omitted variable bias. No fundamental flaws have ever been identified in the Boston Fed Study. And, for that reason, the Boston Fed Study invariably is mentioned in discussions about discrimination in mortgage markets (Ross and Yinger 2002).

### 3.2.4. The Characteristics of Business Owners Survey<sup>12</sup> (CBO)

Prior to 1997, most of the empirical research on discrimination in business lending employed data from the **Characteristics of Business Owners** Survey (CBO) (Bates 1989; Bates 1993,a; Bates 1993,b; Bates 1997; Bates 1997; Robb 2000). The U.S. Census Bureau generated CBO datasets for the years 1982, 1987 and 1992.

The CBO survey drew its samples from those individuals and firms captured by the **Survey of Minority-Owned Business Enterprises** (the “SMOBE”) which was also administered by the U.S. Census Bureau. From 1977 through 1997, SMOBE datasets were generated every five years (Bates 1993, pg. 38). The latest publicly available SMOBE<sup>13</sup> dataset contains information for the year 1997.

The latest publicly available CBO dataset contains information for the year 1992. (U.S. Bureau of the Census ) In total each CBO dataset contains data on more than 116,000 individuals divided into five panels. Each of the five panels contains data more than 20,000 persons who were self-employed during the study year [U. S. Census Bureau, 1997 #290, pg. 7].

“The five panels are as follows: Panel One, Hispanic; Panel Two, other minority (largely Asian); Panel Three, Black; Panel Four, female (minority as well as non-minority); Panel Five, white male” (Bates 1993, pg. 116).

The datasets include more than thirty variables that attempt to capture both quantitative and qualitative information about either the firm or its owner: owner’s demographics (e.g. age, sex, marital status, etc.); owner’s human capital (e.g. years of schooling); firms’ labor force (e.g. size, gender mix, etc.); and, business characteristics (e.g. the firms four-digit SIC code, its legal form of organization, etc.)

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<sup>12</sup> In February 2005, the U.S. Census Bureau made available the “**Advance Report on Characteristics of Employers Business Owners: 2002.**” The Characteristics of Employer Business Owners provides information about firms and their owners for year 2002 and in effect replaces the CBO. The CBO data for 1997 was never made publicly available.

<sup>13</sup> In July 2005, the U.S. Census Bureau made available the 2002 Survey of Business Owners (SBO). The SBO in effect replaces the SMOBE and SWOBE, Survey of Women-Owned Business Enterprises U.S. Census Bureau (2005). 2002 Survey of Business Owners. Washington (D.C.), U.S. Census Bureau. **2006.**

Bates (1997) published the results of a study that is representative of those employing CBO datasets.

One of the primary motivations for this study is to determine if and how the size of a commercial loan obtained by a start-up businesses varies by owner's race and/or ethnicity (Bates 1997, pp. 487-488). Put more simply, the Bates study attempts to determine if the CBO data provides any evidence of discrimination in the small business lending. To address this question, Bates presents a regression model for explaining the size (amount) of a loan made to a small business<sup>14</sup> at start-up after controlling for following types of factors: owner's human capital; owner's equity investment in the start-up; loan source; owner's demographic traits; and firm characteristics (Bates 1997, pp. 488-489). The principal research methodology employed by the Bates study falls into the Fair Share Analyses<sup>15</sup> category.

The Bates study generated two findings that are relevant to our study:

- Black-owned firms receive smaller loans at start-up than non-minority-owned firms, after controlling for the following factors: owner's human capital; owner's equity investment in the start-up; loan source; and firm characteristics (Bates 1997, pp. 488-489).
- Returns to management experience differ for African-Americans relative to non-minorities. All other things being equal, average loan size increases as management experience increases for both blacks and non-minorities. While greater management experience does translate into increased loan amounts for blacks and non-minorities, compared with blacks, non-minority borrowers receive approximately 35%<sup>16</sup> more in incremental loan dollars for each year of additional management experience.

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<sup>14</sup> Bates defines small business as any firm in the CBO database with annual total sales greater than \$4,999 Bates, T. (1997). "Unequal access: financial institution lending to Black- and White-owned small business start-ups." *Journal of Urban Affairs* **19**(4): 487-495.. Bates' definition, in operation, is more restrictive than the standard used by the U.S. Small Business Administration because CBO datasets only capture information for individuals that file tax returns for their interest in businesses organized as sole proprietorships, partnerships or subchapter "S" business corporations. By comparison, the U. S. Small Business Administration defines a firm as a small business if it employs less than 500 workers without regard to how the business is legally organized. So, the SBA's definition of a small business includes firms organized as "C" corporations as well as those captured in the CBO datasets.

<sup>15</sup> For a detailed description of Fair Share Analyses – see pp. 26-27 of this publication.

<sup>16</sup> This author's calculation based on the values for the dependent variable when the mean values of the independent variables are inserted in the regression model that Bates developed Bates, T. (1997). "Unequal access: financial institution lending to Black- and White-owned small business start-ups." *Journal of Urban Affairs* **19**(4): 487-495..



This study has two strengths: (a) it employs large samples of both African-American and non-minority borrowers; and (b) it uses an extensive set of independent variables to explore the sources of disparities between minority and non-minority business owners in accessing commercial bank loans at start-up; thereby, reducing the likelihood of omitted variable bias.

A limitation of the Bates study involves sample selection. The samples analyzed in the Bates study only include African-American- and non-minority-owned firms that had successfully borrowed from a financial institution. The sample excludes firms that have been unsuccessful in obtaining loans and potentially underestimating the full impact of discrimination. So, the findings of the Bates study must be viewed in that light.

While new studies employing CBO datasets continue to appear, much of the recent research on discrimination in business lending employs data from two relatively new sources: the Survey of Small Business Finances (SSBF)<sup>17</sup> and, the small business lending data mandated by the Community Reinvestment Act (CRA). In the next section, we turn our attention to the CRA. First, we describe the CRA datasets. Then, we identify and discuss two major studies the employ CRA datasets.

### 3.2.5. Community Reinvestment Act (CRA) Data

CRA, formally Title VIII of the Housing and Community Development Act of 1977, explicitly states that financial institutions have a duty to help meet the credit needs of the local communities in which they are operation . . . consistent with safe and sound operations of such institutions (Williams and Nesiba 1997, pg. 75). This legislation as amended over the intervening years has been instrumental in providing researchers with empirical data about small business and consumer lending activity around the country.

Under the modified CRA provisions adopted in 1995, banks with assets totaling more than \$250 million or affiliated with a holding company with more than \$1 billion in total assets are required to report small business and small farm loans to their primary regulatory agency (e.g. Comptroller of the Currency, Federal Reserve, etc.) commencing in 1996 (Squires and O'Connor 2001, pg. 3).

Since 1995, several empirical studies have examined small business lending, a direct outgrowth of changes in the Community Reinvestment Act ("CRA"). Among other things, this newly available source of data has allowed researchers to test for the existence of discrimination in small business lending. This new stream of data is important because access to credit (both bank and trade credit)

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<sup>17</sup> In 1998, this survey was renamed the "**Survey of Small Business Finances.**" Prior to 1998, this survey was known as, the **National Survey of Small Business Finances.** While the name has changed the survey instrument and methodology remains largely unchanged.

is a major determinant of the rate of formation and of survival of small businesses.

Below we identify and discuss two studies that are representative of those using CRA datasets: Immergluck(1999) and Squires and O'Connor (2001).

The Immergluck study analysis CRA data for any evidence of either redlining or discrimination in the small business lending in Metro Chicago. Immergluck estimates a regression model for determining the number of loans made to small businesses<sup>18</sup> in a given neighborhood per year, after controlling for firm density, firm size and industrial mix (Immergluck 1999, pg. 128). Specifically, this study explores if and how the number of commercial loans obtained by small businesses in the six-county Chicago area varies by either the income-level or the racial/ethnic composition of the neighborhood where the firm is located (Immergluck 1999, pp. 123-125).

Strictly speaking, '**redlining**' refers to the practice by mortgage lenders of identifying an area within which they would not extend credit. In the past, some mortgage lenders would trace on a map the boundaries of an area within which they would not lend with a red crayon or pen, giving rise to the term 'redlining' (Guttentag and Wachter 1980, pg. 11). In general parlance, redlining refers to the practice by a financial institution of constraining the quantity of credit extended to borrowers located in a given neighborhood based on considerations other than objective measures of creditworthiness.

The principal research methodology employed by the Immergluck study falls into the "Fair Share Analyses" category. (*For a detailed description of Fair Share Analyses – see pp. 26-27 of this publication.*) Specifically, Immergluck engaged in somewhat sophisticated forms of Fair Share Analyses that employed either ordinary least squares (OLS) or weighted least squares (WLS) estimations (Immergluck 1999, pp. 128-131).

Using OLS estimations, Immergluck concluded the following:

- All other variables held constant, going from an all White to an equivalent all Black neighborhood is accompanied by an 18% decrease in the number of loans made in a census tract.

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<sup>18</sup> Immergluck's definition of small business is a firm with annual total sales of less than \$1,000,000. Immergluck, D. (1999). Intraurban patterns of small business lending: findings from the new Community Reinvestment Act data. Business Access to Capital and Credit: A Federal Reserve System Research Conference, Arlington, VA, Federal Reserve System. Immergluck's definition, in operation, is more restrictive than the standard used by the U.S. Small Business Administration. The U. S. Small Business Administration defines a firm as a small business if it employs less than 500 workers.

- All other variables held constant, going from an all White to an equivalent all Hispanic neighborhood is accompanied by a 39% decrease in the number of loans made in a census tract.

In addition to the OLS estimates, Immergluck also used WLS estimators to remedy any bias that might result from spatial autocorrelation.

