The performance of de novo commercial banks: A profit efficiency approach

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Abstract

We examine the profit efficiency of US banks chartered between 1980 and 1994. Our results suggest that profit efficiency improves rapidly at the typical de novo bank during its first three years of operation, but on average takes about nine years to reach established bank levels. Excess branch capacity, reliance on large deposits, and affiliation with a multibank holding company are associated with low profit efficiency at de novo banks. De novo national banks are initially less profit efficient than are state-chartered de novos, perhaps reflecting differences in the chartering philosophy of federal and state bank regulators. © 1998 Elsevier Science B.V. All rights reserved.

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1. Introduction

The consolidation of the US banking industry since 1980 has featured thousands of bank acquisitions, reorganizations of multibank holding companies, and bank failures. Since 1980, over 6400 banks have been acquired or converted into branches and over 1400 banks have failed, resulting in a 28% reduction in commercial banks and a 36% reduction in commercial bank holding companies. Less well publicized are the more than 3100 new bank charters issued by federal and state bank regulators since 1980. As the industry continues to consolidate, actual and potential competition from de novo banks can help maintain competitive rivalry and thwart the exercise of market power.

To a large extent, this surge in new bank charters was an outgrowth of the wave of mergers and acquisitions associated with industry consolidation. Unemployed bank executives put themselves back to work by organizing new banks, and speculators attempted (often unsuccessfully) to profit by establishing new banks and then selling them as entry vehicles to expanding out-of-state banks. In addition, obtaining a national bank charter became easier in 1980 when the Office of the Comptroller of the Currency (1995) (OCC) began to pay less attention to the community’s capacity to support an additional bank, and began to pay increased attention to the quality of the proposed bank’s organizing group and operating plan. So long as these applicants could demonstrate managerial experience, ownership integrity, and financial strength, a new national charter would be awarded and the forces of competition would determine the bank’s fate. In contrast, state regulators continued to require (as

1 Sources: Rhoades (1996), Berger et al. (1995).


3 See “Displaced By Mergers, Some Bankers Launch Their Own Start-Ups”, Wall Street Journal, 1996 and “Years of Bank Mergers...” ibid. Rose (1988) concluded that existing studies “do not rule out the speculative motive in explaining at least some of the recent surge in independent bank chartering”, but that most de novo organizers “reasonably expect their banks to be viable competitors” and have no intention of selling.

4 See White (1992, p. 54) for a description of the OCC’s shift to a market-oriented chartering policy in 1980 and the subsequent impact of this policy change on the number of new national bank charters. The chapter on ‘Charters’ in the OCC’s Comptroller’s Corporate Manual (1995, p. 4) states that the OCC’s chartering policy remains market-oriented: “The marketplace is normally the best regulator of economic activity and competition within the marketplace promotes efficiency and better customer service”. The document goes on to state “It is not the OCC’s policy to ensure that a proposal to establish a national bank is without risk to the organizers or to protect exiting institutions from healthy competition from a new national bank”, and that “An organizing group and its operating plan must be stronger in markets where economic conditions are marginal or competition is intense”.

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had the OCC prior to 1980) applicants for bank charters to demonstrate that the markets they sought to enter could support an additional bank.  

Like business start-ups in other industries, most newly chartered banks incur initial losses followed by a number of years of low earnings. In this paper, we investigate how long it takes the typical de novo bank to get through this period of low profitability. We begin by estimating the profit efficiency of all small, urban, US commercial banks in 1988, 1990, 1992, and 1994. Next, we select subsamples of ‘de novo’ banks and ‘established’ banks from this population. Finally, we simulate a time path for de novo bank profit efficiency, and estimate how quickly de novo banks approach established bank efficiency levels. Our results should interest both bank investors and bank regulators – until it can operate efficiently, a new bank will not earn a satisfactory rate of return, nor will it be a strong rival for established banks.

Our findings both reinforce and extend the results in the existing literature. We find that the average one-year-old de novo bank is far less profit efficient than the average established bank. Although profit efficiency improves rapidly during its second and third years, the typical de novo bank does not reach established bank efficiency levels until it is nine years old. Additional tests show that newly chartered banks with multiple branch locations or large amounts of purchased funds financing tend to be profit inefficient, and that de novo affiliates of multibank holding companies tend to be less profit efficient than independent de novo banks. Our results also suggest that de novo national banks are initially less profit efficient than are state-chartered de novos, perhaps reflecting differences in the chartering philosophy of federal and state bank regulators.

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5 A variety of evidence points to the qualitative difference between federal and state chartering policies. In a study of de novo banks in New England, Dunham (1989) reported that, while federal chartering policy had been liberalized in 1980, “discussions with knowledgeable representatives of all six state banking commissions in New England indicated that no new legal or de facto bank charter policies have been introduced at the state level over the years”. De novo failure data from the 1980s and 1990s suggests that OCC chartering policies were more lenient, at least on average, than were state chartering policies. Bartholomew and Whalen (1996, Appendix, Table 1) show that about 23% of the national banks chartered between 1980 and 1994 failed during those years, compared to only about 13% of newly state chartered banks. Finally, despite that fact that only 30–35% of US commercial banks held national bank charters during our sample period, 47% of our de novo bank sample were granted federal charters, and 60% of the de novos in states that experienced unusually large bursts of de novo activity were granted federal charters (see Table 1 for additional data).
2. Relevant literature

We limit our review to studies examining the post-entry performance of de novo banks, with special emphasis on the relationship between de novo bank age and profitability. The related working paper (DeYoung and Hasan, 1997) reviews other topics in the literature, such as the determinants of de novo entry and the impact of de novo entry on market performance.

Two studies concluded that de novo banks are more sensitive to internal bank conditions than to external market factors. Arshadi and Lawrence (1987) constructed a performance index of profitability, loan yields, deposit rates, and market share for 438 three-year-old and five-year-old banks chartered between 1977 and 1979. They concluded that performance was most directly associated with factors within the control of managers – such as wage containment and growth rates – and was less affected by exogenous factors such as market concentration or per capita income. Hunter and Srinivasan (1990) studied the performance of 169 independent banks chartered in 1980, of which 96 were still operating as independent banks in 1988. The authors constructed a dichotomous ‘financial success’ variable equal to 1 if the bank’s return on assets (ROA) exceeded 80% of the median ROA for small banks (less than $100 million in assets) in the same geographic market. Using a probit model, they concluded that financial success was associated with effective credit policies, good expense controls, and high capitalization, but was not associated with market structure or economic conditions.

