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Newly chartered banks provide an additional credit source for small businesses, but the staying power of new banks can be weak. A multi-state exit model is estimated for U.S. commercial banks chartered between 1980 and 1985 and for a benchmark sample of small established banks. The determinants of failure are similar for both samples, but new bank failure is more sensitive to adverse environmental conditions. The timing of new bank exit-by-failure follows a life-cycle pattern, but the timing of new bank exit-by-acquisition does not. There is mixed evidence on the efficacy of regulations aimed at reducing new bank fragility.

As the U.S. banking industry has consolidated, thousands of small community banks disappeared through merger, acquisition, or failure.[1] Community banks often specialize in small business lending, so when a merger replaces a small local bank with a larger regional or super-regional bank, the supply of credit to small businesses can decline. Newly chartered banks can help fill this gap. Over a 1000 new commercial banks have been chartered in the U.S. since 1995, and recent research indicates that these "de novo" banks tend to locate in post-merger markets and tend to make a large portion of their loans to small businesses. But like most new business start-ups, newly chartered banks can be financially fragile, and the degree to which they are reliable long-run sources of competition and credit depends on whether they can survive to financial maturity.

This study investigates the financial fragility of 1664 new commercial banks chartered in the U.S. between 1980 and 1985, a period of especially intense chartering activity just prior to the turbulent banking conditions of the late 1980s and early 1990s. The long-run probability of de novo bank exit (by failure, acquisition, or branch conversion) is estimated using a multivariate logit approach, conditioned on the financial structure, business mix, and external environment for each bank at the end of its first year of operations. The logit model is also estimated for a series of

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rolling three-year event windows, and the results are used to construct hazard functions for de novo failure, acquisition, and conversion. Similar multivariate logits are estimated for 2371 small established commercial banks located in the same geographic markets as the de novo banks.

The tests generate a rich set of empirical results. The estimated failure rates and acquisition rates for de novo banks were initially similar to those estimated for established banks, but as de novo banks aged—consuming their start-up capital and outlasting legal restrictions on purchasing new banks—they became substantially more likely than established banks to fail or be acquired. The de novo bank failure rate rose to almost five times the established bank rate before declining back to "normal" levels after about a decade. Failure rates also depended on the alignment of a de novo bank's life cycle with the business cycle. New banks chartered in 1984–1985 (in the midst of the bank failure wave) were more likely to fail, and tended to fail more quickly, than new banks chartered in 1980–1981. Abstracting from these life-cycle effects, de novo banks and established banks tended to fail for similar reasons. Imprudent financial practices (e.g., aggressive lending practices, poor cost control, reliance on non-core deposits) were associated with higher rates of failure for both sets of banks. Difficult external conditions (e.g., intense competitive rivalry, slow economic growth) were also associated with higher failure rates for both sets of banks, although the statistical relationships were more systematic for the de novo banks.

The results also shed light on the efficacy of past and present regulatory treatment of de novo banks. State laws that delayed the acquisition of de novo banks were positively associated with de novo failure and in the long-run led to higher, not lower, de novo acquisition rates. There was no evidence that the *laissez-faire* chartering policies practiced by the Office of the Comptroller of the Currency (OCC) during the 1980s contributed to high failure rates for de novo banks. Finally, there was no evidence that the extra-high minimum capital levels imposed on newly chartered banks during the 1990s were more justified for de novo banks than for small established banks.

1. RELATED LITERATURE ON ENTRY

Inter-industry studies find that entry occurs less often in industries with substantial scale economies, high capital requirements, and differentiated products (Schmalensee 1990). These findings are largely consistent with the wave of de novo entry in banking: initial capital requirements are relatively low in banking; bank advertising tends to be informational rather than image-oriented; and although minimum efficient scale is apparently very high in banking, scale-based reductions in unit costs may not be large enough to support limit entry behavior.[2] Entry by de novo banks has been shown to be more likely in fast growing, highly profitable, or highly concentrated markets (Dunham, 1989, and Moore and Skelton, 1998); in markets where mergers have recently occurred (Dunham, 1989, Berger et al., 1999, and Keeton, 2000); and after regulatory restrictions have been relaxed (Ladenson and Bombara, 1984, and Lindley et al., 1992).

Small banks lend more intensively to small businesses than do large banks (Berger and Udell 1996). Thus, when a small bank is acquired, the resulting (larger) post-merger bank may be significantly less likely to make small business loans (Peek and Rosengren, 1998, and Strahan and Weston, 1998). De novo entry can help fill this gap. De novo banks tend to specialize in small business lending (DeYoung, Goldberg, and White 1999) and tend to enter markets where mergers have shifted local deposits from small local banks to large out-of-market banks (Berger et al., 1999, and Keeton, 2000).[3]

However, de novo banks can take years to become financially mature, and because of this they are at high risk of failure, especially during economic downturns when small business access to credit is crucial. DeYoung and Hasan (1998) found that the typical one-year-old bank chartered during the 1980s and early 1990s was only about 25% as profit efficient as the average established bank and remained relatively inefficient until its ninth year of operation. Hunter and Srinivasan (1990) found that new banks chartered in 1980 were still less profitable than their established bank counterparts when they were seven years old. Huyser (1986) found that about half of the banks chartered between 1971 and 1984 still under-performed a conservative performance benchmark (80% of established bank ROA) when they were five years old.

