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The Role of Credit Access in Firm Sustainability: A comparison of the 1998 and 2003 Surveys of Small Business Finances

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Abstract. The current paper uses two nationally representative cross-sections of US businesses from 1998 and 2003 to examine 5-year survival rates of small businesses. Despite the fact that the 2003 cohort experienced the Great Recession at the end of their 5-year window, exits were about 4 percent higher for the 1998 cohort than the 2003. The analysis finds that credit access and credit quality measures are among the most important explanatory variables in each period. Using the Blinder-Oaxaca decomposition to decompose the differences across the cohorts, the data further indicate that the lower survival rate in the 1998 cohort is largely driven by differences in the coefficients on the credit access and credit quality measures. On the other hand, measures of real estate appreciation and depreciation do not seem to have played a large role in the difference.

Keywords: small businesses finances, firm discontinuance, SSBF, NETS.

1. Introduction

According to the Small Business Administration (SBA), small businesses contribute almost half of new job formation, gross national product, and innovation in the U.S. economy. At the same time, there is a great deal of churning in the small business population, with many firms entering the market as many others exit. While this churning is part of the competitive process, there is also dead-weight loss associated with failure. The recent recession and financial crisis have generated a great deal of speculation around the ability of small businesses to survive during a period in which funding and liquidity become constrained. In response to this, many of the policies developed to aid smaller firms during the recent recession focused on easing access to credit (e.g., Small Business Lending Fund, SBA programs, the JOBS Act, etc.).

The importance of credit access and quality to small firm survivability during the 2003-2008 time period has been shown in a recent paper by Mach and Wolken (2012). They estimate a firm survival model for small businesses that were in business at year-end 2003.[1] Credit access and credit quality measures for these firms in 2004 were among the most important indicators of whether the firm was still in business by 2008. The authors caution, however, that the findings may be specific to the 2004-2008 period. Credit and liquidity were considerably constrained during the recent recession, aggravated by the decline in housing prices. Because small businesses often use personal and business real estate as sources of collateral and financing for their businesses, a decline in real estate values may have resulted in deteriorated balance sheets which in turn may have exacerbated the ability of smaller firms to secure credit.

The current paper uses two nationally representative cross-sections of U.S. businesses to try to gain some traction on the question of which businesses went out of business in the most recent period that may not have had the environment been different. Data from the 1998 and 2003 Survey of Small Business Finances (SSBF) are merged with data from the National Establishment Time Series (NETS) data. This merge provides a time series of in-business status indicators for each of the firms in the SSBF over a five year time span: from 1998 to 2004 for the older survey and 2003 to 2009 for the newer survey. For the 1998 survey, 15 percent of firms cease to operate by 2003. In contrast, only 11 percent of the 2003 firms are out of business by 2009. Building on the earlier research, this paper will estimate identical 5-year survival models for both the 1999-2004 and the 2003-2009 cohorts. Using a nonlinear decomposition technique, the paper then estimates the extent to which differences in survival probabilities can be explained by the characteristics of the firms and owners in each cohort, and the extent to which such differences are likely due to the particular period studied.

2. Previous Literature

There is a substantial literature on default prediction models that typically involves several approaches.[2] The earliest, most well-known and widely applied technique to firm failure prediction models uses financial ratio analysis. Following the introduction of such models in the 1960s, researchers provided theoretical arguments for failure that tended to argue one or both of the following hypotheses. The first is that firms will fail because the present value of their costs exceeds their revenues. The second is that inefficiencies in capital markets can lead to failure among firms with positive net present values. While financial statement data are required for ratio analysis studies, the theoretical literature on

1. The effect of credit access and quality on firm entry is an important topic as well, but is beyond the scope of the paper.
2. For summary articles, see Hall (1992) and Keasey and Watson (1991).

firm failure has suggested other variables, including firm and owner characteristics other than financial statement variables, local and macroeconomic conditions, as well as indicators of credit access and credit quality may be useful as well.

Studies predicting failure of businesses began with work in the 1930s that established that accounting ratio measures exhibited by discontinuing firms were different from measures exhibited by surviving firms (Shailer (1989)). Altman (1968) is often credited as the first to apply multivariate techniques to failure analysis. Many studies since Altman have added further support to the potential usefulness of such models for failure prediction. The literature is quite large and studies that provide reviews of earlier works include Ohlson (1980), Taffler (1982), and Altman and Sabato (2007). Such studies have used various statistical techniques (e.g., multiple discriminate analysis, logistic and probit analysis, and factor analysis) and have been applied to several countries including the United States and Great Britain. Little attention was initially given to small or private enterprises, largely owing to the paucity of available data on such firms. The studies which have analyzed private firms have typically been of non-U.S. firms and restricted to very small samples.[3] They do, however, suggest that small business failure models may be a separate avenue of research. For a more detailed review on the use of financial ratios and net present value modeling in the prediction of small firm failure see Mach and Wolken (2012).