“. . . the problem of spatial autocorrelation . . . occurs when the regression residuals of a pair of nearby observations are more similar than those of more distant pairs and can result in biased coefficient estimates.

. . . [spatial autocorrelation is a direct consequence of] the fact that bank branches, which tend to be located in middle- and upper-income areas, [typically] serve [several] census tracts. Thus, the demographics of surrounding areas may be an important determinant of a neighborhood's lending level" (Immergluck 1999, pp. 129-130).

To address the problem of spatial autocorrelation, Immergluck estimated two spatial lag models. Specifically, these models "*account for the lending levels for other [census tracts] within a distance of approximately 7 miles and weights these neighboring observations by an inverse distance function*" (Immergluck 1999, pg. 129). In the first model, the spatial lag variable is equal to the inverse distance squared; and, in the second model, the spatial lag variable is equal to the inverse distance cubed.

Correcting spatial autocorrelation with the addition of a spatial lag variable equal to the inverse distance squared, Immergluck again found statistically significant differences between comparable Hispanic and White neighborhoods; however, the differences for comparable Black and White neighborhoods were not statistically significant.

With the spatial lag variable equaling the inverse distance cubed, the differences for both comparable Hispanic and White neighborhoods and comparable Black and White neighborhoods were statistically significant (see Table III on pg. 135 in Immergluck 1999, pg. 130).

In sum, one can conclude from the Immergluck study that Hispanic neighborhoods experience lower lending rates than non-minority neighborhoods, after controlling for firm size, industrial mix and firm density. The findings for Black neighborhoods are not as conclusive as those for Hispanic neighborhoods.

The strength of the Immergluck study is that it provides a macro-view of the flow of small business loans across a major metropolitan area. That said, both the study's author admits and the critics of the study assert that the lack of a variable(s) to account for the creditworthiness of firms within a given census tract severely limits the study's ability to determine the cause of the observed

disparities in lending volumes between minority and non-minority neighborhoods (Yezer 1999).

Now, we turn our attention to a study by Squires and O'Connor, published in 2001. Compared with the Immergluck study, the Squires and O'Connor study is much less sophisticated. The Squires and O'Connor study explores if and how the number of commercial loans obtained by small businesses varies by either the income-level and/or the racial/ethnic composition of a firm's neighborhood (Squires and O'Connor 2001, pp. 2-3). Put more simply, the Squires and O'Connor study attempts to determine if the CRA data provides any evidence of either redlining<sup>19</sup> or discrimination in the small business lending in Metro Milwaukee.

The Squires and O'Connor "*study examines small business loans*"<sup>20</sup> [for the years 1996 and 1999] *in the four-county Milwaukee metropolitan statistical area (MSA). The four counties are Milwaukee, Ozaukee, Washington, and Waukesha*" (Squires and O'Connor 2001, pp. 3-4). Banks and thrifts made 15,181 loans during 1996 to firms located in the Milwaukee MSA. In 1999, banks and thrifts made 17,356 loans in Metro Milwaukee (see Table 1 in Squires and O'Connor 2001, pp. 6-7).

The principal research methodology employed by the Squires and O'Connor study falls into the "Fair Share Analyses" category. (*For a detailed description of Fair Share Analyses – see pp. 26-27 of this publication.*) Specifically, Squires and O'Connor engaged in a very elementary form of Fair Share Analyses that calculate the actual lending volumes by either the income-level or the racial composition of a neighborhood (Squires and O'Connor 2001, pp. 3-21).

Squires and O'Connor study includes one finding that bears upon our proposed research which is an observation about the distribution of small business lending volume by neighborhood racial/ethnic composition. Relative to the population density, small business lending in Milwaukee was disproportionately concentrated in non-minority neighborhoods in 1996 and in 1999.

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<sup>19</sup> Strictly speaking, '**redlining**' refers to the practice by mortgage lenders of identifying an area within which they would not extend credit. In the past, some mortgage lenders would trace on a map the boundaries of an area within which they would not lend with a red crayon or pen, giving rise to the term 'redlining' Guttentag, J. M. and S. M. Wachter (1980). *Redlining and Public Policy*. New York, New York University, Graduate School of Business Administration, Salomon Brothers Center for the Study of Financial Institutions: pp. 53.. In general parlance, redlining refers to the practice by a financial institution of constraining the quantity of credit extended to borrowers located in a given neighborhood based on considerations other than objective measures of creditworthiness.

<sup>20</sup> Squires and O'Connor define small business loans as those whose original amounts are \$1 million or less and which are secured by nonfarm or nonresidential real estate. In practice, the Squires and O'Connor definition is more restrictive than that of the U.S. Small Business Administration and only captures those loans that meet the definition of "loans to small businesses" that are reported in 'Call Reports' Squires, G. D. and S. O'Connor (2001). *Access to capital: Milwaukee's continuing small business lending gaps*, Woodstock Institute. **2004**: 26..

While the descriptive statistics presented in the Squires and O'Connor study make clear that small business lending volumes are lower in minority neighborhoods compared with non-minority neighborhoods, the findings do not explain why these disparities exist. This is the fundamental weakness of this study. The observed differences could be a function of several factors including: redlining, discrimination, variations in the average level of creditworthiness of the firms located in various neighborhoods and/or variations in mix of types of firms across neighborhoods. The Squires and O'Connor study sheds no light on this question.

As was stated earlier, much of the recent research on discrimination in business lending employs data from two relatively new sources: the small business lending data mandated by the CRA and the Survey of Small Business Finances (SSBF).<sup>21</sup> Having completed our discussion of research using CRA data, we turn our attention the SSBF in the next section. This data is of particular interest because we will use both the 1993 and the 1998 SSBF datasets to conduct our study.

First, we will describe the SSBF datasets. Then, we identify and briefly discuss five studies that employ SSBF datasets.

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<sup>21</sup> In 1998, this survey was renamed the "**Survey of Small Business Finances.**" Prior to 1998, this survey was known as, the **National Survey of Small Business Finances.** While the name has changed the survey instrument and methodology remains largely unchanged.

### 3.2.6. Survey of Small Business Finances (SSBF) Data

SSBF datasets are generated approximately every five years. The first SSBF dataset contains information for the year 1987. The latest available dataset covers the year 1998. To date, the SSBF has been co-sponsored by the Board of Governors of the Federal Reserve (the “Federal Reserve”) and the U. S. Small Business Administration. Each dataset includes data collected from more than 3,000 firms that were selected to provide a representative sample of the population of small businesses in the U.S. The firms included in the datasets were selected from the population of all for-profit, non-financial, non-farm, business enterprises with fewer than 500 employees that were listed in Dun’s Market Identifier file<sup>22</sup> during the relevant study year (Cole and Wolken 1995, pg. 640).

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<sup>22</sup> The Dun’s Market Identifier file, compiled and maintained by Dun and Bradstreet, Inc., contains more than ten million business enterprises and is broadly representative of all business Cole, R. A. and J. D. Wolken (1995). “Financial services used by small businesses: evidence from the 1993 National Survey of Small Business Finances.” Federal Reserve Bulletin (July 1995): 629-667..

**Table 4. Description of available SSBF Datasets**

Description of Available SSBF Datasets: racial/ethnic breakdown of firm owners				
	Survey Year/Dataset Title	1987/NSSBF (i)	1993/NSSBF (ii)	1998/SSBF (iii)
	<b>Total # of Observations (a)</b>	3,103	5,276	3,550
<b>Ethnicity of Owners</b>	<b>Non-Hispanic White (b)</b>	2,968	4,045	2,790
	<b>Hispanic White (b)</b>	N/A (b)	326	243
	<b>Hispanic Other (c)</b>	N/A (b)	43	17
	<b>Hispanic, Total (b)</b>	41(d)	369	260
	<b>Black (c)</b>	45 (d)	523	273
	<b>Asian &amp; Pacific Islander (c)</b>	49 (d)	336	214
	<b>American Indian &amp; Native Alaskans (c)</b>	(d)	45	24
	<b>Year the dataset became publicly available</b>	1991 (e)	1997 (f)	2001
<b>Sources:</b>				
i) (Cavalluzzo and Cavalluzzo 1998, pp. 775-776)				
ii) (See Table 1 in Cole and Wolken 1995, pg. 632)				
iii) (Derived from Table 2 in Bitler, Robb et al. 2001, pg. 186)				
<b>Notes:</b>				
(a) The sum of the various racial/ethnic categories of owners does not equal the "Total" because the observations reflected in the row labeled " <b>Hispanic Other</b> " are also included in the amounts shown for " <b>Black, Asian &amp; Pacific Islander or American Indian &amp; Native Alaskan.</b> "				
(b) Commencing with the 1990 Census, the U.S. Census Bureau considers ' <b>Hispanic</b> ' to be an ethnic classification not a racial classification. As a result, there are White Hispanics, Black Hispanics, Asian Hispanics, etc. However, for the purposes of most government activities and agencies (e.g. the Small Business Administration), all Hispanics are considered minorities. Prior to the 1990 Census, " <b>Hispanic</b> " was treated as a racial category.				
(c) The observations reflected in the row labeled " <b>Hispanic Other</b> " are also included in the amounts shown for " <b>Black, Asian &amp; Pacific Islander or American Indian &amp; Native Alaskan.</b> "				
(d) These figures represent only male-owned firms. Based on comments regarding the dataset by Cavalluzzo, the author concludes that in the aggregate there are less than ninety minority female-owned businesses in the dataset. Again, based on comments by Cavaluzzo, there are less than thirty firms owned by <b>American Indian and Native Alaskans</b> in the dataset (Cavalluzzo and Cavalluzzo 1998).				
(e) (See "Available Financial Data Bases for Research on Small Business" in Yazdipour 1991, pg. 172).				
(f) Author's determination based on note in a Federal Reserve Bulletin: (See Note 3 in Cole and Wolken 1996, pg. 984). The current version of the Public-Use dataset became available in 1999 and only includes observations for 4,637 firms (U.S. Federal Reserve System 1999, pp. 1-4).				