Organizational form has also been linked to de novo bank performance. Rose and Savage (1984) compared independent de novo banks to de novo affiliates of multibank holding companies (MBHCs) in 1972 and 1976. The authors found that the MBHC-sponsored de novos had riskier assets, incurred higher operating expenses, and paid higher dividends. In a later paper, Rose and Savage (1987) found that independent de novos accumulated market share somewhat faster than did MBHC-sponsored de novos between 1972 and 1983.

Brislin and Santomero (1991) found that de novo banks tend to specialize in single types of loans, especially real estate loans. While specialized business strategies require less expertise and may help a new bank find its market niche, low diversification increases portfolio risk.

Surprisingly, bank failure studies do not find an unusually high rate of failure among newly chartered financial institutions. Gunther (1990) concluded that de novo banks in Texas failed at high rates not because they were new banks, but because they engaged in relatively risky strategies (e.g., high concentrations of C&I loans, low liquidity, and reliance on purchased funds rather than core deposits). Huyser (1986) studied failure rates in the Tenth Federal Reserve District between 1970 and 1984, and found that de novo banks were more likely than established banks to fail during the 1970s when banking conditions were relatively stable, but were less likely to fail when conditions dete-
riorated in the early 1980s. Hunter et al. (1996) examined failure rates at thrift institutions chartered between 1980 and 1986, and found similar rates of failure between newly chartered and established thrifts. They linked a high likelihood of failure to inadequate capital, economic stress, operating inefficiencies, inability to manage expanded powers, rapid asset growth, and dependence on brokered funds.

Only a handful of studies examine the relationship between de novo bank performance and de novo bank age. Two of these studies observed a single year of data, then compared the performance of banks across age groups. Brislin and Santomero (1991) examined a cross section of one- and two-year-old banks at year-end 1989. Their data indicate that ROE and ROA increased rapidly during the first four quarters of new banks’ lives, but during the next four quarters leveled-off at only about half the level of established banks. The authors also found that de novos quickly achieve high ratios of loans-to-assets, and low ratios of securities-to-assets. Rose and Savage (1984) studied a cross section of banks that were between four- and eight-years-old in 1980. They found no relationship between age and profitability, but they did find that overhead expense ratios and deposit interest rates both declined with age.

Other studies have tracked the profitability of cohorts of banks chartered in the same year. Hunter and Srinivasan (1990) examined a biannual time series of ROA for de novo banks chartered in 1980. Relative to established banks, profitability at the average de novo bank improved from the third to the fifth year, and improved again from the fifth to the seventh year. The average seven-year-old de novo bank (the endpoint of the study) remained less profitable than the average established bank. Huyser (1986) examined a time series-cross section data set of 552 de novo banks chartered between 1971 and 1984. ROA for about half of these banks exceeded 80% of established bank levels after five full years, about two-thirds of these banks exceeded this benchmark after eleven full years, and about three-quarters exceeded this standard after 13 full years. Because Huyser used mostly pre-1980 data, these results may not be relevant for de novo banks operating in deregulated banking markets.

3. Data

Our primary data set consists of 16,282 observations on 5435 small, urban commercial banks at year-end 1988, 1990, 1992, and 1994. This biannual data panel is unbalanced due to failures, acquisitions, and de novo entry. We observe 2611 banks in all four years, 977 banks in three of the four years, 1005 banks in two years only, and 842 banks in just a single year.

Banks had to meet a number of conditions to be included in the primary data set. First, we only included banks with assets less than $500 million (in 1994 dollars). Banks larger than this may use different production technologies and
employ fundamentally different strategies than do small banks, and as such are not a good benchmark against which to judge de novo banks. Second, we only included banks headquartered in Metropolitan Statistical Areas (MSAs). Amel and Liang (1997) found that de novo entry affects rural markets differently than urban markets. Third, we only included banks that had been in existence for at least 12 months. (For example, we refer to banks chartered during 1993 but observed at year-end 1994 as one-year-old banks, and set the variable $\text{AGE} = 1$ for these banks.) Brislin and Santomero (1991) found that financial statements are quite volatile during the first few months of a bank’s life, which makes performance difficult to measure. Fourth, we excluded banks that made loans but did not take deposits (e.g., credit card banks), and vice versa. Fifth, we excluded a small number of banks for which complete information was not available to estimate the profit efficiency model.

Our general strategy is to separate relatively young banks into age groups, construct a time path that shows how profit efficiency improves as banks mature, and then compare that time path to the average level of profit efficiency at older, more established banks. To facilitate this strategy, we selected a ‘de novo’ bank subsample and an ‘established’ bank subsample from the primary data set. The de novo subsample contains all of the banks that were chartered after 1979, were no more than 14 years old, and had less than $50 million in assets (1994 dollars) at the end of the year in which they were chartered. 7 The 14 year threshold gives newly chartered banks more than enough time to develop successful strategies and exploit opportunities for learning, and was chosen because it matches the longest de novo time series extant in the literature (Huyser, 1986). This selection process yielded 4305 observations on 1579 ‘de novo’ banks. Of these banks, 536 are present in all four years of the subsample, while 372 banks, 351 banks, and 320 banks are present in only three years, two years, and one year, respectively.

6 We found similar relationships in our own data. Loans start out near zero but become the primary asset by the end of the first year. Equity dominates the financing mix at first, but deposits are the primary financing source by year’s end. Interest income, interest expense, and assets also increase rapidly during the first year.

7 Although the $50 million cut-off may exclude a few fast-growing de novos, it prevents established banks that received new charters as part of regulatory reorganizations, as well as established thrift institutions converting to bank charters, from being identified as de novo banks.
The established bank subsample contains banks greater than 14 years old, and was selected to have the same asset size distribution as the de novo bank subsample. It is crucial that the two subsamples have similar size distributions. A bank’s size can limit the production methods, risk strategies, distribution channels, and managerial talent that it has at its disposal, and estimates of profit efficiency can be very sensitive to bank size (DeYoung and Nolle, 1996). This selection process resulted in 4305 observations on 1514 ‘established’ banks. Of these banks, 664 are present in all four years of the subsample, while 216 banks, 354 banks, and 280 banks are present in only three years, two years, and one year, respectively.

Using multiple cross sections of data has a number of advantages. First, it is superior to a single cross section of data (Rose and Savage, 1984) because it allows us to observe each new bank up to four times during the first 14 years of its life. Second, it is superior to a single time series of data (Hunter and Srinivasan, 1990) because it includes banks of the same age that were chartered in different years. (For example, the three-year-old banks in our data set were variously chartered in 1985, 1987, 1989 or 1991.) This prevents a single cohort of banks, such as the new Texas banks that accounted for 40% of the new charters in 1983–1984, from dominating the results in one or more age groups. Finally, using four cross sections of data reduces the impact of survivor bias on our results. While the bounds of our data set prevent us from observing de novo banks that failed or were acquired prior to 1988, we do observe each de novo that failed or was purchased between 1988 and 1994 up to three times before it ceased to exist.

