

CREDIT CARDS AND ENTREPRENEURSHIP

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Prepared for
Visa USA, Inc.



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Recent research has provided evidence that liquidity constraints result in the suboptimal provision of entrepreneurial services. This paper shows that the availability of credit cards has provided an increasingly important source of credit that has effectively relaxed this liquidity constraint in the United States. Using data from the 1993 National Survey of Small Business Finances (NSSBF), the paper shows that nearly half of new firms relied either on the owner's personal credit card or a business credit card to pay for business-related expenses in 1993. We then provide direct evidence that credit-constrained small businesses are more likely to carry business-related credit card debt. Furthermore, we show that companies with business credit cards grow more rapidly than those without.

I. INTRODUCTION

It is well documented that potential entrepreneurs face liquidity constraints in the following sense. Consider two entrepreneurs who are identical in all respects but one: entrepreneur A has more money in the bank than entrepreneur B. Entrepreneur A is more likely to start a business than entrepreneur B despite the fact that both have equally good prospects, and entrepreneur A is more likely to have a larger business than entrepreneur B conditional on each having started a business. This phenomenon was first documented by Evans and Jovanovic using longitudinal data on individuals who switched between wage work and self-employment.¹ The Evans and Jovanovic results were subject to the possible endogeneity of family assets, which they used as a proxy for access to capital. Studies by Blanchflower and Oswald and by Holtz-Eakin, Joulfaian, and Rosen provided more direct evidence by comparing individuals who received inheritances or gifts, which are presumably exogenous.²

¹ See Evans, D. and Jovanovic, B., "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy*, 97, 1989, 808-827. Also see related work by Fazzari, Steven M., R. Hubbard, and B. Petersen, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 1988, 141-95.

² See Blanchflower, D. G. and Oswald, A. J., "What Makes an Entrepreneur?" *Journal of Labor Economics*, 16, 1998, 26-60; Holtz-Eakin, D., D. Joulfaian, and H. Rosen, "Entrepreneurial Decisions and Liquidity Constraints," *The RAND Journal of Economics*, 25, 1994, 334-347; and Holtz-Eakin, D., D. Joulfaian, and H. Rosen, "Sticking it out: Entrepreneurial Survival and Liquidity Constraints," *Journal of Political Economy*, 102, 1994, 53-75.

During the last quarter century, a major but little noted financial innovation has reduced the liquidity constraints faced by prospective entrepreneurs: the growth of general-purpose credit cards. Credit cards³—and credit lines—have become widely available, partly as a result of sophisticated risk-scoring procedures that credit issuers have developed to minimize defaults and the development of financial instruments that enable credit card issuers to diversify their risks.⁴ For many people, getting a \$10,000 credit card line requires little more than filling out an application. It is far easier than getting a loan from a financial institution.

As a result, households have increased their holdings of credit card debt in the last 25 years. The average household in 1970 held only six percent of their total consumer debt as credit card debt. By 1995, this proportion had increased to 32 percent.⁵ The percent of households that owned credit cards increased from 16 percent to 66 percent over that same time period. The self-employed were more likely to get credit cards. In 1970, 26 percent of households headed by self-employed workers had credit cards compared with 20 percent of households headed by wage workers. By 1995, the figure for the self-employed had jumped to 76 percent while the figure for wage workers had jumped to 73 percent.⁶

This paper shows that credit cards have become a major source of financing for small businesses. It principally analyzes data drawn from the 1993 National Survey of Small Business Finances (NSSBF), which was conducted during 1994-5 for the Board of Governors of the Federal Reserve System and the U.S. Small Business Administration. These data provide information on business financing and owner characteristics for a sample of U.S. employers. Some retrospective information is provided back to 1990, but the bulk of the data

³ We use the phrase credit cards to refer to “general purpose credit cards” that can be used at most retail stores in the United States. We excluded “store” credit cards such as those offered by department stores and gasoline and other specialty cards. The major credit cards (along with their date of introduction) are Visa (1966), MasterCard (1966), Discover (1986), and American Express Optima (1987). As of 1997, Visa and MasterCard accounted for 88 percent of all credit cards. This is the share of Visa and MasterCard compared to the total number of credit cards including those of Visa, MasterCard, American Express Optima and Discover. See *The Nilson Report*, March 1998, Number 663.

⁴ For a non-technical discussion of these phenomena see Joseph Nocerra, *A Piece of the Action* (New York, NY: Simon & Schuster, 1994). For a detailed discussion of the growth of the payment card industry in the United States see Evans, D. and Schmalensee, R., *The Economics of the Payment Card Industry* (Cambridge, MA: NERA, Inc., 1993).

⁵ Note that for this discussion we define household consumer debt as total debt minus mortgage debt.

⁶ Board of Governors of the Federal Reserve, *Surveys of Consumer Finance*, 1970-1995.

pertains to 1993.⁷ Appendix A provides more information about the survey and also gives descriptions and summary statistics of the variables used in this paper.

We provide evidence that shows that small businesses tend to circumvent liquidity constraints by carrying business-related credit card debt. By providing a readily available source of financing, one might also expect that the availability of credit cards would make it easier for businesses to expand. By smoothing good periods and bad, cards may also sustain firms, and, in the long run, help turn a small employer into a large employer. Indeed, we show that firms with business credit cards are faster growing than firms without them.⁸

The paper is organized as follows. Section II summarizes the theoretical and empirical evidence on liquidity constraints for small businesses. Section III examines the use of credit cards by small businesses. Section IV focuses on the relationship between credit card use and employment growth. Section V presents brief conclusions.

II. SMALL BUSINESS FINANCING AND LIQUIDITY CONSTRAINTS

While there are many sources of financing available to small businesses, a number of factors make it difficult for potential entrepreneurs to secure funds to start their businesses and for existing entrepreneurs to finance the expansion of their businesses. Lending is inherently risky, but lending to small businesses is especially risky. Most small businesses fail within a short span of time. About 20 percent of new firms fail in each of the two years following their birth.⁹ In 1995, approximately 50,500 businesses filed for bankruptcy while overall there were 71,000 business failures; many of these were small businesses.¹⁰ Of course, the fact that lending to small businesses is risky does not necessarily imply that funds are not available. After all, lenders can offset their higher risks with higher lending rates. In fact, banks typically

⁷ The 1993 NSSBF consists of a stratified random sample of 4,637 firms. All firms have fewer than 500 employees. Minority-owned firms were over-sampled. Of the firms surveyed, 12 percent are owned by blacks, 6 percent by Hispanics, and 7 percent by “other.” When we report aggregate figures, we use sampling weights to generate nationally representative figures.

⁸ As we discuss below, however, the relationship between employment growth and credit card use is complicated and subject to a variety of sample selection and related endogeneity issues.

⁹ *The State of Small Business*, A Report of the President, 1996 (Washington, DC: US Government Printing Office, 1997).

¹⁰ *Id.*

charge higher interest rates to small business borrowers than to large business borrowers. Two problems, however, could result in lenders “rationing” the amount of credit they provide to small businesses. First, moral hazard arises because people tend to be less prudent with other people’s money than with their own. Second, there exists an adverse selection problem. Lenders that charge high interest rates tend to attract the riskier borrowers who cannot secure funding elsewhere, or who do not want to finance their businesses with their own money. The only way to deal with these problems is to ration credit—to limit the amount that individuals can borrow.¹¹ In some cases, the lender may find that the most prudent loan is no loan at all.

Another problem, known as “asymmetric information” exacerbates moral hazard and adverse selection and increases lenders’ incentives to limit credit. Asymmetric information exists when lenders know less about a particular business venture’s prospects than borrowers do. It is difficult for lenders to identify which entrepreneurs are likely to have successful businesses and which entrepreneurs are likely to fail. “Good” entrepreneurs end up facing higher interest rates and receiving less capital than they would if lenders could perfectly differentiate good entrepreneurs from bad ones.

Moral hazard, adverse selection and asymmetric information conspire to create “liquidity constraints” for small businesses. Consider again two prospective entrepreneurs who are identical in all respects but one.¹² The optimal startup capital for their businesses is C . Entrepreneur A can finance C entirely from his own assets. Entrepreneur B has to secure outside financing. Despite the fact that A and B have exactly identical business prospects, it is possible that B will not be able to find a lender to advance him any money whatsoever. In that case, B may not be able to start his business at all. It is also possible that lenders will only advance him a portion of C . In that case, B may end up starting a smaller business than A.

¹¹ The classic theoretical treatment of credit rationing is Stiglitz, J. and Weiss, A., “Credit Rationing in Markets with Imperfect Information,” *American Economic Review*, Volume 71, Number 3, June 1981. A useful summary of the subsequent literature is provided by Freixas, X and Rochet, J, *Microeconomics of Banking* (Cambridge, MA: MIT Press, 1997). Freixas and Rochet point out that credit rationing can also arise from “moral hazard,” because an increase in the nominal interest rate may change consumer behavior in ways that make default more likely.

¹² You can think of them as identical twins that were separated at birth. A received an inheritance, but B did not.

A number of studies have documented the existence of liquidity constraints for small businesses. Evans and Jovanovic found that people with more assets were more likely to start businesses because they were wealthier, not because they were better entrepreneurs. According to their results, which were admittedly rough and meant mainly for illustrative purposes, liquidity constraints deterred about 300,000 people annually from starting their own businesses in 1976 and reduced the amount of investment in small businesses by about \$2.7 billion in 1976 dollars (\$6.5 billion in 1998 dollars).

One criticism of Evans and Jovanovic is that wealthier people may be better entrepreneurs, and the empirical techniques used by these authors to address that problem are not robust. Two subsequent studies have shown that people who receive purely exogenous increases in assets—*manna from heaven*, so to speak—are more likely to start businesses. Holtz-Eakin, et al. examined the effect of receiving an inheritance on operating a small business.¹³ They found that people who received inheritances are more likely to continue their small businesses and have larger businesses. They say, “[f]or example, a \$150,000 inheritance increases the probability that an individual will continue as a sole proprietor by 1.3 percentage points, and conditional on surviving, the receipts of the enterprise increase by almost 20 percent.”¹⁴ Blanchflower and Oswald found that people in the United Kingdom who received inheritances were more likely to start a small business. According to these authors, “[t]hose who were given or inherited £5,000 for example, were approximately twice as likely ... to set up in business.”¹⁵

This empirical evidence of liquidity constraints is buttressed by surveys that indicate that obtaining financing is one of the major obstacles in establishing a small business.¹⁶ According to the 1997 National Small Business United (NSBU)/Arthur Andersen Survey of

¹³ Holtz-Eakin, et al. *supra* note 2.