Each of the SSBF dataset contains more than 300 hundred variables that capture the following types of information for each firm:

- Demographic Information on the owner(s)
- Firm Characteristics (e.g. industry, firm age, location, etc.)
- An inventory of the firm's various deposit and savings accounts
- An inventory of the firm's various credit obligations (including credit lines, mortgages, vehicle loans, equipment loans, etc.)
- Characteristics of the firm's financial services suppliers (e.g. type – bank, finance company, etc.)
- Firm's recent experience applying for credit (e.g. number of loan applications and the disposition of those requests)
- Firm's recent experience applying for trade credit
- Data from the Firm's income statement and balance sheet for the relevant study period; and
- Information regarding the recent credit history of the firm and its owner(s) (U.S. Federal Reserve System 1996; U.S. Federal Reserve System 1999; U.S. Federal Reserve System 2002).

In the following pages, we will discuss five studies that employ SSBF datasets. Three of the five studies are representative of the major empirical studies that have tested for evidence of discrimination in credit markets. (Blanchflower, Levine et al. 1998; Bostic and Lampani 1999; Cavalluzzo 2002) The remaining two studies are included because these are the only two empirical studies that this author has found that address (even tangentially) the primary research question of our study (Coleman 2003; Aaronson, Bostic et al. 2004).

The Blanchflower study explores if and how the size of a commercial loan obtained by small businesses varies by the owner's race and/or ethnicity (Blanchflower, Levine et al. 1998, pp. 7-9). Blanchflower *et al.* estimate a regression model for determining the probability of a commercial bank loan being denied<sup>23</sup> (the loan denial rate), after controlling for creditworthiness (Blanchflower, Levine et al. 1998, pg. 1).

The principal research methodology employed by Blanchflower study falls into the "Rejection Rate Analyses" category. Specifically, Blanchflower *et al.* engaged in a sophisticated form of Rejection Rate Analysis that employs binomial probit models (Blanchflower, Levine et al. 1998, pp. 11-12).

The Blanchflower study generated three major findings of interest:

- Blanchflower *et al.* determined that compared with non-minorities, minorities are more likely to have unmet credit needs.

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<sup>23</sup> Approval rates analyses and *Rejection Rate Analyses* are essentially one and the same: one is the mirror image of the other.



- After controlling for a number of creditworthiness factors, Blanchflower *et al.* found that there was no statistically significant difference between non-minorities and Hispanics; however, blacks remained much more likely to be denied credit than non-minorities.
- They also, found that if loans were granted, Blacks paid a higher interest rate compared with non-minority-owned firms.

The strength of this study is that it employs such an extensive set of variables to explore the sources of disparities between minority and non-minority business owners in accessing commercial bank loans; thus, lowering the likelihood of omitted variable bias. That said, critics of the study assert that the lack of a measure of the personal net worth of a firm's owner(s) could result in overestimation of unwarranted disparities between black-owned and non-minority-owned firms. (Avery 1999) These critics raise a legitimate issue. Assessing the owner's personal net worth is typically an integral part of the underwriting process for small business loans, and in omitting this variable, the model used by Blanchflower *et al.* potentially over-estimates the role of discrimination (Cavalluzzo 2002, pg. 3).

Aware of the concerns raised about the Blanchflower study, Cavalluzzo *et al.* (2002) published the result of a study that addressed the perceived weaknesses of the Blanchflower study.

Like Blanchflower study, the Cavalluzzo study explores if and how the amount of commercial loans obtained by small businesses varies by owner's race and/or ethnicity. Cavalluzzo *et al.* estimate a regression model for determining the probability of a commercial bank loan being denied<sup>24</sup> (the loan denial rate), after controlling for creditworthiness (Cavalluzzo 2002, pp. 3-5). However, unlike the Blanchflower study, Cavalluzzo *et al.* included among their independent variables some measures of both the personal net worth and credit history of the firm's owner.

In addition to analyzing the variations in loan denial rates across various racial/ethnic groups, the Cavalluzzo study also tested if credit market concentration impacts any observed disparities in denial rates across racial/ethnic groups (Cavalluzzo 2002, pg. 4). Essentially, Cavalluzzo *et al.* sought to test the relationship between market concentration and the exercise of prejudicial discrimination hypothesized by Becker (1957).

“ The level of bank concentration in the firm's local area is of particular interest because small businesses tend to borrow locally, rather than nationally. It is important therefore to understand more fully the possible implications of high levels of concentration in local banking markets for

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<sup>24</sup> Approval rates analyses and *Rejection Rate Analyses* are essentially one and the same: one is the mirror image of the other.

[small businesses]. One reason that differences in access to credit across demographic groups could widen with lender concentration comes from Becker (1957), who showed that exercising prejudicial tastes can cut into firm profits. As such, one would expect highly competitive markets to eventually purge discriminatory behavior from the market place. In less competitive markets, however, prejudicial discrimination could be sustained in the long run. By controlling for the level of lender market concentration, we can test for *ceteris paribus* differences in denial rates [across racial/ethnic groups] according to the level of competition faced by lenders” (Cavalluzzo 2002, pg. 4).

The Cavalluzzo study analyzed observations for 948 firms contained in the 1998 SSBF dataset.<sup>25</sup> Given that one of the primary objectives of the study is the analysis of loan denial rates, Cavalluzzo *et al.* selected only those firms that had applied for loans within the same three-year period (Cavalluzzo 2002, pg. 6).

The 1998 SSBF dataset differs from the 1987 and the 1993 datasets in one important respect. In addition to the extensive collection of explanatory variables referenced above, the 1998 dataset contains data on the personal net worth of the principal owner of each firm.

The principal research methodology employed by Cavalluzzo study falls into the “Rejection Rate Analyses” category. (*For a detailed description of Rejection Rate Analyses – see pp. 23-26 of this publication.*) Specifically, Cavalluzzo *et al.* engaged in a sophisticated form of Rejection Rate Analysis that employed binomial logit models.

The Cavalluzzo study generated three major findings.

- Cavalluzzo *et al.* observed substantial disparities in loan denial rates between non-minority- and minority-owned firms even after controlling for the following: (i) the creditworthiness, credit history and characteristics of the firm; and (ii) the personal net worth, credit history and demographic characteristics of the owner (Cavalluzzo 2002, pp. 11-15).
- Cavalluzzo *et al.* also found some evidence that lender market concentration can explain some of the observed disparities between non-minority- and African-American-owned firms as Becker<sup>26</sup> would predict. No evidence was found that lender market concentration significantly impacts the observed disparities between non-minority- and Hispanic- and

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<sup>25</sup> In total, the 1998 SSBF dataset contains observations on 3,550. (see Table 6 on pg. 41 for more details about the composition of the 1998 dataset)

<sup>26</sup> Becker hypothesize that the distinguishing feature of prejudicial discrimination versus statistical discrimination is the willingness to pay something, either directly or in the form of reduced income, to indulge one’s taste for discrimination Becker, G. S. (1971). The economics of discrimination. Chicago, University of Chicago..

Asian-owned firms (Cavalluzzo 2002, pp. 11-15 and see Table 5 on pg. 31).

- Cavalluzzo *et al.* observed that including a measure of “*the owner’s personal wealth did explain some differences between Hispanic-/Asian-owned businesses and those owned by whites, but almost none for the African-American[-owned firms]*” (Cavalluzzo 2002, pg. 21).

The strength of this study is that it employs such an extensive set of variables to explore the sources of disparities between minority and non-minority business owners in accessing commercial bank loans thus, lowering the likelihood of omitted variable bias. As a result, it is difficult to attribute the observed disparities between non-minority- and minority-owned firms to omitted variable bias.

That said, the study’s finding regarding impact of lender market concentration on the observed disparities between non-minority- and minority-owned firms may be open to some question because of the limited number of observations for minority-owned firms.

Like the Cavalluzzo study, the Bostic and Lampani study estimates a regression model for determining the probability of a commercial bank loan being denied<sup>27</sup> (the loan denial rate), after controlling for creditworthiness (Bostic and Lampani 1999, pp. 149-151). This study explores if and how the amount of commercial loans obtained by small businesses varies by owner’s race and/or ethnicity. However, unlike the Blanchflower study, Bostic and Lampani included among their independent variables some measures of a firm’s local geography. Bostic and Lampani included two types of local geography variables: economic characteristics of the area where a firm is located and, measures of the racial composition of the area where a firm is located (Bostic and Lampani 1999, pg. 155). Bostic and Lampani clearly indicate that one of the primary motivations for their study is to determine if the inclusion of a measure of a firm’s local geography will impact observed disparities between various racial/ethnic groups.

Given their interest in the impact of geography on observed disparities in loan denial rates across demographic groups, Bostic and Lampani augmented the 1993 SSBF dataset with economic and demographic data from the 1990 Census and measures of the market structure of various local credit markets obtained from call reports<sup>28</sup>.

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<sup>27</sup> Approval rates analyses and *Rejection Rate Analyses* are essentially one and the same: one is the mirror image of the other.

<sup>28</sup> A Call Report is a quarterly report submitted by commercial banks to various federal and state banking regulators that details the financial condition and performance of a bank and includes, among other things, a breakdown of outstanding loans (segmented by type – e.g. residential mortgage, automobile loans, etc.).