Table 1 displays descriptive statistics for the de novo bank and established bank subsamples, and includes all of the variables used in the profit efficiency model (1,2) and Tobit regression analysis (3) described in the following sections. All of the variables in Table 1 were constructed using data from the annual \textit{Reports of Condition and Income} (call reports), with the exception of the Herfindahl index which was constructed using annual \textit{Summary of Deposits} data.

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8 The established bank subsample was chosen as follows. Observations of banks more than 14 years old were grouped into 10 asset size categories ($0–$50 million, $50–$100 million, . . . , $450–$500 million). A different number of observations were then drawn (starting with the lowest bank identification number) from each category depending on the distribution of the 4305 de novo banks across the categories. The assets of the resulting established bank subsample averaged $55.97 million with a standard deviation of $49.64 million, compared to the de novo subsample average of $54.39 million and standard deviation of $48.70 million. We could not reject the null hypothesis the means of the two subsamples were equal at the 10\% level of significance.

9 Some amount of survivor bias is inevitable. Measured profit efficiency will probably be biased upward, because efficient banks are less likely to fail than are inefficient banks, and because acquiring banks tend to be more efficient than the banks they acquire. See DeYoung (1997) for evidence.
Table 1
Descriptive statistics for ‘de novo’ banks (1 ≤ AGE ≤ 14) and ‘established’ banks (AGE > 14)

<table>
<thead>
<tr>
<th></th>
<th>1 ≤ AGE ≤ 14</th>
<th>AGE &gt; 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>4305</td>
<td>4305</td>
</tr>
<tr>
<td><strong>Percentage of subsample:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988 data (YEAR88)</td>
<td>25.44%</td>
<td>28.66%</td>
</tr>
<tr>
<td>1990 data (YEAR90)</td>
<td>26.81%</td>
<td>26.23%</td>
</tr>
<tr>
<td>1992 data (YEAR92)</td>
<td>26.13%</td>
<td>24.83%</td>
</tr>
<tr>
<td>1994 data (YEAR94)</td>
<td>21.63%</td>
<td>20.28%</td>
</tr>
<tr>
<td>Independent banks</td>
<td>51.54%</td>
<td>29.92%</td>
</tr>
<tr>
<td>Affiliate in one-bank holding company</td>
<td>27.67%</td>
<td>43.28%</td>
</tr>
<tr>
<td>Affiliate in multibank holding company (MBHC)</td>
<td>20.79%</td>
<td>26.81%</td>
</tr>
<tr>
<td>Federal charter (FEDERAL)</td>
<td>47.15%</td>
<td>25.34%</td>
</tr>
<tr>
<td>chartered in California, 1981–1984 (CA)</td>
<td>11.08%</td>
<td>0%</td>
</tr>
<tr>
<td>chartered in Colorado, 1981–1982 (CO)</td>
<td>2.32%</td>
<td>0%</td>
</tr>
<tr>
<td>chartered in Texas, 1981–1986 (TX)</td>
<td>18.05%</td>
<td>0%</td>
</tr>
<tr>
<td>chartered in Florida, 1982–1989 (FL)</td>
<td>11.49%</td>
<td>0%</td>
</tr>
<tr>
<td>chartered in Illinois, 1991–1993 (IL)</td>
<td>0.58%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Means and (standard deviations):**

<table>
<thead>
<tr>
<th></th>
<th>1 ≤ AGE ≤ 14</th>
<th>AGE &gt; 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar years since chartering (AGE)</td>
<td>5.91</td>
<td>61.83***</td>
</tr>
<tr>
<td>(3.14)</td>
<td>(43.21)</td>
<td></td>
</tr>
<tr>
<td>Assets, in $ thousands</td>
<td>$54,393</td>
<td>$55,966</td>
</tr>
<tr>
<td>(48,697)</td>
<td>(49,641)</td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>0.0091</td>
<td>0.0149***</td>
</tr>
<tr>
<td>(0.0154)</td>
<td>(0.0094)</td>
<td></td>
</tr>
<tr>
<td>Equity-to-assets</td>
<td>0.0857</td>
<td>0.0867</td>
</tr>
<tr>
<td>(0.0450)</td>
<td>(0.0294)</td>
<td></td>
</tr>
<tr>
<td>Asset growth rate (ASSGROW)</td>
<td>0.2150***</td>
<td>0.0656</td>
</tr>
<tr>
<td>(0.4733)</td>
<td>(0.1737)</td>
<td></td>
</tr>
<tr>
<td>Loans-to-assets</td>
<td>0.6009***</td>
<td>0.5306</td>
</tr>
<tr>
<td>(0.1367)</td>
<td>(0.1429)</td>
<td></td>
</tr>
<tr>
<td>Transactions deposits-to-assets</td>
<td>0.2778***</td>
<td>0.2709</td>
</tr>
<tr>
<td>(0.1081)</td>
<td>(0.0855)</td>
<td></td>
</tr>
<tr>
<td>Noninterest income-to-net revenue (FEEREV)</td>
<td>0.1947***</td>
<td>0.1674</td>
</tr>
<tr>
<td>(0.1147)</td>
<td>(0.0879)</td>
<td></td>
</tr>
<tr>
<td>Wage rate, in $ thousands</td>
<td>$32.392***</td>
<td>$28.238</td>
</tr>
<tr>
<td>(9.923)</td>
<td>(7.164)</td>
<td></td>
</tr>
<tr>
<td>Rate on nontransactions deposits</td>
<td>0.0533</td>
<td>0.0549***</td>
</tr>
<tr>
<td>(0.0165)</td>
<td>(0.0143)</td>
<td></td>
</tr>
<tr>
<td>Rate on physical capital</td>
<td>0.5549***</td>
<td>0.4241</td>
</tr>
<tr>
<td>(0.7736)</td>
<td>(1.3035)</td>
<td></td>
</tr>
<tr>
<td>Herfindahl index (HHI)</td>
<td>0.1313</td>
<td>0.1345**</td>
</tr>
<tr>
<td>(0.0604)</td>
<td>(0.0673)</td>
<td></td>
</tr>
<tr>
<td>Market nonperforming loan ratio (MARKETNPL)</td>
<td>0.0226***</td>
<td>0.0171</td>
</tr>
<tr>
<td>(0.0149)</td>
<td>(0.0121)</td>
<td></td>
</tr>
<tr>
<td>Relative nonperforming loan ratio (RELNPL)</td>
<td>-0.0011</td>
<td>0.0009***</td>
</tr>
<tr>
<td>(0.0298)</td>
<td>(0.0206)</td>
<td></td>
</tr>
<tr>
<td>Employees-to-net revenue (FTEREV)</td>
<td>12.4062</td>
<td>12.8369**</td>
</tr>
<tr>
<td>(8.9111)</td>
<td>(5.9998)</td>
<td></td>
</tr>
</tbody>
</table>
The new bank charters in our data are distributed disproportionately across time, location, organizational form, and charter type. California de novos, which accounted for more than 10% of all new urban charters in each year from 1981 to 1984, compose about 11% of our de novo subsample. Only four other states accounted for more than 10% of new urban charters in any year: Colorado (1981–1982), Texas (1981–1986), Florida (1982–1989), and Illinois (1991–1993). About half of the banks in the de novo subsample were independent banks, but the data suggest a migration to holding company status as these banks mature. Nearly half of the de novos had federal charters, compared to a quarter of the established banks, evidence of the market-based chartering policy practiced by the OCC during the 1980s.