Numerous studies have modeled financial institution failure (e.g., Whalen, 1991, Thomson, 1992, Wheelock and Wilson, 1995, Cole and Gunther, 1995, and Wheelock and Wilson, 2000), but few have modeled the failure of new financial institutions. Hunter, Verbrugge, and Whidbee (1996) estimated a split-population duration model for thrift institutions chartered between 1980 and 1986 and found that credit risk, adverse economic conditions, low capital stocks, and cost inefficiencies all contributed to failure. DeYoung (1999, 2003) estimated a similar model for commercial banks chartered in 1985 and found that failure rates follow a life-cycle pattern: low initial failure rates due to plentiful start-up capital, high failure rates next as fast growth and negative earnings erode capital, and finally normal failure rates as de novo banks reach financial maturity. Santarelli (2000) estimated a proportional hazard model for Italian start-ups in 1989 and 1990 and found that small start-ups and nonbank start-ups are more prone to early failure than are large start-ups and bank start-ups.

2. STATISTICAL METHOD, DATA, AND HYPOTHESES

Banks can exit the market by failing, by being acquired by another bank, or by being converted from a separately chartered holding company affiliate into a branch of the parent bank. This study models de novo bank failure using a multivariate logit framework that accounts explicitly for all three of these exit states. Although de novo bank failure is the main focus of the study, including the other two exit states in the model should improve the accuracy of the failure estimates. The model takes the following form:

$$\text{Prob}(\text{OUTCOME}_i = k) = \frac{e^{\beta'_k x_i}}{\sum_{j=0}^{J} e^{\beta'_j x_i}}, \tag{1}$$

where $i = (1, N)$ indexes the banks, $j = (0, J)$ indexes the outcomes, and x is a vector of exogenous variables that influence bank exit. OUTCOME equals 0 for banks that survived to the end of the event window and equals 1, 2, or 3, respectively, for banks that failed, were acquired by unrelated banks, or were converted into branches before the end of the event window. The model is estimated using maximum likelihood techniques, after restricting the vector of coefficients associated with survival to 0 (i.e., restricting $\beta'_0 = 0$). The marginal probability of outcome k with respect to variable x is calculated in straightforward fashion as ∂Prob(OUTCOME $= k)/\partial x$. Note that the estimated sign and significance of ∂Prob(OUTCOME $= k)/\partial x$ can differ from the estimated sign and significance of the β coefficient-associated outcome k and variable x because a change in x affects the probability derivative through three different coefficients β_j. (See Greene, 1997, for further details about the multivariate logit model.)

The model is estimated separately for a sample of de novo banks and a benchmark sample of established banks. The x vectors are observed at or near the beginning of the event window. The main tests use a single, 14-year-long event window, making Equation (1) a model of long-run bank failure, acquisition, and conversion. Additional tests use rolling, three-year event windows; the resulting exit probabilities from these estimations are interpreted as hazard rates and are used to construct hazard functions for failure, acquisition, and conversion.

2.1 Data and Variables

The data sample consists of 1664 de novo banks and 2371 established banks. The de novo sample includes all newly chartered banks that began operations between 1980:Q1 and 1985:Q4 for which full information was available. These banks were chartered at the beginning of a merger and consolidation wave that continues today and just prior to a historically large episode of bank insolvencies that stretched from the mid-1980s into the early 1990ss.[4] The age of a new bank may affect its ability to withstand difficult economic conditions; for example, a bank that started in 1980 had several years to mature before the onset of the banking recession, while a bank that started in 1985 did not. To test the extent of this effect, the de novo banks are organized into three subsamples: a cohort of 394 de novo banks that started up in 1980 or 1981, a cohort of 617 de novo banks that started up in 1982 or 1983, and a cohort of 653 de novo banks that started up in 1984 or 1985.

The 2371 established banks provide a benchmark against which to judge de novo bank performance. A 1980–1981 cohort of 1342 established banks includes every commercial bank that met the following conditions at year-end 1980: it was located in a geographic market (an urban MSA or a rural county) represented in the 1980–1981 de novo bank cohort; it had less than $100 million in assets (in 1985 dollars); it had at least a 6% capital-to-asset ratio; and it was at least 20 years old. A 1982–1983 cohort of 1462 established banks was similarly selected from year-end 1982 data, as was a 1984–1985 cohort of 1279 established banks from year-end 1984 data. A number of established banks appeared in more than one cohort group; each of these overlapping banks was randomly assigned to a single cohort, resulting in the overall sample of 2371 established banks.

De novo banks and established banks were observed for a 14-year event window, beginning with the start-up date for the de novo banks and with the middle of the cohort group for the established banks. Many of the banks exited *via* failure, acquisition, or conversion before the end of their event windows. A bank was defined as failed if its regulator declared it insolvent, if it received regulatory assistance (e.g., a capital injection) without which it would have become insolvent, or if it was acquired soon after its net worth declined to less than 1% of its assets. A bank was defined as acquired if it was purchased by an unrelated bank. A bank was defined as converted if it was consolidated into its parent company as a branch.

Table 1 displays definitions and summary statistics for the variables used to specify Equation (1). Financial variables were observed at the end of the fourth full quarter of operation for the de novo banks and at the end of the fourth quarter of the cohort groups (year-end 1980, 1982, and 1984) for the established banks. Unless indicated, all other variables were also observed at or near those dates. Exit dates were collected from the National Information Center (NIC) database; bank financials were constructed from the Reports of Condition and Income (call reports); Herfindahl indices were constructed from the Federal Deposit Insurance Corporation (FDIC) summary of deposit data; state job data were compiled from the Bureau of Labor and Statistics web site; and regulatory variables were taken from Amel (1993) and Calem (1994).