The principal research methodology employed by Bostic and Lampani study falls into the “*Rejection Rate Analyses*” category. (*For a detailed description of Rejection Rate Analyses – see pp. 23-26 of this publication.*) Specifically, Bostic and Lampani engaged in a sophisticated form of Rejection Rate Analysis that employs binomial logit models (Bostic and Lampani 1999, pp. 158-161).

The four major findings of the Bostic and Lampani study are:

- Compared with non-minority-owned firms, minority-owned firms, on average, “*have fewer assets, worse credit history, and other features that make them appear more risky to prospective lenders*” (Bostic and Lampani 1999, pg. 161).
- After controlling for a number of factors (including “*firm, owner, loan and banking market characteristics*”), Bostic and Lampani found that there was no statistically significant difference in loan denial rates between non-minorities and Asians and Hispanics (Bostic and Lampani 1999, pg. 161).
- However, after controlling for a number of factors (including “*firm, owner, loan and banking market characteristics*”), Bostic and Lampani found that blacks remained much more likely to be denied credit than non-minorities (Bostic and Lampani 1999, pg. 161).
- Finally, the study’s results show that “*considerations of the local geography are important in measuring differences in credit market experiences across firms.*” Bostic and Lampani estimated that the inclusion of various measures of local geography reduced the disparity in the Black-White loan approval rate by approximately 20 percent (Bostic and Lampani 1999, pg. 161).

The virtue of this study is that it identifies and includes a new class of variables (local geography) in loan denial rate analysis. The authors persuasively argue that this class of variable may be a source of the observed disparities in commercial loan approval rates between minority and non-minority business owners thereby, lowering the likelihood of omitted variable bias. That said, given the pervasive residential segregation that characterizes major MSAs throughout the United States, variables that identify and/or characterize various geographical locales may be highly correlated with race (especially so, when considering various differences between blacks and non-minorities) (Massey and Denton 1993). So, one might reasonably speculate that much of the apparent explanatory power of these local geography measures is ultimately attributable to race. In other words, local geography measures may share most of their explanatory power with ‘race’ variables . . . so, it might be redundant to add them to a loan approval model.

### 3.2.7. Summary of Empirical Research on Discrimination

To summarize this discussion of the empirical research regarding discrimination in credit markets, we can say the following:

Empirical research in this area began in earnest in 1987 when appropriate datasets became widely available to researchers. Much of the empirical research to date has attempted in one way or another to determine if there is any evidence of prejudicial discrimination in various credit markets. From 1987 to the present, a preponderance of the major empirical studies have found significant disparities in access to credit between Blacks and non-minorities. In most instances, the researchers who have found these disparities generally have suggested that the observed disparities are evidence of prejudicial discrimination. In response to those suggestions that prejudicial discrimination is alive and well in various credit markets, the critics of those empirical studies generally have replied that the observed disparities reflect either omitted variables bias or statistical discrimination not prejudicial discrimination.

In the end, this author concludes that it is difficult to dismiss the possibility of prejudicial discrimination after a careful review of the major empirical studies.

### 3.2.8. Prior Research on Trade credit and Discrimination

Now, we will discuss the only two empirical studies that we have found that address (even tangentially) the primary research questions to be addressed by our proposed research (Coleman 2003; Aaronson, Bostic et al. 2004). Our research questions are:

- Is there any disparity in the quantity of trade credit extended to minority-owned firms compared with non-minority-owned firms?
- After controlling for creditworthiness, is there any disparity in the quantity of trade credit extended to minority-owned firms compared with non-minority-owned firms?
- If, in fact, disparities exist after controlling for creditworthiness, have these disparities narrowed over time as Becker would predict?

As was true of the preceding three studies, both of these studies employ SSBF datasets.

Aaronson *et al.* explore if participation by small firms in networks that include potential suppliers impact a firm's access to trade credit.

“Our study explores the importance of social relationships, including geographic and ethnic ties, for urban, minority small businesses accessing [trade credit]” (Aaronson, Bostic et al. 2004, pg 47).

To address this question, Aaronson *et al.*, in essence, designed, completed and reported the results of two separate empirical studies in one paper (Aaronson, Bostic et al. 2004). Given that the primary study exclusively employed survey data collected in two small neighborhoods in Chicago, Aaronson *et al.* recognized that the findings from the primary study might not be representative of the general population of small businesses across the country (Aaronson, Bostic et al. 2004, pg. 58). To vet that possibility, Aaronson *et al.* completed a secondary study that employed data from the 1993 SSBF dataset. It is this secondary study that is of interest to us.

Among other things, the secondary study includes estimations of regression models for determining either: (i) the number of trade credit supplier that a firm has; or (ii) the percentage of purchases made on account (see Table 4 of Aaronson, Bostic et al. 2004, pg. 60).

To generate the two regressions referenced in the preceding paragraph, Aaronson *et al.* analyzed observations for 2,986 firms contained in the 1993 SSBF dataset.<sup>29</sup> Given that one of the purposes of the study is the analysis of access to and use of trade credit, Aaronson *et al.* selected only those firms that used some trade credit during the survey period.

In total, Aaronson *et al.* estimated eleven different models with eleven different dependent variables, using a variety of estimation techniques. Only two of the eleven regressions directly bear on our research study: models # 3 and # 5. The dependent variables for those two models are identified in Table 5 below.

**Table 5. Trade Credit Regression Models estimated by Aaronson et al.**

Trade Credit Regression Models estimated by Aaronson <i>et al.</i>			
Regression #	Dependent Variable	Estimation Technique	Sample Size
3	Ln(number of suppliers on account +1) (i)	WLS (ii)	2,986 (i)
5	Percentage of purchases on account (i)	WLS (ii)	2,986 (i)
Notes:			
(i) Only those with at least \$1 of outstanding trade credit were include in this sample.			
(ii) WLS is an abbreviation for the Weighted Least Squares (an estimation method). WLS often is employed as a remedy for heteroskedasticity (Studenmund 2001, pp. 362-365).			
Source: (The content presented in this Table was derived from Table # 4 in Aaronson, Bostic et al. 2004, pg. 60).			

The dependent variable for model #3 is: the natural log of the number of trade credit suppliers that a firm has. The dependent variable for model #5 is: the

<sup>29</sup> In total, the 1993 SSBF dataset contains observations for approximately 5,300 firms. (see Table 6 on pg. 41 for more details about the composition of the 1993 dataset)

percentage of purchases made on account (Aaronson, Bostic et al. 2004, see Table 4 pg. 60).

To derive the coefficients for models #3 and # 5, Aaronson *et al.* used the Weighted Least Squares (WLS) estimation method.

Relative to models # 3 and # 5, Aaronson *et al.* report the following two findings:

- After controlling for firm size, owner and firm credit history, and industry classification, there was no evidence that there is a statistically significant difference in the use of trade credit between non-minority- and Hispanic-owned firms (Aaronson, Bostic et al. 2004, pg. 61).
- After controlling for firm size, owner and firm credit history, and industry classification, there was evidence that there is a statistically significant difference in the use of trade credit between non-minority- and Black-owned firms. Compared with Non-minority-owned firms, Black-owned firms that use trade credit have 10.5 fewer suppliers and make 6.4 percent fewer purchases on account (Aaronson, Bostic et al. 2004, pg. 61).

Clearly, these findings suggest that even after controlling for industry and the creditworthiness of a firm and its owner, access to trade credit may vary with the race/ethnicity of the owner as a result of discrimination and/or other factors. However Aaronson *et al.* did not design their study to determine directly if the quantity of trade credit varies with the race/ethnicity of the owner. Clearly, more research is needed to determine if the quantity of trade credit varies with the race/ethnicity of the owner.

Now, we discuss an empirical study completed by Coleman<sup>30</sup> [2003]. This is the only other empirical study that we have found that addresses in part the primary research questions to be addressed by our study. As was true of the study by Aaronson *et al.*, the Coleman study employs a SSBF dataset.

The Coleman study attempts to identify the characteristics of those firms that are most likely to repay trade credit within the '*discount period*' and of those firms which are most likely to pay late thus incurring late payment penalties. Coleman refers to trade credit repaid within the '*discount period*' as "**Free**" and trade credit repaid with late payment penalties as "**Costly**." Using Coleman's parlance, the primary purpose of the study can be restated as follows: to categorize the firms most likely to use '**free**' trade credit and those most likely to use '**costly**' trade credit. Coleman's study compares the usage of trade credit by types of firms (i.e.

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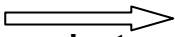
<sup>30</sup> Susan Coleman is currently an Associate Professor at the Barney School of Business, University of Hartford. She has written numerous articles regarding the development and financing of small, women-owned firms University of Hartford (n.d.). [www.hartford.edu](http://www.hartford.edu), University of Hartford. 2004..

firms owned by non-minority men, non-minority women, black men, Hispanic men or Asian-American men) using data from the 1998 SSBF.

Among other things, the Coleman study includes estimations of regression models for determining if a firm either: (i) has any outstanding trade credit; or, (ii) has been denied trade credit during the period specified by the 1998 SSBF (Coleman 2003, pp. 9-10). Both of these dependent variables are estimated using binomial logit models. Table 6 (below) identifies both the dependent variable and independent variables for these two models estimated by Coleman.