On average, the de novo banks produced more loans and transactions deposits per dollar of assets, more demand deposits per dollar of total deposits, and more noninterest income per dollar of net revenue, than did the established banks. The relative nonperforming loan ratio (i.e., a bank’s nonperforming loan ratio minus the MSA average nonperforming loan ratio) was negative for de novos, a likely reflection of the unseasoned loan portfolios at very young banks. These apparent output advantages did not translate into high profits.

Table 1 (Continued)

<table>
<thead>
<tr>
<th></th>
<th>1 ≤ AGE ≤ 14</th>
<th>AGE &gt; 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries-to-assets (SALASSETS)</td>
<td>0.0199***</td>
<td>0.0173</td>
</tr>
<tr>
<td></td>
<td>(0.0083)</td>
<td>(0.0057)</td>
</tr>
<tr>
<td>Branches-to-deposits (BRANCHDEP)</td>
<td>0.0876</td>
<td>0.0818</td>
</tr>
<tr>
<td></td>
<td>(0.4162)</td>
<td>(0.3986)</td>
</tr>
<tr>
<td>Large deposits-to-deposits (%LARGEDEP)</td>
<td>0.1595***</td>
<td>0.0902</td>
</tr>
<tr>
<td></td>
<td>(0.1013)</td>
<td>(0.0684)</td>
</tr>
<tr>
<td>Demand deposits-to-deposits (%DEMDEP)</td>
<td>0.1946***</td>
<td>0.1629</td>
</tr>
<tr>
<td></td>
<td>(0.0907)</td>
<td>(0.0689)</td>
</tr>
<tr>
<td>Loan concentration index (LOANCONC)</td>
<td>0.4693***</td>
<td>0.4459</td>
</tr>
<tr>
<td></td>
<td>(0.1237)</td>
<td>(0.1229)</td>
</tr>
</tbody>
</table>

ROA is the earnings before taxes, extraordinary items, and loan losses, divided by assets. MARKETNPL is the average nonperforming loan ratio for the MSA in which the bank is located. RELNPL is the difference between a bank’s nonperforming loan ratio and its MARKETNPL. LOANCONC is a Herfindahl index based on each bank’s portfolio share of business loans, consumer loans, and real estate loans. ASSGROW is the percentage growth in bank assets during the current year. Other variables are self-explanatory. Superscripts ***, **, and * indicate that the de novo bank mean is statistically larger than the established bank mean, or vice versa, at the 1%, 5%, or 10% significance levels, respectively.

10 Note that over 60% of the de novo banks in these states and time periods were chartered as national banks. Since only about 30–35% of US commercial banks during the 1980s and 1990s held national bank charters, this is a disproportionately high frequency. This suggests that the flurry of new banks in these states was due to economic or other conditions favorable to new banks, and was not due to short periods of lenient chartering policies by state bank regulators.
however, as de novo bank ROA was substantially lower than established bank ROA. Table 1 suggests a number of potential reasons for this. On average, de novo banks faced low Herfindahl indices and high market nonperforming loan ratios, conditions that typically depress profits. Asset growth was higher at de novo banks than at established banks, and de novos funded at least some of this asset growth with expensive large deposits (greater than $100,000). De novos also paid significantly higher wage rates and salaries per asset dollar than did established banks. 11

4. Estimating profit efficiency

We estimated separate econometric profit frontiers for banks in 1988, 1990, 1992, and 1994, using the data in our primary data set (i.e., not just the banks in the ‘de novo’ and ‘established’ subsamples). Estimating annual profit frontiers is more flexible than estimating a single multiyear profit frontier, because it allows all of the estimated coefficients to vary across time as technology changes. This approach yields up to four estimates of profit efficiency for each bank, depending on how many years the bank entered our unbalanced panel of data. We use a Fourier-flexible, nonstandard profit function to estimate the annual profit frontiers:

\[
\text{PROF} = a_0 + \sum_{i}^{3} \beta_i Y_i + \frac{1}{2} \sum_{i}^{3} \sum_{j}^{3} \beta_{ij} Y_i Y_j + \sum_{m}^{3} \gamma_m W_m
\]

\[
+ \frac{1}{2} \sum_{m}^{3} \sum_{n}^{3} \gamma_{mn} W_m W_n + \sum_{k}^{3} \phi_k Z_k + \frac{1}{2} \sum_{k}^{3} \sum_{l}^{3} \phi_{kl} Z_k Z_l
\]

\[
+ \sum_{i}^{3} \sum_{m}^{3} \rho_{im} Y_i W_m + \sum_{i}^{3} \sum_{k}^{3} \phi_{ik} Y_i Z_k + \sum_{m}^{3} \sum_{k}^{3} \phi_{mk} W_m Z_k
\]

\[
+ \sum_{i=1}^{9} [\delta_i \cos X_i + \theta_i \sin X_i] + \sum_{i=1}^{9} \sum_{j=1}^{9} [\delta_{ij} \cos (X_i + X_j)]
\]

\[
+ \theta_{ij} \sin (X_i + X_j)] + \sum_{i=1}^{9} \sum_{j=1}^{9} \sum_{k=1}^{9} [\delta_{ijk} \cos (X_i + X_j + X_k)]
\]

\[
+ \theta_{ijk} \sin (X_i + X_j + X_k)] + v + u. \tag{1}
\]

11 There are a number of potential reasons for high wages at de novo banks. Corporate officers might be paid higher salaries to compensate for that fact that new banks typically do not pay dividends. De novo banks may have to pay a premium to coerce experienced workers away from safe jobs at established banks. Differences in product mix between new and established banks may simply require a different mix of labor inputs. Confirming these speculations is beyond the scope of our study.
PROF is operating profits (earnings before taxes, extraordinary items, and loan losses). $Y$ is a vector of three outputs: total loans, transactions deposits, and fee-based financial services. $W$ is a vector of market prices for inputs, which we observe at the MSA level: the wage rate for labor, the interest rate for borrowed funds, and the price of physical capital. The profit function is conditioned on a vector of variables $Z$ that includes equity capital for each bank (to control for the increased costs of funds due to financial risk), a Herfindahl Index for each MSA (to control for differences in competitive rivalry across markets), and the average nonperforming loan ratio across the banks in each MSA (to control for differences in economic conditions across markets).

