BANK LOANS AS PREDICTORS OF SMALL BUSINESS START-UP SURVIVAL*

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Abstract

This paper reports an investigation of the validity and reliability of a set of predictors of the survival of small, start-up companies. Having a bank loan was a significant positive predictor of survival. The use of the model as a predictor of survival was investigated on an hold-out sample. One group of companies in the hold-out sample had high predicted probabilities of survival, in spite of not having bank loans. This group had a survival rate that was slightly better than that of companies in the hold-out sample that had obtained bank loans. The group with a high survival rate, but without bank loans, made greater use of other forms of loans. The group of companies with a high survival rate, but without bank loans, accounted for 22% of the hold-out.

Keywords: bank loans, start-up survival, human capital, forecast

JEL Classification: G21, M20

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1. Introduction

This paper reports an investigation of the validity and reliability of a set of predictors of the survival of small, start-up companies. The focus of the investigation was on the implications for survival of whether or not the companies had bank loans at start-up. We considered human capital proxies, and industry and company descriptors as well as indicators for bank loans and other loans as predictors of survival. There were two main issues: First, was the question of whether or not knowledge that a start-up business got a bank loan was a useful predictor of survival. Second, we wanted to see if we could use the set of predictors to identify companies with high probabilities of survival independently of whether or not they got bank loans. The first question addresses the state of knowledge banks had about start-up businesses prospects in the late 1980's, the time period for which data were obtained. The second question addresses whether banks ability to forecast business survival could be improved using a set of human capital, industry and company descriptors.

We found that having a bank loan was a significant positive predictor of survival. We also found, using a hold-out sample, that it was possible to identify groups of companies with high survival rates. Companies in the out of sample set that had high predicted probabilities of survival had a significantly higher observed survival rate than the average for the out of sample set. One group of companies in the out of sample set had high predicted probabilities of survival, in spite of not having bank loans. This group had a survival rate that was slightly better than that of all companies in the out of sample set with start-up bank loans. The group with a high survival rate, but without

bank loans, made greater use of other forms of loans. The group of companies with a high survival rate, but without bank loans, accounted for 22% of the out of sample set. A group with high predicted probabilities of survival and with bank loans had the highest survival rate of any of the groups in the out of sample set that we considered. This group accounted for 19% of the out of sample set.

We know of only one prior work, Cressy (1996), concerning bank loans as predictors of start-up company survival, where there was also a broad range of other predictors. Cressy looked at companies that opened business accounts with National Westminster Bank in Great Britain in 1988. A company was said to have survived if the account was still open in 1992. Cressy's results are consistent with ours. He found that having a business loan from National Westminster was a significant predictor of survival. One other paper, Bates (1990), reports work related to our investigation. Bates used discriminant analysis to distinguish between survivors and non-survivors in a sample of small business start-ups. His model included human capital and financial variables. The amount of capital the firm had at start-up had a large standardized coefficient in his model, while the degree of leverage did not.

The rest of this paper has four parts: First, we describe the data base and sampling criteria that we used. Next, we discuss the set of predictors. Third, we discuss our methods of analysis and present our findings. Finally, we have a brief conclusion.

2. The Data Base and Sampling

We used the 1987 U. S. Census Characteristics of Business Owners (CBO) data base to evaluate the predictors. The data base is described in Nucci (1992). The observations in the data base were derived from a stratified random sample. The 1987 CBO survey has information about businesses and their owners.

The CBO sample was taken from the set of 1987 tax filings for various forms of small businesses, single ownership, partnerships, and small (sub-chapter S) corporations (U. S. Bureau of the Census, 1991, iv). The survey contains information on businesses that were in operation in 1987. The businesses may have been started in 1987 or earlier. CBO owner and business information was assembled from questionnaire responses of owners of the sampled businesses. Other firm-level information came from the IRS.