**Table 6. Trade Credit Regression Model estimated by Coleman**

Access to Trade Credit as a function of Firm Owner's Characteristics			
Model		A	B
	 <b>Dependent Variable</b>	Ln (Trade Credit?) 1= yes, firm has some 0 = no, firm has none	Ln (Denied Trade Credit?) 1= Denied Trade Credit 0= Not Denied Trade Credit
		Coefficients	Coefficients
Independent Variables	Intercept	1.0193**	-2.2416**
	Owner's Age	-0.0154**	-0.0107
	Education	0.1109	0.2937
	Experience	0.0188**	-0.0192*
	Owner: White Women 1= yes; 0 = no	-0.4520**	0.0073
	Owner: Black Men 1= yes; 0 = no	-0.5269**	0.9517**
	Owner: Hispanic Men 1= yes; 0 = no	-0.7734**	0.2236
	Owner: Asian Men 1= yes; 0 = no	-0.1552	-0.1950
<b>Notes:</b> * results significant at the <b>0.05</b> level ** results significant at the <b>0.01</b> levels			
<b>Source:</b> (contents of in this table was derived from Table VI in Coleman 2003, pg. 23)			

The regression estimates shown in Table 9 are based on observations for 3,252 firms contained in the 1998 SSBF dataset.<sup>31</sup> While the overall sample size is large, it contains a relatively small number of firms owned by minority women, therefore, no observations for firms owned by Black, Hispanic, or Asian women were analyzed (Coleman 2003, pg. 4).

Based on analyses of the two models identified in Table 9, Coleman concluded the following:

- ❑ Controlling for various measures of human capital (education, experience and age), firms owned by white women, black men, and Hispanic men were significantly less likely to have trade credit than firms owned by white men (Coleman 2003, pp. 10-11).
- ❑ Controlling for various measures of human capital (education, experience and age), firms owned by black men were significantly more likely to be denied trade credit (Coleman 2003, pp. 10-11).

<sup>31</sup> In total, the 1998 SSBF dataset contains observations on 3,550. (see Table 6 on pg. 41 for more details about the composition of the 1998 dataset)

- Controlling for various measures of human capital (education, experience and age), firms owned by black men were significantly more likely to payoff trade credit late (Coleman 2003, pp. 10-11).

Coleman does not specify and/or discuss a single model that controls for the creditworthiness of both the firm and the owner, and characteristics of the firm as well as owner. As a result, it is impossible to determine from the Coleman study if the observed disparities arise from discrimination and/or other factors. The preceding observation is not meant as a criticism. The Coleman study was not designed to examine discrimination in access to trade credit. The primary objective of the Coleman study is to characterize those firms that are most likely to use 'free' trade credit and those most likely to use 'costly' trade credit.

Ultimately, the findings of Coleman and Aaronson *et al.* allow for the possibility of discrimination in access to trade credit and make it clear that little is known about how discrimination might impact access to trade credit for minority-owned firms. Our research study begins the process of addressing this gap in the literature directly.

In the next section of this paper, our research methodology and results are presented.

## 4. Research Methodology and Results

This study consists of a quantitative analysis of empirical data from the 1993 and 1998 SSBF datasets.

Our study falls into the “Fair Share Analyses” category and required the development of a regression model to estimate the amount of trade credit that a firm will receive after controlling industry and creditworthiness of the firm and owner. The applicable unit of analysis is the firm.

While trade credit is an important source of financing for small businesses, little is known about how discrimination might impact access to trade credit for minority-owned firms. This study begins the process of addressing this issue by focusing on the following three research questions:

- Is there any disparity in the quantity of trade credit extended to minority-owned firms compared with non-minority-owned firms?
- After controlling for creditworthiness, is there any disparity in the quantity of trade credit extended to firms owned by minorities compared with those owned by non-Hispanic whites?
- If in fact disparities exist after controlling for creditworthiness, have these disparities narrowed over time?

### 4.1. The Data

The study examined data collected via 1993 and 1998 Survey of Small Business Finances (SSBF)<sup>32</sup>, co-sponsored by the Federal Reserve Board and the U.S. Small Business Administration. The main purposes of the SSBF are to provide information on the use of credit by small and minority-owned firms and to create a general-purpose database on the finances of such firms. The survey was structured to yield sufficient numbers of minority-owned firms to conduct separate analyses of minority- and non-minority-owned small businesses. Survey datasets are generated approximately every five years, commencing with the year 1987 (U.S. Federal Reserve System 1996; Haggerty, Grigorian et al. 2001). The latest available dataset contains observations for the year 1998. Table 7 on page 52 provides a breakdown of the racial/ethnic composition of the 1993 and 1998 SSBF datasets.

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<sup>32</sup> Formally, the two datasets are entitled the 1993 National Survey of Small Business Finances and the 1998 Survey of Small Business Finances. In this document, for ease of exposition, we refer to the two datasets as the 1993 SSBF dataset and the 1998 SSBF dataset.

**Table 7. Description of the 1993 & 1998 SSBF Datasets**

<b>Description of the 1993 &amp; 1998 SSBF Datasets</b> (racial/ethnic breakdown of firm owners)			
	<b>Survey Year/Dataset Title</b>	<b>1993/NSSBF (1)</b>	<b>1998/SSBF (2)</b>
	<b>Total # of Observations (a)</b>	5,276	3,550
<b>Ethnicity of Owners</b>	<b>Non-Hispanic White (b)</b>	4,045	2,790
	<b>Hispanic White (b)</b>	326	243
	<b>Hispanic Other (c)</b>	43	17
	<b>Hispanic, Total (b)</b>	369	260
	<b>Black (c)</b>	523	273
	<b>Asian &amp; Pacific Islander (c)</b>	336	214
	<b>American Indian &amp; Native Alaskans (c)</b>	45	24
	<b>Year the dataset became publicly available</b>	1997 (d)	2001
<b>Sources:</b>			
1) (See Table 1 in Cole and Wolken 1995, pg. 632)			
2) (Derived from Table 2 in Bitler, Robb et al. 2001, pg. 186)			
<b>Notes:</b>			
(a) The sum of the various racial/ethnic categories of owners do not equal the "Total" because the observations reflected in the row labeled " <b>Hispanic Other</b> " are also included in the amounts shown for " <b>Black, Asian &amp; Pacific Islander or American Indian &amp; Native Alaskan.</b> "			
(b) Commencing with the 1990 Census, the U.S. Census Bureau considers ' <b>Hispanic</b> ' to be an ethnic classification not a racial classification. As a result, there are White Hispanics, Black Hispanics, Asian Hispanics, etc. However, for the purposes of most government activities and agencies (e.g. the Small Business Administration), all Hispanics are considered minorities. Prior to the 1990 Census, " <b>Hispanic</b> " was treated as a racial category.			
(c) The observations reflected in the row labeled " <b>Hispanic Other</b> " are also included in the amounts shown for " <b>Black, Asian &amp; Pacific Islander or American Indian &amp; Native Alaskan.</b> "			
(d) Author's determination based on a note in a Federal Reserve Bulletin: (See Note 3 in Cole and Wolken 1996, pg.984). The current version of the Public-Use dataset became available in 1999 and only includes observations for 4,637 firms (U.S. Federal Reserve System 1999, pp. 1-4),			

The 1993 SSBF dataset includes information from approximately 5,300<sup>33</sup> completed interviews of a random sample of small businesses, with stratification by firm size, location (urban or rural), and geographic region of the country.

<sup>33</sup> A little more than fifty percent of the firms contacted responded U.S. Federal Reserve System (1996). National Survey of Small Business Finances: Methodology Report. Washington, Board of Governors of the Federal Reserve System: 113..

Included among the approximately 5,300 completed surveys are responses from 523 African-American-owned firms, 336 Asian-American-owned firms, and 369 Hispanic-owned firms. The survey drew its sample from the population of all for-profit, non-financial, non-farm business enterprises that were listed in Dun's Market Identifier (DMI) file and that were in operation as of year-end 1992 with fewer than 500 employees.<sup>34</sup> More than 14,000 firms were contacted, of which about 10,200 met the definition of small business as used in this study.

The 1998 SSBF dataset includes information from approximately 3,550<sup>35</sup> completed interviews. Included among those completed surveys are responses from 273 African-American-owned firms, 214 Asian-American-owned firms, and 260 Hispanic-owned firms (Bitler, Robb et al. 2001, pp. 185-187).

The data in both datasets are organized into four partitions:

**Main Partition:**

While this partition consists primarily of non-minority-owned firms, it does include minority firms. As a result, it is referred to as the "Main Partition" as opposed to the "White Partition."

This partition includes 90 sampling strata defined by:

- ✓ 9 Census Regions
- ✓ Urban/Rural Businesses (2 groups)
- ✓ 5 Size Groups (1-19, 20-49, 50-99, 100-499 employees, and Unknown)

**African-American Partition:**

This partition contains two sampling strata: Urban/Rural Businesses.

**Asian-American Partition:**

This partition contains two sampling strata: Urban/Rural Businesses.

**Hispanic Partition:**

This partition contains two sampling strata: Urban/Rural Businesses.

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<sup>34</sup> Dun's Marketing Service, Dun and Bradstreet, Inc. The DMI list, containing nearly 10 million businesses, is broadly representative of all businesses but does not include many of the newest start-up firms or the self-employed individuals filing business tax returns. In contrast, the Internal Revenue Service reports that for 1991 about 20 million individuals filed business tax returns, including about 13 million sole proprietorships, of which about 3 million reported less than \$2,500 in annual receipts.

<sup>35</sup> Approximately 33% of the firms contacted responded Bitler, M. P., A. M. Robb, et al. (2001). Financial services used by small businesses: evidence from the 1998 Survey of Small Business Finances, Board of Governors of the Federal Reserve System. **2002**..

A firm was classified as being owned by individuals of a specific race, ethnic group, or sex if more than 50 percent of the ownership shares belonged to such individuals during the survey period.

The SSBF datasets include information on the availability and use of credit by small and minority-owned businesses. Both datasets provide detailed information on the types and sources of financial services used by small businesses, with emphasis on the use of credit. The SSBF datasets also contain information regarding each firm's employment, assets, liabilities, equity, income and expenses; firm characteristics, including location, organizational form, and age; and demographic characteristics of each firm's primary owner, including sex, age, education, experience, ethnicity, and race.