¹⁴ *Id.*

¹⁵ Blanchflower and Oswald, *supra* note 2.

¹⁶ In recognition of the difficulty that entrepreneurs face in obtaining financing, several programs have developed to provide loans to poor or unemployed individuals. In the United States, the Small Business Administration (SBA) provides loan guarantees through banks, loans through the Certified Development Company as well as venture capital through the Small Business Investment Company. Micro-finance programs also provide community based business loans across the U.S. The World Bank through its Consultative Group to Assist the Poorest (CGAP) sponsors micro-finance programs around the World.

Small and Mid-Sized Businesses, 24 percent of small business owners surveyed reported that they were not able to obtain adequate financing in 1996-7. In addition, evidence from the 1995 Survey of Consumer Finances (SCF) suggests that one third of all self-employed respondents who applied for loans in the last five years were either denied credit, or given less credit than they wanted.¹⁷

III. THE USE OF CREDIT CARDS BY SMALL BUSINESSES

After describing personal and business credit cards in more detail, this section examines the relationship between whether businesses have and use these cards and the characteristics of the businesses and their owners.

A. Overview of Credit Cards

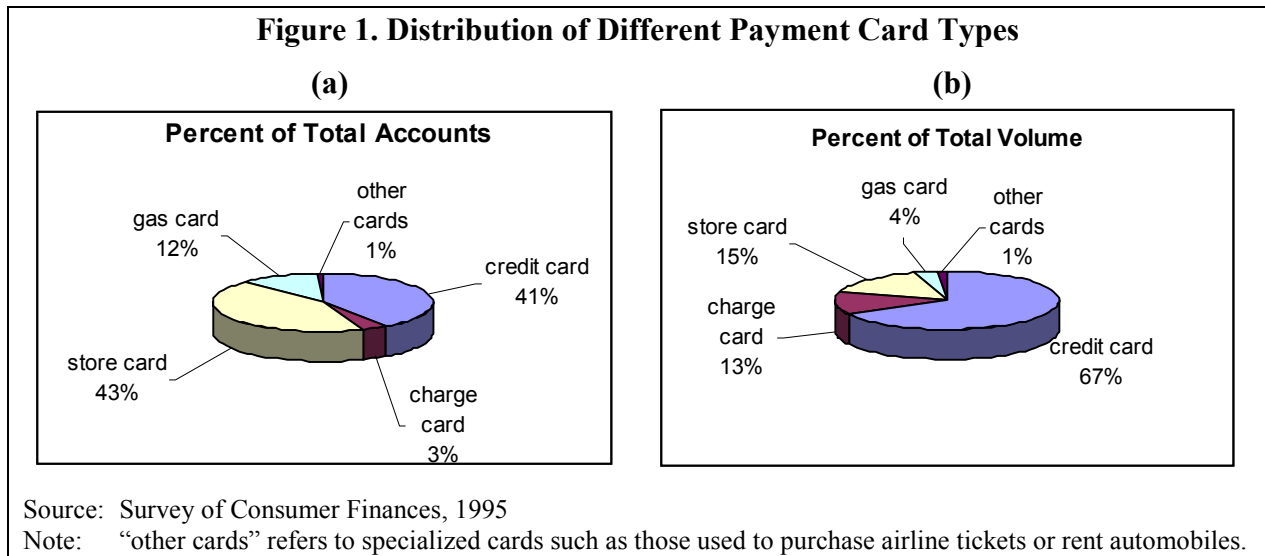
Credit cards can be used at many individual merchants for payment and financing. They are available from two associations of banks and two proprietary companies. The bank associations are MasterCard and Visa. Member banks of these associations issue cards under those brand names.¹⁸ Novus Services is a proprietary company that issues the Discover, Private Issue, and Bravo credit cards. American Express is a proprietary company that issues the Optima credit card.

Credit cards are only one species in the greater genus of cards known as payment cards. In addition to credit cards, there are also debit cards, which deduct the cost of purchases directly from a cardholder's checking account, charge cards such as American Express and Diners Club, store cards such as those offered by nationwide department stores, gas cards such as those offered by Mobil, and other credit cards which can be used to rent cars or purchase airline tickets. Figure 1(a) shows the relative number of each type of card. Figure 1(b) shows the relative magnitude of payments charged on each type of card. Credit cards account for approximately 41 percent of the total payment card accounts used by consumers and nearly 70

¹⁷ Board of Governors of the Federal Reserve System, *Survey of Consumer Finances*, 1995.

¹⁸ The term "bank card" refers to credit cards issued by MasterCard and Visa.

percent of the dollars charged on cards.¹⁹ As noted above, when we refer to credit cards, we do not include store cards, gas cards, charge cards or other cards.



Credit cards provide consumers with a significant competitive alternative to cash, checks, and money orders as well as to loans from depository institutions and finance companies. Credit cards are useful for many types of transactions. Consumers use them to pay for dinners at restaurants, to guarantee hotel rooms, rent cars and to finance home durable goods from refrigerators to computers. Small-business owners use credit cards to finance capital investments. And more and more, credit cards are becoming an indispensable means of making payment transactions in the burgeoning world of cyberspace.

On the credit side, credit cards provide consumers with an open line of credit that requires no collateral,²⁰ no down payment and gets virtually instant authorization. Within some modest limitations, card credit can be paid back as quickly or as slowly as the consumer chooses. For making payments, credit cards are convenient because they free consumers from

¹⁹ In 1995, the Survey of Consumer Finances started including questions regarding a specific type of bank card known as a debit card. Because debit card information is limited, our discussion is restricted to credit, charge, gas, store and "other" cards.

²⁰ This is not true for credit cards known as secured cards. Secured cards allow credit to be extended against a consumer's deposit held at her lending institution.

carrying lots of cash, or a checkbook together with various forms of identification. Credit cards come fully-insured,²¹ and therefore reduce consumers' risk of loss due to theft or accidents.

More than 65 percent of all households have at least one credit card.²² In 1997, there were almost 370 million Visa and MasterCard accounts in existence.²³ Today in total, there are over 450 million credit cards in the hands of U.S. consumers.²⁴ In 1997, consumers used credit cards to purchase more than 500 billion dollars worth of goods and services.²⁵

Although most people who are not impoverished have at least one, credit cards have not been around for long. In fact, it has only been about three decades since the introduction of MasterCard and Visa (both started under different names in 1966). At that time, consumers relied principally on cash and checks to make payments. And while consumers were often able to obtain expensive lines of credit from department stores and other merchants, proprietors of small startup businesses had no such option. Discover entered in 1986, followed by the other Novus products, and American Express Optima in 1987. Figure 2 shows that between 1970 and 1995, the number of households owning a general purpose credit card quadrupled from a mere 16 percent to over 65 percent of the population. In 1970, households with credit cards were usually members of the economic elite. The median household income of households with at least one credit card was 47 percent higher than the median income of households overall. In 1995, households that did not have credit cards were on the economic fringes of society. The median household income of households with no cards was 50 percent lower than the median household income of households overall. Approximately 70 percent of households without cards in 1995 had incomes under \$23,000, and more than 40 percent fell below the poverty line.²⁶

²¹ If a credit card is lost or stolen, its owner is generally liable for no more than \$50 worth of losses.

²² Note that if we exclude households below the poverty line (as reported in the *Federal Register* by the Department of Health and Human Services (HHS), more than three quarters of all households own at least one credit card.

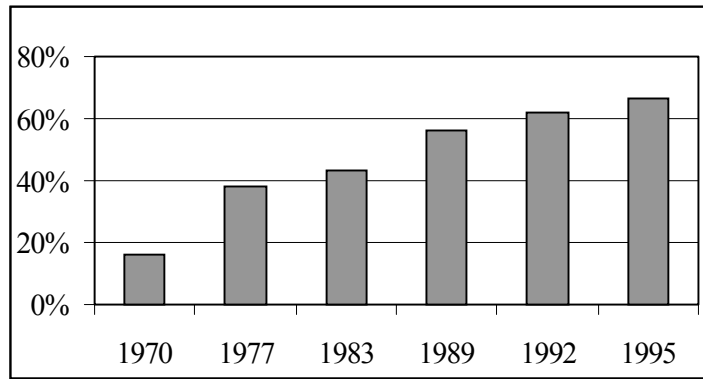
²³ *The Nilson Report*, March 1998, Number 664.

²⁴ *The Nilson Report*, March 1998, Number 664.

²⁵ *Id.*

²⁶ For further details, see Evans, D. and Leder, M., "The Growth and Diffusion of Credit Cards in Society," NERA Working Paper, August 1998.

Figure 2. Percent of Households with Credit Cards

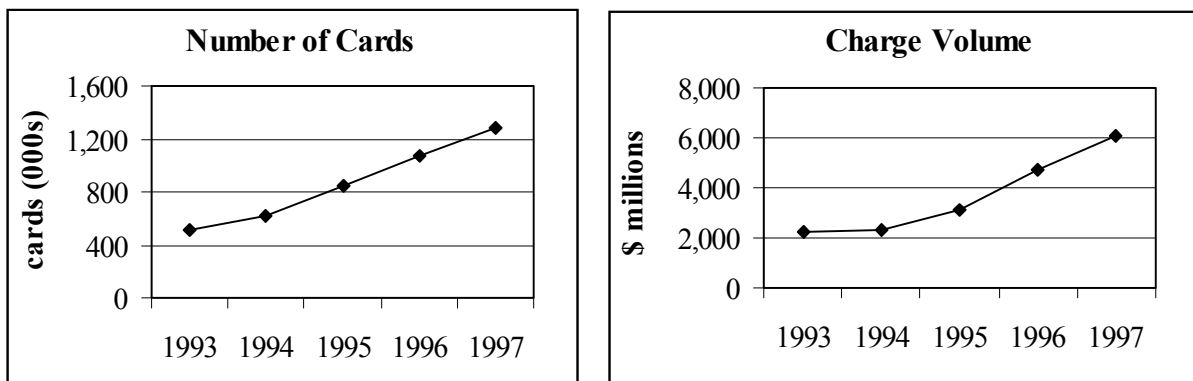


Source: Survey of Consumer Finances

MasterCard and Visa have offered commercial cards to businesses and corporations since the 1980s. The original commercial cards were focused mainly towards providing firms with convenient travel and entertainment services as well as auto leasing and insurance conveniences. Although some of the early card products offered credit lines attached to them, it was not until the 1990s that the card organizations began to actively pursue small businesses and to offer them credit and financing services.