Three concerns guided our decisions on sampling: 1. We sought to avoid complicating factors that would make interpretation of our results more difficult. To this end we used the white male sub-sample. This limitation was made to avoid issues related to racial and gender discrimination. 2. We were concerned with possible sample attrition bias. The CBO survey was based on 1987 tax filings. Pre-1987 cohorts were likely to have been reduced by drop outs of weaker companies. For this reason we limited our sample to companies that were started in 1987. These businesses were start-ups in the sense that the owners were new to the businesses in 1987. The businesses may have been newly formed or they may have existed before under different ownership. 3. We wanted to limit our sample to companies that were possible candidates for bank loans. Some companies may actually have been independent tradesmen who filed business tax forms to reduce tax liability. Bates (1990), using the 1982 CBO survey, deleted companies that had zero capital at start-up. We also deleted these companies. This left us with 964 observations of companies. Bates also required firms to have annual sales of at least $5000. This has the difficulty that a company's sales will have depended on whether or not it got a bank loan. Companies that would have had $5000 in sales, had they received a

loan, may have been eliminated from the sample if, in fact, they did not get a loan. The effect of this would be to tilt the sample to those firms with loans. We did reduce our initial sample by eliminating companies with *predicted* sales of less than $5000 in 1987. Predicted sales were estimated from exogenous variables. The set of variables did not include any variables that would be affected by a company getting a bank loan. We used weighted least squares to form this estimate.[1] After this selection we were left with 785 observations.

3. The Predictors

We used three sets of predictors of survival. They were: 1. indicators for whether or not the company had bank loans and/or other loans at start-up; 2. human capital proxies; and 3. industry and company descriptors. (The names and definitions of the predictors are shown in Table 1.) The implications of these predictors for survival depend on the definition of survival. Therefore, we shall state our definition of survival before discussing the predictors.

The data for our sample refer to two times. The first time is the time of start-up -- 1987 for our sample. The second time is four years later, 1991. We have defined survival as occurring if a company still existed in 1991 whether or not there was a change of ownership.

There are three reasons to expect having a bank loan to be a predictor of company survival. First, having a loan from any source relaxes financial constraints on investment. Several researchers have found evidence that financial constraints may be binding (Blanchflower and Oswald, 1990; Evans and Jovanovic, 1989; Holtz-Eakin, Joulfaian and Rosen, 1994a; 1994b). Second, having a bank loan may increase a

company's credibility with potential suppliers and customers. There is a discussion of this idea for public companies in Best and Zhang, (1993). Finally, the indicator for a loan may proxy for qualities of the owners and the company that were observable by the lender, but are not observable by the researcher.

More human capital gives owner managers greater ability to create and manage viable enterprises. Therefore, we expect high values of human capital proxies to be predictors of company survival. We used variables representing the level of formal education, the area of any post-secondary study, family business background, previous ownership experience, years of prior work experience, and the number of owners.

Except for the number of owners, these human capital proxies need no explaining. A greater number of owners will increase start-up company viability for three reasons. First, it implies greater availability of managerial labour to accomplish the required tasks of starting and running a new enterprise. Second, it may imply a greater variety of complementary skills. Third, having more than a single owner may proxy for a greater commitment to making the enterprise work.[2]

All of our human capital variables, except for the number owners, were categorical variables. We measured the variables as the proportions of owners in the various categories.

We used three company descriptors, an indicator of whether or not the company had total equity of at least $25 000 at start-up[3], an indicator of whether the company was new or purchased from a previous owner, and an indicator of whether the company was a franchise or not. High equity will contribute to the viability of a

company by reducing vulnerability to fluctuations in revenue. We expect an on-going company to have a greater chance of survival than a new company because uncertainties about markets and production methods will be less for an on-going company. This is consistent with previous work (Bates, 1990; Cressy, 1996). Finally, a franchisee may have easier access to supplies as well managerial support which should increase survival chances, but on the other hand pays a franchise fee which might reduce survival. The net effect is an empirical question.

The industry descriptors that we used were proxies for scale economies in the industries. The descriptors were at the two-digit SIC level of aggregation. We expect that start-ups in industries with apparent advantages for large size companies or plants would have lower chances of survival than companies in industries where small companies appear to do well. We used two such measures: We proxied scale economies with the percentages of plants in the industries with either 1 - 19 employees or with 1 - 49 employees.[4] Data for these proxies were obtained from County Business Patterns (U.S. Bureau of the Census, 1987).