The summary data indicate that the de novo banks were more likely than the established banks to exit by failure, acquisition, or conversion. De novo banks were statistically more likely to be located in concentrated markets (HHI), in urban markets (URBAN), and in markets with strong employment growth during the 14-year event windows (MACRO).[5] The typical one-year-old de novo bank was smaller (ASSETS), was growing faster (ASSGROW), and was better capitalized (EQASS) than the typical established bank. De novo banks used more large deposit financing (BIGDEP), invested a larger portion of their assets in loans (LOAN), and spent proportionately more on salaries and physical plant (SPEND) than did established banks.[6]

2.2 De Novo Bank Policy Hypotheses

The OCC has in the past tended to rely on *ex post* market forces, rather than *ex ante* administrative guidelines, to determine which local markets could support a new commercial bank.[7] Consistent with this *laissez-faire* chartering philosophy, a large proportion of the de novo bank sample held federal charters (OCC). Given

TABLE 1

DESCRIPTIVE STATISTICS FOR VARIABLES USED IN MULTIVARIATE LOGIT MODEL

	1664 De Novo Banks		2371 Established Banks	
Percent survived the entire 14-year event window	31.01		52.47	
Percent failed during 14-year event window	22.84		8.10	
Percent acquired during 14-year event window	21.15		17.63	
Percent converted to branches during 14-year event window	24.64		21.81	
	Mean	Standard Deviation	Mean	Standard Deviation
YEAR8283 = 1 if the bank is in the 1982–1983 cohort	0.3708	0.4884	0.3551	0.4786
YEAR8485 = 1 if the bank is in the 1984–1985 cohort	0.3924***	0.4831	0.3210	0.4669
HHI = Herfindahl Index in bank's home city or county	0.1704**	0.1417	0.1595	0.1218
MACRO = average annual job growth in state during the 14-year event window (in %)	1.9429***	1.4967	1.7385	1.3693
MBHC = 1 if the bank is an affiliate in a multibank holding company	0.1412	0.3484	0.1455	0.3503
URBAN = 1 if the bank is located in an MSA	0.7614***	0.4263	0.6761	0.4679
DELAY = the length of any state prohibition on acquiring a de novo bank, in years	3.2224***	2.3505	2.3686	2.4209
LIMITS = 1 if the bank is in state with severe branching limits	0.5234	0.4996	0.5369	0.4988
OCC = 1 if the bank has federal charter	0.5859***	0.4927	0.2746	0.4496
ASSETS = total bank assets	47.0137***	28.2065	72.9447	38.2773
ASSGROW = asset growth rate during first year	1.8587***	1.6126	0.1106	0.1997
EQASS = equity/assets	0.1501***	0.0724	0.0912	0.0287
BIGDEP = (deposits larger than $100,000)/total assets	0.2408***	0.1413	0.0889	0.0747
LOAN = total loans/total assets	0.5727***	0.1639	0.5126	0.1290
SPEND = expenses on salaries, benefits, and premises per $1000 of assets	26.9095***	14.3249	20.9942	11.7035

NOTES: All financial variables are measured in 1985 dollars. De novo banks began operations between 1980:Q1 and 1985:Q4. Except where indicated, de novo bank variables were observed at the conclusion of the fourth full quarter of operation. Established banks were at least 20 years old, held less than $100 million of assets, had at least a 6% equity-to-assets ratio, and were located in the same geographic markets as the de novo banks. Except where indicated, all established bank variables were observed at year-end 1980, year-end 1982, or year-end 1984, based on established bank cohort. The superscripts ***, **, and * indicate that the de novo bank means are significantly different from the established bank means at the 1%, 5%, 10% levels, respectively. The data in this table were acquired from the *Reports of Condition and Income* (call reports); the National Information Center database; the Federal Deposit Insurance Corporation summary of deposits database; the Bureau of Labor and Statistics web site; Amel (1993); and Calem (1994).

the relatively easy federal chartering policy during the early stages of the sample period, one might reasonably expect OCC to be positively related to de novo bank failure.

Some states prohibit the acquisition of de novo banks until they are several years old. These regulations are supposed to prevent speculators from applying for bank charters, but in practice they may have secondary consequences, such as discouraging investment in start-up banks, supporting the acquisition prices of established banks, and restricting the menu of exit options for financially troubled de novo banks. If these secondary consequences outweigh the official intent of the prohibitions, DELAY could be positively related to de novo bank failure—for example, by preventing acquisitions, the prohibition could deny de novo banks access to external financial capital or management expertise. (This variable is specified as the natural log of DELAY + 1 in the logit model.)

In response to the large number of de novo banks that failed during the late 1980s and early 1990s, federal regulators imposed higher minimum capital levels on de novo banks. For example, the FDIC now requires all newly chartered banks to maintain Tier 1 capital equal to 8% of risk-based assets for their first three years, double the 4% Tier 1 ratio necessary for established banks to be considered "adequately capitalized. " A negative relationship between EQASS and de novo bank failure, combined with a less negative or non-negative relationship for established banks, will provide *ex post* support for these higher de novo capital minimums.

2.3 Other Failure Hypotheses

The probability of bank failure is expected to vary positively with the following variables. De novo banks in the 1982–1983 and 1984–1985 cohorts (YEAR8283 and YEAR8485) may have been more likely to fail because they had less time to mature prior to the onset of the banking recession. The intense competition faced by banks in urban markets (URBAN) should make them more likely to fail than rural banks are (although the opportunity for greater diversification in urban areas may offset this risk to some extent). Banks whose branch activities are restricted (LIMITS) will be relatively undiversified and less likely to survive local economic troubles.[8] Rapid asset growth (ASSGROW) is often associated with risky behavior, such as relaxed lending standards, that increase the chance of financial problems during an economic downturn. Banks that invest a large portion of their assets in loans (LOAN) will be less liquid and more exposed to credit risk than are banks with larger investments in government securities. Large deposit financing (BIGDEP) is expensive, and these uninsured depositors are likely to run should the bank get into trouble. Disproportionate spending on physical capital, premises, salaries, and benefits (SPEND) may indicate inefficient management and/or agency problems.