For both the 1993 and 1998 datasets, business size is measured in three ways. For the 1993 dataset, the average number of full-time-equivalent employees for 1993, revenues for fiscal year (FY) 1992, and year-end FY 1992 total assets. The employment size of the vast majority of firms in the population of small businesses is near the bottom of the 0–499 range. For 1993 dataset, nearly 70 percent of firms employed fewer than five full-time-equivalent workers and only 3 percent had more than fifty. For the 1998 dataset, the frequency distribution for this variable is similar.

For the 1993 dataset, size in terms of sales and assets reveals a similar skew in distribution. For example, more than half of the firms reported revenues of less than \$250,000, whereas fewer than 5 percent had annual revenues in excess of \$5 million. For the 1998 dataset, the frequency distribution for this variable is similar.

A business can be organized as a corporation (**C**-type or **S**-type), a proprietorship, or a partnership. For the 1993 dataset, most small businesses were organized as sole proprietorships. Sole proprietorships accounted for more than 40 percent of firms. About 30 percent were organized as "**C**" corporations, 20 percent as "**S**" corporations, and the remainder as partnerships (Cole and Wolken 1995, pg. 631). For the 1998 dataset, the proportion of firms that were organized as sole proprietorships was even higher. Sole proprietorships accounted for approximately half of firms; "**C**" corporations accounted for about 24 percent; "**S**" corporations accounted for 20 percent; and, the remainder were organized as partnerships (Bitler, Robb et al. 2001, pg.185).

Firms were classified by industry using Standard Industrial Classification (SIC) system. For the 1993 dataset, the majority of firms (60 percent) were distributed among the business services, retail trade, and professional services industries. Only about ten percent were in manufacturing or transportation industries. (Cole and Wolken 1995, pg. 632) The distribution of firms by industry was similar for the 1998 dataset (Bitler, Robb et al. 2001, pg. 186).

For both the 1993 and 1998 datasets, firms less than five years old (that is, whose current ownership had been in place less than five years) accounted for about 15 percent of the sample, as did firms twenty-five years old or older. More than one-quarter of all firms were between five and ten years old, and the mean value was 14.5 years (Cole and Wolken 1995, pg. 632; Bitler, Robb et al. 2001, pg. 186).

For both the 1993 and 1998 datasets, about 80 percent of all small businesses were located in urban areas, with approximately 90 percent having a single office and an owner–manager. Fewer than one in ten small businesses reported export sales (Cole and Wolken 1995, pg. 632; Bitler, Robb et al. 2001, pg. 186).

#### 4.2. Our Study Sample

The samples that we used to address our research questions were drawn from the SSBF datasets; however, they did not use all of the observations contained in the SSBF dataset. For example, the 1998 SSBF dataset contains 3,561 observations, and our 1998 study sample includes observations for 1,072 firms. Observations for firms in the following industries were excluded from our study sample: service; FIRE (financial services, insurance and real estate); and, mining. Firms in these three industries were excluded because on average the compositions of their balance sheets differ significantly from those included in our sample. The study sample also only included observations for firms that majority-owned by males. The 1998 SSBF dataset only include observations for a small number of firms majority-owned by minority women. So, to eliminate any possible influence of gender discrimination on any research findings, firms owned by women were excluded from our study sample. Finally, our study sample only includes firms that sought trade credit during the 1998 to ensure that any observed disparity did not result from demand-side differences<sup>36</sup>. Ultimately, the study sample consists of 1,072 observations for firms majority-owned by males active in one of the following five industries: construction, manufacturing, retail, transportation and wholesale.

#### 4.3. Methodology and Model

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<sup>36</sup> The 1998 SSBF dataset includes responses to the following the question: “**Did the firm purchase any goods or services on account during 1998 rather than pay for the purchase before or at the time of delivery?**” U.S. Federal Reserve System (2002). Codebook for 1998 National Survey of Small Business Finances (SSBF). Washington, Board of Governors of the Federal Reserve System: 147.. See Appendix A for a complete list of all variables employed by this study. We recognize that excluding firms that were unsuccessful in obtaining any trade credit in 1998 potentially underestimating the full impact of discrimination; however, this is preferable to incorrectly attributing to discrimination disparities that result from minority-owned firms that did not request any trade credit during 1998.

With access to the SSBF data, we developed a model that allowed us to address the primary research question: “*Is there empirical evidence of racial discrimination in the extension of trade credit?*”

To address this question, a measure of amount of trade credit provided to a firm that was sensitive to variation in the size of firms was needed. Our model uses **TC\_PCT** as the primary measure of the quantity of trade credit provided. **TC\_PCT** measures the percentage of all of a firm’s purchases made with trade credit. For example, if a firm was granted trade credit for all of its purchases, **TC\_PCT** would equal 100% and if a firm was never granted trade credit, **TC\_PCT** would equal 0%. The dependent variable (**High\_TC-use**) used in our model is a dummy variable that identifies those firms whose use of trade credit (as measured by **TC\_PCT**) equals or exceeds the median value for non-Hispanic white men. Consistent with prior research, we control for firm creditworthiness, industrial classification, owner’s human capital and/or owner’s creditworthiness.

To identify the appropriate independent variables for this model, two separate bodies of research were reviewed.

The first of these two bodies of research seeks to identify the factors that determine who receives trade credit (Emery 1984; Walker 1985; Chant and Walker 1988; Elliehausen and Wolken 1993; Peterson and Rajan 1997; Ng, Smith et al. 1999; Wilson 2002). The second body of research seeks to determine if there is evidence of racial and/or gender discrimination in various credit markets (e.g. mortgage loans, consumer loans, etc.) (Becker 1971; Peterson and Peterson 1981; Handy and Swinton 1984; Ando 1988; Elliehausen and Lawrence 1990; Bates 1993; Dymski 1995; Munnell, Tootell et al. 1996; Bates 1997; Kijakazi 1997; Blanchflower, Levine et al. 1998; Bostic and Lampani 1999; Immergluck 1999; Coleman 2000; Han 2001; Squires and O’Connor 2001; Cavalluzzo 2002).

Based on a review of these two bodies of literature, a model was developed that allowed us to address the basic research question.

A logistic regression model was crafted having the following form:

$$\begin{aligned} High\_TC\_use_i = & \beta_0 + \beta_1 SIC\_C_i + \beta_2 SIC\_R_i + \beta_3 SIC\_T_i + \beta_4 SIC\_W_i + \beta_5 ORG_i \\ & + \beta_6 Ln\_tot\_ast\_1_i + \beta_7 Ln\_F\_age\_2_i + \beta_8 SLOPAY\_3_i + \beta_9 exp + \beta_{10} aa\_own_i \\ & + \beta_{11} lat\_own_i + \beta_{12} asia\_own_i + \beta_{13} other\_race_i + \varepsilon_i \end{aligned}$$

Logistic regression was used because the dependent variable (**High\_TC\_use**) is a dummy variable that identifies those firms whose use of trade credit is ‘high’ or ‘low.’ Specifically, the dependent variable (**High\_TC-use**) identifies those firms whose use of trade credit (as measured by **TC\_PCT**) equals or exceeds the median value for non-Hispanic white men.



Industry dummies are included in the model because prior research clearly demonstrates that terms and quantity of trade supplied vary significantly from industry to industry (Ng, Smith et al. 1999, pp. 1117-1119). That said, within an industry, trade credit terms are generally quite uniform. Typically, suppliers address variations in creditworthiness of their customers by vary the quantity of trade credit provided rather the terms (Chant and Walker 1988, pg. 864; Ng, Smith et al. 1999, pp. 1117-1119). The base/reference industry is manufacturing for this model, therefore the coefficients for the other industry dummies indicate whether firms in that industry receive more or less trade credit than a manufacturing firm, *ceteris paribus*. The model includes dummies for the following industries: construction, retail, transportation and wholesale. It should be noted that the study sample excludes observations for the following industries: service; FIRE (financial services, insurance and real estate); and, mining. Firms in these three industries were excluded because on average the compositions of their balance sheets differ significantly from those included in our sample.

**ORG**, a dummy variable that identifies those firms set up as corporations or other limited liability entities, is included in our model because Petersen and Rajan (1997, pg. 679) have demonstrated that this a significant determinant of the amount of trade credit provided to small firms. While no consensus exists on why firms organized as corporations and/or other limited liability entities are provided more trade credit on average than those organized as proprietorships and partnerships, several researchers suggest that the limited liabilities entities as a group may be more perceived by suppliers as more 'sophisticated' and 'established' (Walker 1985, pg. 38; Coleman 2003, pg. 11).

Variables (**Ln\_tot-ast\_1** and **Ln\_F\_age\_2**) that account for variation in a firm's total assets and age are included in our model as measures of a firm's creditworthiness. The size of a firm (as measured by sales and total assets) is an important factor in assessing the firm's creditworthiness. Prior research provides evidence that both total assets and firm age are significant determinants of the amount of trade credit provided to small firms (Walker 1985, pg. 38; Peterson and Rajan 1997, pp. 678-679). The preference for older firms is supported by evidence that a firm likelihood of failure drops with each passing year of operation (see Bates' chapter, Financing Capital Structure and Small Business Viability, in Yazdipour 1991, pp. 63-77).

The model also includes measures of the owner's human capital (**exp**) and creditworthiness (**SLOPAY\_3**). Aaronson et al. (2004, pp. 46-48) suggest that as owners spend more time working in an industry and/or market, he or she may develop social capital with suppliers that increases their access to trade credit, *ceteris paribus*. Cavaluzzo and Wolken (Cavalluzzo 2002) clearly demonstrate that the creditworthiness of firm owners is a significant determinant of whether small firms can obtain bank financing. It seems reasonable that suppliers of trade credit also might conclude that the creditworthiness of the owner of a small firm should be a factor in their decision to provide trade credit to that firm.