Since 1993, Visa has offered three different commercial card products—the Visa Business, Corporate and Purchasing cards. The Visa Business card is geared towards small companies with fewer than 100 employees and sales of up to \$10 million per year. Figure 3 demonstrates the growth of these cards since 1993. Between 1993 and 1997, the number of Visa Business cards alone has grown from approximately 500,000 to over 1.2 million. During the same time, charges to these cards have increased from \$2.2 billion to just over \$6 billion.

Figure 3. Growth of Visa Business Cards



Source: Visa USA, Inc.

Business cards are a type of *commercial* card geared towards small and medium sized firms, those that spend less than \$1 million per year. A business card has many benefits over personal credit cards and other methods of reimbursing business-related expenses. Traditionally an employee would pay for business-related expenses either with cash or her own credit card, and her company would reimburse her. A business card however, allows the employee to charge directly to the company's account, thus eliminating the need for the employee to involve her personal finances in the operation of the business.

Business cards provide certain services that allow the company to monitor and control business expenses. For instance, different credit limits and purchase restrictions can be set on individual cards to minimize exposure. There is generally both a central as well as individual billing option, and periodic (monthly, quarterly or yearly) management reports can provide various forms of data or expense analysis. These services help to facilitate the tracking of business-related expenses.

Business cards have the additional feature of a grace period that may help a business by delaying payment obligations, thus giving the business more time to collect on their receivables. Firms may take advantage of this interest-free period to coordinate their cashflow and increase the lag between receiving supplies and making payments. Business cards may therefore provide a substitute for the use of trade credit, which can strain relationships with suppliers. The use of business credit cards also means that businesses need less cash on hand to deal with everyday operating expenses and may dedicate those funds to higher yielding projects.

B. Evidence of Credit Card Use by The Self-Employed

The Surveys of Consumer Finances (SCFs) provide information on the use of credit cards by households and whether or not the household was headed by a self-employed individual. This section uses the SCF to document the increase in the use of credit cards by the self-employed from 1970 to 1995. The SCF does not provide any information on whether the card was actually used for business purposes. However, the NSSBF reports that 41 percent of

small businesses used their owners' personal credit cards to finance the business.²⁷ Therefore, the availability of credit cards and credit lines to small business owners is important.

We begin by documenting the use of credit cards by the self-employed over time. In 1970, 26 percent of all households headed by a self-employed worker had at least one credit card.²⁸ By 1995, approximately 7.7 million self-employed households had a credit card. These households accounted for more than three quarters of all self-employed households in the country.

By 1995, households headed by the self-employed reported having \$134 billion of credit available on their cards. They reported having borrowed \$19 billion against those credit lines.²⁹ While data on available credit are not available for 1970, it is clear that credit card borrowing has increased dramatically over time. The average credit card loans outstanding for households headed by a self-employed worker was \$97 in 1970 and approximately \$2465 in 1995—a more than 25-fold increase.³⁰

Figure 4 compares the rates of credit card ownership for wage workers and the self-employed. In 1970, over one fourth of all self-employed households owned credit cards. Only one fifth of wage workers at that time had a credit card. Growth of credit cards for both self-employed households and employees has continued up until today. In 1995, 76 percent of all self-employed households owned credit cards compared to 73 percent of all households headed by wage workers.

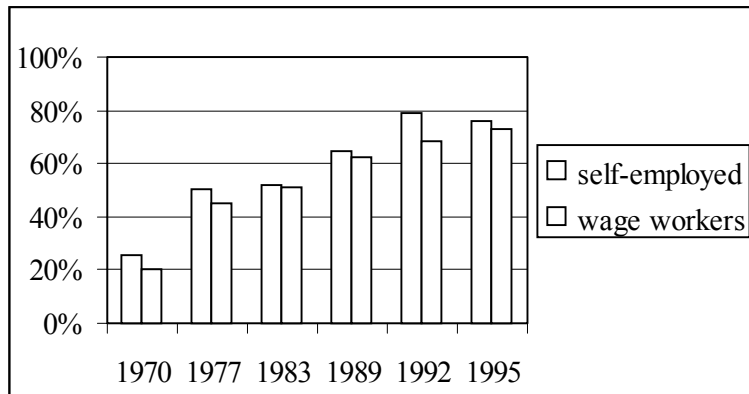
²⁷ Details are reported below.

²⁸ Because of the manner in which the Federal Reserve Board constructed the 1970 sample, it is not possible to project the total number of individuals in the population that corresponds to this percentage.

²⁹ The SCF understates credit card loans considerably. Depending upon the year, MasterCard and Visa members report between two and three times the credit card balances reported in the SCF. Therefore, the amount of loans outstanding to households headed by the self-employed is probably much larger than indicated in the text.

³⁰ All dollar values are expressed in terms of 1995 dollars.

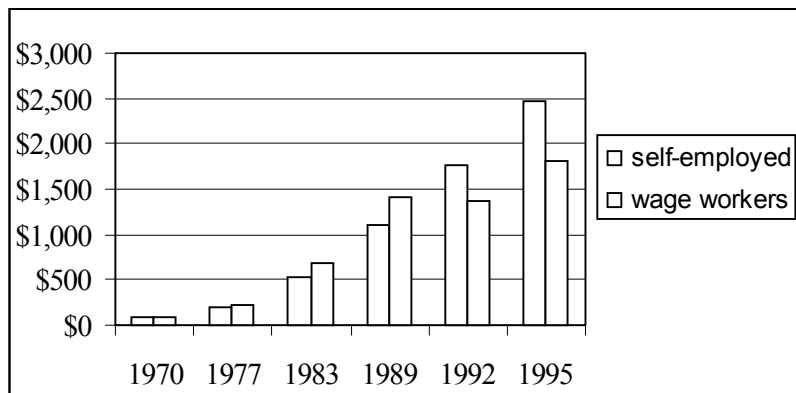
Figure 4. Credit Card Ownership of Employees and the Self Employed



Source: Surveys of Consumer Finances

Up until 1992, the balances of self-employed and non-self-employed households grew virtually in lockstep as shown in Figure 5. Every year up through 1989, non-self-employed households had on average, slightly more credit card debt than self-employed households. In 1992, this changed dramatically. In 1992, the balances of self-employed households were 25 percent greater than employees' balances. By 1995 this gap grew even further. This suggests that over time self-employed individuals have increasingly availed themselves of the credit available on their credit cards.

Figure 5. Growth of Credit Card Balances, 1970-1995

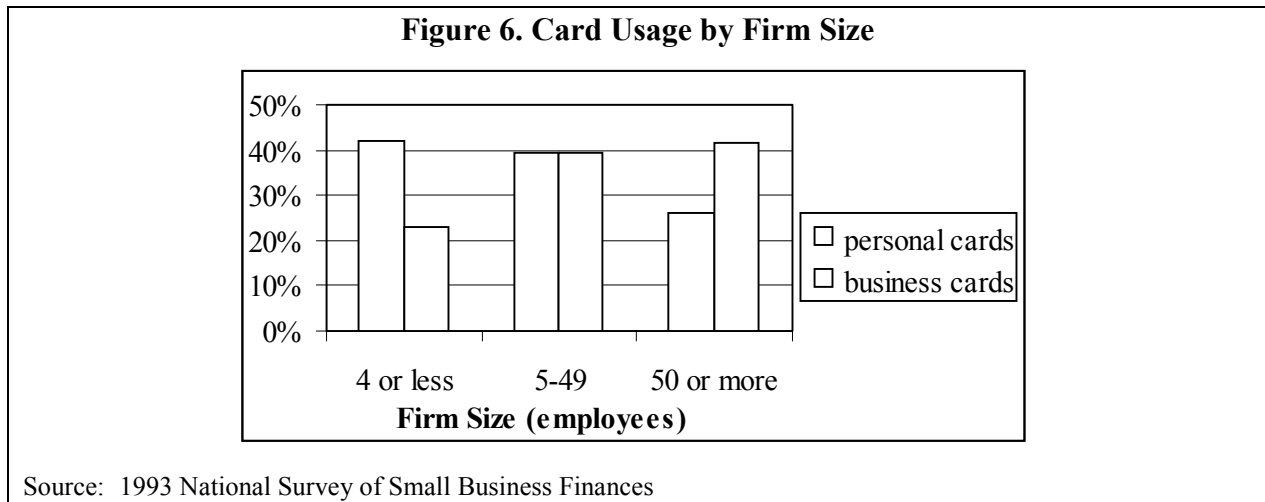


Source: Surveys of Consumer Finances

C. Who Uses Credit Cards for Financing Businesses?

Table 1 summarizes the incidence of personal versus business credit card usage by the characteristics of the firm and its owner. In the sample, 40.7 percent of firms' owners used their personal credit cards to help finance business operations. A smaller, but still large, 28.9 percent used business credit cards. And 15.5 percent used both types of cards. Overall, 54 percent used business credit cards. And 15.5 percent used both types of cards. Overall, 54 percent of America's small firms used some kind of credit card in 1993 to pay for business expenses.³¹

Table 1 further shows that credit card use is spread across many types of small firms. Entrepreneurs who export their product (51.9 percent use credit cards) or who face serious or somewhat serious credit market problems (52.5 percent and 47.3 percent, respectively) are most likely to use personal credit cards for financing. Not surprisingly, firm size is also a significant determinant of whether the owner uses his or her personal card to finance business expenses. Figure 6 below shows personal and business card use in relation to firm size.