The probability of de novo bank and established bank failure is expected to vary negatively with the following variables. Banks in a highly concentrated markets (HHI) may be less likely to fail during economic downturns because they face little competitive rivalry. Banks in states with robust economies (MACRO) will be less likely to suffer loan quality problems. Banks affiliated with multibank holding companies (MBHC) may have access to greater financial resources and managerial expertise needed to deal with a financial crisis. Large banks (ASSETS) tend to be more diversified and may have higher quality managers, both of which can reduce the risk of failure. (This variable is specified as the natural log of ASSETS in the logit model.)

3. RESULTS

The multivariate logit results are reported in Table 1. For completeness, the estimated coefficients are displayed for all three exit states, and the probabilities and marginal probabilities are displayed for all four outcomes.[9] Because the main objective of this study is the financial fragility of de novo banks, most of the analysis in this section focuses on exit by failure.

For the de novo banks, nine of the 15 right-hand-side variables had statistically significant failure coefficients and/or statistically significant marginal probabilities of failure (first two columns of Table 2). As expected, de novo bank failure was positively related to urban location, large deposit financing, intensive lending

TABLE 2

Results from Multivariate Logit Models, Entire 1980–1998 Sample Period

A. De Novo Bank Model (N = 1664; log likelihood = −2055.92; chi-squared = 467.64; degrees of freedom = 45)

Outcome	Failed 19.3%		Acquired 24.4%		Converted 24.5%		Survived 31.8%
Predicted Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Marginal Probability
Constant	−0.7552	−0.1674	0.3958	0.0689	0.6604	0.1343	−0.0359
YEAR8283	0.1435	0.0294	−0.1316	−0.0299	−0.0179	−0.0022	0.0028
YEAR8485	−0.2482	−0.0102	−0.2284	−0.0080	−0.3744*	−0.0439	0.0621*
HHI	−2.3051***	−0.2627**	−0.0069	0.2282**	−2.0231***	−0.2650**	0.2997***
MACRO	−0.1087*	−0.0167**	−0.0049	0.0038	0.0065	0.0066	0.0065
MBHC	−0.2512	−0.1803***	0.9585***	0.0668*	2.0333***	0.3310***	−0.2175***
URBAN	0.6233***	0.0463	0.7647***	0.0931**	0.3116	−0.0176	−0.1218***
lnDELAY	0.2509**	0.0205	0.1946*	0.0122	0.1979*	0.0161	−0.0459***
LIMITS	0.1695	0.0319	−0.0903	−0.0229	−0.0285	−0.0079	−0.0012
OCC	−0.0500	−0.0232	0.1542	0.0204	0.1732	0.0252	−0.0224
lnASSETS	−0.5846**	−0.0701*	−0.2955	−0.0182	−0.1475	0.0180	0.0702*
ASSGROW	−0.0694	−0.0014	−0.1715**	−0.0267**	−0.0277	0.0084	0.0197**
EQASS	−1.6606	−0.0979	−2.1884*	−0.2525	−1.2186	−0.0161	0.3665*
BIGDEP	3.6858***	0.5697***	0.5229	−0.0506	−0.4378	−0.2868***	−0.2323**
LOAN	2.6046***	0.4417***	0.2775	−0.0087	−1.0455**	−0.3334***	−0.0996
SPEND	0.0113*	0.0014*	−0.0012	−0.0012	0.0079	0.0011	−0.0022

B. Established Bank Model (N = 2,371; log likelihood = -2486.74; chi-squared = 688.19; degrees of freedom = 45)

Outcome	Failed 4.7%		Acquired 19.1%		Converted 20.8%		Survived 55.4%
Predicted Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Marginal Probability
Constant	−0.5942	0.0439	−1.6057	−0.0167	−5.7012***	−0.8680***	0.8408***
YEAR8283	−3.1999***	−0.1795***	0.5668	−0.0029	3.0131***	0.5045***	−0.3222**
YEAR8485	−3.4206***	−0.1844***	0.3744	−0.0175	2.6827***	0.4600***	−0.2580*
HHI	−0.9034	−0.0302	−0.3199	−0.0099	−0.7885	−0.1081	0.1482
MACRO	−0.0382	−0.0030	0.0889*	0.0122	0.0489	0.0049	−0.0140
MBHC	1.0320***	0.0112	1.3777***	0.1113***	2.3290***	0.3182***	−0.4407***
URBAN	−0.2016	−0.0162	0.4072**	0.0514**	0.3392**	0.0416	−0.0768**
lnDELAY	0.6071***	0.0264***	0.1013	0.0096	0.0136	−0.0077	−0.0282**
LIMITS	0.6250***	0.0374***	−0.6137***	−0.0862***	−0.3626***	−0.0414**	0.0903***
OCC	0.3061*	0.0143*	0.0189	−0.0029	0.0699	0.0074	−0.0189
lnASSETS	−0.5058***	−0.0293***	0.1199	0.0014	0.5473***	0.0902***	−0.0623***
ASSGROW	0.8726***	0.0373**	0.0144	−0.0140	0.2086	0.0251	−0.0484
EQASS	−7.5367*	−0.1843	−9.5760***	−1.1330***	−7.0555***	−0.7060	2.0232***
BIGDEP	7.1453***	0.3286***	0.4328	0.0405	−0.9671	−0.2466*	−0.1225
LOAN	4.7078***	0.2235***	−0.3160	−0.0599	−0.7978*	−0.1650**	0.0014
SPEND	0.0166***	0.0007**	0.0056	0.0006	0.0039	0.0003	−0.0015

Notes: The superscripts ***, **, and * indicate significant difference from 0 at the 1%, 5%, 10% levels, respectively.

activity, and noninterest expenditures. Also as expected, de novo bank failure was negatively related to market concentration, macroeconomic conditions, holding company affiliation, and bank size. Regarding the three de novo policy variables, the coefficient on lnDELAY is positive and significant, suggesting that restrictions on acquiring de novo banks increase the likelihood that these banks fail. The coefficient on OCC is not statistically significant, which suggests that the Comptroller's market-based chartering policy allowed freer de novo entry without causing a higher rate of de novo failure. Finally, the model provides little support for the higher regulatory capital minimums imposed on de novo banks in the 1990s: the coefficient on EQASS is not statistically significant.

