The Effect of Credit Availability on Small Business Success

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Abstract

The purpose of this paper is to analyze the effect of credit availability on small business success. By using log sales as the endogenous variable for small business success, a linear regression on the exogenous variables of credit, firm characteristics and owner characteristics is used. Through this OLS procedure, this paper aims to understand how the credit variables affect small business success in comparison to the control variables of firm characteristics and owner characteristics. The evidence shows that although the credit variables provide some explanation for the success of these enterprises, firm characteristics seem to have a much stronger effect in comparison.

Introduction

There are approximately 29.6 million small businesses in the United States, which comprise 99.7% of all employer firms in the country, according to statistics from score.org. When attempting to start or run a small business it is necessary to have a large amount of capital in order to finance such an undertaking. In my research, I hope to find whether there is any correlation between the sources of this capital in relation to the success of small businesses.

Literature Review

A variety of sources were used to draw inspiration for the model and coinciding background information used to analyze the data. The main paper that was used for reinforcing knowledge was by Allen N. Berger one of the previous governors of the Federal Reserve Board, written in 1998. This paper entitled "The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle," provides strong insights into the area of small business finances and how they are affected by the nature of business growth cycles. One of the main ideas that are relevant to the analysis in this paper is represented in Figure 1 in the appendix. This figure drawn directly from Berger's paper shows a timeline for the growth of businesses as they enter the market as a very small firm with no track record or collateral and evolve to a large firm with known risk and track record. This business growth cycle is also followed by a series of corresponding credit sources, which the businesses tend to gravitate towards as they expand. These insights will be very useful in the analysis of the corresponding credit variables, further expanded in the technical analysis section.

The next series of sources that is used are from the United States Government's Small Business Association's (SBA) Office of Advocacy. The SBA compiled these sources in a compendium of research released in July 2009 that use the survey of small business finances (SSBF). "An Examination of Financial Patterns Using the Survey of Small Business Finances," by George W. Haynes and James R. Brown is the main paper that is used to assist in this research. Looking at the model in figure 2 of the appendix, Haynes and Brown developed a linear regression that quantified the relationship between the endogenous variable in commercial bank loans to the exogenous variables of firm characteristics, owner characteristics, loan types and dummy variables for the time period. Using a concatenated dataset from the 1993, 1998 and 2003 SSBF's Haynes and Brown were able to run regressions on both the share of loans from finance companies as well as the share of loans from commercial banks. Comparing these two loan types, Haynes and Brown were able to show that there was a shift away from commercial bank loans to more finance loans over time. In my research I will use a similar model to look at the relationship between the credit availability to small business success.

Data

The data set, which I used, is the Federal Reserve's Survey of Small Business Finances (SSBF). This survey is a collection of information from small businesses in the United States. The firms that are included are no larger than five hundred employees and consist of a target population that is all-for-profit, nonfinancial, nonfarm and non-subsidiary business enterprises. The SSBF compiles information about owner characteristics, firm size, use of financial services and the income and

balance sheets of the firm, being just a few of the main examples. The publicly available datasets are currently available in five-year increments from 1987, 1993, 1998 and 2003 on the Federal Reserve website. The survey is collected in the two years following the year it represents, for example the 2003 dataset was collected in the years 2004 and 2005. Therefore, the 2008 survey is not yet available to the public so I used the data from 2003 in order to develop my technical analysis.

The Survey of Small Business Finances provides an excellent cross-section of the United States small businesses. There are a total of 21, 200 observations that are available in the public use dataset. Since this survey limits the target population to all-for-profit, nonfinancial, nonfarm and non-subsidiary business enterprises, the screening process provides a stratified sample of firms that represent 6.3 million small businesses in the United States. Due to the massive number of variables, which are compiled through the SSBF, I selected the variables in the data that are more relevant to my topic, described in depth in the next section.

Conceptual Framework & Model

The model that was chosen is a linear regression to quantify the strength of the relationship between credit availability and small business success. Through the ordinary least squares model the following linear regression equation is used:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

The above equation consists of a dependent variable Y, which is a measure of small business success. For this analysis log (sales) will be used to quantify or assess the

achievements of the observed small businesses. β_0 is the constant in the OLS regression while β_1, β_2 and β_3 will be coefficient estimates for the corresponding variables X_1, X_2 and X_3.