Because the recent financial crisis was thought to severely disrupt the supply of credit to small businesses, the current paper focuses on the role played by capital market imperfections. Capital market imperfections and, by implication, credit constraints and poor credit quality, can lead to failure among firms with positive net present values.[4] In particular, banks (and other lenders) have been accused of charging small firms too much, demanding too high a level of collateralization, being inefficient in their procedures for credit assessment (or economies of scale with firm size), and in some cases unwilling to lend to smaller firms. As a result of these imperfections, small firms facing such constraints will be less able to adjust to shocks to their operations than larger firms.[5]

Early tests of failure models based on capital market imperfections use variables that were intended to be surrogates for shocks to cost or revenue flows, as was true of the studies by Dunne et al (1988), Storey et al (1987), and Keasey and Watson (1986). The literature also suggests several indicators of credit access and credit quality that are likely related to the probability of discontinuance. Applying and being denied credit signals that a firm is unable to secure the desired level of credit. Credit constrained firms have less access to credit which may also force them to use relatively more expensive shorter term

3. See, for example, Peel and Peel (1987) and Shailer (1986).
4. See, for example, Wadwhani (1986), Hudson (1986), and Simmons (1989).
5. err and Nanda (2009) provide a good summary of the literature on the impact of financial constraints on firm entry decisions.

debt to finance their operations. Such restrictions and costs may leave them vulnerable to shocks in their cash flow. This in turn puts them at a higher risk of failure (Keasey and Watson (1991)). It may also constrain the firm from initiating new projects, expanding operations, investing in research and development, or even making its payroll, and ultimately affect the firm's probability of survival. For example, Musso and Schiavo (2008) report a significant relationship between survival and financial constraint.

Examples of alternative but somewhat more expensive types of credit are borrowing using credit cards or using trade credit. These are often more expensive than traditional bank loans. Blanchflower and Evans (2004) found that firms that had their credit access constrained–i.e., denied credit or feared applying because they thought they would be denied–were significantly more likely to borrow using credit cards. In a recent study of start-up firms, Scott (2009) reports a negative correlation between the level of credit card debt and subsequent survival. And Peterson and Rajan (1997) report that firms that had loan requests denied were more likely to borrow using trade credit.

In addition to credit constraint indicators, the credit quality of firms may also be related to subsequent survival. Several studies have found that firms with poor credit histories (e.g., bankruptcy, delinquency on current debt, and judgments), or low credit scores, are less likely to have loan requests approved (e.g., Blanchflower, et al (2003) and Cavalluzzo and Wolken (2005)). Robb and Robinson (2014) examine differences between surviving and failing "new" firms and report that firm credit scores are positively associated with indicators of success–revenues, assets, profits, and number of employees larger than the sample median levels.

The current paper adds to the literature by using the existing modeling to examine differences in the importance of firm characteristics and credit market imperfections across two different cohorts of firms.

3. The Data

1998 and 2003 Survey of Small Business Finances (SSBF)

The majority of data for this paper come from the 1998 and 2003 Surveys of Small Business Finances (SSBF). The SSBFs were conducted to collect information from the owners of a nationally representative sample of U.S. small business enterprises. Owners were asked about firm income statements; balance sheets; financial relationships; credit experiences; lending terms and conditions; the number of branches and firm headquarters location; the types of, and locations of financial institutions that were used; and about various other firm characteristics.[6]

The target population of the survey was defined as: for-profit, nonfinancial, nonfarm, nonsubsidiary business enterprises that had fewer than 500 employees. Firms in the sample had to be either single establishments, or the headquarters of multiple establishment enterprises that were not majority owned subsidiaries of other firms. Additionally, in order to be eligible, firms had to have been in business during December of 2003 and at the time of the interview. The majority of interviews occurred between June and December of 2004.

The Dun and Bradstreet (D&B) Market Identifier file (DMI) was used to construct the sampling frame for the 1998 and 2003 SSBF. The DMI contains minimal basic company data on U.S. businesses. It is a meant to be a snapshot of active businesses *at a particular point in time*.

National Establishment Time-Series (NETS) Database

In order to incorporate a time element into the SSBF cross-section, we merge in data from the National Establishment Time-Series (NETS) Database. The NETS Database is constructed from 20 "snapshots" taken every January since 1990 of all active Dun and Bradstreet establishments (currently over 24 million). Each year, the snapshot is compared to information from the previous years. No establishments are ever deleted from the database; but their last year in business is indicated making it possible to follow a firm over time. Walls & Associates maintains the NETS database and continues to update estimates before the next annual release.[7]

One unique feature of the NETS database is that it allows the researcher to distinguish between a firm that is no longer in business and one that has been purchased by another firm or changed its organizational form but essentially continues to operate. On the D&B DMI file, firms that were purchased by other firms or changed organizational form are assigned a new DUNS number. Thus, comparing two point-in-time snapshots of the D&B file without the quality control implemented by the NETS database would make these firms that went out of business appear identical to firms that were still operating with different names or organizational forms. However, the NETS database does not provide information on why a particular business is no longer in business. As such, it does not allow us to differentiate between firms that went out of business due to