For the established banks, 12 of the 15 right-hand-side variables had statistically significant failure coefficients and/or statistically significant marginal probabilities of failure. As expected, established bank failure was positively related to branching restrictions, asset growth, large deposit financing, intensive lending activity, and noninterest expenditures. Also as expected, established bank failure was negatively related to bank size and capital levels. Established banks with federal charters had a slightly higher probability of failure, about 1.5% (0.0143) higher than established banks with state charters. Unexpectedly, the failure coefficients on MBHC and lnDELAY are positive and significant for established banks. The negative and significant coefficients on YEAR8283 and YEAR8485 have no economic meaning in the established bank regressions; they simply reflect the manner in which the established bank sample was constructed.[10]

The two models share some systematic similarities, but there are also some systematic differences across the two models. Five of the failure coefficients (on lnDELAY, lnASSETS, BIGDEP, LOAN, and SPEND) are statistically significant and have the same signs in both models; four of these are financial variables, which suggests that the financial determinants of failure are similar for de novo banks and established banks. The two remaining financial variables (ASSGROW and EQASS) have significant coefficients in the established model but not in the de novo bank model; the extreme volatility of asset growth and equity ratios at young banks (DeYoung 1999) may preclude these variables from giving clear distress signals in a long-run failure model. The coefficient on LIMITS is also significant for established banks but not for de novo banks, perhaps because branching is not a strategically important consideration for de novo banks until they are several years old. The environmental variables HHI, MACRO, and URBAN were statistically significant determinants of failure for de novo banks but not for established banks, suggesting that new entrants may be more sensitive than incumbents to local market conditions. A pseudo-Chow test rejects (at the 1% significance level) the hypothesis that the two models are the same and implies that the determinants of de novo exit/survival are different from the determinants of established bank exit/survival.

3.1 Non-Failure Exit States

The determinants of exit by acquisition were similar across the two models. Both de novo banks and established banks were more likely to be acquired if they were members of multibank holding companies or located in urban markets and were less likely to be acquired if they had high levels of equity capital. Overall, exit by acquisition was associated more often with market structure and environmental factors (six of the market structure or environment variables had statistically significant coefficients or marginal probabilities in either one or both of the two models: HHI, MACRO, MBHC, URBAN, lnDELAY, and LIMITS) than with bank behavior (only two of the bank behavior variables had statistically significant coefficients or marginal probabilities: ASSGROW and EQASS). Thus, for a group of investors starting a de novo bank for speculative purposes, choosing the "right" market may be more important for attracting a suitor than the bank's post-entry behavior.

Not surprisingly, the determinants of exit by conversion are dominated by MBHC affiliation. De novo bank affiliates and established bank affiliates were, respectively, 33% and 32% more likely to exit by conversion than independent banks (which had a 0% chance of exiting in this fashion). Large deposit financing and intense lending activity were also significantly related to conversion in both models but had much smaller marginal effects: a one standard deviation increase in either BIGDEP or LOAN reduced the probability of conversion by about 3%. This may indicate that multibank organizations isolated riskier affiliates outside the main bank to shield organizational assets, should these banks becomes insolvent.[11] The two models do not share any other common determinants of exit by conversion.

The marginal probabilities of survival are displayed in the far right-hand column of Table 2. Four of these marginal probabilities (MBHC, URBAN, lnDELAY and EQASS) were statistically significant and had the same signs in both models. Recall that the probability of survival is the complement of the combined probabilities of the three exit states. Thus, affiliates of multibank organizations were less likely to survive, chiefly due to a high probability of conversion; urban banks were less likely to survive, chiefly due to a high probability of acquisition; banks in states that delayed de novo acquisitions were less likely to survive, chiefly due to a high probability of failure; and well capitalized banks were more likely to survive, chiefly due to a low probability of acquisition.

3.2 Hazard Functions

It is clear from the raw data that the de novo banks were, on average, more likely than the established banks to exit by failure, by acquisition, or by conversion over the entire 14-year event window. However, these relative exit frequencies may have varied substantially from year to year as de novo banks grew and matured. To explore this notion, Equation (1) was estimated for a series of rolling three-year exit windows (i.e., exits during years 1–3, exits during years 2–4,…, exits during years 12–14) for both de novo banks and established banks. The right-hand-side of each three-year model was specified as in Table 2, with the exception that the MACRO variable was redefined to equal the growth rate in state employment during each three-year exit window. The exit probabilities generated in each three-year model can be interpreted as hazard rates because they are conditional on banks surviving up to the start of the exit window. Non-parametric hazard functions—the shapes of which are not constrained by any assumptions about the distribution of exit risk—can be formed by placing these hazard rates in sequence. Figure 1 displays the resulting failure, acquisition, and conversion hazard functions (respectively, in Figures 1A–1C) for de novo banks and established banks.