X_1 will represent the matrix of credit variables, which will represent the availability of credit. These credit variables will include dummy variables for credit measures such as checking, savings, owner's personal credit card usage, business credit card usage, any lines of credit, mortgage, equipment loans, capital leases, other loans and trade credit. The credit variables will also include a section of variables representing the primary institutions that these small businesses use for daily financial needs, using dummy variables for the use of commercial banks, savings banks, savings and loans, credit unions, finance companies, insurance companies and brokerage companies. All the variables in the X_1 measure of credit availability are dummy variables where a 1 will represent that they use a checking account for example and a 0 will represent that they do not have such an account.

X_2 will control for the series of variables corresponding to firm characteristics. These firm characteristics will include log (firm age), log (total employees), credit risk, bankruptcy and metropolitan location. The variable for credit risk is from the Dun and Bradstreet Rank Credit Score, which is measured through a Likart scale where 1 is most risky and 6, is least risky. The representative scores for each level include 1: 0-10, 2: 11-25, 3: 26-50, 4:51-75, 5: 76-90, 6: 91-100. The variables for bankruptcy and metropolitan location will be represented by dummy variables. The bankruptcy variable will be equal to 1 if the firm has gone

through a bankruptcy or a 0 if it has not. The metropolitan location is separated into rural and urban. The dummy variable for the metropolitan location will be represented by urban to avoid multicollinearity and also have a point of comparison to that of rural areas.

X_3 will represent the control variables for owner characteristics. These variables include log (age of owner), log (experience of owner), and dummy variables for gender, owner management, education and race. For the gender dummy a 1 will represent a female owner while a 0 will represent an owner that is not female. The variable for owner management is a 1 if the variable signifies an owner managed firm while a 0 corresponds to the contrary. The race variables include proxies for owners that are Hispanic, Black, White and Asian. These race variables are also dummies that show 1 if the owner is a specific race as opposed to a 0 if they are not that race. The last series of variables that are included involve the education of the owner. The education variables include dummies that represent owners with less than a high school degree, high school degree or equivalent GED, some college but no degree granted, associate degree or occupational academic program, trade school or vocational program, a college degree (BA, BS, etc.) and post graduate degree (MBA, MS, MA, PhD, MD, etc.). Similarly, the dummy variables for education show a 1 if they have achieved the specified level of education or a 0 for the counter.

Technical Analysis

The means of the data are represented in Table 1 of the appendix. Taking a deeper look into this data it is possible to infer a lot of information about the sample. The hierarchy of firm credit usage goes down from a checking account at 96%, a trade credit at nearly 70%, a business credit card at 54% and any credit line and an owner credit card coming in around 45%. While the rest of the credit usage variables linger around 29% for savings accounts and motor vehicle loans and approximately 15% or less for variables such as capital leases, equipment loans and other loans. The next credit variables to look at would be the main credit facility that the firm uses. The commercial bank variable dominates this category with nearly 90% of firms using commercial banks as their main credit facility.

The variables for education, race, manage and female owner characteristics show some interesting features of the sample. The female variable shows that less than 22% of the sample is associated with female small business owners. Also, this data shows that 85% of these firms are managed directly by the owner. For the race variable over 90% of the small business owners are white, while the rest is distributed amongst Asian, Black and Hispanic owners. This gives a good variable for comparison as White business owners carry such a strong majority. The education variables reveal that around 32% of business owners are college graduates, 20% have a post graduate degree and 19% have a high school degree, with the rest dispersed among the other variables.

The firm characteristic variables of interest in terms of the means are mainly the bankruptcy, urban and credit risk variables. The bankruptcy variable shows that only 0.8% of the sample has ever had a bankruptcy. The urban variable shows that only 18% of the sample's firms are located within an urban setting. This means that over 82% of small businesses are located in more rural locations. Lastly, the credit risk variable shows that the majority of the sample has a pretty good credit score leaning more toward the upper end of the spectrum at 3.86. Overall, the means reveal a general picture of the demographic spread of this sample data set in association to the overall population of these small businesses in the United States of America.

According to the regression results on log sales, the variables for credit availability, firm characteristics and owner characteristics, explain about 76% of the effects for this measure of small business success. Some of the interesting results for the coefficient estimates are that the majority of the credit forms provided a positive and significant return on sales. The only variables that resulted in a negative return on sales included the mortgage variable and the owner credit card variable. A possible explanation for the mortgage variable is that unlike motor vehicle loans, for example, where the business is provided a vehicle to enhance sales, a mortgage may not be as beneficial in such facets of sales. Also, the coefficient for the mortgage variable is not significant, which may play a role in its sign.