6. Selected survey results are summarized in Mach and Wolken (2006) and Bitler et al (2001). The database includes a credit score for each firm purchased from Dun and Bradstreet.
7. For more information on the construction of the NETS database, see Walls & Associates (2009). As new data becomes available (the next year), Walls and Associates reexamines and corrects, if necessary, previous years' data as well. The results reported in this paper are for the NETS database as of 2009. Due to the dynamic nature of the database, results may be slightly different if the models were to be estimated with a different release of the NETS database even if the same time period were examined.

bankruptcy or poor performance from those that closed down because the owner simply retired or decided to pursue other interests.[8]

The NETS database also contains several other yearly measures of firm characteristics such as employment, sales, and credit ratings. Because our experience with the employment and sales numbers from the DMI file have indicated that these numbers are not very accurate, we do not use this information in analysis.[9] However, because D&B specializes in credit rating, this measure may be more informative. The credit rating is a composite credit worthiness measure; unlike the credit score, which provides a *relative* ranking of firms, the credit rating is *specific* to the firm.[10]

Geographic Controls

The location where the firm operates is likely to have an impact on the survivability of the firms. We include a limited number of measures of the economic environment. Using the MSA or rural county where the firm's headquarters is located, we merge in measures of population and establishment density from Census data, the average wage per job and per capita income from BEA, and the unemployment rate from BLS. As an area becomes more densely populated, we would expect the firm to have relatively more demand for its products, increasing the likelihood that the firm will stay in business. The relationship with the number of establishments in the area is theoretically less clear. While higher densities of businesses would likely be associated with better infrastructure, decreasing the cost of doing business, more businesses could also mean more competition. Because small businesses are also potential employers, rising wages in the area where the firm operates is likely to increase the cost of production; thus, we would expect to see an inverse relationship between average wages and firm survivability. Per capita income, on the other hand, should have a positive relationship with survivability as more wealthy residents would be more capable of buying the firm's output. We would expect unemployment rates to be negatively associated with survivability.

Many small business owners rely on personal assets to guarantee or collateralize loans for their firms. For most households, their home is the largest asset they own. As their equity in real estate holdings has generally declined in value during the recent turmoil, owners' ability to tap into personal balance sheets to secure their business credit needs has also shrunk (Dennis 2010). To capture

8. The models control for this possibility by including a variable on the owner's age. See below.
9. For example, the correlation coefficient of total sales provided on the D&B DMI and total sales provided by the individual firms is 0.6 and the correlation coefficient of employment is similar.
10. A detailed interpretation of the credit ranking can be found at http://www.dnb.com/about-dnb/15062603-1.html. The variable is a multi-tiered variable based both on the firm's credit history and size. For our analysis, we construct a discrete variable with 5 categories: high, good, fair, limited, or not rated. Its value may change from year to year.

the potential value of this asset we merge in a couple measures of the house price index in the state in which the firm's headquarter office is located.[11] We also include the housing price elasticity data calculated by Saiz (2010) for the metropolitan area where the firm's headquarters is located.

To capture the changing nature of the economic environment, we use the percentage change in all of the geographic measure except the Saiz housing price elasticity: between 1999 and 2004 for the 1998 cohort and 2004 and 2009 for the 2003 cohort.

4. 2001 Recession vs. 2007-09 Recession: Testable Implications

Both cohorts of firms experienced a recession roughly three years after they were surveyed. However, the recession faced by business owners in the 1998 SSBF cohort was different than the one faced by the 2003 cohort. At 18 months, the 2007 recession lasted more than twice as long as the 2001 recession.

In July 2003, the National Bureau of Economic Research (NBER) declared that the 2001 recession had ended in November 2001. It was relatively short and generally considered shallow. It resembled the mild 1969-70 and 1990-91 recessions, which, respectively, followed the second- and third-longest expansions in U.S. history. Although the past two business cycles are consistent with the evidence that U.S. expansions have gotten progressively longer over time, and that recessions have become shorter, the mildness of the 2001 recession is perhaps surprising given the jarring economic developments that preceded it. In particular, the resiliency of the U.S. economy in the face of a boom and bust in U.S. equity markets and business outlays for capital equipment, as well as the economic disturbances caused by the fallout from the events of September 11, 2001, has been noted prominently by several policymakers and economists (Kliesen (2003)).

While the 2001 recession was relatively mild, the 2007 recession was the longest and deepest of the post-World War II era, according to the NBER. It lasted from December 2007 through June 2009 and was associated with the largest decline in output, consumption, and investment and the largest increase in unemployment than any post-war recession, including the recessions of 1973 and 1981. Although all recessions experience some decline in residential investment, the retraction in residential investment was unusually severe and accompanied by large declines in housing prices.