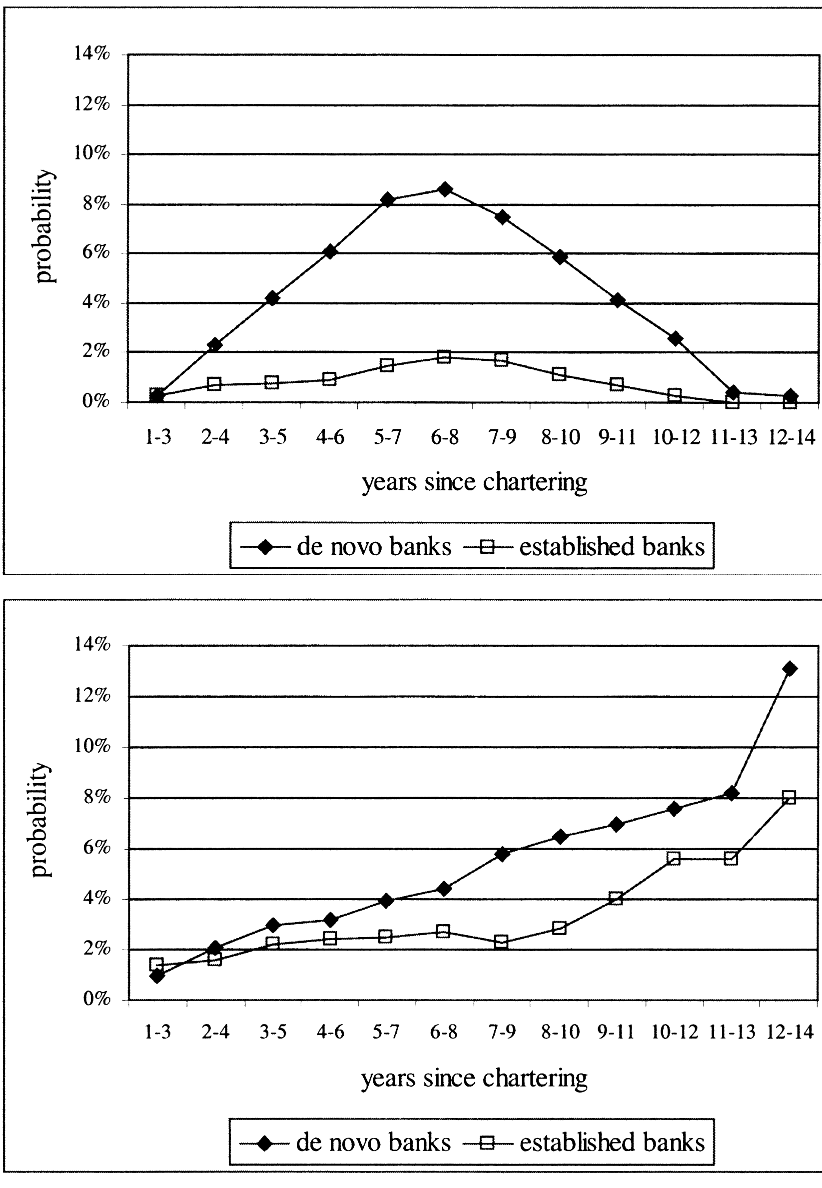

Fig. 1. (A) Nonparametric failure hazard functions. (B) Nonparametric acquisition hazard functions.

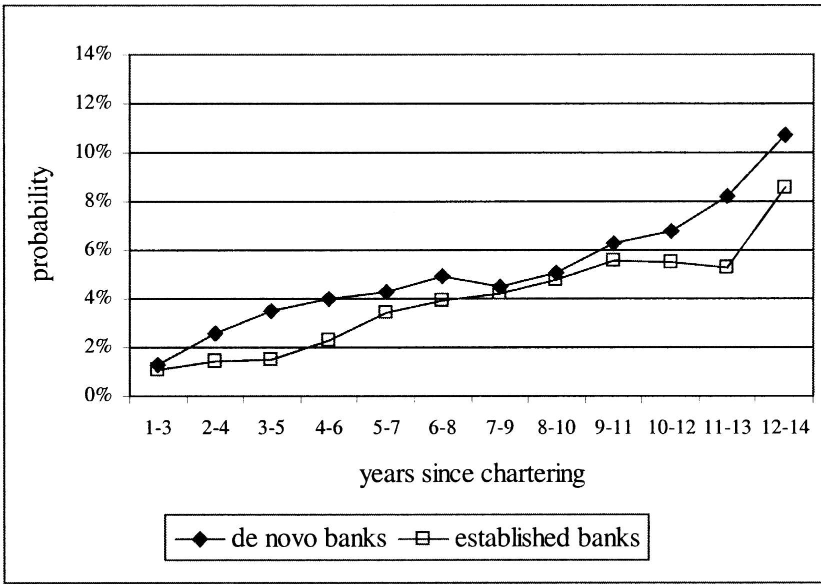

FIG. 1. (C) Nonparametric conversion hazard functions

The failure hazard functions have an inverted-U shape for both de novo banks and established banks, consistent with the bank failure wave that peaked roughly in the middle of the 1980–1998 sample period. The de novo failure hazard rate peaked almost five times higher than the contemporaneous peak for the established banks: a de novo bank that survived until it was 6–8 years old had a 8.6% probability of failing during those three years, compared with only 1.8% for established banks. Failure hazards declined after that for both sets of banks, and roughly converged during the 11 to 13-year window.[12] The acquisition and conversion hazard functions are increasing for both de novo banks and established banks, reflecting the continuous conversion of the banking industry during the sample period. De novo banks had a slightly lower acquisition hazard in the initial 1 to 3-year window, but this rate moved sharply higher as state restrictions on de novo bank acquisition began to expire. The conversion hazard rates follow similar, though less extreme, patterns for the two sets of banks.