Insert Table 1 about here

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4. Statistical Procedures and Results

There were four main steps in our statistical procedures. First, we used weighted least squares to estimate predicted sales in 1987 for the set of 964 observations that met the selection criteria discussed in Section 1.[5] We used the criterion of predicted sales greater than $5000 to reduce the sample from 964 observations to 785 observations. Univariate statistics for the 785 observations are shown in Table 2. Second, we used weighted maximum likelihood to estimate the probit prediction model. Third, we used a random procedure to divide the sample into two approximately equal parts.[6] We estimated the probit model, still using weighed maximum likelihood, for one of the two sub-samples (subset #1). Fourth we used the coefficients estimated from subset #1 to forecast survival in subset #2. We divided the other sub-sample (subset #2) into groups according to whether or not they got bank loans and according to the estimated probability of survival, *using the coefficients from subset #1's estimation.* We then compared survival rates for the various groups.

Insert Table 2 about here

The results of the maximum likelihood estimate of the model for the full sample are shown in Table 3. The most interesting results are that having a commercial bank loan or another type of loan were both significant predictors of survival. Also interesting is that the coefficient of a loan other than a commercial bank loan is

greater than that for a commercial bank loan. The human capital and company coefficients have the expected signs. The positive sign for the coefficient of the proportion of firms in the 2-digit industry with fewer than 20 employees was expected. The negative sign for the proportion with fewer than 50 employees is a bit surprising. It suggests a very low threshold for scale economies.

Insert Table 3 about here

We tested the reliability of the predictors with a split sample. We re-estimated the model with a randomly chosen subset (subset #1) of the original sample. The results are displayed in Table 4. The coefficients of the model for the subset seems to be in reasonable agreement with the coefficients of the model for the full sample. We then applied the coefficients from the re-estimation to the out of sample subset (subset #2). Univariate statistics for subset #2 are shown in Table 5. We divided subset #2 according to two factors. The first factor was whether or not the companies had bank loans at start-up. The second factor was whether or not the predicted survival probability, based on the coefficients from the subset #1 re-estimation, was at least 0.9.

Insert Table 4 about here

Insert Table 5 about here

Survival rates for subset #2 as well various groups within subset #2 are shown in Table 6. There is evidence that the model is reliable. The observed survival rate for the entire subset #2 was 71.4%, while the rate for those companies with predicted probability of survival at least 0.9 was 85.5%. The difference is significant at better than 1% ($Z = 2.734$). Notice that the survival rate for all those that got bank loans, 78.3%, is not significantly better than the rate for entire subset #2 % ($Z = 1.262$, $p<0.11$).

Notice also that while not significant, the survival rate of companies with P(survive)≥0.9, 85.5%, was better than that of companies with commercial bank loans: 78.3% ($Z = 1.201$, $p<0.12$). In addition, the size of the sample with P(survive)≥0.9, 163, was not smaller than the sample with bank loans, 158. These two results imply that banks could have fared no worse in terms of exposure to borrower's business failure risk with no reduction in number of loans granted by using the reported predictors of survival instead of whatever lending rules that were applied. Even the survival rate of companies with P(survive)≥0.9, but who did *not* have a commercial bank loan at start-up, 82.7%, was slightly better than that of companies with commercial bank loans: 78.3%. And the sample with high probability of survival

but no bank loan represents more than 50% of the number of start-up loans actually granted.

The highest survival rate, 94.3%, was for companies that had both predicted probabilities for survival of at least 0.9 as well as bank loans. This rate of survival was significantly higher than the rate for those with a bank loan ($Z = 2.381$, $p<0.01$). The average predicted probability of survival for this group was 0.962. This was not very different from the average predicted probability of survival for all companies with predicted probability of survival at least 0.9 which was 0.966. This suggests that there is information about the companies available to banks that was not reliably picked up by the indicator for bank loans, and was not contained in the other predictors in the model.

One other interesting part of the data in Table 6 is the difference in the use of other type loans between companies that had bank loans and the companies that did not have bank loans, but did have a predicted probability of survival of at least 0.9. The 22.6% proportion of all companies with bank loans that had other loans is significantly less than the 69.3% of companies that had high predicted probabilities of survival in spite of not having bank loans.

Insert Table 6 about here

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5. Conclusion

We discovered that having a bank loan is a significant predictor of start-up company survival. However, there appears to be a substantial number of start-ups with high survival rates who do not have bank loans. These companies make significantly more use of other sources of borrowed capital than those who have bank loans. The other sources of finance may be more attractive to these successful companies. Or, banks may be failing to recognize that these companies are good loan risks. The correct answer can not be determined from this investigation. A more complete model that explains start-up company and bank behaviour is necessary for this.

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END NOTES

[1] The weights reflected the unequal probability of being selected in the stratified sampling for the CBO.