The negative owner credit card coefficient may provide insights into the Berger paper, pertaining to financial growth cycles. This is because smaller

businesses probably use owner credit cards more as opposed to larger businesses. While larger businesses probably need to have more readily available credit and therefore open business credit cards. This result may show signs that more credit is necessary as a firm increases in size. As a result, a combination of credit and firm size may contribute to the growth of log sales.

The coefficient variables for the main credit facility usage show a positive and significant relationship with sales. The only variable that reveals a negative relationship is the usage of insurance companies as the main credit facility of a company. This negative relationship may be a result of excess risk from adverse selection. This is because in general, companies that gravitate toward insurance companies tend to be higher risk firms. Therefore, adverse selection may play a role in this negative effect of the insurance coefficient. Furthermore, this variable is not significant in the 95% interval, which may also play a role in its sign.

In order to gain a better idea of the effect of the different variables on log sales, variables were removed and the regressions were reran as seen in tables 3-6. In table 3, the control variables for firm characteristics were removed. In table 4, the control variables for owner characteristics were removed. In table 5, the credit variables were removed. In table 6 both the controls for firm and owner characteristics were removed. Table 7 combines the data from all the regressions and provides the difference between the new regressions and that of the full regression. This difference provides an indicator for the effect of the removed variables on the regression.

The results of the difference calculations and the percentage change reveal that removing the firm characteristics has the greatest effect on the adjusted R-squared. This shows that although the credit variables do provide some explanation for log sales the majority is explained by firm characteristics. Furthermore, looking at the change from removing owner characteristics, it seems that this set of variables provides the least amount of explanation for log sales. Overall, the interesting thing to notice is that by removing the control variables the adjusted R-squared drops significantly compared to when only the credit variables are removed. This may signify that firm characteristics such as firm size have a greater effect on log sales than credit.

Conclusion

The log sales regression shows that the majority of the credit variables provide a positive effect on the success of small businesses. Looking deeper into the effect of credit on the adjusted R-squared it looks as if the set of credit variables have the second weakest amount explained compared to owner characteristics and firm characteristics. Furthermore, firm characteristics by far seem to explain more than both of the other variable sets of credit and owner characteristics. Therefore, it is possible to conclude that although credit does show positive effects on small business success, other variables such as the firm characteristics have a stronger weight than credit in judging the success of an enterprise.

Future Work

The effect of firm characteristics and the evidence of some firm size effects on the use of credit provide insight into how credit may affect small business success. By separating the effect of firm size on the use of credit it may be possible to get a clearer understanding of how credit effects small business success. Furthermore, through this additional research it may be possible to provide more evidence for the financial growth cycle explained in Berger's paper (Figure 1).