Moreover, financial markets, which experience downturns in most recessions, generally continue to function smoothly. In 2007, that was not the

11. We consider indices from the Federal Housing Finance Agency (FHFA) and LoanPerformance (LP). For more information on the construction of the FHFA index, see Calhoun (1996); for more information on the construction of the LoanPerformance index, see http://www.corelogic.com/Products/CoreLogic-HPI.aspx#container-Overview.

case, as short-term capital markets, and other financial markets were sorely strained, causing policymakers to aggressively intervene to stimulate the economy and provide direct assistance to the financial sector (Labonte (2010)). Call Report data indicate that outstanding small loans to businesses by commercial banks dropped off beginning in 2008 and have continued to do so while no such decline was seen on small loans during the earlier period (Figure 1).[12] At the same time, there was a large tightening of standards and terms on loans to small businesses that far exceeded the tightening that occurred in the earlier period (Figure 2). There was also a much larger fraction of firms reporting that credit was becoming ever more difficult to obtain in the later period than the early one (Figure 3).

It has been argued that the current recession was different than previous recessions for (small) businesses because of the large disruptions in the credit markets, the virtual freezing of the short-term credit market (overnight, fed funds, and commercial paper), the heavy reliance of small businesses on real estate at the time of the real estate bubble collapse, and credit lines collapsing because of credit markets collapsing. At the same time, banks were becoming very restrictive in lending. These contentions would lead to the following hypotheses.

1. With respect to *real estate*, we would predict that a) heavy reliance on real estate as a finance vehicle for the firm increases probability of failure, but b) more so in the latter period than the former because of the collapse of the real estate bubble. We would expect a) positive coefficient estimates on measures of real estate backed financing on the likelihood of failure, and b) such coefficients to be larger in the latter period.

2. With respect to *credit access*, a) restrictions on access to credit should ceteris paribus increase probability of failure and b) they should have a larger effect in the latter period due to severely restricted access. We would expect a) positive coefficient estimates on measures of access to credit coefficients and b) such coefficients to be larger in the latter period.

3. With respect to *credit quality*, a) more creditworthy firms should be less likely to fail due to lack of access to capital, and b) they should have a larger effect in the latter period due to diminished risk tolerance on the part of banks because of a reevaluation by banks, or because of concern over regulator criticism. We would

12. Bank Call Reports do not provide information on the size of the business obtaining the loan. Small loans are those with original principal amounts of less than $1 million; these loans are often taken as a proxy for lending to small businesses. These data are available on a quarterly basis since 2010, and annually prior to that.

expect a) negative coefficient estimates on measures of credit quality on the likelihood of failure, and b) such coefficients to be larger in the latter period.

5. The Sample

Five years after their interviews, 480 firms from the 1998 cohort and 363 firms from the 2003 cohort were no longer in business (Table 1).[13] This represents slightly more than 15 percent and 11 percent of the 1998 and 2003 cohort populations respectively. Statistics from the Bureau of Labor Statistics indicate that around 20 percent of employer establishments formed in 1994 were out of business by 1995; among establishments that survived through 2000, only 8 percent were out of business by 2001 (Board of Governors of the Federal Reserve System (2012)). Because the SSBF firms are not all very young firms—the median 1998 firm was 11 years old and the median 2003 firm was 12—and they are not all employer firms, one would not expect the survival rates to match perfectly, but the 15 and 11 percent do not seem extraordinarily high or low. This leads to the obvious question of why there were more failures in the 1998 cohort during the less severe recession.

Table 2 provides summary statistics for the two cohorts.

Real estate. We consider multiple measures of real estate markets to capture firms' potential to leverage it to borrow funds. The share of a firm's assets that are held in real estate is essentially constant across cohorts, with a bit over a third of all the average firm's assets being held in real estate. There is, however, a significant increase in the fraction of firms that used real estate as collateral on one or more loans. In 1998 fewer than 10 percent of firms reported doing so compared to more than 20 percent of the 2003 cohort. In addition, while the 1998 firms saw a fairly substantial increase in real estate prices in the five years following the survey, the 2003 firms saw a much smaller increase, or small decrease depending on the measure of home prices.

Credit quality. Overall, the 1998 cohort seems to have lower credit quality. The firms in the 1998 cohort were more likely to have been 60 or more days delinquent on three or more business obligations in the three years prior to the survey. They were also more likely to have zero or negative equity in their business and less likely to have no D&B credit rating. Credit scores were not statistically different across the two cohorts.

13. In order to not bias the results, firms that already looked defunct when they were interviewed were removed from the data. For the analysis, we eliminated firms that reported assets of less than $0 or sales of less than $1,000. For the 1998 cohort, this eliminated 148 firms and 160 firms for the 2003 cohort.

Credit access. There are also apparent differences in credit access experiences of the two cohorts. On the one hand, the 1998 cohort reported forgoing applying for credit because they felt the application would be turned down more often than the 2003 cohort. On the other hand, the 2003 cohort reported borrowing on their credit cards more often than the 1998 cohort. Given the relatively higher cost of borrowing on credit cards compared to other forms of credit, this would seem to indicate less access to credit. Equal shares of firms in both cohorts borrowed on trade credit—waited to pay off the invoice until after the discount period has passed—and only a small fraction of firms were denied trade credit in either year.

6. Reduced Form Model

The current research seeks to address to what extent is the difference in the failure rate a function of differences in observable characteristics across the two cohorts and to what extent is it a function of those characteristics being treated differently over time. Given the difference in the recessions faced by the two cohorts of firms, we would like to pay particular attention to the roles played by credit quality, credit access, and the collapse of the real estate market.