Eq. (1) is specified as a ‘nonstandard’ profit function (Pulley and Braunstein, 1992; Humphrey and Pulley, 1997). A ‘standard’ neoclassical profit function assumes that banks are price-takers in both input and output markets; the nonstandard profit function assumes that banks can set output prices. For example, banks tend to have pricing power in loan markets because changing lenders imposes informational costs on borrowers. Thus, our nonstandard profit function is specified in terms of input prices and output quantities ($\pi = f(W, Y)$), whereas standard profit functions are specified in terms of input prices and output prices ($\pi = f(W, P)$). Specifying profits as a function of output quantities rather than output prices has at least two empirical advantages. First, it avoids having to measure output prices, which are not available for transactions services and fee-based outputs and can only be imperfectly constructed for loan outputs. Second, output quantities tend to vary across banks to a greater degree than do output prices, and as a result explain a larger portion of the variation in profits in regression analysis.

Eq. (1) uses a Fourier-flexible functional form, a hybrid form that combines a quadratic profit function with a series of trigonometric, or Fourier, terms. By itself, the quadratic functional form is only a local approximation of the data – that is, it provides a good fit for banks with values of $Y$, $W$, and $Z$ close to the sample means but may provide a poor fit for banks located far from the means of the data (e.g., newly chartered banks that are especially small). Adding the trigonometric terms provides a global approximation of the profit function over the entire range of the data. The nine $X$ variables transform $Y$, $W$, and

---

12 Fee-based financial services equals noninterest income less service charges on deposit accounts. We net-out service charges because transactions-related outputs are already accounted for in the output vector $Y$.

13 Market input prices are unweighted averages of the bank-specific input prices within each MSA. Market prices are theoretically more appropriate than bank-specific prices, because the profit function assumes that inputs are purchased in competitive markets.

14 Because the nonstandard profit function does not contain output prices, our estimation routine does not restrict profits to be homogeneous of degree one in prices.
Z so that they fall on the interval $(0, 2\pi)$, the domain of the trigonometric functions.  

Bank cost efficiency studies have shown that a translog-Fourier hybrid fits the data better than does the standard translog cost specification (McAllister and McManus, 1993; Berger et al., 1994; Mitchell and Onvural, 1996; Berger and DeYoung, 1997). We substitute a quadratic form for the translog form here because the translog cannot be estimated for nonpositive values of profits.

The composite disturbance term $v + u$ captures random error plus any profit inefficiency (i.e., the shortfall below potential profit due to excess expenses and/or deficient revenues) that is unrelated to the regressors. The $v$ term represents random error and is assumed to be distributed normally with a zero mean, while the $u$ term represents dollars of profit inefficiency and is assumed to be distributed below the efficient frontier as a half normal random variable. Jondrow et al. (1982) showed that calculating the expected value of $u$ conditional on $v + u$ is a tractable way to separate the inefficiency term from the random error term, and we use this ‘stochastic frontier’ approach to generate separate estimates of $v$ and $u$ for each bank. Because large banks naturally generate more dollars worth of profit than do small banks, we re-scale $u$ in terms of potential profits as follows:

$$
\text{EFF}_i = \begin{cases} 
\frac{\pi_i}{(\pi_i + u_i)} & \text{if } \pi_i \geq 0, \\
0 & \text{if } \pi_i < 0
\end{cases}
$$

(2)

where $\pi_i + u_i$ equals potential profit (i.e., the profit that bank $i$ would have earned had it operated on the efficient profit frontier). EFF measures percent profit efficiency, is bounded from below at 0 for the most profit inefficient banks, and approaches 1 for the most profit efficient banks. A substantial number of newly chartered banks had both negative profits $\pi$ and negative potential profits $\pi + u$. To maintain a monotonic efficiency ordering, we set EFF to zero for banks with negative $\pi$.

Including the market average nonperforming loan ratio in the profit equation bears special mention. This variable is superior to more standard economic condition variables (such as regional GDP growth rates or unemployment rates) because it stresses the portion of economic conditions that are most relevant to banks. Averaging the nonperforming loan ratios across all the banks in the MSA makes this ratio superior to the bank-specific nonperforming loan ratio, which can be endogenous to the profit efficiency (EFF) of the bank. Several recent papers advance hypotheses concerning the relationships between

---

15 See Berger et al. (1994) for a detailed description of these transformations. Due to the limits of our software, we could not include all of the Fourier transforms in Eq. (1). We included the transforms of the $Y$ terms only, because outputs have more variation across banks than either input prices $W$ or the control variables $Z$. 
efficiency and loan quality at banks, but these relationships are not yet fully understood.\textsuperscript{16} We choose to leave the loan quality of individual banks out of the profit function, but to control for it in later stages of our analysis.

5. Results

Descriptive statistics for estimated EFF are displayed in Table 2. Overall, estimated profit efficiency EFF averaged 0.5113, had a standard deviation of 0.2799, and ranged from 0 to 0.9958. Hence, the average bank would have approximately doubled its earnings (before taxes, extraordinary items, and loan losses) had it been able to operate on the efficient profit frontier. This estimate falls at the high end of most previous estimates of bank profit efficiency. Berger et al. (1993), DeYoung and Nolle (1996) and Akhavein et al. (1997) each found profit inefficiencies that, if eliminated, would at least double return on assets at the average bank.\textsuperscript{17} The distribution of EFF shifts up and becomes tighter with time, which likely reflects the improvements in banking conditions as well as the exit of weak competitors from the industry over the sample period. For all four years, an \textit{F}-test rejected (at the 1\% level) the null hypothesis that the coefficients on the Fourier terms were jointly equal to zero.

5.1. The time path for de novo bank profit efficiency

Table 3 reports average EFF by age group for the banks in the ‘de novo’ subsample, as well as the overall average for the ‘established’ bank subsample.

\textsuperscript{16} Berger and DeYoung (1997) and Hughes and Mester (1993) discuss bank efficiency and loan quality.