References

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Appendix

Figure 1

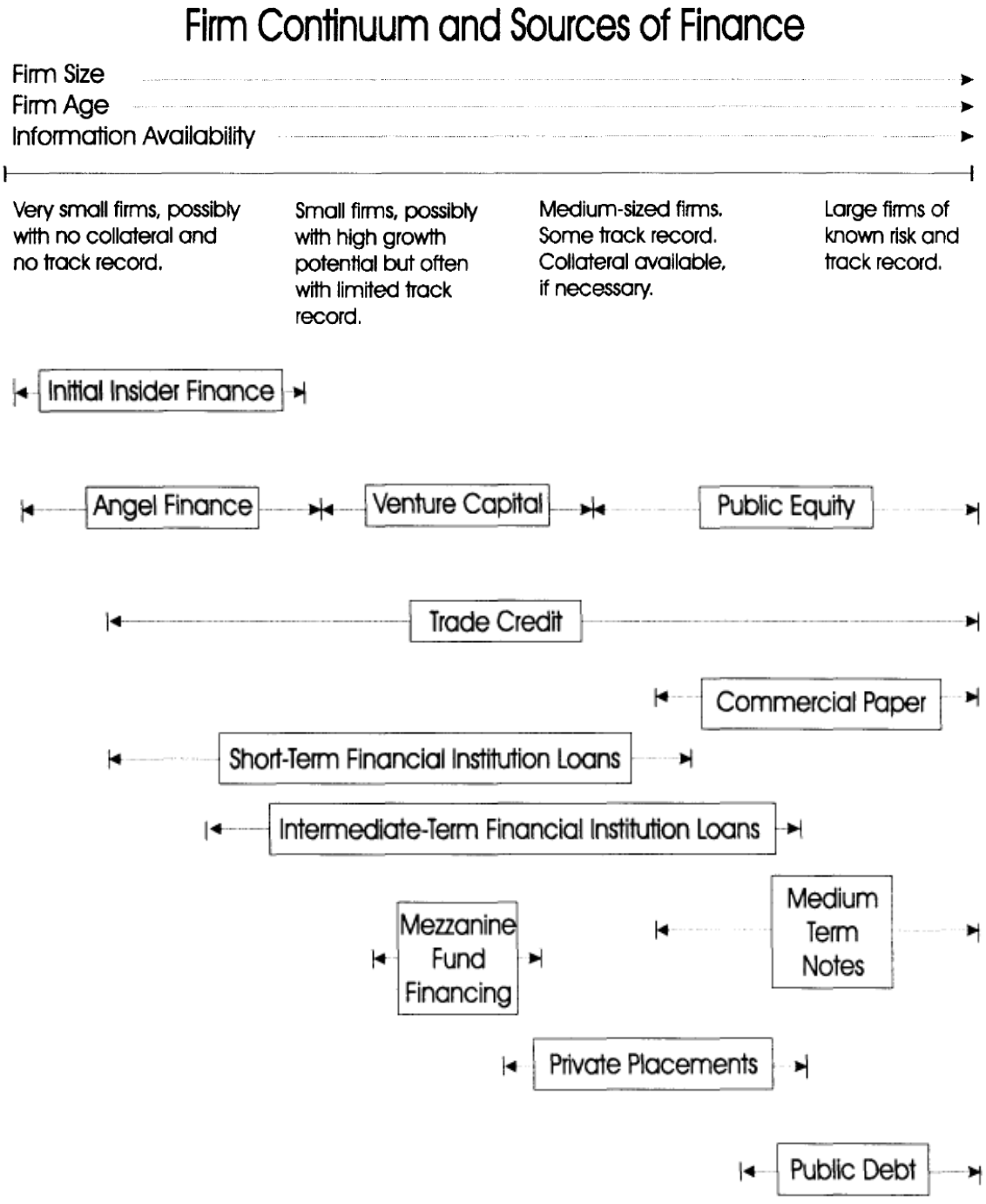

Figure 2

$$CB = \alpha_0 + \alpha_1 (year\_1993) + \alpha_2 (year\_1998) + \alpha_3 (firm\ characteristics) + \alpha_4 (owner\ characteristics) + \alpha_5 (loan\ types) + \varepsilon_i$$

where

CB = share of loans held by a commercial bank;

year_1993 = dummy variable for 1993 (reference year is 2003);

year_1998 = dummy variable for 1998 (reference year is 2003);

firm characteristics = bankruptcy filings by the owner, natural log of number of employees (size), natural log of age, industrial classification, rural/urban location, legal organization;

owner characteristics = natural log of age, natural log of experience, gender and race of the majority owner; and,

loan types = dummy variables are included for line of credit, mortgage, vehicle, equipment, capital leases and other traditional loans. The dummy variable indicates that the firm holds a loan with a positive balance.

$$FC = \alpha_0 + \alpha_1 (year\_1993) + \alpha_2 (year\_1998) + \alpha_3 (firm\ characteristics) + \alpha_4 (owner\ characteristics) + \alpha_5 (loan\ types) + \varepsilon_i$$

where

FC = share of loans held by a finance company; and

other variables are the same as above.