We estimate the following reduced form model:

$$F_{ic}^{\bullet} = f(RE_{ic}, CQ_{ic}, CA_{ic}, O_{ic}) F_{ic}^{\bullet} = f(RE_{ic}, CQ_{ic}, CA_{ic}, O_{ic}),$$

Where $F_{ic}^{\bullet} F_{ic}^{\bullet}$ is the probability that firm *i* in cohort *c* goes out of business within 5 years of the interview is a function of real estate usage for financing the firm (RE), credit quality (CQ), credit access (CA), and other characteristics (O) including owner and firm characteristics, Census Division, industry, and geographic controls. We estimate the model using the Stata Oaxaca-Blinder decomposition assuming a jointly-estimated logit model.[14] Results from the individual years are presented in Tables 3 and 4 and the Oaxaca-Blinder decomposition results are presented in Tables 5 and 6.

7. Results

We estimate the logistic model for each cohort separately. We provide a number of different specifications to capture the role of real estate and its changing values on the firms' availability of collateral and consequently credit. The first model uses only the Saiz housing price elasticity measure. The second uses the SSBF measures of the firms' intensity in real estate investment and collateral usage.

14. For details on the estimation procedure, see Jann (2008).

The third model uses both measures and the final two models repeat the third while incorporating the two different home price indices.

Table 3 presents the results from the logistic model for the 1998 cohort. Because the coefficients from the logistic model are not straightforward to interpret, the results are presented as odds ratios. Each ratio provides the change in the odds of a firm discontinuing with a one-unit change in the independent variable holding everything else constant. Odds ratios greater than one indicate an increase in the odds of discontinuing while odds ratios of less than one indicate a decrease in the odds. For example, the odds ratio in the first model on the Saiz elasticity measure says that a one-unit increase in this measure *increases* the odds of discontinuing by 7.4 percent, if it were significant. Similarly, the odds ratio on the share of asses in real estate in the third model says that a one percent increase in this share *decreases* the probability of the firm discontinuing by 5.6 percent, again if it were significant.

The size and significance of other coefficients in the model are stable across each of the specifications. Among the real estate values, only the LoanPerformance home price index has a significant impact on the likelihood of the firm no longer being in business five years after the survey. The model predicts that a one percentage change in the home price index increases the likelihood that a firm discontinues by 1 percent. This positive relationship is counter to our hypotheses.

The credit quality measures behave more in line with our initial hypotheses: the higher the credit quality at the beginning of the period, the more likely the firm is to be in business at the end of the period. Each additional credit score percentile translates into about a one percent decrease in the likelihood that the firm will discontinue. Firms with more than 3 delinquencies are more than 50 percent more likely to not be in business in 2004. Not being rated by D&B due to insufficient credit history in the initial survey year is very nearly significant and positively associated with no longer being in business at the end of the period.

With the exception of firms not applying for credit because they feared being turned down, none of the credit access measures are significant predictors of the likelihood of firm discontinuance. Firms that feared applying for credit were less likely to be out of business. On the surface, this result seems somewhat counterintuitive. One plausible explanation is that this cautiousness allowed the firms to not hold too much debt when the economy went into recession.

Table 4 presents the odds ratios from the logistic model for the 2003 cohort. The results are similar to the 1998 cohort, but there are some differences. For example, there is no significant impact of having forgone applying for credit, but borrowing on trade credit significantly increases the likelihood of being out of business. In addition, more of the credit quality measures are significant.

While the individual cohort results are interesting, they do not provide any insights into the second part of our hypotheses: what are the relative size of the

impacts of credit quality, credit access, and real estate involvement across the two cohorts. The remaining part of the paper looks at just this.

The Blinder-Oaxaca decomposition breaks the fraction of firms that were out of business by the end of the five year period into the part that is explained by differences in the characteristics and the part that is due to differences in the evaluations of the characteristics. The original application of this technique was looking at wage differentials between races or genders. In such examples, it is fairly clear that one would want to use the characteristics from the group thought to be discriminated against and apply the coefficients estimated from the non-discriminated against group. In our case, it has been argued that the period leading up to the Great Recession was an extraordinary one in terms of credit access and availability so we assume that 1998 was the more normal period. Thus we ask the hypothetical question of how the 2003 cohort would have fared had they faced the 1998 world.

Table 5 displays the Blinder-Oaxaca decomposition results from the 2003 perspective. The first part of the table computes the 5 year discontinuance rate for the two cohorts, reiterating the surprising gap in the years. Depending on the sample used—the Saiz measure is only available for firms located in the metropolitan areas—the gap is between 3 and 4 percent and is always significant. The next three lines break this difference into the endowment effect, the coefficient effect, and the interaction effect. The endowment effect is the mean difference in the 2003 discontinuance rate predicted if the firm characteristics in 2003 had looked like the 1998 characteristics. For example, in the first model where only the Saiz measure is used, the endowment effect says that if the 2003 firms had the same characteristics, 1.4 percent more of them would have been out of business at the end of the five year period. The coefficient effect can be interpreted as the change in the discontinuance rate predicted if the characteristics of the 2003 firms were evaluated the same as the 1998 firms. The first model would have predicted 2.6 percent more of firms to discontinue were this true. Finally, the interaction effect measures the difference in the rate due to the simultaneous changes in both characteristics and levels. Again looking at the first model, the interaction effect would have predicted 0.6 percent fewer firms would have been out of business by the end of the five years. Looking across all 5 of the models, these overall decomposition effects are seldom statistically significant and do not add overly much to our intuition about the impact of credit quality and access over this period. The next part of the decomposition does just this.