\textsuperscript{17} Humphrey and Pulley (1997) found that profit inefficiency equals only 15–20\% of ROA. Their small estimates are likely due to their thick frontier method, which truncates banks with very high and very low profits.
Table 3
Profit efficiency (EFF) by age of bank

<table>
<thead>
<tr>
<th>AGE</th>
<th>De novo subsample</th>
<th></th>
<th>Expanded subsample</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$</td>
<td>Mean</td>
<td>Standard deviation</td>
<td>$N$</td>
</tr>
<tr>
<td>1</td>
<td>283</td>
<td>0.1253 $^a$</td>
<td>0.1684</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>384</td>
<td>0.2492 $^a$</td>
<td>0.2124</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>425</td>
<td>0.3198 $^a$</td>
<td>0.2349</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>515</td>
<td>0.3307 $^a$</td>
<td>0.2585</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>484</td>
<td>0.3785 $^a$</td>
<td>0.2646</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>496</td>
<td>0.3835 $^a$</td>
<td>0.2619</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>395</td>
<td>0.4129 $^a$</td>
<td>0.2770</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>414</td>
<td>0.4154 $^a$</td>
<td>0.2674</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>265</td>
<td>0.4650</td>
<td>0.2718</td>
<td>347</td>
</tr>
<tr>
<td>10</td>
<td>271</td>
<td>0.4523</td>
<td>0.2726</td>
<td>331</td>
</tr>
<tr>
<td>11</td>
<td>132</td>
<td>0.5215 $^a$</td>
<td>0.2648</td>
<td>265</td>
</tr>
<tr>
<td>12</td>
<td>141</td>
<td>0.4549</td>
<td>0.2803</td>
<td>254</td>
</tr>
<tr>
<td>13</td>
<td>45</td>
<td>0.4338</td>
<td>0.2779</td>
<td>241</td>
</tr>
<tr>
<td>14</td>
<td>55</td>
<td>0.4624</td>
<td>0.2649</td>
<td>259</td>
</tr>
<tr>
<td>All de novo banks</td>
<td>4305</td>
<td>0.3646 $^a$</td>
<td>0.2694</td>
<td>–</td>
</tr>
<tr>
<td>Established banks</td>
<td>4305</td>
<td>0.4575</td>
<td>0.2365</td>
<td>–</td>
</tr>
</tbody>
</table>

Combined data from 1988, 1990, 1992, and 1994. AGE is the number of whole calendar years elapsed since chartering.

$^a$ Significantly different from 0.4575, the profit efficiency of the average established, at the 1 percent level in two-tailed tests.

Fig. 1. Simulated time path for de novo bank profit efficiency.
Fig. 1 displays the same information graphically, and can be interpreted as the time path of profit efficiency for the typical de novo bank. EFF averages 0.1253 for one-year-old banks, which is significantly less (at the 1% level) than the average of 0.4575 for the 4305 established banks in our asset size-matched subsample. 18 De novo bank profit efficiency improves rapidly during years 2 and 3, improves more slowly between years 3 and 9, and levels off after that. The average de novo bank is significantly less profit efficient than the average established bank for every year between age = 1 and age = 8, and remains at least as profit efficient as the average established bank thereafter. De novo profit efficiency is actually higher than established bank profit efficiency in year 11, but this is because 11-year-old banks come disproportionately from the more profit efficient 1990, 1992, and 1994 cross sections. When we expand the de novo subsample to include banks between 9 and 14 years old that were chartered before 1980 (the de novo subsample includes only banks chartered after 1979), the year 11 result vanishes and the overall time path in Fig. 1 becomes more smooth.

These results both reinforce and extend the existing de novo bank literature. Like Brislin and Santomero (1991), we find substantial improvement in de novo profitability during year 1. Unlike Rose and Savage (1984), we find a strong relationship between age and performance for banks between 4 and 8 years old. Like Hunter and Srinivasan (1990), we find that seven-year-old banks still lag behind established banks. Unlike Huyser (1986), we find that de novo profitability stops improving after 9 years. Our results also contain some information about the riskiness of newly chartered banks. The standard deviation of EFF is significantly higher (at the 1% level) for de novo banks (0.2694) than for established banks (0.2365), despite the fact that mean EFF is significantly lower for de novos (0.3646 versus 0.4575). However, this result must be considered in light of other potentially offsetting information from Table 1, such as the fact that de novo banks tend to have fewer nonperforming loans.

5.2. The determinants of profit efficiency in de novo banks

The profit efficiency differences between de novo banks and established banks probably depend on other characteristics in additional to bank age.

18 To perform this test of significance, we constructed a data set that included the 4305 established bank observations plus the 283 one-year-old de novo banks. For these data, we used Tobit regression techniques to regress EFF on a dummy variable that equaled one for the one-year-old banks and zero otherwise. The chi-square statistic for the estimated dummy variable coefficient provided the test.
To investigate, we regressed EFF on a set of economic, regulatory, structural, and financial variables:

\[ \text{EFF} = \text{EFF}(\text{AGE}, \text{HHI}, \text{MARKETNPL}, \text{CA}, \text{CO}, \text{FL}, \text{IL}, \text{TX}, \text{YEAR90}, \text{YEAR92}, \text{YEAR94}, \text{MBHC}, \text{FEDERAL}, \text{ln ASSETS}, \text{RELNPL}, \text{ASSGROW}, \text{SALASSETS}, \text{FTEREV}, \text{BRANCHDEP}, \%\text{DEMDEP}, \%\text{LARGEDEP}, \text{FEEREV}, \text{LOANCONC}) + \epsilon \]  

(3)

using Tobit estimation techniques to account for the truncated distribution of EFF. For the de novo subsample, we estimated Eq. (3) separately for the 1607 banks between 1 and 4 years old, for the 1708 banks between 5 and 8 years old, and for the 909 banks between 9 and 14 years old. Similarly, we separated the established bank subsample into 938 banks between 15 and 24 years old, and 3364 banks more than 24 years old. We chose these age cut-offs based on the literature (e.g., Rose and Savage, 1984), on the changing shape of the time path of EFF in Fig. 1, and on our desire to have roughly similar numbers of banks in adjoining age groups.

Statistical summaries for all of the right-hand-side variables appear in Table 1. We include a number of variables to control for economic conditions. The Herfindahl index, HHI, is a proxy for the degree of competitive rivalry in the MSA, and should have a positive coefficient if concentration leads to higher prices and profits. The average nonperforming loan ratio in the MSA, MARKETNPL, controls for inter-MSA differences in the economic conditions facing banks, and should have a negative effect on profit efficiency. Two additional sets of variables control for broader based economic conditions. The dummy variables CA, CO, FL, IL, and TX, respectively, equal one in years in which California, Colorado, Florida, Illinois, and Texas experienced a disproportionate share of overall de novo activity (see Table 1). The dummy variables YEAR90, YEAR92, and YEAR94 identify the year each data point was observed (YEAR88 is excluded to avoid perfect collinearity), and are included

---

19 A number of the arguments in Eq. (3) also appear as arguments in the profit function (1). Denote these shared variables by $X_{SH}$. Including $X_{SH}$ in Eq. (3) will not cause bias or inefficiency in the estimation. Recall that EFF is constructed from both $\pi$ (which is observed) and $u$ (which is estimated). $X_{SH}$ will affect EFF only through its impact on $\pi$, because by definition $X_{SH}$ is orthogonal to $u$.