Table 1

Variable	N	Mean	Std Dev	Minimum	Maximum
A0_DB_CREDRK	21055	3.8610781	1.4475841	1	6
Checking	21200	0.9639151	0.1865058	0	1
Savings	21200	0.2775943	0.4478227	0	1
OwnerCC	21200	0.4359906	0.4958976	0	1
BusinessCC	21200	0.5364623	0.4986805	0	1
Anycreditline	21200	0.4504717	0.4975526	0	1
Mortgage	21200	0.1643868	0.3706349	0	1
MVL	21200	0.2860849	0.4519402	0	1
Equiploan	21200	0.1514151	0.3584615	0	1
Caplease	21200	0.1301887	0.3365188	0	1
Otherloan	21200	0.1214623	0.3266714	0	1
Tradecredit	21200	0.6891509	0.4628521	0	1
Combank	21200	0.8978774	0.3028167	0	1
SavBank	21200	0.0549528	0.2278935	0	1
SNL	21200	0.0167453	0.1283186	0	1
Creditunion	21200	0.004717	0.0685197	0	1
Financeco	21200	0.0023585	0.0485081	0	1
Insuranceco	21200	0.000707547	0.026591	0	1
Brokerageco	21200	0.000707547	0.026591	0	1
Female	21200	0.217217	0.4123612	0	1
LogAge	20780	3.9510808	0.2206322	2.944439	4.5217886
LogExper	20720	2.888459	0.7183715	0	4.2626799
LessHS	21200	0.0181604	0.1335343	0	1
HSGrad	21200	0.1890094	0.3915253	0	1
SomeColAA	21200	0.0612264	0.2397508	0	1
Vocational	21200	0.0262736	0.1599515	0	1
ColGrad	21200	0.3240094	0.4680146	0	1
PostGrad	21200	0.2045755	0.4034006	0	1
Manage	21200	0.8574057	0.3496669	0	1
Hispanic	21200	0.0365094	0.1875584	0	1
White	21200	0.9046226	0.2937424	0	1
Black	21200	0.0289623	0.1677044	0	1
Asian	21200	0.0395283	0.1948528	0	1
Firmage	21200	2.467794	0.9078053	0	4.634729
Familyown	21200	0.834717	0.3714445	0	1
Urban	21200	0.1775943	0.3821799	0	1
logTotalemp	21185	2.1620639	1.6307695	0	6.1862086
Bankruptcy	21200	0.0084906	0.0917544	0	1
logsales	20885	13.1701847	2.3659145	3.988984	19.1667111
logcosts	21060	12.886189	2.4924783	1.6094379	19.2041069

Table 2

The REG Procedure
Model: MODEL1
Dependent Variable: logsales

Number of Observations Read	21200
Number of Observations Used	20265
Number of Observations with Missing Values	935

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	35	84606	2417.32091	1872.27	<.0001
Error	20229	26118	1.29112		
Corrected Total	20264	110724			

Root MSE	1.13627	R-Square	0.7641
Dependent Mean	13.12440	Adj R-Sq	0.7637
Coeff Var	8.65772		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.22182	0.18532	55.16	<.0001
Checking	1	0.74714	0.07143	10.46	<.0001
Savings	1	0.12950	0.01851	7.00	<.0001
OwnerCC	1	-0.08500	0.01692	-5.02	<.0001
BusinessCC	1	0.19979	0.01768	11.30	<.0001
Anycreditline	1	0.46682	0.01820	25.65	<.0001
Mortgage	1	-0.01480	0.02222	-0.67	0.5054
MVL	1	0.12800	0.01860	6.88	<.0001
Equiploan	1	0.04447	0.02370	1.88	0.0606
Caplease	1	0.15308	0.02476	6.18	<.0001
Otherloan	1	0.15329	0.02535	6.05	<.0001
Tradecredit	1	0.39162	0.01928	20.32	<.0001
Combank	1	0.74305	0.09097	8.17	<.0001
SavBank	1	0.76467	0.09580	7.98	<.0001
SNL	1	0.89205	0.10780	8.28	<.0001
Creditunion	1	1.06014	0.14884	7.12	<.0001
Financeco	1	1.29749	0.19390	6.69	<.0001
Insuranceco	1	-0.39342	0.30800	-1.28	0.2015
Brokerageco	1	1.06726	0.30876	3.46	0.0005
Female	1	-0.43529	0.02027	-21.48	<.0001
LogAge	1	-0.51437	0.04821	-10.67	<.0001
LogExper	1	0.17133	0.01664	10.30	<.0001
Manage	1	-0.15591	0.02576	-6.05	<.0001
LessHS	1	-0.17076	0.06018	-2.84	0.0046
HSGrad	1	-0.08380	0.02170	-3.86	0.0001
SomeColAA	1	-0.24735	0.03413	-7.25	<.0001
Vocational	1	-0.24472	0.05033	-4.86	<.0001
PostGrad	1	0.00390	0.02132	0.18	0.8549
Black	1	-0.64217	0.04845	-13.25	<.0001
Hispanic	1	-0.10931	0.04288	-2.55	0.0108
Asian	1	0.30088	0.04140	7.27	<.0001
Firmage	1	0.11459	0.01207	9.50	<.0001
A0_DB_CREDRK	1	0.06428	0.00587	10.94	<.0001
Urban	1	-0.14762	0.02115	-6.98	<.0001
logTotalemp	1	0.97347	0.00647	150.42	<.0001
Bankruptcy	1	0.33316	0.08717	3.82	0.0001