There is little indication that changes in the *levels* of real estate holdings, credit quality, and credit access played much of a role in the differences in discontinuance rates across cohorts. Rather, most of the action seems to stem from the differences in the coefficients on credit access and credit quality. Interestingly, the estimates indicate that had credit quality and credit access measures been evaluated as they had been in the earlier cohort, *fewer* firms would have been out of business by the end of the 5 year period.

8. Conclusion

During the recent economic downturn, credit markets were thought to be extremely tight for small businesses. To exacerbate this problem, the plummeting real estate prices made it harder for small business owners to use their homes and other real estate holdings as collateral in securing financing as a backup plan. To investigate the validity of these concerns, the current paper looks at the impact of credit access, credit quality, and real estate holdings by small businesses on their ability to remain in business. It does so by matching the two most recent waves of the Surveys of Small Business Finances with data from the National Economics Times Series Database which provide snapshots of firms' in- or out-of business status five years after their. This matched dataset is used to analyze the effect credit access, credit quality, and real estate investment play in the discontinuance of firms across these two cohorts.

Both cohorts experienced a recessionary economy about three years after they were interviewed. Despite the fact that the 2003 cohort was subject to a much longer and more severe recession, fewer of the 2003 firms were no longer in business five years after being surveyed than of the 1998 firms. Mach and Wolken (2006) provide evidence that this difference cannot easily be explained by differences in firm characteristics. The firms in the 1998 SSBF looked very similar to those in the 2003 cohort in owner characteristics, industry distribution, and geographic distribution. When the cohorts are examined individually, credit access and credit quality measures are estimated to be important predictors of firms being out of business by the end of the period for both cohorts. Measure of real estate investment and the availability of it as collateral for borrowing are only significant in one specification for the older cohort of firms and not at all so for the newer cohort.

Results from the Blinder-Oaxaca decomposition reinforce the previous observation that the difference in out of business rates is not being driven by differences in endowments. Rather the differential treatment of these endowments—in particular, the differential treatment of the credit access and credit quality measures—caused more firms from the 1998 cohort to discontinue than from the 2003 cohort. If one uses the estimated coefficients from the 1998 model to predict what would have happened to the 2003 firms, the model predicts that an additional one to two percent of the 2003 firms would have been out of business at the end of the five years. It is unclear, however, what this means. On the one hand, one might be inclined to point to the government interventions that were passed during the most recent crisis and pronounce that they were successful in keeping credit flowing to firms during the crisis thereby allowing them to remain in operation. On the other hand, one might point to the historic ease of which firms in the 2003 cohort were able to obtain credit leading into the crisis. Such conditions may have led firms to be holding larger amounts of cash reserves at the start of the crisis that allowed them to better weather the downturn. Because

we do not have information on the firm balance sheets beyond 2003, we cannot distinguish between these two possibilities. It is also possible that 2009 was not long enough after the onset of the most recent recession to fully capture the full share of businesses that would eventually go out of business. Again, data limitations prohibit us from more fully exploring this. Future research may consider obtaining an updated snapshot of the sampled firms from NETS to address this last issue. Unfortunately, such a snapshot will not address the first two possibilities. To do so would require much more detailed updated information on the sampled firms similar to what was collected in the original SSBF, which is not likely to be a possibility.

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Table 1: Firms out of business, by last year in business

Last year in business	Unweighted frequency	Unweighted percent	Weighted percent	
	1998 cohort			
1999	52	1.53	1.72	
2000	129	3.79	4.31	
2001	115	3.37	3.90	
2002	94	2.76	2.75	
2003	90	2.64	2.65	
Total	480	14.08	15.35	
	2003 cohort			
2004	42	1.03	1.2	
2005	92	2.26	2.66	
2006	90	2.21	2.87	
2007	66	1.62	2.02	
2008	73	1.79	2.28	
Total	363	8.92	11.03	

Notes: Statistics are based on the firms that were matched to the NETS database and had assets greater than zero and sales of more than $1,000 when interviewed in the 1998 and 2003 SSBF; weighting accounts for sampling and nonresponse. For comparability across cohorts, the 2003 cohort only uses the fifth replicate.