³¹ The NSSBF results are consistent with another survey. The National Small Business United (NSBU) /Arthur Andersen Survey of Small and Mid-Sized Businesses found that 34 percent of businesses surveyed counted credit cards as a source for business financing in 1997. In 1993, the NSBU reported that the figure was 17 percent. Over the same period commercial bank loans decreased in importance from 49 percent of companies with commercial loans in 1993 to only 38 percent in 1997. Credit cards and commercial loans were the top two sources for small business finance according to this survey.

Small US companies rely heavily on personal cards, while small-to-medium companies charge mainly to business credit cards. Furthermore, business credit cards allow large firms to manage expenses by issuing many cards, something that is unnecessary for smaller “mom and pops.” Further evidence of the importance to young firms of personal credit cards can be found in the “firm age” section of Table 1. Young firms (under 5 years) are less likely to use a business credit card while very old firms (over 20 years) are less likely to use personal credit cards. The incidence of both business and personal credit cards appears to be positively correlated with the principal owner’s level of education. Business credit cards are especially important in firms with at least five employees where the owner has at least some college education. Personal credit cards are particularly prevalent in firms where there are less than 5 workers, and where the owner has at least some college education.

D. Probit Models of Business Related Credit Card Use

In this section we estimate probit models for the use of personal and business credit card for business expenses as a function of characteristics of the firm and the owner. We use data from the 1993 NSSBF. There are about 4600 firms in our sample. Tables 2 and 3 present results from various specifications for the probit model of business-related personal and business credit card use, respectively. In modeling personal and business credit card use for business expenses, we start with a simple specification that includes owner’s share of the firm, owner’s age, education, and race as control variables. Then we steadily add in more variables as controls.

Before discussing the results, however, we need to discuss various identification difficulties. The most basic difficulty is that we cannot identify the firms that do not have any credit cards available to them. The NSSBF asked whether or not the firms use a personal or a business credit card, but did not ask whether or not they have a personal or business credit card available to them for business-related use. Hence, we cannot distinguish from firms that have a credit card and do not use it from firms that do not have a credit card and therefore cannot use it. This problem, coupled with the possibility that some of the control variables are likely to be endogenous, makes difficult the identification and interpretation of the correlation between the use of credit card and various characteristics of the owners and the firms. For example, the variables that we use to proxy creditworthiness of the owner or the firm may be correlated more

with the probability of obtaining a credit card than with the probability of using it. Less creditworthy owners or businesses may rely more on credit cards because they cannot obtain business loans. But, at the same time, these firms and owners are less likely to obtain a credit card. Hence some of the results reported in Tables 2 and 3 do not always have an unambiguous interpretation.

Overall, Table 2 shows that businesses where the owner's share in the firm is higher are more likely to use a personal credit card for business-related expenses. Owner's age and education also seem to be significantly correlated with the probability of using a personal credit card for business-related expenses. Younger entrepreneurs and more educated entrepreneurs are more likely to charge business-related expenses on their personal credit cards. Confirming the cross-tabulations shown in Table 1, results shown in Table 2 indicate that larger and older firms are less likely to use a personal credit card. These general findings are robust to the various specifications.

We include four proxy variables for the creditworthiness of—and to some extent the liquidity constraint facing—the owners and firms in Column 4 of Table 2. Of these four variables, only one, which measures the creditworthiness of the firms, shows a statistically significant correlation with the likelihood of using personal credit cards for their businesses—firms that were delinquent on repayments in the last three years are more likely to use a personal credit card. The other three proxy variables, which are related more directly to the creditworthiness of the owners rather than that of the firms, are not statistically significant. This result is consistent with the interpretation that less creditworthy firms tend to rely more on personal credit cards because they are less likely to qualify for business loans, and it is consistent with the interpretation that credit cards relax liquidity constraints.

We then add, in column (5), two variables that more directly measure credit constraints facing the firms. Results show that firms that were dissuaded from applying for credit for fear of being turned down and those that were denied credit in the last three years are more likely to use a personal credit card for business expenses. This result is also consistent with the view that credit cards relax liquidity constraints.

A similar probit equation for business credit cards is set out in Table 3. In Column 1 owner's share enters negatively and statistically significant; however, once we control for firm type the sign reverses, confirming that firms with a high owner's share are more likely to use

credit cards in general. Owner's age and educational level are positively correlated with business credit card use as they were for business related personal credit card use. However, contrary to the results shown in Table 2, older firms and larger firms are more likely to use a business credit card.

The organization type of the firm is now strongly correlated with business card use. Use is lower for sole proprietors than for corporations (C or S corporations) or partnerships. These results may stem from the differences in various characteristics between personal and business credit cards in credit requirements and intended users among other things. Business cards are probably marketed more aggressively to medium and larger firms. A single proprietor probably has little use for some of the other conveniences of business cards—like multiple card issuing and oversight. Small mom-and-pop stores are probably satisfied with using their own personal cards for business expenses—and have little or no need for a business credit card—since there is less of a distinction between firm and owner.

Estimated coefficients on the proxy variables for creditworthiness and liquidity constraints in Table 3 are in general of the same sign as those in Table 2 but are larger in magnitude and more statistically significant. Results indicate that less creditworthy firms rely more on business credit cards than do more creditworthy firms and that firms with less creditworthy owners rely less on business credit card than do firms with more creditworthy owners. The latter result regarding the creditworthiness of the owners is difficult to interpret. It may be that these firms are less likely to have a business credit card rather than that they are less likely to use it. This result is also consistent with the notion that creditworthiness of owners has much to do with the likelihood of obtaining a business credit card for small businesses and that it is more difficult to obtain a business credit card than to obtain a personal credit card. Hence, the differences between Table 2 and Table 3 in the magnitude and the statistical significance of the estimated coefficients on the proxy variables for creditworthiness and liquidity constraint seem to reflect the relative importance of owner's personal credit-related characteristics and those of the firms.

Despite some difficulties in interpreting estimated coefficients as discussed above, overall, results shown in Tables 2 and 3 indicate that firms' creditworthiness and credit constraints are significantly correlated with the probability of using credit cards for business-related expenses. This evidence is consistent with the interpretation that credit constrained

firms use credit cards to relax this constraint. We provide more evidence supporting this view in the next section.

E. Evidence of the Use of Credit Cards to Relax Entrepreneurial Liquidity Constraints

As we have shown, a large number of businesses make use of personal and business credit cards regularly. On the one hand the credit card allows for convenient payment and management of business expenses, but on the other hand it allows for easy financing when the firm is credit constrained. While the previous section provided striking evidence on the use of credit cards to pay for business expenses, it is important to know which firms actually carried credit card debt beyond an interest free grace period. The NSBU reports that 24 percent of companies that use credit cards usually carry a balance, while 60 percent of them report that they always pay their monthly balance in full.³² We explore fully the relationship between being credit constrained and financing business expenses through credit card debt in this section. Table 4, Column 1 presents a probit model of the determinants of financing business activities on credit cards. The dependent variable here is equal to one if the company reported carrying a positive balance on its credit cards.³³ The survey does not distinguish business card balances from business-related personal card balances. Notice that this variable is a measure of the balances that are revolved or carried over from month to month.

We include two dummy variables that measure being credit constrained, the first variable indicates whether the firm had been denied credit in the last three years while the other variable indicates whether the firm needed credit, but did not apply fearing denial. Other independent variables are as they appeared in Tables 2 and 3.

Table 4, Column 1 shows striking evidence that being credit constrained has a large and significant positive effect on the probability of carrying business-related expenses on credit cards. Firms that were denied credit in the last three years were 5 percent more likely to carry

³² See Highlights of the 1997 NSBU/Arthur Andersen Survey of Small and Mid-Sized Businesses on-line document, <http://www.nsbu.org/sur3.htm> last visited 8/20/98.

³³ The question reads “After the last payments were made on these accounts, what was the balance of business charges remaining at the end of a typical month?”

business related credit card balances, while firms who were “dissuaded” from applying for credit were 19.3 percent more likely to carry balances.

The effect of other variables in Column 1 are interesting. First we find that as education level increases the probability of carrying a balance decreases, the opposite of the pattern of usage reported in Table 2. Sole proprietors and partnerships are respectively 12 percent and 11 percent more likely to carry positive business related balances than a corporation is. We find that, after controlling for education, firm size, industry, credit risk and constraint, there is a race effect: firms headed by whites are 9 percent less likely to carry business related credit card balances than nonwhite firms are. This is important since it is argued that minorities have less access to funds than do whites, therefore credit cards would be a logical alternative.³⁴ Other variables either have very small effects or are statistically insignificant.

Next we go further by considering the actual size of the business related credit card balances. Table 4, Column 2 presents a Tobit model relating balances to characteristics of the company and its owner and the dummies for credit constraint. Note that the base for these regressions are those who reported using a business or personal credit card for business expenses. The results are striking. Companies denied credit in the past three years carried an average of about \$2,300 more business related credit card debt, while those who felt “dissuaded” from applying for credit carried \$6,400 more. These results show that credit cards provide an important source of credit for some entrepreneurs and may significantly relax liquidity constraints. It should be noted however that the causality may work in the opposite direction. It could be that firms are denied credit precisely because they are carrying high balances, although the mechanism that leads to a “rational” firm holding high balances undoubtedly includes an inability to secure traditional business financing in the past.

Other findings from Column 2 are similar to Column 1. For instance, sole proprietors, partnerships, and S corporations carry respectively \$3,700, \$3,200 and \$2,000 more credit card debt than the average credit card-using corporation. Firms whose owner holds an advanced

³⁴ The recent evidence suggesting that racial discrimination in lending practices still exist is in dispute. See, for example, Munnell, Alicia H., et al, “Mortgage Lending in Boston: Interpreting HMDA Data,” *American Economic Review*, March 1996. Also see U.S. Department of Housing and Urban Development, *Cityscape: A Journal of Policy Development and Research*, Vol. 2, No. 1.

degree, while they may use credit cards more, actually carry much lower balances than firms whose owners have less education. And finally, white-owned firms carry much lower business-related credit card balances than nonwhite-owned firms do.