20 We also estimated these three models after excluding 897 observations of banks that experienced nontrivial changes in organizational form between the time they were chartered and the year in which they were observed in the sample. The results were quite similar to those shown below for the entire de novo subsample, and are contained in the related working paper (DeYoung and Hasan, 1997).

21 We lacked complete regression data for three of the established banks.
to reflect changes in the distribution of estimated profit efficiency across time that are not accounted for by the other right-hand-side control variables.

We also control for bank-specific conditions that are beyond the control of the bank in the short run. MBHC is a dummy variable equal to one for banks that are affiliates of multibank holding companies, and will have a negative coefficient if, as found by Rose and Savage (1984, 1987), independent de novo banks are more successful than holding company de novos. FEDERAL is a dummy variable equal to one for banks with national charters, and will have a negative coefficient if the typical de novo national bank is less profit efficient than the typical state-chartered de novo bank. The natural log of assets, ln ASSETS, controls for size effects that were not neutralized by the scaling adjustment in Eq. (2).

The remainder of the right-hand-side variables are relatively standard measures of bank performance. We expect the coefficient on RELNPL, the difference between each bank’s nonperforming loan ratio and MARKETNPL, to be negative because nonperforming loans reduce bank revenues and increase loan monitoring expenses. Hunter et al. (1996) found a positive relationship between growth rates and the failure rate of newly chartered thrifts, which leads us to expect a negative coefficient on ASSGROW, the rate at which bank assets grew over the previous 12 months. We include the ratios of salaries-to-assets, employees-to-net revenues, and branches-to-deposits (respectively, SALASSETS, FTEREV, and BRANCHDEP) to measure the impact of overhead expenses on profit efficiency, and expect negative coefficients on all three of these variables. We expect a positive coefficient on %DEMDEP, the ratio of demand deposits-to-total deposits, because banks pay no interest on demand deposits and because these deposits indicate the presence of core customers to whom the bank can cross-sell other financial services. We expect a negative coefficient on %LARGEDEP, the ratio of large deposits-to-total deposits, because these are volatile and expensive balances typically purchased by banks that cannot fund their growth with core deposits. The coefficient on FEEREV, the ratio of noninterest income-to-net revenues, will be positive if nonlending activities are more profitable at the margin than lending activities, or if profit efficient banks do a better job cross-selling financial services. Brislin and Santomero (1991) found that de novo banks tend to have specialized lending strategies, and the coefficient on the loan portfolio concentration index LOANCONC tests whether such specialization affects profit efficiency.

Table 4 displays the results of the Tobit regressions. After controlling for economic, regulatory, structural, and financial conditions, the relationship between AGE and profit efficiency remains similar to that shown in Table 3 and Fig. 1. For banks between 1 and 4 years old, a one year increase in AGE is associated with a statistically significant 3.18 percentage point increase in profit efficiency. The annual increase for banks between 5 and 8 years old is only 0.87 percentage points per year, but is still statistically different from zero.
Table 4
Tobit regressions by age of bank

<table>
<thead>
<tr>
<th>Age Range</th>
<th>1 ≤ Age ≤ 4</th>
<th>5 ≤ Age ≤ 8</th>
<th>9 ≤ Age ≤ 14</th>
<th>15 ≤ Age ≤ 24</th>
<th>Age &gt; 24</th>
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</thead>
<tbody>
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<td>Intercept</td>
<td>-1.4784***</td>
<td>-1.4784***</td>
<td>-1.2416***</td>
<td>-1.6050***</td>
<td>-1.3747***</td>
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<td></td>
<td>0.0471</td>
<td>0.0486</td>
<td>0.1315</td>
<td>0.1149</td>
<td>0.0438</td>
</tr>
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<td>AGE</td>
<td>0.0318***</td>
<td>0.0087*</td>
<td>-0.0010</td>
<td>0.0026</td>
<td>0.0000</td>
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<tr>
<td></td>
<td>0.0056</td>
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<td>0.0055</td>
<td>0.0020</td>
<td>0.0001</td>
</tr>
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<td>MBHC</td>
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<td>-0.0534***</td>
<td>-0.0448**</td>
<td>-0.0153</td>
<td>-0.0081</td>
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<tr>
<td></td>
<td>0.0124</td>
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<td>0.0179</td>
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<td>0.0065</td>
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<td>FEDERAL</td>
<td>-0.0271***</td>
<td>-0.0010</td>
<td>-0.0144</td>
<td>-0.0201</td>
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</tr>
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<td>YEAR94</td>
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<tr>
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<td>CO</td>
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<tr>
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<td>0.1978***</td>
<td>0.2079***</td>
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</tr>
<tr>
<td></td>
<td>0.0092</td>
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<tr>
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<td>0.2567**</td>
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<td>-4.6617***</td>
<td>-5.3298***</td>
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<td>FEEREV</td>
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<td>-0.2280***</td>
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<td>-5.6802***</td>
<td>-9.1911***</td>
<td>-4.6777***</td>
<td>-5.7682***</td>
<td>-4.8671***</td>
</tr>
<tr>
<td></td>
<td>0.8433</td>
<td>0.9730</td>
<td>0.9786</td>
<td>1.2687</td>
<td>0.6570</td>
</tr>
<tr>
<td>FTEREV</td>
<td>-0.0266***</td>
<td>-0.0114***</td>
<td>-0.0176***</td>
<td>-0.0072***</td>
<td>-0.0101***</td>
</tr>
<tr>
<td></td>
<td>0.0015</td>
<td>0.0010</td>
<td>0.0019</td>
<td>0.0008</td>
<td>0.0006</td>
</tr>
<tr>
<td>%DEMDEP</td>
<td>0.1285*</td>
<td>0.0749</td>
<td>-0.1896**</td>
<td>0.5833***</td>
<td>0.2155***</td>
</tr>
<tr>
<td></td>
<td>0.0676</td>
<td>0.0629</td>
<td>0.0801</td>
<td>0.0958</td>
<td>0.0506</td>
</tr>
<tr>
<td>%LARGEDEP</td>
<td>-0.1498***</td>
<td>0.1010</td>
<td>0.0429</td>
<td>-0.0904</td>
<td>-0.0667</td>
</tr>
<tr>
<td></td>
<td>0.0518</td>
<td>0.0589</td>
<td>0.0899</td>
<td>0.0855</td>
<td>0.0444</td>
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The regressions show no significant relationship between AGE and EFF after 9 years, consistent with our earlier conclusion that experience effects have largely run their course by this time.