Table 2: Means and Medians by Cohort

	1998 Cohort		2003 Cohort	
	Mean	**Median**	**Mean**	**Median**
Fail	0.15***	0.00	0.11	0.00
Real Estate Variables				
Share of assets in real estate	0.35	0.24	0.37	0.27
Used real estate as collateral	0.07***	0.00	0.21	0.00
Saiz supply elasticity	1.25	1.03	1.25	1.04
LP home prices (% 1998-04, 04-09)	46.64***	38.70	-3.56	-1.37
FHFA home prices (% 1998-04, 04-09)	38.15***	30.95	14.13	14.38
Credit Quality Variables				
Firm credit score	51.51	55.00	52.50	56.00
Firm or owner declared bankruptcy	0.02	0.00	0.03	0.00
Firm or owner delinquent 3+ times	0.11**	0.00	0.09	0.00
Judgment against firm or owner	0.04	0.00	0.04	0.00
Zero or negative equity indicator	0.22***	0.00	0.19	0.00
No D&B credit rating in 2003	0.81**	1.00	0.78	1.00
Credit Access Variables				
Did not apply for credit fearing denial	0.23***	0.00	0.18	0.00
Borrowed on credit cards	0.16***	0.00	0.23	0.00
Borrowed on trade credit	0.27	0.00	0.25	0.00
Denied trade credit	0.06	0.00	0.05	0.00

Notes: Statistics are based on the firms that were matched to the NETS database and had assets greater than zero and sales of more than $1,000 when interviewed; statistics are weighted to account for sampling and nonresponse.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Select odds ratios from logistic models of going out of business by 2004

	(1)	(2)	(3)	(4)	(5)
Real Estate Variables					
Saiz elasticity	1.074		1.074	1.216	1.073
	(0.52)		(0.52)	(1.33)	(0.46)
Share of firm assets in real estate		1.087	0.940	0.965	0.940
		(0.46)	(-0.25)	(-0.14)	(-0.25)
Firms using real estate as collateral		0.943	0.865	0.872	0.865
		(-0.23)	(-0.40)	(-0.37)	(-0.40)
LP home prices (% 1999-04)				1.014**	
				(1.98)	
FHFA home prices (% 1999-04)					1.000
					(-0.02)
Credit Quality Variables					
Firm credit score	0.991***	0.992***	0.991***	0.992**	0.991**
	(-2.73)	(-3.50)	(-2.75)	(-2.69)	(-2.72)
Firm or owner declared bankruptcy	0.420	0.859	0.417	0.408	0.417
	(-1.46)	(-0.41)	(-1.47)	(-1.46)	(-1.46)
Firm or owner delinquent 3+ times	1.570*	1.615**	1.567*	1.558*	1.567*
	(1.76)	(2.51)	(1.74)	(1.71)	(1.74)
Judgment against the firm or owner	1.084	1.022	1.084	1.095	1.084
	(0.21)	(0.07)	(0.21)	(0.24)	(0.21)
Had no D&B rating in 1998	1.565	1.393	1.563	1.583	1.563
	(1.61)	(1.62)	(1.59)	(1.62)	(1.59)
Credit Access Variables					
Firms fearing denial	0.591**	0.620***	0.593**	0.579***	0.593**
	(-2.57)	(-3.12)	(-2.54)	(-2.67)	(-2.55)
Borrowing on credit cards	0.709	0.846	0.707	0.694	0.707
	(-1.47)	(-0.96)	(-1.47)	(-1.55)	(-1.47)
Borrowing on trade credit	0.806	0.938	0.810	0.823	0.810
	(-1.07)	(-0.42)	(-1.05)	(-0.97)	(-1.05)
Been denied trade credit	1.047	1.005	1.053	1.052	1.053
	(0.14)	(0.02)	(0.16)	(0.15)	(0.16)
N	1991	3404	1991	1989	1991

Notes: t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Estimates and standard errors have been adjusted for survey sampling. In addition to the above variables, the models also include measure of owner age and experience; firm industry, geographic division, age, employment, assets, sales, and financial ratios (liability to assets, cash to sale, accounts payable to sales, pretax profits to assets, and pretax profits to liabilities), and an indicator of negative equity; and local population density, unemployment rate, establishment density, and average wage earnings.

Table 4: Select odds ratios from logistic models of going out of business by 2009

	(1)	(2)	(3)	(4)	(5)
Real Estate Variables					
Saiz elasticity	0.989		0.978	0.981	0.971
	(-0.07)		(-0.13)	(-0.11)	(-0.17)
Share of firm assets in real estate		0.815	1.157	1.157	1.154
		(-0.90)	(0.48)	(0.48)	(0.48)
Firms using real estate as collateral		1.070	1.168	1.167	1.167
		(0.36)	(0.62)	(0.61)	(0.61)
LP home prices (% 2004-09)					1.002
					(0.14)
FHFA home prices (% 2004-09)				0.998	
				(-0.14)	
Credit Quality Variables					
Firm credit score	0.995	0.993***	0.995	0.995	0.995
	(-1.53)	(-2.58)	(-1.54)	(-1.54)	(-1.53)
Firm or owner declared bankruptcy	0.326	0.882	0.334	0.334	0.333
	(-1.64)	(-0.31)	(-1.61)	(-1.61)	(-1.61)
Firm or owner delinquent 3+ times	1.640*	1.515*	1.646*	1.644*	1.647*
	(1.78)	(1.91)	(1.80)	(1.79)	(1.80)
Judgment against the firm or owner	2.159*	1.904**	2.181*	2.179*	2.172*
	(1.92)	(1.98)	(1.94)	(1.95)	(1.92)
Had no D&B rating in 2003	8.163***	6.304***	8.394***	8.403***	8.372***
	(5.30)	(6.16)	(5.43)	(5.42)	(5.42)
Credit Access Variables					
Firms fearing denial	1.099	1.005	1.084	1.085	1.084
	(0.33)	(0.02)	(0.28)	(0.29)	(0.29)
Borrowing on credit cards	1.154	1.374*	1.144	1.145	1.146
	(0.60)	(1.79)	(0.56)	(0.56)	(0.56)
Borrowing on trade credit	1.987***	1.722***	2.004***	2.003***	2.003***
	(2.85)	(3.08)	(2.88)	(2.88)	(2.88)
Been denied trade credit	0.916	0.755	0.919	0.919	0.921
	(-0.22)	(-0.84)	(-0.21)	(-0.21)	(-0.20)
N	2330	4066	2330	2330	2330