IV. EXPLORING THE RELATIONSHIP BETWEEN EMPLOYMENT AND CREDIT

This section examines the relationship between firm employment growth and access to credit card capital. It would be possible to start simply by examining the reduced-form correlation between a firm's performance and its ability to obtain credit. However, it is more helpful to begin by thinking about simultaneity between these variables. Two mechanisms are likely to be discernible in the data. A firm that can obtain credit more easily should be able to produce better economic performance (however measured), while one performing well should be less constrained in its borrowing. Thus, causality may run in both directions and a simple correlation is not informative. Delineating the two relationships is a standard econometric identification problem.

Consider a static model. A competitive firm chooses its optimal levels of inputs by solving the following kind of problem: set employment, n , and capital, k , so as to

$$\text{Maximize } \pi = pf(n) - wn - rk \quad \text{Profit function} \quad (1)$$

where p is an exogenous selling price of output, $f(n)$ is a concave and increasing production function defined on employment, w is the wage paid to workers, and r is the interest rate or rental rate of capital. Let the solution to this maximization be the employment or labor-demand function $n = n(p, w, r)$, which determines the amount of employment as a function of relevant output and input prices.

If the firm is borrowing in a credit market, it is likely that the effective interest rate, denoted r^* , will vary with the credit history of the firm and the amount borrowed. Let A be some measure of the firm's ease of access to credit. Let k be thought of as the amount borrowed. Write the equation for the effective interest rate, then, as

$$r^* = r^*(k, A), \quad \text{Effective interest-rate} \quad (2)$$

which might be thought of as increasing in capital, k , and decreasing in access, A . Those entrepreneurs who borrow more may have to pay a greater interest rate—perhaps because of

the risk engendered by their company's rapid expansion. Entrepreneurs with few borrowing opportunities (that is, low A) may be forced to accept relatively unattractive interest rates from those sources that will lend.

Access to credit will depend on the firm's, and perhaps especially in a small firm the owner's, characteristics. Previous credit history will, in practice, be one influence. Let B be a measure of the owner's borrowing or repayment history (such as whether the owner has been bankrupt in the past). The size and performance of the firm, as proxied by employment, may itself help to determine its credit access. Combining these, write the firm's ability to get credit as

$$A = A(n, B). \quad \text{Access to credit} \quad (3)$$

Equations (1) and (2) imply:

$$n = n(p, w, r^*(A)) \quad \text{Employment equation} \quad (4)$$

Therefore equations (3) and (4) give a simple two-equation system in which, to summarise, n is employment, p is the selling price of output, w is the wage, r^* is the effective interest rate, A is some measure of the firm's ability to borrow, and B is a measure of the creditworthiness of the firm or its owner. This system can be estimated empirically. It is not possible to identify the access-to-credit equation because we do not explicitly observe ease of access (A). We can obtain unbiased estimates of the employment equation using two-stage-least-square techniques since B appears only in the access-to-credit-equation.

While this is an elementary framework, the same principles will apply regardless of how complicated the model is made. For example, with lags and costs of adjustment, the employment function will generally be derived as a difference- or differential-equation solution to a dynamic optimization problem by the firm. Common parameterizations generate a second-order autoregressive equation in employment.

An econometric application naturally takes the structure, for period t ,

$$n_t = \beta_0 + \beta_1 n_{t-1} + \beta_2 n_{t-2} + \beta_3 p_t + \beta_4 w_t + \beta_5 A_t + \text{error term} \quad (6)$$

$$A_t = \beta_6 + \beta_7 n_t + \beta_8 B_t + \text{error term}, \quad (7)$$

where t 's denote time subscripts, and the key identifying role is played by the creditworthiness

variable B. In practice, it is likely to be difficult to obtain reliable firm-level data on selling prices and wage rates. Nevertheless, with local competitive markets there will be strong industry and regional components to these, so that industry and region dummies should capture most of the variation in w and p . Variants on equations (6) and (7) are estimated in the paper.

A. Employment Growth and Credit: Simple Estimates

This section studies the size of firms through time, and documents an apparent credit card growth effect. Employment is used as the indicator of size, so that a growth rate is measured here as the percentage change in the number of employees. Two kinds of employment data are available for the firms surveyed. First, firms were asked to record their current (in 1993) numbers of full time employees, and to state the average number of paid full time employees in 1990. This provides a three-year change. Second, firms were asked “During 1993, how many employees were hired, including both full- and part-time?” and also “During 1993, how many paid employees left the firm, including both full- and part-time employees?” The difference in the answers gives the one-year change in employment, so, as the 1993 employment level is known, it is possible to calculate back to the implied 1992 level of employment. (We estimate equations for the logarithm of employment using as regressors the logs of lagged employment levels. In some of the regressions and tables we drop firms with zero employment in 1990.)

The lower section of Table 5 reveals the characteristics of the firms that prospered in the early 1990s. It is divided into two columns. The first is for the one-year employment change (from 1992 to 1993) within NSSBF companies; the second is for the three-year change (from 1990 to 1993). These figures are all in percentages. In the first column of Table 5, the data show that mean employment growth for the whole sample of firms between 1992 and 1993 was 7.5 percent. Behind this number, however, lies a striking difference between firms with and without business credit cards. Firms that used business credit cards grew at 10.5 percent while firms that used no credit cards grew at only 5.8 percent. Businesses that just used personal credit cards grew at 7.0 percent. Hence firms with business credit cards expand nearly twice as fast as those without credit cards. These correlations do not establish a causal relationship, but are not inconsistent with the idea that the ability to borrow using a company credit card is good for growth.

Other patterns are found in the first column of Table 5 that reports one-year growth rates. Employment growth tends to be greater in firms that are minority-owned, young, owned by females, S corporations, and small. “Credit market problems” are not correlated in a monotonic way with employment growth, although firms reporting serious credit problems have markedly low rates of growth.

Broadly similar results emerge from the second column of Table 5, where the 1990-1993 employment change has a mean of 13.39 percent annualized across the whole sample (hence a figure here of 13.39 percent means approximately a 4 percent annual rate). Once again, a strong correlation is found with use of a business credit card, and to some degree also with use of a personal credit card. Firms' owners with no credit cards preside over the lowest employment increase, 10.11 percent.

B. Employment Growth and Credit: Regression Estimates

The previous section of the paper demonstrates that there is a powerful statistical link between firm growth and the use of business credit cards. Here we explore the likely causal mechanisms. Regression analysis allows a like-for-like comparison between companies with and without business and personal credit cards.

Table 6 illustrates the first of the formal regression results. Its dependent variable is the logarithm of employment in 1993. The equation holds constant either or both of employment in 1990 (the variable called $\ln E_{t-3}$) and 1992 (the variable called $\ln E_{t-1}$). Hence Table 6 gives information about which firms expanded from their previous employment levels. Two credit card dummy variables are included throughout the table: these are for use of a business credit card and use of a personal credit card. The other factors held constant in this regression are the age of the company, whether it exports, is in a metropolitan area, is a partnership, an S corporation, or a C corporation. In addition, 60 industry dummies are included as independent variables, as are 8 region dummies, and 5 race-of-owner dummies.

Sets of “future problem” dummy variables are included in the specification in the final column, (7), of Table 6. These are based on the answers given by the firms to the question “What do you think will be the most important issue affecting your firm over the next 12

months?” (question D14R). Each firm was offered a long checklist of potential answers.³⁵ Interestingly, the single largest quantitative effect from these problem dummies (the 28 coefficients are not reported here) turns out to be the coefficient on the dummy variable for “scarcity of government or SBA loans.” This is consistent with the relevance of capital constraints to small firms.

Column 1 of Table 6 reports an elementary specification where the only regressors are credit card variables and one lagged dependent variable. As the coefficient on the logarithm of lagged employment is close to unity, and the dependent variable is the log of employment, this equation can be viewed as a growth equation. The dummy variable for “having used a business credit card” enters with a coefficient of 0.0354, and is well-defined. Although no controls are included in the equation, it is worth noting the size of the implied effect. It translates to growth of three and a half percentage points a year. By contrast, the personal credit card dummy is smaller and negative, with a t-statistic not large enough to allow rejection of the null of zero. Table 6’s later columns steadily add extra explanatory variables. Column 2’s structure is similar to that of column 1, but now the t-3 employment level is also included. Column 3 of Table 6 includes a range of firm characteristics. It finds a strong negative effect from a firm-age variable, and positive ones from exporting and being either a subchapter S corporation or C corporation. In this equation, the coefficient on the business credit card has fallen slightly to 0.0277, but the t-statistic of 3.07 indicates the null of zero is still comfortably rejected. As column 3 has the log of employment in 1992 entering with a coefficient of 0.8 and the log of employment in 1990 with a coefficient of 0.2, it continues to be natural to view this highly auto-regressive specification as determining the growth rate of employment of firms.

Columns 4 to 7 of Table 6 increase still further the number of independent controls. Column 4 shows that including 60 industry dummy variables into the regression leaves the

³⁵ The choices for answers were: general government regulation, environmental rules, health care and insurance, insurance mandates, spending cuts, taxes and tax policy, workman's compensation and OSHA, other regulation issues such as family leave or ADA, general US business conditions, international economy and trade, state or region's economy, economy in general, inflation, unemployment, economic growth, growth policies, credit availability, high interest rates, scarcity of government or SBA loans, competition from other countries, competition from other firms, declining or troubled industry, costs of conducting business, crime or illegal immigration, legal issues and liability insurance costs, weather and acts of God, no issues or problems anticipated, profits or cash flow, other firm-specific problems.

large business credit card effect unaffected. Systematically extending the set of variables—columns 5 to 7—to the others listed towards the foot of Table 6 makes no substantive difference to the estimated coefficients on credit cards. Such robustness is unusual. It suggests that whatever is driving the pattern in the data is not connected to the composition of the sample.

The results in Table 6 show that even after controlling for other factors, use of business credit cards is strongly associated with employment expansion. To recapitulate, the variable “business credit card” means that the entrepreneur answered yes to the question: Did the firm use business credit cards to finance business expenses during 1993? The estimated coefficient on the variable ranges from 0.0261 to 0.0354, implying large positive effects. Interestingly, personal credit card use is associated with slightly less employment growth, although not in a way that is statistically significant at normal confidence levels. An obvious possibility is that there is reverse causation at the bottom of the business credit card variable. The paper turns to this later.