[2] If we had defined survival as the continuance of the 1987 owners in the business, as was done by Bates (1989), the implications of high values of indicators of human capital would have been unclear. The reason is that most of the indicators are non-specific in terms of relevance for starting an enterprise, for managing an enterprise, or for paid work. The choice of roles depends on comparative advantage (Evans and Jovanovic, 1989). A highly productive person may specialize in starting enterprises and selling them when the enterprises' prospects become demonstrable (Holmes and Schmitz, 1990). A competent owner-manager may start an enterprise. The enterprise may do well; but the owner-manager may discover that she could do better as a paid worker (Jovanovic, 1982).

[3] We used this single indicator because of an apparent ambiguity in the questionnaire from which the data were derived. It appeared that some persons who used personal loans to enter the business did not count the proceeds of the loans as part of their equity. Other owners did count the loans as part of equity. We noticed this because there were large numbers of companies with positive capital, but who claimed to have no equity.

[4] We tried other variables that did not have explanatory power. There were two human capital proxies. These were indicators for prior managerial experience, and whether or not the owners had ever been married. There were also two industry descriptors, the survival rate of companies, and median assets for suvivors in the same two digit industry in the 1982 CBO.

[5] The explanatory variables included these human capital variables, age, education, work experience, native born versus immigrant, marital status and full-time versus part-time work in the business. Company descriptors included were total equity, franchise, new company as opposed to an acquired existing company, and the legal form of the company. Industry descriptors were, the survival rate of companies, and median assets for suvivors in the same

two digit industry in the 1982 CBO, and scale economies. There was also a proxy for personal wealth of the owners.

[6] We used each firm's sample weight to split the sample. This number had up to 4 digits to the right of the decimal point. We split the sample according to whether the 2nd digit to the right of the decimal point was odd or even. The model was reestimated with the subset given by even even numbers.

Table 1.Definitions of Predictors Used in the Final Model

Name	Definition
business	proportion of owners with business degree
denovo	=1 if newly formed business in 1987, else 0
edu3	proportion of owners who were high school graduates
edu4	proportion of owners who were college drop-outs
edu5	proportion of owners who were college graduates
edu6	proportion of owners who did post-graduate studies
franchi	=1 if franchise, else 0
loan	=1 if any owner in the firm had a start-up commercial bank loan, else 0
othloan	=1 if any owner had a start-up loan other than a commercial bank loan, else 0
owner	proportion of owners who had previous ownership experience
respno	number of owners
scale20	proportion of firms in 2-digit industry with 1-19 employees
scale50	proportion of firms in 2-digit industry with 1-49 employees
scieng	proportion of owners with science or engineering degree
toteq	=1 if total equity from all owners at least $25,000, else 0
workexp3	proportion of owners with 2-5 years of work experience
workexp4	proportion of owners with 6-9 years of work experience
workexp5	proportion of owners with 10-19 years of work experience
workexp6	proportion of owners with at least 20 years of work experience
wrkfam	proportion of owners who previously have worked in family business

Table 2. Total Sample Wieghted Univariate Statistics

	Mean	Std Dev	Minimum	Maximum
survive	0.7132	0.4525	0	1
business	0.2721	0.4418	0	1
denovo	0.6889	0.4632	0	1
edu3	0.2700	0.4374	0	1
edu4	0.2986	0.4539	0	1
edu5	0.2206	0.4031	0	1
edu6	0.0993	0.2896	0	1
franchi	0.0594	0.2366	0	1
loan	0.2170	0.4125	0	1
othloan	0.2119	0.4089	0	1
owner	0.2326	0.4107	0	1
respno	1.1508	0.5437	0	10
scale20	0.8810	0.0823	0.46	0.97
scale50	0.9550	0.0449	0.64	0.99
scieng	0.1052	0.3055	0	1
toteq	0.1621	0.3688	0	1
workexp3	0.1378	0.3418	0	1
workexp4	0.1675	0.3715	0	1
workexp5	0.2282	0.4130	0	1
workexp6	0.2819	0.4373	0	1
wrkfam	0.2923	0.4504	0	1