Table 3

Firm Characteristics removed

The REG Procedure
Model: MODEL1
Dependent Variable: logsales

Number of Observations Read	21200
Number of Observations Used	20410
Number of Observations with Missing Values	790

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	30	55178	1839.26395	663.23	<.0001
Error	20379	56515	2.77318		
Corrected Total	20409	111693			

Root MSE	1.66529	R-Square	0.4940
Dependent Mean	13.11636	Adj R-Sq	0.493β
Coeff Var	12.69627		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.30899	0.26640	38.70	<.0001
Checking	1	1.13020	0.10366	10.90	<.0001
Savings	1	0.54481	0.02657	20.50	<.0001
OwnerCC	1	-0.34161	0.02459	-13.89	<.0001
BusinessCC	1	0.39261	0.02570	15.28	<.0001
Anycreditline	1	1.14866	0.02571	44.68	<.0001
Mortgage	1	0.23547	0.03226	7.30	<.0001
MVL	1	0.22613	0.02710	8.35	<.0001
Equiploan	1	0.73621	0.03390	21.71	<.0001
Caplease	1	0.60756	0.03590	16.92	<.0001
Otherloan	1	0.55534	0.03650	15.21	<.0001
Tradecredit	1	1.01094	0.02750	36.76	<.0001
Combank	1	0.77509	0.13220	5.86	<.0001
SavBank	1	0.74909	0.13899	5.39	<.0001
SNL	1	1.05475	0.15692	6.72	<.0001
Creditunion	1	1.10698	0.21729	5.09	<.0001
Financeco	1	1.97348	0.28361	6.96	<.0001
Insuranceco	1	-0.10716	0.45102	-0.24	0.8122
Brokerageco	1	2.24744	0.45159	4.98	<.0001
Female	1	-0.63637	0.02947	-21.59	<.0001
LogAge	1	-0.35356	0.06879	-5.14	<.0001
LogExper	1	0.57338	0.02133	26.88	<.0001
Manage	1	-0.97251	0.03675	-26.46	<.0001
LessHS	1	-0.46195	0.08792	-5.25	<.0001
HSGrad	1	-0.28547	0.03151	-9.06	<.0001
SomeColAA	1	-0.53557	0.04984	-10.75	<.0001
Vocational	1	-0.63477	0.07352	-8.63	<.0001
PostGrad	1	-0.02172	0.03108	-0.70	0.4845
Black	1	-0.64079	0.06974	-9.19	<.0001
Hispanic	1	-0.07076	0.06274	-1.13	0.2594
Asian	1	0.55378	0.05993	9.24	<.0001

Table 4

Owner Characteristics Removed

The REG Procedure
Model: MODEL1
Dependent Variable: logsales

Number of Observations Read	21200
Number of Observations Used	20740
Number of Observations with Missing Values	460

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	87612	3809.21114	2788.30	<.0001
Error	20716	28301	1.36614		
Corrected Total	20739	115913			

Root MSE	1.16882	R-Square	0.7558
Dependent Mean	13.17842	Adj R-Sq	0.7556
Coeff Var	8.86920		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	8.02755	0.06511	123.30	<.0001
Checking		1	0.90404	0.07258	12.46	<.0001
Savings		1	0.12924	0.01874	6.90	<.0001
OwnerCC		1	-0.08225	0.01706	-4.82	<.0001
BusinessCC		1	0.19171	0.01788	10.72	<.0001
Anycreditline		1	0.51255	0.01841	27.84	<.0001
Mortgage		1	-0.01914	0.02248	-0.85	0.3947
MVL		1	0.11039	0.01876	5.88	<.0001
Equiploan		1	0.06335	0.02388	2.65	0.0080
Caplease		1	0.11361	0.02490	4.56	<.0001
Otherloan		1	0.17502	0.02556	6.85	<.0001
Tradecredit		1	0.44014	0.01942	22.66	<.0001
Combank		1	0.70147	0.09300	7.54	<.0001
SavBank		1	0.74352	0.09755	7.62	<.0001
SNL		1	0.83531	0.11035	7.57	<.0001
Creditunion		1	0.99698	0.15217	6.55	<.0001
Financeco		1	1.34976	0.19071	7.08	<.0001
Insuranceco		1	-0.41544	0.31648	-1.31	0.1893
Brokerageco		1	1.12479	0.31710	3.55	0.0004
Firmage		1	0.15285	0.00968	15.79	<.0001
A0_DB_CREDRK	D&B Credit Score	1	0.07684	0.00591	13.01	<.0001
Urban		1	-0.17036	0.02135	-7.98	<.0001
logTotalemp		1	1.01201	0.00624	162.11	<.0001
Bankruptcy		1	0.30556	0.08823	3.46	0.0005