Tables 7 and 8 move to three-year changes. Here we have to face the issue that in 1990 (the first year) some of the companies had zero employment—in other words they were born between 1991 and 1993. They are true births. Out of the 401 unweighted observations in the data file that had zero employment at the time of interview in 1994, six were born in 1994, 16 in 1993, 168 in 1992 and 211 in 1991. Table 7, in column 1, is estimated by setting the 1990 employment zeroes equal to 0.001, so that logarithms can still be taken. Column 1 of Table 7 reveals that when a log-employment regression for 1993 is estimated (now with 4636 observations), the variable for the log of employment in 1990 enters with a coefficient of 0.1967 with a large t-statistic. Business credit card use enters with a well-determined coefficient of 0.2389, which confirms the general kind of result found in Table 6. Personal credit card use enters negatively and statistically significantly. Other variables are approximately as seen in the earlier table.

The later columns of Table 7, columns 2 to 5 inclusive, leave out the zeroes. In other words, they are estimated on a smaller sample, of 4235 firms, because those firms that report having had zero employment in 1990 are now omitted from the regressions. It can be seen in Table 7 that the variable for business credit card continues to be positive and well-defined. The

size of the coefficient appears to move around, but that is partly an illusion caused by the changing nature of the dependent variable. Another way of handling the zeroes is represented in the final columns of Table 7, namely in regressions 5 and 6. Here a dependent variable is used in which an averaging is done to create a suitable denominator. Once more the business card variable is robust to experimentation.

Table 8 provides further variants. This table sticks to a simple structure where the dependent variable is the logarithm of employment in 1993 and there is a single lagged dependent variable from three years before. Once again, “using a business credit card” is strongly and positively associated with greater employment in 1993, after conditioning on employment in 1990. The size of the coefficient on the business credit card variable varies in Table 8 from 0.4447 to 0.2327, where the smaller values emerge from holding constant a larger number of other factors. Personal credit card enters with coefficients between -0.3350 and -.02118. In Table 8, firm age is positively associated with more growth. Exporting and certain kinds of firm dummies are also correlated with increasing employment.

Taken together, these simple results might be viewed as somewhat supportive of the idea that credit cards play a role in aiding entrepreneurial activity in the US economy. Unfortunately, the estimates reported above are subject to some potential endogeneity problems that are difficult to address with the available data. First, firms that have growth plans may be more likely to secure and use credit lines from personal or business cards. Obviously, firms that are less likely to expand are less likely to be in need of credit. Second, more able entrepreneurs may be able to expand their businesses more quickly. Such entrepreneurs may also be more creditworthy individuals who are more likely to receive credit cards and larger lines of credit on those cards. In principle, there are econometric techniques that could sort out (a) the effects of providing credit card loans on employment growth from (b) the effect of employment growth on applying for credit card loans and (c) the joint effect of entrepreneurial ability on employment growth and being approved for credit card loans. In practice, we lack the data to estimate structural models that account for this endogeneity (e.g. we do not know who applied for personal and business cards and whether they were approved.) We also lack a set of instruments that affects credit card use but does not affect employment growth—thus, it is not possible to estimate a sensible reduced-form equation. Therefore, while our results are

certainly consistent with the view that the provision of personal and business credit cards have stimulated employment growth by relaxing liquidity constraints, it is not possible at this stage of our research to say anything more definitive.

V. CONCLUSIONS

Recent research on entrepreneurship has pointed to the empirical importance of borrowing constraints. Yet economists have paid little attention to the role played by different sources of credit in facilitating entrepreneurship. This paper documents some of the first evidence. It examines the links between credit card use and entrepreneurial activity.

New firms, we show, routinely use the owner's personal credit card as a source of financing. This phenomenon is most noticeable among small firms run by highly educated owners. Second, after the start-up phase of a firm's life, companies that use a business credit card grow more rapidly than those without a card.

The paper uses a sample of nearly five thousand firms drawn from the National Survey of Small Businesses. In more detail, it reaches the following conclusions:

1. More than half of small US firms use some kind of credit card to pay for business expenditures.
2. Millions of American entrepreneurs rely on personal credit cards to help finance the early years of their companies.
3. Credit constrained small businesses are more likely to carry credit card debt.
4. Firms that use business credit cards grow faster than those that do not. Our empirical results raise the possibility—we would not wish to put it more strongly—that credit cards play a role in shaping the performance of the real economy.
5. The estimated credit card growth effect is large. Although corroborative research would be valuable, our calculation is that, holding other factors constant, firms with access to business credit cards expand nearly twice as fast as those without cards.

The paper also makes a non-econometric contribution. Since potential entrepreneurs say in surveys that they are held back by lack of capital, and credit cards offer a type of instant finance, the finding that nearly half of the new firms in the United States rely on their owners'

personal credit cards seems of interest. This is direct evidence of the usefulness of plastic cards to entrepreneurs, especially when coupled with the fact that self-employed workers had \$132 billion of credit card loans available to them in 1995.

TABLES

Table 1. Incidence of Credit Cards (%)

	Personal	Business	Both
1) All	40.7	28.9	15.5
2) White owned	40.8	28.9	15.2
3) Minority owned	40.2	27.7	17.1
4) Not in business 1990	41.5	22.5	12.4
5) Firm age <5 yrs	42.1	22.9	12.8
6) Firm age >=5 & <20	41.6	29.9	15.5
7) Firm age >=20	36.3	29.2	16.5
8) 1993 employment <5	42.0	23.0	13.3
9) 1993 employment 5-49	39.4	39.4	20.0
10) 1993 employment ≥ 50	26.1	41.8	13.0
11) positive 3 yr. employment growth	42.7	30.2	16.1
12) negative 3 yr. employment growth	40.3	27.6	15.9
13) positive 1 yr. employment growth	42.0	37.3	18.3
14) negative 1 yr. employment growth	45.1	31.9	19.1
15) Exporter	51.9	45.0	25.2
16) Sole proprietor	42.5	22.9	13.8
17) Partnership	35.0	25.0	14.2
18) S corporation	45.3	34.8	19.6
19) Corporation	36.4	34.7	15.3
20) Manufacturing	38.8	32.0	16.9
21) Non-manufacturing	41.8	27.9	15.0
22) Serious credit market problems	52.5	30.2	20.7
23) Somewhat serious credit market problems	47.3	34.9	20.9
24) Not serious credit market problems	36.3	26.7	12.7
25) Top quartile profits/head	40.5	30.0	16.3
26) Bottom quartile profits/head	40.8	28.3	15.3
27) Principal owner <8 th grade education	28.2	24.8	11.5
28) Principal owner 9 th -11 th grade education	23.8	21.1	10.7
29) Principal owner high school graduate	33.5	23.5	12.9
30) Principal owner some college	42.6	28.1	15.6
31) Principal owner college graduate	42.9	32.6	18.1
32) Principal owner post-graduate	47.2	32.5	15.7
<u>1993 employment <5</u>			
33) Principal owner <= high school graduate	31.2	18.8	10.2
34) Principal owner >high school graduate	46.7	24.8	14.7
<u>1993 employment >=5</u>			
35) Principal owner <= high school graduate	34.4	34.1	18.3
36) Principal owner >high school graduate	39.6	41.3	19.8

Table 2. Probability of Using a Personal Credit Card

	(1)	(2)	dF/dx (3)	(4)	(5)
Owner's share	0.002 ^{***} (0.000)	0.001 ^{***} (0.000)	0.001 ^{***} (0.000)	0.001 ^{***} (0.000)	0.001 ^{***} (0.000)
Owner's age	-0.003 ^{***} (0.001)	-0.001 ^{**} (0.001)	-0.002 [*] (0.001)	-0.002 ^{**} (0.001)	-0.001 ^{**} (0.001)
9th-11 th grade	-0.025 (0.074)	-0.031 (0.073)	-0.027 (0.076)	-0.029 (0.075)	-0.036 (0.075)
High school graduate	0.031 (0.061)	0.032 (0.061)	0.023 (0.063)	0.020 (0.063)	0.018 (0.062)
Some college	0.116 [*] (0.062)	0.117 [*] (0.062)	0.097 (0.064)	0.091 (0.064)	0.087 (0.063)
College graduate	0.106 [*] (0.061)	0.108 [*] (0.061)	0.074 (0.064)	0.070 (0.063)	0.070 (0.063)
Post graduate	0.146 ^{**} (0.063)	0.147 ^{**} (0.063)	0.104 (0.066)	0.102 (0.066)	0.098 (0.066)
1990 Employment		-0.001 ^{***} (0.000)	-0.001 ^{***} (0.000)	-0.001 ^{***} (0.000)	-0.001 ^{***} (0.000)
Firm age		-0.002 ^{**} (0.001)	-0.001 [*] (0.001)	-0.001 ^{**} (0.001)	-0.001 ^{**} (0.001)
Export		0.095 ^{***} (0.024)	0.092 ^{***} (0.027)	0.086 ^{***} (0.027)	0.087 ^{***} (0.027)
Partnership		-0.013 (0.034)	-0.009 (0.035)	-0.014 (0.035)	-0.013 (0.035)
S corporation		0.017 (0.023)	0.028 (0.023)	0.025 (0.024)	0.022 (0.024)
Corporation		-0.024 (0.021)	-0.020 (0.022)	-0.026 (0.022)	-0.030 (0.022)
Owner delinquent last 3 years				0.004 (0.025)	-0.016 (0.025)
Firm delinquent last 3 years				0.083 ^{***} (0.021)	0.051 ^{**} (0.022)
Judgment against owner last 3 yrs.				-0.003 (0.034)	-0.019 (0.034)
Owner bankrupt last 7 years				-0.031 (0.042)	-0.063 (0.041)
Dissuaded from applying for credit					0.112 ^{***} (0.020)
Denied credit in last 3 years					0.042 [*] (0.024)
Industry dummies	No	No	Yes	Yes	Yes
Region dummies	No	No	Yes	Yes	Yes
Race dummies	Yes	Yes	Yes	Yes	Yes
N	4637	4637	4635	4635	4635
χ^2	105.86	150.98	312.82	340.93	353.50
Log likelihood	-2997.45	-2969.35	-2910.89	-2900.94	-2895.52

Notes: Models are probits. The value reported is the change in the probability for an infinitesimal change in each independent variable or a discrete change for each dummy variable. Huber-White standard errors are in parentheses.