The failure coefficients from the three-year models are summarized in Table 3. A "+" entry ("−" entry) indicates the coefficient in question was positive (negative) and significantly different from 0 at the 10% level. For established banks, the results conform closely to the main model (Table 2), and in addition the expected negative coefficients on HHI and MACRO are now statistically significant for some of the exit windows. Remarkably, broad financial strategies (e.g., LOAN and BIGDEP) established by one-year-old de novo banks were significantly associated with failure over a decade later. In contrast to the main model, EQASS was significantly associated

TABLE 3

Selected Results from Multivariate Logit Models Estimated for Rolling 3-Year Event Windows

A. De Novo Bank Models Event Window	1–3	2–4	3–5	4–6	5–7	6–8	7–9	8–10	9–11	10–12	11–13	12–14
N (banks surviving up to event window)	1664	1650	1609	1545	1436	1322	1206	1104	1014	932	844	776
Probability of Failure (failure hazard rate)	.003	.023	.043	.062	.081	.087	.074	.056	.037	.026	.004	.003
YEAR8283			+	+	+	+			−	−	−	−
YEAR8485		+	+	+	+		−	−	−	−	−	−
HHI		−	−	−	−							
MACRO		−	−	−				+	+	+		
MBHC		−		−	−	−						
URBAN							+					
lnDELAY				+	+	+			−	−		
LIMITS		−		+	+	+						
OCC						−			+			
lnASSETS	−	−	−		−	−	−					
ASSGROW	−											−
EQASS	−	−	−									
BIGDEP	+	+	+	+	+	+	+	+	+	+	+	+
LOAN	+	+	+	+	+	+	+	+	+		+	
SPEND			+	+				−				
B. Established Bank Models Event Window	**1–3**	**2–4**	**3–5**	**4–6**	**5–7**	**6–8**	**7–9**	**8–10**	**9–11**	**10–12**	**11–13**	**12–14**
N (banks surviving up to event window)	2,371	2,307	2,237	2,157	2,075	2,003	1,917	1,829	1,756	1,688	1,613	1,542
Probability of Failure (failure hazard rate)	.003	.007	.008	.009	.015	.018	.017	.011	.007	.003	.000	.000
YEAR8283		−	−	−	−	−						
YEAR8485		−	−	−	−	−	−					
HHI			−	−								
MACRO	−	−			−					−	−	−
MBHC				+							+	+
URBAN				-							−	
lnDELAY			+	+	+	+	+	+	+	+	+	
LIMITS				+	+	+	+	+				
OCC								+				+
lnASSETS	−	−	−	−	−	−						
ASSGROW	−	−				+	+	+	+	+		
EQASS	−	−	−	−								
BIGDEP	+	+	+	+	+	+	+	+	+			
LOAN	+	+	+	+	+	+						
SPEND								+	+			

Notes: +(−) indicates that the model in question generated a positive (negative) failure coefficient that was significantly different from 0 at the 10% level.

with de novo failure during each of the first three rolling exit windows; however, note that there is a similar result in Table 3 for the established banks, which suggests that the higher capital requirements imposed on de novo banks in the 1990s may have been just as usefully applied to small established banks.

Several of the coefficients changed signs as de novo banks grew and matured. The coefficients on YEAR8283 and YEAR8485 are an interesting case: as expected, banks launched just prior to the banking recession were more likely to fail in the short-term but less likely to fail in the long-run. (A plausible explanation is that banks that survived the recession at a young age had superior managers and thus were better equipped to survive troubles in later years.) To more closely investigate this relationship, the three-year rolling logit models were estimated separately for each of the three de novo bank cohorts. The resulting failure hazard functions are displayed in Figure 2, and they exhibit clear life-cycle effects. Each of the three de novo hazard functions exhibits the familiar inverted-U shape, but the failure hazard increases more slowly, peaks at a lower rate, and occurs later for the de novo banks that had more time to mature prior to the banking recession.

4. CONCLUSIONS

Recent research indicates that de novo banks tend to enter markets that have experienced mergers, and once there these new banks are likely to provide service for small businesses abandoned or dissatisfied by the merging banks. However, de novo banks can continue to provide these services only if they survive in the long-run, and their high rates of failure and acquisition work against this proposition. This study uses a multivariate logit model to estimate the long-run patterns of failure and acquisition for 1664 commercial banks chartered between 1980 and 1985, a

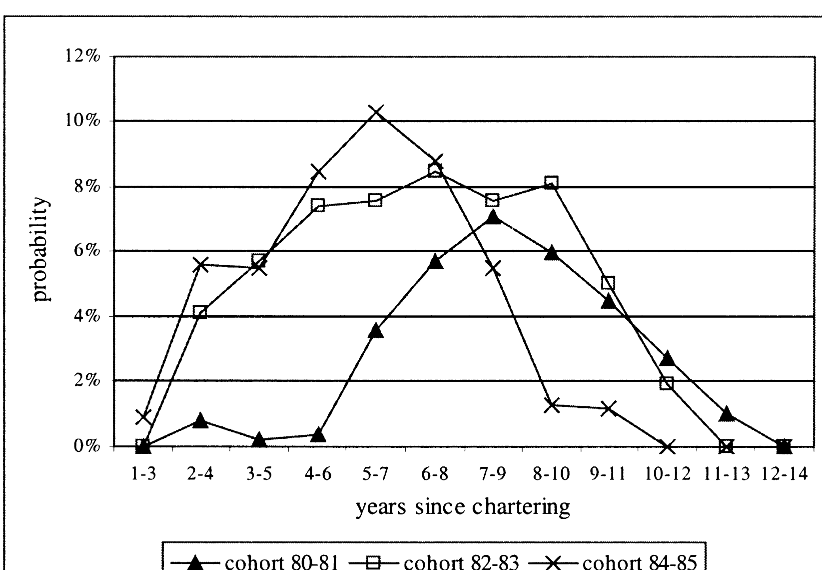

FIG. 2 Nonparametric failure hazard functions for de novo bank cohorts

period of especially intense chartering activity that immediately preceded the bank failure and bank merger waves of the late 1980s and early 1990s and compares the results with a benchmark group of 2371 small established banks.