Finally, the model includes four race dummies to identify firms owned by African-Americans, Hispanic whites, Asian-Americans and other minorities, respectively: **aa\_own**, **lat\_own**, **asia\_own** and **other\_race**. The base/reference group is non-Hispanic whites, therefore the coefficients for these race/ethnicity dummies indicate whether firms owned by that group receive more or less trade credit than non-Hispanic whites, *ceteris paribus*.

#### 4.4. Variables of Interests

While the 1993 and 1998 SSBF datasets were not specifically designed to address this study's central research question, they both contain detailed information on firm and owner characteristics required to address this question. The firm characteristics include the industrial classification, the firm's age, measures of creditworthiness, information about the quantity, the nature and sources of the funds that capitalize a firm. Owner data includes gender, ethnicity/race, management experience, education and past financial problems.

Several of the questions in both the 1993 and 1998 SSBF address a firm's use of trade credit, including:

- Did the firm purchase any goods or services on account last year?
- Has any supplier that offers trade credit denied a request by your firm?
- From how many suppliers did the firm make purchases on account during 1993 or 1998?
- What percentage of purchases was made on account in 1993 or 1998?
- What portion of suppliers offered cash discounts for prompt payment?
- What portion of the cash discount offered did the firm take advantage of?
- What portion of payments on account was made after the due date in 1993 or 1998?

On page 59, Table 8 lists most of the variables to be used in this study. Some of the variables shown on the next page are those used in the SSBF datasets and others variables were derived for this study using one or more of the variables contained in the SSBF datasets. (Appendix A contains a complete list of the variables used in this study and also identifies the corresponding variable names for the 1993 and 1998 SSBF datasets)

**Table 8. An Abridged Variable Dictionary**

An Abridged Variable Dictionary (a)			
Type	Variable Name	Variable Description/Definition	Row
Dependent Variable	TC_High_use	Identifies those firms whose use of trade credit (as measured by <b>TC_PCT</b> ) equals or exceeds the median value for non-Hispanic white men (dummy)	1
	TC_PCT	Measures the percentage of all of a firm's purchases made with trade credit.	2
Owner's Race	aa_own	Identifies firms owned by African-Americans (dummy)	3
	lat_own	Identifies firms owned by Hispanic whites (dummy)	4
	asia_own	Identifies firms owned by Asian-American (dummy)	5
	non_min_own	Identifies firms owned by non-Hispanic whites (dummy)	6
Owner Characteristics	exp	Owner's management experience (measured in years)	7
	SLOPAY_3	Identifies # of an Owner with three or more personal accounts that were 60 days or more past due within the past 3 years (dummy)	8
Industry and Firm Info	SIC_C	Identifies firms engaged in Construction (dummy)	9
	SIC_Mfg	Identifies firms engaged in Manufacturing (dummy)	10
	SIC_R	Identifies firms engaged in Retail (dummy)	11
	SIC_T	Identifies firms engaged in Transportation (dummy)	12
	SIC_W	Identifies firms engaged in Wholesale (dummy)	13
	ORG	Identifies corporations and other limited liability entities (dummy)	14
Firm's Creditworthiness Variables	F_age	Years since firms was started/purchased/acquired by current management	15
	Ln_F_age_2	Ln ( <b>F_age</b> squared)	16
	tot_ast	Total Assets at fiscal year-end 1998	17
	tot_ast_1	Total Assets at fiscal year-end 1998 (excluding firms with negative values which not indicative of going concerns)	18
	Ln_tot_ast_1	Ln( <b>tot_ast_1</b> )	19
(a) This is table contains most the variables that will be used to conduct this study. For a more complete list see Appendix A.			

#### 4.5. Descriptive Statistics

The first of our three research questions asks, *'Is there any disparity in the quantity of trade credit extended to minority-owned firms compared with those*

*owned by non-Hispanic whites?* To address that question, we looked at the use of trade credit by firms owned by non-Hispanic white, African-Americans, Hispanic whites and Asian-Americans, respectively, to determine if there were any statistically significant differences in their levels of use. In other words, we determined the mean value of the dependent variable (**TC\_High\_use**) and a few other measures of trade credit use and tested for any statistically significant differences in the values for firms owned by African-Americans, Hispanic whites and Asian-Americans relative to those owned by non-Hispanic whites.

Similarly, we also calculated the mean values for the various independent variables that were used to assess a firm's creditworthiness, industry classification, owner's creditworthiness or owner's human capital. And, for each of these independent variables, we tested for any statistically significant differences in the values for firms owned by African-Americans, Hispanic whites and Asian-Americans relative to those owned by non-Hispanic whites.

For expositional ease, the variables are grouped into four categories: firm characteristics; industrial classifications; owner's characteristics; and, use of trade credit.

#### 4.5.1. Firm Characteristics

Table X reveals that the firms owned by non-Hispanic white men are significantly larger than those owned by minorities as measured by sales or total assets. These disparities are of interest because size is a primary indicator of creditworthiness and therefore a principal determinant of if and how much trade credit a firm will receive. The sales of firms owned by Hispanic white men and African-American men average approximately one-third of those of non-Hispanic white men. Similarly, the total assets of firms owned by Hispanic white men and African-American men average approximately one-fourth of those of non-Hispanic white men. Comparing firms owned by Asian-Americans with those owned by non-Hispanic whites, no statistically significant differences were observed for either sales or total assets.

#### 4.5.2. Industrial Classifications and Organizational form

Only a few noteworthy differences were observed relative to the distribution of firms across industrial classifications. Firms owned by Hispanic men or Asian-American men were significantly less likely to be involved in the construction field than those owned by non-Hispanic white men. Whereas, firms owned by African-Americans were significantly less likely to be wholesalers than those owned by non-Hispanic whites.

#### 4.5.3. Owner Characteristics

One measure of human capital is years of management experience (**exp**). No significant differences were observed in the level of management experience between non-Hispanic whites, African-Americans and Hispanic whites. However, on average non-Hispanic whites had almost twice as much management experience as Asian-Americans.

One measure of an owner's creditworthiness is their payment history relative to their personal debts. The variable **SLOPAY\_3** identifies those owners who have been late (60 days or more) on three or more personal obligations. Using this measure, no significant differences were observed in the level of creditworthiness between non-Hispanic whites, African-Americans and Hispanic whites. However, on average non-Hispanic whites were ten times more likely to be delinquent on their debts than Asian-Americans.

#### 4.5.4. Use of Trade Credit

Table X we report the mean values for two variables: **TC\_PCT** and **High\_TC\_yes**. **TC\_PCT** measures the percentage of all of a firm's purchases made with trade credit. For example, if a firm was granted trade credit for all of its purchases, **TC\_PCT** would equal 100% and if a firm was never granted trade credit, **TC\_PCT** would equal 0%. As measured by **TC\_PCT**, firms owned non-Hispanic white men were granted trade credit for a significantly higher percentage of their purchases than those owned by either African-American men, Hispanic white men or Asian-American men. The variable **High\_TC-use** is a dummy variable that identifies those firms whose use of trade credit (as measured by **TC\_PCT**) equals or exceeds the median value for non-Hispanic white men. As measured by **High\_TC-use**, the use of trade credit by firms owned African-American men did not differ significantly from those owned by non-Hispanic white men. However, significant differences were observed for firms owned by Hispanic white men and Asian-American men relative to those owned by non-Hispanic white men. Using **High\_TC-use** as a measure, the use of trade credit by non-Hispanic white men was roughly twice that observed for firms owned by either Hispanic white men or Asian-American men.

The finding that firms owned by Asian-American men received significantly less trade credit (as measured by **TC\_PCT** and **High\_TC-use**) than those owned by non-Hispanic white men is noteworthy because many scholars suggest that Asian-Americans do not experience difficulties in accessing credit comparable to those experienced by other minorities (Chen and Cole 1988; Bates 1989, pp. 25-42; Bates 1993; Bates 1993; Bates 1997; Christopher 1998).

To summarize, we observed that there were some significant differences in access to trade credit for firms owned by minorities compared with those owned

by non-Hispanic white men. We also observed that firms owned by non-Hispanic white men were larger (as measured by sales or total assets) than those owned by either African-American men or Hispanic white men. However, no significant differences in size were observed between firms owned by non-Hispanic white men and Asian-American men. Turning to industrial classifications, we observed some significant differences in the level of participation in various industries by firms owned by African-American men, Hispanic white men and Asian-American men relative to those owned by non-Hispanic white men. Continuing we observed that non-Hispanic men had significantly more business experience than either Hispanic white men or Asian-American men. However, no significant differences in management experience were observed between firms owned by non-Hispanic white men and African-American men. Turning to owner's creditworthiness, no significant differences were observed between non-Hispanic white men and African-American men or Hispanic white men. In contrast, Asian-American men were found to be significantly more creditworthy than non-Hispanic white men as measured by **SLOPAY\_3**.

This review of the descriptive statistics for access to trade credit provides an answer to first of our three research questions: *'Is there any disparity in the quantity of trade credit extended to minority-owned firms compared with those owned by non-Hispanic whites?'* Clearly, the answer is 'yes.'

So this brings us to the second research question: *'After controlling for creditworthiness and other salient factors, is there any disparity in the quantity of trade credit extended to firms owned by minorities compared with those owned by non-Hispanic whites?'*

In the next section, we will discuss the model used to test for differences in access to trade credit between firms owned by non-Hispanic whites men and those owned by either African-American men, Hispanic white men and Asian-American men after controlling for firm creditworthiness, industrial classification, owner's human capital and/or owner's creditworthiness.