Some of the starkest differences across equations occur for the youngest de novo banks. The coefficients on FEDERAL, BRANCHDEP, and %LARGE-DEP are negative and significantly different from zero only for banks between 1 and 4 years old. The significantly negative coefficient on FEDERAL for these banks indicates that very young de novo national banks initially perform more poorly than do very young state-chartered de novo banks. This difference is not present for banks that are more than 4 years old, which suggests that poorly performing de novo national banks either become more profit efficient or exit the market (via acquisition or failure) relatively quickly. These results may reflect fundamental differences between the chartering philosophies of the OCC, which tends to rely ex post on the marketplace to regulate economic activity, and the typical state bank regulator, which tends to base the chartering decision on the ex ante likelihood that the applicant will be able to operate profitably in its proposed local market (see footnotes 4 and 5). The results for BRANCHDEP suggest that branch offices represent costly excess capacity for new banks, but that as banks become more established they manage to offset these expenses by using the additional branches to attract low-cost deposits. Along a similar vein, the results for %LARGEDEP suggest that newly chartered banks have trouble attracting core deposits, and have to purchase more expensive large deposits as a substitute.

Three variables – MBHC, FEEREV, and HHI – have significant coefficients for all three de novo age groups but not for established banks. MBHC is

<table>
<thead>
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<th>Table 4 (Continued)</th>
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<tr>
<td>1 ≤ Age ≤ 4</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>LOANCONC</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>Left censored</td>
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<tr>
<td>Log likelihood</td>
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</tbody>
</table>

Dependent variable in all regressions is EFF. Equations [1]–[3] include ‘de novo’ banks. Equations [4] and [5] include ‘established’ banks. Standard errors appear under coefficient estimates. Coefficients with ***, **, and * are statistically different from zero at the 1%, 5%, and 10% levels of significance.

The conclusion is consistent with the data presented by Bartholomew and Whalen (1996) (and cited above in footnote 5) which shows that de novo national banks chartered between 1980 and 1994 were more likely to fail (23%) than were de novo state banks (13%).
significantly negative for the de novo banks. Because multibank companies
generate earnings from multiple sources, they can afford to trade initial profits
for, say, faster market penetration. Without such outside sources of strength,
managers at new independent and one-bank holding companies may face a
greater incentive to generate profits quickly. The coefficient on FEEREV are
significant and positive for the de novo banks, but diminish in size as these
banks mature. It may be the case that very young banks already have in place
the excess capacity necessary to generate these revenues (labor and office space)
and as such can generate marginal amounts of these services in a less costly
fashion than can established banks. The coefficient on HHI is significant and
positive for all three de novo age groups, remains significant but gets smaller
for the 15- to 24-year-old banks, and loses its significance for the oldest group
of banks. These results suggest that de novo banks benefit more than do estab-
lished banks from operating under concentrated market conditions, or, in oth-
er words, de novo banks have a particularly difficult time earning profits under
competitive market conditions.

Four variables, SALASSETS, FTEREV, MARKETNPL, and RELNPL,
retain negative and statistically significant coefficients in all of the age groups,
although some of these coefficients vary in size across age groups. For example,
the very youngest banks (1 \( \leq \) AGE \( \leq \) 4) are relatively more sensitive to FT-
REV, while the most established banks (AGE > 24) are relatively less sensitive
to MARKETNPL. The latter result suggests that learning to handle exogenous
economic shocks is a very long-run process that requires a bank to be exposed
to several business cycles, or that relatively old banks small enough to remain
in our sample simply practice low-risk business strategies.

The control variables for size, state, and year tend to be statistically signifi-
cant throughout. The coefficient on ln ASSETS is positive and nearly the same
magnitude for all age groups. Banks that were chartered amidst the flurry of de
1993) performed relatively poorly. This may reflect the difficulty of establishing
a new business in a crowded marketplace, or (as with the Texas de novos)
downturns in local real estate markets. The coefficients on YEAR90, YEAR92,
and YEAR94 suggest intertemporal changes in profit efficiency very different
from those shown in Table 2. After controlling for market, regulatory, struc-
tural, and financial conditions, profit efficiency actually diminished across time
for the average bank, especially the youngest banks. For example, one- to four-
year-old de novos were about 15 percentage points less profit efficient in 1994
than in 1988, suggesting that the climate for de novo entry worsened over this
time period.
6. Conclusions

This paper adds to a small empirical literature that attempts to identify the age at which newly chartered commercial banks attain levels of profitability comparable to those recorded by established banks. Rather than relying on simple accounting ratios, we measure profitability using an efficient profit frontier model that takes into account differences in output mix, market prices, and economic conditions. We apply the model to a panel of data on 1579 de novo banks chartered in the US between 1980 and 1993. This data set allows us to track the performance of de novo banks for up to 14 years after they were chartered.

We find that the average established bank is about 50% profit efficient, an estimate that is slightly lower than those found in most previous studies of bank profit efficiency. The average de novo bank, however, is only about 12% profit efficient after its first full year of operation. Although its profit efficiency improves rapidly over the next two years, the typical de novo bank does not become as profit efficient as similar-size established banks until it is nine years old. Profit efficiency levels off between years 9 and 14, and there is no statistical difference between the profit efficiency of de novos and established banks over this time period. These results confirm the picture that can be constructed by piecing together the results of existing studies, and also fill in some of the gaps left by these studies, such as identifying the age at which the profitability of de novo banks stops improving.

We also identify a number of economic, regulatory, structural, and financial conditions associated with de novo profitability. For example, our results suggest that newly chartered banks do not exploit multiple branch locations or purchased funds financing as well as established banks, and that new affiliates of multi bank holding companies are initially less profit efficient than independent de novo banks. We also find that de novo national banks are initially less profit efficient than are state-chartered de novos, perhaps reflecting differences in the chartering philosophy of federal and state bank regulators. This performance difference disappeared once banks became more than four-years-old.

We find little to suggest that de novo entry should be made either easier or more difficult. The bank chartering and deposit insurance authorities in the US currently require newly chartered banks to have enough initial capital to offset three years worth of losses and low earnings. This requirement is roughly consistent with our finding that, by its third year, the average de novo bank has closed the lion’s share of the profit efficiency gap between itself and its established bank rivals. Although we also find that de novo banks continue to underperform established banks for the next six years, this calls for close supervisory vigilance of de novos through their ninth year, not a tighter chartering policy.
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