Table 3. Probability of Using a Business Credit Card

	dF/dx				
	(1)	(2)	(3)	(4)	(5)
Owner's share	-0.001 ^{***}	0.001 ^{**}	0.001 ^{**}	0.001 ^{**}	0.001 ^{**}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Owner's age	-0.001 ^{**}	-0.003 ^{***}	-0.003 ^{***}	-0.003 ^{***}	-0.003 ^{***}
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
9th-11th grade	-0.031	-0.022	0.006	0.003	-0.001
	(0.070)	(0.070)	(0.075)	(0.075)	(0.074)
High school graduate	-0.018	-0.032	-0.026	-0.028	-0.029
	(0.057)	(0.056)	(0.057)	(0.058)	(0.057)
Some college	0.046	0.027	0.018	0.014	0.012
	(0.059)	(0.058)	(0.059)	(0.059)	(0.059)
College graduate	0.079	0.035	0.009	0.004	0.003
	(0.059)	(0.058)	(0.059)	(0.059)	(0.059)
Post graduate	0.097	0.059	0.002	-0.002	-0.005
	(0.061)	(0.060)	(0.060)	(0.060)	(0.060)
1990 Employment		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Firm age		0.001 ^{**}	0.002 ^{***}	0.002 ^{**}	0.002 ^{**}
		(0.001)	(0.001)	(0.001)	(0.001)
Export		0.122 ^{***}	0.102 ^{***}	0.103 ^{***}	0.103 ^{***}
		(0.023)	(0.027)	(0.027)	(0.027)
Partnership		0.065 [*]	0.078 ^{**}	0.072 ^{**}	0.072 ^{**}
		(0.036)	(0.037)	(0.037)	(0.037)
S corporation		0.139 ^{***}	0.161 ^{**}	0.156 ^{***}	0.153 ^{***}
		(0.023)	(0.024)	(0.024)	(0.024)
Corporation		0.159 ^{***}	0.167 ^{***}	0.162 ^{***}	0.160 ^{***}
		(0.021)	(0.022)	(0.022)	(0.021)
Owner delinquent last 3 years				-0.070 ^{***}	-0.072 ^{***}
				(0.024)	(0.023)
Firm delinquent last 3 years				0.052 ^{**}	0.045 ^{**}
				(0.021)	(0.021)
Judgement against owner last 3 yrs.				-0.083 ^{**}	-0.083 ^{***}
				(0.031)	(0.031)
Owner bankrupt last 7 years				-0.112 ^{***}	-0.112 ^{***}
				(0.037)	(0.037)
Dissuaded from applying for credit.					-0.015
					(0.019)
Denied credit last 3 years					0.074 ^{***}
					(0.025)
60 industry dummies	No	No	Yes	Yes	Yes
8 region dummies	No	No	Yes	Yes	Yes
5 race dummies	Yes	Yes	Yes	Yes	Yes
N	4635	4635	4626	4626	4626
χ^2	75.71	208.73	438.66	446.36	456.74
Log likelihood	-2870.45	-2806.54	-2715	-2701.33	-2695.53

Notes: Models are probits. The value reported is the change in the probability for an infinitesimal change in each independent variable or a discrete change for each dummy variable. Huber-White standard errors are in parentheses.

Table 4. The Impact of Liquidity Constraints on Business Charge Behavior

	Probit (dF/dx) Positive balances (1)	Tobit Business balances (2)
Denied credit last 3 years	0.050** (0.026)	2281.35** (972.48)
Dissuaded from applying for credit	0.193*** (0.023)	6443.40*** (798.66)
Owner's share	-0.000 (0.000)	-8.38 (17.29)
Owner's age	0.001 (0.001)	24.20 (37.62)
9th-11th grade	0.106 (0.114)	2745.58 (0.92)
High school graduate	0.012 (0.072)	-274.80 (3042.69)
Some college	0.001 (0.070)	15.48 (3005.26)
College graduate	0.014 (0.071)	816.24 (3004.44)
Post graduate	-0.023 (0.068)	-1125.15 (3040.08)
Employment	-0.002*** (0.000)	-57.90*** (20.22)
Employment squared	0.000*** (0.000)	0.166*** (0.055)
1992 Sales	0.000* (0.000)	-0.000* (0.001)
1992 Sales squared	0.000 (0.000)	0.000 (0.000)
Firm age	-0.000 (0.001)	-5.09 (33.93)
Export	0.024 (0.028)	436.77 (1140.76)
Sole Proprietor	0.121*** (0.028)	3711.17*** (1045.09)
Partnership	0.106*** (0.045)	3206.77** (1561.88)
S corporation	0.028 (0.023)	1986.39** (945.18)
White	-0.092*** (0.022)	-2668.03*** (824.44)
Female	0.025 (0.022)	-274.53 (870.81)
N	2498	2498
χ^2	284.91	225.71
Log likelihood	-1193.33	-6891.82

Notes: For the probit models, we report the change in the probability for an infinitesimal change in each independent variable; or a discrete change for each dummy variable. Huber-White standard errors are in parentheses. Regressions include 8 industry dummies.

Table 5. Business and Personal Credit Cards (weighted)

1).

a) % used business card	28.9
b) % used personal card	40.7
c) % used both	15.5
d) % used neither	45.9

$$\left(\frac{E_t - E_{t-1}}{E_{t-1}} \right)$$

$$\left(\frac{E_t - E_{t-3}}{E_{t-3}} \right)$$

2). Employment Change (%)

a) All	7.50	13.39
b) Used business card	10.53	18.30
c) Used personal card	7.04	15.66
d) No cards	5.82	10.11
e) White owned	7.18	12.36
f) Minority owned	10.01	21.56
g) Firm age <10 yrs	9.70	25.29
h) Firm age >=10 & <20	5.14	7.72
i) Firm age >=20	6.88	4.04
j) Exporter	6.66	23.90
k) 100% Female owned	9.09	12.04
l) Sole proprietor	7.14	8.47
m) Partnership	3.23	15.17
n) S corporation	12.41	20.05
o) Corporation	5.68	15.75
p) Serious credit market problems	4.00	14.22
q) Somewhat serious	12.43	16.68
r) Not serious	6.73	12.27
s) Base year size <10	9.00	14.84
t) Base year size 10-99	-0.34	5.77
u) Base year size >99	-1.22	10.81

Notes: 1992 Employment is FTE employees in 1993 minus the number of hires plus the number of terminations in past year. We drop 70 firms that show negative employment in 1992 due to the mixing of FTE and total number of employee flows.

Table 6. One Year Employment Growth Equations (dep var = LnE_t)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnE_{t-1}	0.979*** (0.003)	0.807*** (0.019)	0.802*** (0.019)	0.801*** (0.019)	0.800*** (0.019)	0.800*** (0.019)	0.800*** (0.020)
LnE_{t-3}		0.191*** (0.019)	0.191*** (0.019)	0.191*** (0.019)	0.191*** (0.019)	0.192*** (0.019)	0.193*** (0.020)
Business credit card	0.035*** (0.010)	0.031*** (0.010)	0.028*** (0.010)	0.026*** (0.010)	0.026*** (0.010)	0.027*** (0.010)	0.027*** (0.010)
Personal credit card	-0.0160* (0.010)	-0.0116 (0.010)	-0.016* (0.010)	-0.017* (0.009)	-0.016* (0.009)	-0.017* (0.010)	-0.016* (0.009)
Firm Age			-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Export			0.026** (0.012)	0.028* (0.014)	0.028** (0.014)	0.032** (0.014)	0.029** (0.014)
MSA			0.009 (0.009)	0.011 (0.009)	0.018* (0.010)	0.016* (0.010)	0.017* (0.010)
Partnership			0.003 (0.018)	0.001 (0.018)	0.004 (0.018)	0.004 (0.018)	0.002 (0.019)
S corporation			0.047*** (0.014)	0.046*** (0.015)	0.047*** (0.015)	0.046*** (0.015)	0.038*** (0.015)
Corporation			0.030 (0.012)	0.029* (0.013)	0.030* (0.013)	0.028* (0.013)	0.021 (0.013)
Industry dummies (60)	No	No	No	Yes	Yes	Yes	Yes
Region dummies (8)	No	No	No	No	Yes	Yes	Yes
Race of owner dummies (5)	No	No	No	No	No	Yes	Yes
Future problem dummies (28)	No	No	No	No	No	No	Yes
Constant	0.065	0.029	0.027	-0.014	-0.042	-0.040	-0.025
R^2	.969	.975	.976	.976	.976	.976	.977
N	4275	3910	3910	3910	3910	3910	3711
F	46768.13	48431.51	19829.41	3.03	2.75	50.78	36.69

Notes: Huber-White standard errors are in parentheses.