Table 5

Credit Variables Removed

The REG Procedure
Model: MODEL1
Dependent Variable: logsales

Number of Observations Read	21200
Number of Observations Used	20265
Number of Observations with Missing Values	935

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	17	80667	4745.12591	3196.40	<.0001
Error	20247	30057	1.48452		
Corrected Total	20264	110724			

Root MSE	1.21841	R-Square	0.7285
Dependent Mean	13.12440	Adj R-Sq	0.7283
Coeff Var	9.28354		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	12.74006	0.18556	68.66	<.0001
Female		1	-0.55706	0.02153	-25.88	<.0001
LogAge		1	-0.75107	0.05124	-14.66	<.0001
LogExper		1	0.22140	0.01776	12.46	<.0001
Manage		1	-0.18180	0.02752	-6.61	<.0001
LessHS		1	-0.23448	0.06434	-3.64	0.0003
HSGrad		1	-0.07350	0.02316	-3.17	0.0015
SomeColAA		1	-0.20367	0.03645	-5.59	<.0001
Vocational		1	-0.20873	0.05383	-3.88	0.0001
PostGrad		1	-0.03246	0.02274	-1.43	0.1535
Black		1	-0.79701	0.05155	-15.46	<.0001
Hispanic		1	-0.13411	0.04581	-2.93	0.0034
Asian		1	0.22713	0.04424	5.13	<.0001
Firmage		1	0.12559	0.01285	9.77	<.0001
A0_DB_CREDRK	D&B Credit Score	1	0.08930	0.00618	14.46	<.0001
Urban		1	-0.15790	0.02255	-7.00	<.0001
logTotalemp		1	1.13196	0.00586	193.33	<.0001
Bankruptcy		1	0.14592	0.09322	1.57	0.1175

Table 6

Credit Only

The REG Procedure
Model: MODEL1
Dependent Variable: logsales

Number of Observations Read	21200
Number of Observations Used	20885
Number of Observations with Missing Values	315

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	18	48464	2692.43744	820.93	<.0001
Error	20866	68435	3.27976		
Corrected Total	20884	116899			

Root MSE	1.81101	R-Square	0.4146
Dependent Mean	13.17018	Adj R-Sq	0.4141
Coeff Var	13.75083		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8.89566	0.09195	96.74	<.0001
Checking	1	1.56070	0.11125	14.03	<.0001
Savings	1	0.66904	0.02836	23.59	<.0001
OwnerCC	1	-0.40609	0.02616	-15.52	<.0001
BusinessCC	1	0.37173	0.02747	13.53	<.0001
Anycreditline	1	1.37932	0.02726	50.61	<.0001
Mortgage	1	0.28309	0.03447	8.21	<.0001
MVL	1	0.13424	0.02891	4.64	<.0001
Equiploan	1	0.84581	0.03610	23.43	<.0001
Caplease	1	0.62639	0.03815	16.42	<.0001
Otherloan	1	0.57035	0.03884	14.68	<.0001
Tradecredit	1	1.24431	0.02904	42.85	<.0001
Combank	1	0.69522	0.14289	4.87	<.0001
SavBank	1	0.73106	0.14968	4.88	<.0001
SNL	1	0.95366	0.16987	5.61	<.0001
Creditunion	1	1.11170	0.23499	4.73	<.0001
Financeco	1	2.05657	0.29486	6.97	<.0001
Insuranceco	1	-0.64906	0.48984	-1.33	0.1852
Brokerageco	1	2.06441	0.49039	4.21	<.0001

Table 7

#	Regression	Adjusted R-Squared	Difference (R_1-R_n)	Percentage Change (R_1-R_n)/ R_1
R_1	Full Regression	0.7637	0	0
R_2	Firm Characteristics Removed	0.4933	0.2704	35.4%
R_3	Owner Characteristics Removed	0.7556	0.0081	1.06%
R_4	Credit Removed	0.7283	0.0354	4.63%
R_5	Credit Only	0.4141	0.3496	54.22%