Failure rates for de novo banks followed a life-cycle pattern (DeYoung 1999, 2003). Initially, new banks were no more likely to fail than small established banks but became substantially more likely to fail as fast growth and negative earnings eroded their start-up capital. De novo failure rates eventually declined and finally converged with those of established banks after about a decade, as the surviving de novos reached financial maturity. De novo bank fragility also depended on how this life cycle was positioned *vis à vis* the business cycle. *Ceteris paribus*, banks chartered just prior to the bank failure wave had higher failure rates, and tended to fail more quickly, than banks chartered just a few years earlier.

Aggressive lending activity, large deposit funding, and (to a lesser extent) poor cost control were significant long-run predictors of failure for both de novo banks and established banks. External market conditions such as strong competitive rivalry, slow economic growth, and urban location were significant predictors of de novo bank failure in all the models estimated here but were less systematically associated with established bank failure. Laws that restricted the acquisition of new banks tended to reduce the likelihood that these banks would survive in the long-run. There is evidence that higher minimum capital requirements for newly chartered banks would have reduced the failure rate for young banks, but there is no evidence that this protection was any more necessary for new banks than for small established banks. National de novo banks failed at rates similar to state-chartered de novo banks, suggesting that the OCC's historically *laissez-faire* chartering policy did not contribute to the high failure rates for newly chartered banks.

De novo banks were more likely to exit by acquisition (and to some extent by conversion) than established banks, even after controlling for ongoing industry consolidation and laws that restricted the acquisition of de novo banks in some states. The differences in acquisition rates were not as large as the peak differences in failure rates, but they persisted for the entire 1980–1998 sample period. For both sets of banks, the risk of acquisition was associated more closely with local competitive, economic, and regulatory factors than with bank financial ratios. If an investor group obtained a bank charter for the speculative purpose of selling that charter in the future, the results generated here suggest that the choice of a market would have been at least as important as the post-entry behavior of the bank.

Because these results were generated using data from new banks chartered during the 1980s, it is natural to wonder how prescriptive they are for the wave of new banks chartered in the late 1990s. On one hand, the removal of branching, interest rate, and product line restrictions over the past two decades may have increased the fragility of new banks by exposing them to increased competition and allowing them to take more risk. On the other hand, new banks are examined more frequently and required to hold larger capital cushions now than in the 1980s, deregulation has allowed banks greater opportunity for diversification, and new financial technologies allow well-managed banks to better control risk. If a de novo bank enters a consolidating local market, if it has a long-run commitment to that market (as opposed to a speculative motive), if it follows prudential financial procedures, and if it can avoid episodes of bad luck (e.g., economic downturns) that tend to affect new banks more severely than they do established banks, then the results presented here imply that it should have a chance of long-run survival similar to a small established bank.

NOTES

1. Between 1985 and 2000 the number of U.S. commercial banks with less than $500 million in assets declined by 5399 banks and their proportion declined from 74% to 60% of the industry population. In contrast, the number of banks with more than $1 billion in assets declined by only 25 and their proportion increased from 3% to 4.5% of the industry population.

2. Hughes, Mester, and Moon (2000) find that scale economies are available to banks of all sizes but argue that risk-taking and inefficient operations often preclude large banks from capturing these cost savings. Evanoff and Israilevich (1991) demonstrate that increasing returns to scale need not result in large absolute cost savings.

3. In contrast, Seeling and Critchfield (1999) found that de novo bank entry is less likely in the aftermath of mergers.

4. There were 1295 U.S. commercial bank failures between 1984 and 1992, a rate of over 140 bank failures per year. In comparison, only about 10 banks failed per year between 1966 and 1983, and only about 10 banks failed per year between 1993 and 2000 (FDIC web site).

5. It is not obvious *a priori* whether MACRO (which varied substantially over the 1980–1998 sample period) should be measured over the entire 14-year event window or observed near the beginning of the event window like the other environmental variables (which varied very little over 1980–1998). As a robustness check, the main tests were estimated three times, using MACRO14, MACRO5, and MACRO3. The coefficient on the MACRO variable was statistically significant more often using the 14-year definition, while none of the other results were materially affected.

6. In contrast to much of the previous literature, the model estimated here does not include potentially endogenous financial performance variables in the x vector, such as return-on-assets and nonperforming loans.

7. DeYoung and Hasan (1998) discuss the historical differences in state and federal chartering philosophies. State and federal chartering policies have tended to converge over time, due in part to the Federal Deposit Insurance Corporation Improvements Act of 1991 (FDICIA), which required the FDIC to approve all new federal and state bank charters.

8. The LIMITS variable reflects legal conditions in 1985, the final year in which de novo banks were observed for this study. Calem (1994) defined branching restrictions to be "severe" if banks were limited to five branch locations.

9. The probabilities of exit and survival are generated by evaluating Equation (1) using the estimated β coefficients and the mean values of the x variables.

10. The established banks that were randomly assigned to the 1980–1981 cohort were guaranteed to survive for a minimum of six years, but those that were randomly assigned to the 1982–1983 and 1984–1985 cohorts were only guaranteed to survive for a minimum of four years and two years, respectively.

11. Regulators and legislators have attempted to limit this type of behavior. The Federal Reserve has long advocated requiring bank holding companies to act as a "source of strength" for their bank subsidiaries, but Congress has not adopted this doctrine into law. However, when the FDIC is resolving an insolvent bank that is an affiliate of a multibank holding company, the current law does allow the FDIC to hold sister bank affiliates liable for any losses that the FDIC sustains.

12. This is consistent with the study of DeYoung and Hasan (1998), which concludes that the typical de novo bank does not become financially mature until it is at least nine years old.

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