#### 4.6. Hypotheses

Our second research question can be formally stated as a hypothesis. Prior to doing so, it would be helpful to revisit the model that we developed. A logistic regression model was crafted having the following form:

$$\begin{aligned} High\_TC\_use_i = & \beta_0 + \beta_1 SIC\_C_i + \beta_2 SIC\_R_i + \beta_3 SIC\_T_i + \beta_4 SIC\_W_i + \beta_5 ORG_i \\ & + \beta_6 Ln\_tot\_ast\_1_i + \beta_7 Ln\_F\_age\_2_i + \beta_8 SLOPAY\_3_i + \beta_9 exp + \beta_{10} aa\_own_i \\ & + \beta_{11} lat\_own_i + \beta_{12} asia\_own_i + \beta_{13} other\_race_i + \varepsilon_i \end{aligned}$$

Logistic regression was used because the dependent variable (**High\_TC\_use**) is a dummy variable that identifies those firms whose use of trade credit is 'high' or

'low.' Specifically, the dependent variable (**High\_TC-use**) identifies those firms whose use of trade credit (as measured by **TC\_PCT**) equals or exceeds the median value for non-Hispanic white men.

Stated formally, we tested the following hypothesis, for firms owned by African-Americans:

$$H_0 : \beta_{10} \geq 0$$

$$H_A : \beta_{10} < 0$$

And, we tested the following hypothesis for firms owned by Hispanic whites:

$$H_0 : \beta_{11} \geq 0$$

$$H_A : \beta_{11} < 0$$

And, we tested the following hypothesis for firms owned by Asian-Americans:

$$H_0 : \beta_{12} \geq 0$$

$$H_A : \beta_{12} < 0$$

In the next section, we report the findings of our analysis.

#### 4.7. Empirical Results

The results of our analysis of factors influencing the quantity of trade credit provided to a firm is outline in Table 9. All of the reported coefficients carry the expect signs that prior research would suggest.

**Table 9. Logistic Regression: Estimates of Trade Credit Use**

Dependent Variable: TC_High_use {a dummy variable that identifies those firms whose use of trade credit (as measured by TC_PCT) equals or exceeds the median value for non-Hispanic white men}				
Independent Variables	Coefficient	Wald Statistic	Significance p value	EXP (B)
Industry				
SIC_C	0.684**	12.863	.000	1.981
SIC_R -0.214		1.345	.246	0.807
SIC_T -0.491		2.367	.124	0.612
SIC_W	0.620**	8.055	.005	1.859
Organizational Form				
ORG	0.340*	5.651	.017	1.405
Firm Creditworthiness				
Ln_tot_ast_1	0.078*	5.756	.016	1.081
Ln_F_age_2	0.119*	4.917	.027	1.126
Owner's Characteristics				
Exp	0.015*	4.097	.043	1.015
SLOPAY_3 -0.290		1.104	.293	0.748
Race/Ethnicity of Owner				
aa_ow -0.503		1.495	.221	0.605
lat_ow -0.706		3.667	.055	0.494
asia_ow -0.811*		3.868	.049	0.444
Other_race -1.220*		4.826	.028	0.295
Constant				
Constant -1.863		18.274	.000	0.155

N = 1,072

\* differences from Non-Hispanic, White men significant at the .05 level

\*\* differences from Non-Hispanic, White men significant at the .01 level

The coefficient for **ORG** (which identifies firms organized as corporations or other limited liability entities) is positive and significant.

The coefficients associated with both of the measures of firm creditworthiness (**Ln\_tot\_ast\_1** and **Ln\_F\_age\_2**) are positive and significant.



The coefficient associate **exp** (owner's management experience in years) is positive and significant.

While the coefficient associate **SLOPAY\_3** (a measure of a owner's creditworthiness) is positive, it is not significant the 5% level.

The primary purpose of this study was determined if race/ethnicity significantly influences the amount of trade credit provided to a firm, *ceteris paribus*. The results are mixed and not completely consistent with prior research.

While the coefficient for **aa\_own** (which identifies firms owned by African-Americans) is negative as prior research would suggest, it is not significant.

The same can be said of **lat\_own**. While the coefficient for **lat\_own** (which identifies firms owned by Hispanic whites) is negative as prior research would suggest, it also is not significant.

Interestingly, the coefficient associated with **asia\_own** offer strong evidence of that firms owned by Asian-Americans received less trade credit those owned by non-Hispanic whites, *ceteris paribus*. The coefficient associated with **asia\_own** is negative and significant.

The finding that firms owned by Asian-American men received significantly less trade credit than those owned by non-Hispanic white men is noteworthy because many scholars suggest that Asian-Americans do not experience difficulties in accessing credit comparable to those experienced by other minorities (Chen and Cole 1988; Bates 1989, pp. 25-42; Bates 1993; Bates 1993; Bates 1997; Christopher 1998).

To quantify the disparity, we calculated the mean probability of being provided a 'high' level of trade credit for firms owned by non-Hispanic white men and Asian-American men<sup>37</sup>. The probability of being provided a high level of trade credit for non-Hispanic white men is 62%. For firms owned by Asian-Americans, the probability of being provided a high level of trade credit is 32%

One way to quantify the portion of the disparity directly attributable to the race/ethnicity of the owner is to calculate the probability of being provided a 'high' level of trade credit for firms owned by Asian-American men if the mean values of those firms were identical to those of non-Hispanic white men. When we do that the probability for firms owned by Asian-American men rises from 32% to 42%; however, it still falls well below the 62% probability rate for firms owned by non-Hispanic white men.

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<sup>37</sup> To calculate these values, the mean values for each group were plugged into the logistic regression model and the reported probabilities for the dependent variable (TC\_High\_use) are the end result of that exercise.

At the onset of this study, a third research question was posed: *'If in fact disparities in the amounts of trade credit provided to firms owned by minorities versus those owned by non-Hispanic whites did exist in 1998, ceteris paribus, have these disparities narrowed over time?'* To address this third questions, we had proposed to analyze the 1993 SSBF dataset with the same model that we used to analyze the 1998 SSBF dataset and determine if there were any statistically significant disparities in the quantity of trade credit extended in 1993 to firms owned by minorities compared with those owned by non-Hispanic whites. If so, we could address the third research question: *'Did the disparities in the amounts of trade credit provided to firms owned by minorities versus those owned by non-Hispanic whites narrow during the period from 1993 to 1998?'*

Our analysis of the 1998 study sample did not reveal any statistically significant disparity in the provision of trade credit to firms owned by either African-American men or Hispanic white men compared with firms owned by non-Hispanic white men, ceteris paribus. So, for these two groups, the third research question cannot be addressed.

Our analysis of the 1998 study sample does reveal a statistically significant disparity in the provision of trade credit to firms owned by Asian-American men compared with firms owned by non-Hispanic white men, ceteris paribus. So for this group, the third research question should be addressed. Unfortunately, our study design did not anticipate this finding and we did not include observations for firms owned by Asian-Americans in the 1993 study sample. So, this analysis must be deferred.

## 5. Conclusions

Our examination of various descriptive statistics that measure access to trade credit clearly demonstrates that on average firms owned by minorities receive less trade credit than those owned by non-Hispanic white men. Our analysis also indicates that most if not all of the observed disparities for firms owned by African-Americans and Hispanic whites compared with those owned non-Hispanic whites can be attributed to differences in either firm creditworthiness, owner's human capital and/or distribution by industry. For firms owned by Asian-Americans, this is not the case. Significant disparities in access to trade credit remain after controlling for firm creditworthiness, owner's human capital and distribution by industry for firms owned by Asian-American men compared with those owned non-Hispanic white men

But does the evidence suggest that prejudicial discrimination is the cause of the observed disparities. While our findings are consistent with the existence of prejudicial behavior, other factors may also explain these findings. For example, the Asian-American business community may include a significant percentage of owners for whom English is not their first language. If so, the associated language barriers may retard the development of relationships with some suppliers who are non-Hispanic whites, and thereby limit access to trade credit for firms owned by Asian-Americans. The preceding comment is pure speculation and the SSBF datasets do not contain any observations regarding the language skills of firm owners. However, this armchair exercise does illustrate that there may be other explanations that account for these findings. Clearly, more research is required.

Like all empirical research, this study has some limitations. One of these limitations involves sample selection. We estimated a model using data that included observations for firms in five different industries. Prior research clearly demonstrates that terms and quantity of trade supplied vary significantly from industry to industry (Ng, Smith et al. 1999, pp. 1117-1119). That said, within an industry, trade credit terms are generally quite uniform. Typically, suppliers address variations in creditworthiness of their customers by vary the quantity of trade credit provided rather the terms (Chant and Walker 1988, pg. 864; Ng, Smith et al. 1999, pp. 1117-1119). This suggests that it would be preferable to estimate models for each industry separately because the coefficients associated with various model variables (e.g. measure of firm creditworthiness) might differ significantly from industry to industry. Unfortunately, the SSBF datasets do not contain sufficient numbers of observations for minority-owned firms to allow one to safely infer much about the population of minority-owned businesses for most industries. If and when appropriate datasets are available, industry specific samples clearly would be preferable.

Some readers of our findings might have an additional concern about the sample used to complete this study. The sample analyzed only includes firms that had successfully obtained at least one dollar of trade credit in 1998. The sample excluded firms that may have sought trade credit in 1998 and received none; thereby, potentially underestimating the full impact of discrimination. So, our findings must be viewed in that light.

In sum, our findings must be interpreted with some cautions given the limitations outlined. That said, our findings are consistent with the existence of prejudicial behavior and make it difficult to dismiss this possibility for now.

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