Data (Sas Code) 1

```
libname j'\\Cfile.ucsc.edu\cfilehomes\jchiu\Econ 234';

data one;
      set j.ssbf03;
      keep A0_MSA A0_DB_CREDRK A_TOTEMP CF_FAGE CF_FAMILY H1 U1

            C_FEMALE_1 C_AGE_1 C_EDUC_1 C_EXPER_1 C_MANAGE_1
            C_HISP_1 C_WHITE_1 C_BLACK_1 C_ASIAN_1

            E1 E4 F1 F4 F7 F20 F27 F33 F50 F54 L1
            P2 P4 P5 PROFIT R12 S8 S_EQUITY;
      run;

data two;
      set one;

      /*Credit*/
      if E1 = 1 then Checking = 1;
            else Checking = 0;
      if E4 = 1 then Savings = 1;
            else Savings = 0;
      if F1 = 1 then OwnerCC = 1;
            else OwnerCC = 0;
      if F4 = 1 then BusinessCC = 1;
            else BusinessCC = 0;
      if F7 = 1 then Anycreditline = 1;
            else Anycreditline = 0;
      if F20 = 1 then Mortgage = 1;
            else Mortgage = 0;
      if F27 = 1 then MVL = 1;
            else MVL = 0;
      if F33 = 1 then Equiploan = 1;
            else Equiploan = 0;
      if F50 = 1 then Caplease = 1;
            else Caplease = 0;
      if F54 = 1 then Otherloan = 1;
            else Otherloan = 0;
      if L1 = 1 then Tradecredit = 1;
```

```
      else TradeCredit = 0;

if H1 = 1 then Combank = 1;
      else Combank = 0;
if H1 = 2 then SavBank = 1;
      else Savbank = 0;
if H1 = 3 then SNL = 1;
      else SNL = 0;
if H1 = 4 then Creditunion = 1;
      else Creditunion = 0;
if H1 = 5 then Financeco = 1;
      else Financeco = 0;
if H1 = 6 then Insuranceco = 1;
      else Insuranceco = 0;
if H1 = 7 then Brokerageco = 1;
      else Brokerageco = 0;

/*Owner Characteristics*/
if C_FEMALE_1 = 1 then Female = 1;
      else Female = 0;
LogAge = log(C_Age_1);
if C_EXPER_1 <= 0 then LogExper = .;
      else LogExper = log(C_EXPER_1);
if C_EDUC_1 = 1 then LessHS = 1;
      else LessHS = 0;
if C_EDUC_1 = 2 then HSGrad = 1;
      else HSGrad = 0;
if C_EDUC_1 = 3 then SomeColAA = 1;
      else SomeColAA = 0;
if C_EDUC_1 = 4 then SomeColAA = 1;
      else SomeColAA = 0;
if C_EDUC_1 = 5 then Vocational = 1;
      else Vocational = 0;
if C_EDUC_1 = 6 then ColGrad = 1;
      else ColGrad = 0;
if C_EDUC_1 = 7 then PostGrad = 1;
      else PostGrad = 0;
if C_MANAGE_1 = 1 then Manage = 1;
      else Manage = 0;
if C_HISP_1 = 1 then Hispanic = 1;
      else Hispanic = 0;
if C_WHITE_1 = 1 then White = 1;
      else White = 0;
if C_BLACK_1 = 1 then Black = 1;
      else Black = 0;
if C_ASIAN_1 = 1 then Asian = 1;
      else Asian = 0;

/*Firm Characteristics*/
Firmage = log(CF_FAGE);
if CF_Family = 1 then Familyown = 1;
      else Familyown = 0;
if A0_MSA = 2 then Urban = 1;
      else Urban = 0;
if A_TOTEMP <= 0 then logTotalemp = .;
      else logTotalemp = log(A_TOTEMP);
if U1 = 1 then Bankruptcy = 1;
```

```
            else Bankruptcy = 0;

      /*Financial Information*/
      if P2 <= 0 then logsales = .;
            else logsales = Log(P2);
      if P5 <= 0 then logcosts = .;
            else logcosts = Log(P5);

      /*if profit <= 0 then logprofit = .;
            else logprofit = log((Profit**2)/21200);*/

run;


proc means data = two;
      run;

/*
proc reg data = two;
      model logsales =

            Checking Savings OwnerCC BusinessCC Anycreditline Mortgage
MVL
            Equiploan Caplease Otherloan Tradecredit Combank SavBank
SNL
            Creditunion Financeco Insuranceco Brokerageco

            Female LogAge LogExper Manage
            LessHS HSGrad SomeColAA Vocational PostGrad
            Black Hispanic Asian

            Firmage A0_DB_CREDRK Urban logTotalemp Bankruptcy;

run;

*/
```