Notes: t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Estimates and standard errors have been adjusted for survey sampling. In addition to the above variables, the models also include measure of owner age and experience; firm industry, geographic division, age, employment, assets, sales, and financial ratios (liability to assets, cash to sale, accounts payable to sales, pretax profits to assets, and pretax profits to liabilities), and an indicator of negative equity; and local population density, unemployment rate, establishment density, and average wage earnings.

Table 5: Blinder-Oaxaca threefold decomposition results relative to 2003 cohort

	(1)	(2)	(3)	(4)	(5)
Overall					
1998	0.151***	0.154***	0.151***	0.141***	0.151***
	(16.17)	(20.92)	(16.16)	(18.10)	(16.16)
2003	0.117***	0.110***	0.117***	0.094***	0.117***
	(12.48)	(15.99)	(12.49)	(14.78)	(12.49)
Difference	0.034**	0.043***	0.034**	0.046***	0.0342**
	(2.58)	(4.31)	(2.58)	(4.59)	(2.59)
Endowments	0.014	0.006	0.013	0.036	0.009
	(0.38)	(0.46)	(0.34)	(0.70)	(0.20)
Coefficients	0.026	0.033*	0.024	0.010	0.002
	(1.18)	(2.46)	(1.11)	(0.38)	(0.09)
Interaction	-0.006	0.005	-0.003	0.000	0.023
	(-0.15)	(0.31)	(-0.07)	(0.00)	(0.49)
Endowments					
Real Estate	0.000	0.000	-0.001	-0.003	-0.003
	(0.05)	(-0.23)	(-0.41)	(-0.06)	(-0.21)
Credit Quality	0.004	0.002	0.004	0.019*	0.003
	(0.65)	(0.67)	(0.57)	(2.40)	(0.34)
Credit Access	0.001	0.000	0.001	0.001	0.001
	(0.46)	(-0.54)	(0.43)	(0.80)	(0.30)
Other	0.009	0.004	0.009	0.018	0.008
	(0.30)	(0.40)	(0.27)	(0.97)	(0.23)
Coefficients					
Real Estate	0.005	0.005	0.000	-0.005	0.003
	(0.38)	(0.63)	(-0.02)	(-0.40)	(0.10)
Credit Quality	-0.077*	-0.086**	-0.075*	-0.028	-0.013
	(-1.87)	(-3.24)	(-1.76)	(-0.57)	(-0.10)
Credit Access	-0.024**	-0.023***	-0.022*	-0.009	-0.004
	(-1.97)	(-3.42)	(-1.82)	(-0.58)	(-0.10)
Other	-0.069	-0.121*	-0.065	-0.032	-0.014
	(-1.00)	(-2.31)	(-0.97)	(-0.53)	(-0.10)
Constant	0.190	0.257***	0.188	0.084	0.031
	(1.58)	(3.43)	(1.52)	(0.54)	(0.10)
Interaction					
Real Estate	0.000	-0.001	0.001	0.000	0.079
	(-0.08)	(-0.12)	(0.09)	(-0.00)	(0.88)
Credit Quality	-0.001	0.003	-0.001	0.000	-0.005
	(-0.20)	(0.14)	(-0.09)	(0.00)	(-0.62)
Credit Access	-0.001	0.000	-0.001	0.000	-0.005
	(-0.19)	(0.12)	(-0.09)	(0.00)	(-0.53)
Other	-0.004	0.002	-0.002	0.000	-0.045
	(-0.12)	(0.29)	(-0.07)	(0.00)	(-0.44)

Notes: Estimates from models described in Tables 3 and 4 from the Stata Oaxaca module. The decomposition is expressed from the viewpoint of the 2003 cohort. Results employ survey weights to control for complex sample design. 'Other' includes measure of owner age and experience; firm

industry, geographic division, age, employment, assets, sales, and financial ratios (liability to assets, cash to sale, accounts payable to sales, pretax profits to assets, and pretax profits to liabilities), and an indicator of negative equity; and local population density, unemployment rate, establishment density, and average wage earnings.