number of observation = 785

Table 3. Probit MLE of Predictors of Start-Up Business Survival

Predictor	Coefficient Estimate	Std Error	t-statistic
const	5.1189	1.4938	3.4268
business	0.3966	0.0962	4.1221
denovo	-0.2892	0.0862	-3.3544
edu3	0.2836	0.1120	2.5315
edu4	0.4342	0.1290	3.3669
edu5	0.3788	0.1413	2.6807
edu6	1.1813	0.2451	4.8194
franchi	-0.5498	0.1422	-3.8664
loan	0.4073	0.0965	4.2199
othloan	0.5138	0.0939	5.4726
owner	0.3019	0.0990	3.0480
respno	0.4163	0.1090	3.8196
scale20	5.0306	1.4859	3.3854
scale50	-11.0631	2.7823	-3.9763
scieng	0.1899	0.1255	1.5128
toteq	0.4863	0.1377	3.5316
workexp3	0.3009	0.1130	2.6621
workexp4	0.3736	0.0890	4.1950
workexp5	0.6280	0.1057	5.9398
workexp6	0.7759	0.1014	7.6486
wrkfam	0.4372	0.0850	5.1421

n=785
Chi-square (d.f.=20) = 165.08

Table 4. Probit MLE, Subset #1

Predictor	Coefficient Estimate	Std Error	t-statistic
const	7.4238	3.2264	2.3009
business	0.6025	0.1778	3.3883
denovo	-0.4103	0.1378	-2.9763
edu3	0.4306	0.2947	1.4608
edu4	0.4402	0.3476	1.2663
edu5	0.4687	0.3394	1.3811
edu6	1.6519	0.4000	4.1298
franchi	-0.9866	0.2602	-3.7910
loan	0.2897	0.1877	1.5435
othloan	1.3698	0.2574	5.3203
owner	0.3966	0.1802	2.2000
respno	0.2854	0.3380	0.8444
scale20	6.1903	3.1388	1.9722
scale50	-14.6479	6.1478	-2.3826
scieng	-0.2015	0.2111	-0.9546
toteq	0.6625	0.2236	2.9623
workexp3	0.2591	0.2475	1.0468
workexp4	0.4230	0.1828	2.3133
workexp5	0.5979	0.1815	3.2927
workexp6	0.5278	0.2151	2.4543
wrkfam	0.6656	0.1486	4.4769

n=372 (subset #1)

Table 5. Subset #2 Weigthed Univariate Statistics

	Mean	Std Dev	Minimum	Maximum
survive	0.7104	0.4541	0	1
business	0.1951	0.3918	0	1
denovo	0.7647	0.4954	0	1
edu3	0.2727	0.4377	0	1
edu4	0.3490	0.4725	0	1
edu5	0.1631	0.3500	0	1
edu6	0.0708	0.2367	0	1
franchi	0.0560	0.2302	0	1
loan	0.2542	0.4359	0	1
othloan	0.2110	0.4081	0	1
owner	0.2212	0.3957	0	1
respno	1.1946	0.6022	0	10
scale20	0.8779	0.0848	0.46	0.97
scale50	0.9536	0.0470	0.64	0.99
scieng	0.1345	0.3402	0	1
toteq	0.1228	0.3286	0	1
workexp3	0.1366	0.3392	0	1
workexp4	0.1201	0.3226	0	1
workexp5	0.1912	0.3827	0	1
workexp6	0.3409	0.4543	0	1
wrkfam	0.2757	0.4437	0	1

number of observation = 413

Table 6. Results for Various Groups in Subset #2

Variable	1	2	3	4	5	6
survive	0.710	0.855	0.783	0.943	0.827	0.686
loan	0.254	0.243	1.000	0.316	0.000	0.000
othloan	0.211	0.579	0.099	0.226	0.693	0.249
Number	413	163	158	73	90	255

Column 1: Total subset #2
Column 2: P(Survive) ≥ 0.9
Column 3: Bank loan
Column 4: Bank loan and P(Survive) ≥ 0.9
Column 5: No bank loan and P(Survive) ≥ 0.9
Column 6: No bank loan

Test of difference in survival rates, col. 1 vs. col. 2: Z = 2.734
Test of difference in survival rates, col. 1 vs. col. 3: Z = 1.262
Test of difference in survival rates, col. 2 vs. col. 3: Z = 1.201
Test of difference in survival rates, col. 3 vs. col. 4: Z = 2.381
Test of difference in survival rates, col. 3 vs. col. 6: Z = 1.534
Test of difference in survival rates, col. 5 vs. col. 3: Z = 0.605

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