Table 7. Employment Growth Equations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\text{Ln}E_t$	$\text{Ln}E_t$	$\text{Ln}E_t - \text{Ln}E_{t-3}$	$(E_t - E_{t-3})/E_{t-3}$	$(E_t - E_{t-3})/((E_t + E_{t-3}))/2$ Missing None	$(E_t - E_{t-3})/((E_t + E_{t-3}))/2$ $\ln(0.001)$	$(E_t - E_{t-3})/((E_t + E_{t-3}))/3$
Zeros	$\text{Ln}(.001)$	Missing	Missing	Missing	Missing	-	-0.183***
$\text{Ln}E_{t-3}$	0.197*** (0.010)	0.957*** (0.006)	-0.043*** (0.006)	-0.116*** (0.025)	-0.037*** (0.005)	-	(0.002)
Business credit card	0.239*** (0.039)	0.068*** (0.017)	0.068*** (0.017)	0.182** (0.089)	0.058*** (0.015)	0.045*** (0.014)	0.081*** (0.015)
Personal credit card	-0.212*** (0.036)	-0.019 (0.016)	-0.019 (0.016)	-0.039 (0.047)	-0.017 (0.015)	-0.009 (0.013)	-0.051*** (0.015)
Firm Age	0.004*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.006*** (0.001)	-0.002*** (0.000)	-0.003*** (0.000)	-0.001** (0.001)
Export	0.465*** (0.067)	0.089*** (0.026)	0.089*** (0.026)	0.183*** (0.058)	0.077*** (0.024)	0.056*** (0.021)	0.133*** (0.024)
MSA	0.149*** (0.043)	0.023 (0.019)	0.023 (0.019)	0.101** (0.048)	0.018 (0.017)	0.010 (0.016)	0.043** (0.018)
Partnership	0.838*** (0.074)	0.107 (0.038)	0.107 (0.038)	0.555** (0.262)	0.083 (0.032)	0.045 (0.027)	0.208*** (0.030)
S corporation	1.249*** (0.049)	0.156 (0.023)	0.156 (0.023)	0.254 (0.051)	0.140 (0.021)	0.078 (0.017)	0.323*** (0.019)
Corporation	1.293*** (0.045)	0.133 (0.022)	0.133 (0.022)	0.275*** (0.049)	0.118 (0.020)	0.055*** (0.016)	0.308*** (0.017)
Birth Dummy						1.911	
Industry dummies (60)	Yes	Yes	Yes	Yes	Yes	(0.012)	Yes
Region dummies (8)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Race of owner dummies (5)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.974	-0.130	-0.130	-0.270	-0.114	-0.009	-0.439
R^2	0.534	0.918	0.061	0.084	0.059	0.652	0.569
N	4636	4235	4235	4235	4235	4636	4636
F	1690.81	10.27	10.27	43.92	97.28	4.31	

Notes: Huber-White standard errors are in parentheses.

Table 8. Employment Growth Equations (dep var = LnE_{it})

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnE _{t-3}	0.290*** (0.011)	0.2777*** (0.012)	0.217*** (0.010)	0.200*** (0.010)	0.201*** (0.010)	0.197*** (0.010)	0.198*** (0.010)
Business credit card	0.445*** (0.045)	0.378*** (0.044)	0.234*** (0.040)	0.248*** (0.039)	0.245*** (0.039)	0.239*** (0.039)	0.233*** (0.039)
Personal credit card	-0.313*** (0.043)	-0.335*** (0.042)	-0.261*** (0.037)	-0.220*** (0.036)	-0.214*** (0.036)	-0.212*** (0.036)	-0.222*** (0.037)
Firm Age		0.002 (0.001)	0.003** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Export		0.882*** (0.068)	0.611*** (0.063)	0.460*** (0.067)	0.465*** (0.067)	0.465*** (0.067)	0.468*** (0.068)
MSA		0.124** (0.049)	0.008 (0.044)	0.067 (0.042)	0.111*** (0.043)	0.149*** (0.043)	0.131*** (0.045)
Partnership			0.936*** (0.078)	0.861*** (0.075)	0.871*** (0.074)	0.838*** (0.074)	0.808*** (0.075)
S corporation			1.370*** (0.051)	1.285*** (0.049)	1.283*** (0.050)	1.249*** (0.049)	1.210*** (0.051)
Corporation			1.420*** (0.046)	1.319*** (0.045)	1.317*** (0.045)	1.293*** (0.045)	1.259*** (0.046)
Industry dummies (60)	No	No	No	Yes	Yes	Yes	Yes
Region dummies (8)	No	No	No	No	Yes	Yes	Yes
Race of owner dummies (5)	No	No	No	No	No	Yes	Yes
Future problem dummies (28)	No	No	No	No	No	No	Yes
Constant	1.680	1.535	0.778	-1.781	-1.972	-1.974	-1.458
R ²	0.311	0.342	0.472	0.525	0.528	0.534	0.548
N	4636	4636	4636	4636	4636	4636	4387
F	352.28	254.38	501.56	2137.99	1734.09	1690.81	

Notes: Huber-White standard errors are in parentheses.

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APPENDIX A: THE 1993 NATIONAL SURVEY OF SMALL BUSINESS FINANCES

The 1993 National Survey of Small Business Finances provides information about a nationally representative sample of small businesses in the United States. The survey was conducted during 1994-95 for the Board of Governors of the Federal Reserve System and the U.S. Small Business Administration. The target population is the population of all for-profit, non-financial, non-farm business enterprises that had fewer than 500 employees and were in operation as of year-end 1992. The sample was drawn from firms listed on the Dun's Market Identifier file as of November, 1993. The DMI list, containing nearly ten 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. The public use dataset contains 4,637 firms. These firms represent nearly five million small businesses.

The sample was a stratified random design with over sampling to ensure the ability to estimate separately the reporting domains by employment size groups, urban or rural location, and in census regions. The specific sampling strata were five employment-size groups (0-19, 20-49, 50-99, 100-499, unknown), nine Census regions (East North Central, East South Central, Middle Atlantic Mountain, New England, Pacific, South Atlantic, West North Central and West South Central), and urban or rural location. In addition, three minority partitions of firms likely to be owned by Asians, African-Americans, and Hispanics were extracted from the Dun's frames prior to sampling to create samples of minority-owned businesses. Each of the minority partitions was proportionately stratified by urban or rural location. Because the larger and minority-owned firms are small percentages of the population of small businesses but are of special interest to researchers, the survey over-sampled larger firms (20 to 499 employees), as well as Black-owned, Asian-owned, and Hispanic-owned firms to ensure sufficient numbers for analyses of these groups.

Businesses were contacted in advance of the survey to determine eligibility, verify addresses, and identify a contact person. Not all businesses were eligible (i.e., met the target-population definition). Some businesses could not be contacted, some failed at least one of the

eligibility criteria (e.g., not in business, for profit, etc.), and some had erroneous frame data. The eligibility rate of sampled businesses averaged about 60 percent.

The average duration of the telephone interviews was fifty minutes. The interviews were conducted by Price Waterhouse. The survey was voluntary. The response rate was about 50 percent. The survey collected the following types of information from each business:

- Demographic information on the owners and characteristics of the firm, such as the industry to which it belongs, age, and type of organization (sections A, B, C, and D of the questionnaire).
- An inventory of the firm's deposit and savings accounts, capital leases, credit lines, mortgages, motor vehicle loans, equipment loans, other loans, and selected other financial products. For each of these services, the supplier of the service was also identified (sections E, F, and G of the questionnaire).
- Information about the characteristics of the financial service suppliers: type (e.g., bank, individual), location vis-a-vis the firm, method of conducting business, number of years the firm has done business with the supplier, and reasons for choosing the source (sections H and J of the questionnaire and section I of the codebook).
- Experience in the past three years in applying for credit (section J of the questionnaire).
- Data from each firm's income statement and balance sheet (sections P, R, and S of the questionnaire).
- Information on the recent credit history of the firm and its owners (section U of the questionnaire).

Generally, the reference period for the survey data is 1993. However, the income statement and balance sheet data were collected for fiscal year 1992 because that date was the time of the last complete set of financial statements for most firms. Sales and employment data were collected for 1992 and for 1990.

The NSSBF does not use an equal-probability sample design, so that the weights play a critical role in interpreting the survey data. The weights included with this data set are based on the original weights computed by Price Waterhouse. As is true of all surveys, there is some

amount of missing data for nearly every NSSBF question. An attempt has been made to impute most missing values. The general model used to perform imputations in the NSSBF is a randomized regression model. The methodology employed is similar to that used in the first-stage procedures of the Survey of Consumer Finances. Multiple-categorical response questions (e.g., check all responses that apply) were converted to a series of yes-no responses, and then each of these yes-no responses was estimated using a randomized linear-probability model (i.e., randomized regression where the dependent variable takes on one of two values). Not all variables lend themselves to estimation by regression. In particular, questions that evoked single discrete categorical responses (e.g., type of source) are typically imputed using a randomized hot-deck procedure.

Further details of the survey may be found in Cole and Wolken. See also Cole, Woodburn, and Wolken. Additional documentation, codebooks and data are available for download on the web page of the Federal Reserve Board of Governors at the following address: <http://www.bog.frb.fed.us/pubs/oss/oss3/nssbftoc.htm>.

Table of Means

Variable	Obs	Mean	Std. Dev.	Min	Max
Business credit card used	4637	0.288252	0.452998	0	1
Personal credit card used	4637	0.407165	0.491359	0	1
Used either business or personal credit card	4637	0.540908	0.498378	0	1
Used both business and personal card	4637	0.154509	0.361475	0	1
Positive business related credit card balance	2498	0.249144	0.432604	0	1
Business related credit card balances	2498	912.5104	4099.319	0	150000
Denied credit in last 3 years	4637	.0991109	.2988431	0	1
Dissuaded from applying for credit	4637	.2467441	.431163	0	1
Credit market conditions were a serious problem in past year.	4637	0.137294	0.344195	0	1
Owner declared bankruptcy in last 7 years	4637	0.026794	0.161498	0	1
Owner delinquent on personal obligations	4637	0.134381	0.341098	0	1
Firm delinquent on business obligations	4637	0.190251	0.392541	0	1
Judgement rendered against owner	4637	0.050726	0.219462	0	1
Firm's age	4637	14.28356	12.13118	0	216
Total number of employees	4637	8.493908	22.89981	0	495
number of employees squared	4637	596.4345	6133.457	0	245025
Total sales in 1992	4637	1001330	4383181	0	3.6×10^9
Total sales in 1992 squared	4637	2.02×10^{13}	6.72×10^{14}	0	1.3×10^{18}
Owner's share of firm	4637	81.04097	26.05962	0	100
Sole proprietor	4637	0.432144	0.495428	0	1
Partnership	4637	0.080085	0.271454	0	1
S corporation	4637	0.203333	0.402521	0	1
White	4637	0.883839	0.320453	0	1
Female	4637	0.206091	0.40454	0	1
Owner's age	4637	49.4056	11.45007	19	92
Exporter	4637	0.077803	0.26789	0	1
Education <8th grade	4637	0.017894	0.132581	0	1
Education 9-11	4637	0.02839	0.166101	0	1
High School graduate	4637	0.234452	0.423702	0	1
College graduate	4637	0.263061	0.440343	0	1
Graduate school	4637	0.202979	0.402261	0	1