BIRTHS, DEATHS, AND MARRIAGES IN THE U.S. COMMERCIAL BANKING INDUSTRY

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Regulatory change not seen since the Great Depression swept the U.S. banking industry beginning in the early 1980s and culminated with the Interstate Banking and Branching Efficiency Act of 1994. This article examines whether deregulation affected new charter (birth), failure (death), and merger (marriage) rates of U.S. commercial banks from 1978 to 2004 after controlling for bank performance and state economic activity. We find strong evidence that intrastate and interstate deregulation stimulated marriages, but not births or deaths. Finally, temporal causality tests show that mergers temporally lead to new charters and that failures lead to mergers (a demonstration effect). (*JEL* G21, L51)

I. INTRODUCTION

The twentieth century witnessed two periods of dramatic regulatory and structural change in the U.S. banking industry—the Great Depression and the events of the 1980s and 1990s. While many important regulations were enacted during the Great Depression, the 1980s and 1990s experienced the repeal or reversal of most Depression-era financial regulations. The 1980s and early 1990s experienced severe financial turbulence—the savings and loan crisis followed by another crisis in the commercial banking industry. Those crises led to failure rates among financial institutions not seen since the Great Depression. As a consequence, the 1980s and 1990s saw deregulation that transformed the banking industry from one with much geographic limitation on banking and branching to one now characterized by interstate banking and branching.[1]

The theory of industrial organization addresses several stylized facts or empirical regularities of industry dynamics: (1) entry is common, (2) entry is small scale, (3) survival is low-probability, and (4) entry and exit are highly correlated. Dunne et al. (1988) and Pepall et al. (2002, chap. 6) provide more details. Moreover, the fourth empirical regularity contradicts standard microeconomic theory where entry associates with high-performing, profitable, expanding industries and exit associates with low-performing, unprofitable, contracting industries. The empirical evidence implies that the process resembles a lottery where many firms buy tickets (i.e., enter the market), most firms eventually

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1. Conventional wisdom suggests that the emergence of interstate banking and branching generated a significant increase in mergers and acquisitions as seen in Rhoades (2000) and Jeon and Miller (2003). One view of the consolidation process in the banking industry suggests that it is by and large a positive event—banks became more efficient, as argued by Jayaratne and Strahan (1997, 1998), and better-run banks increased their market share, as noted by Stiroh and Strahan (2003). Another view, articulated by Ely and Robinson (2001), sees a possible negative effect of consolidation on the availability of loans to small businesses. Still another view notes that recent merger activity increased measures of industry concentration and profitability, where concentration temporally led profitability as argued by Jeon and Miller (2005). Together, failures and mergers led to a large exodus of institutions from the banking industry. New charters counterbalanced that movement to some extent.

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lose (i.e., exit the market), and only a few firms win (i.e., stay in the market). In other words, long-term, permanent penetration into an existing market presents significant barriers, and thus few new firms succeed, because incumbent firms possess significant advantages. Urban et al. (1984) and Pepall et al. (2002, chap. 6) provide additional discussion.

The commercial banking industry during the recent two-decade period of deregulation experienced those standard empirical regularities with some variations. That is, entry occurred frequently and involved small banks generally. Only a minority of those banks survived. The number of entries and exits both increased dramatically during the past two decades, although exits typically exceeded entries as the number of banks traversed a downward trend. In addition, exits in the regulated banking industry mostly involve mergers, even for failing banks.[2]

The U.S. commercial banking industry possessed institutional characteristics that affect how the industry dynamics corresponded to and differed from those empirical regularities. First, the founding fathers exhibited much concern about preventing concentrations of power. They adopted rules and regulations, in an attempt to prevent such concentrations of power from emerging. That concern bore fruit in the banking industry in the peculiar pattern of bank charters—a dual banking system—and the regulation of banking activity on a geographic basis. Thus, as we entered the last two decades of the twentieth century, the United States possessed many more banks per capita than most other countries in the world.[3] The deregulation of geographic restrictions on banking activity expectedly led to a decline in the number of banks. Thus, although both entries and exits played a significant role over the past two decades, exits exceeded entries so that the total number of banks fell, as noted.

Second, the banking industry plays a critical role in any nation's economy. The loss of confidence in the banking industry that led to subsequent bank panics and runs provided the typical scenario for recession and depression throughout the nineteenth century.[4] Consequently, the banking industry in the twentieth century exhibited significant control on entry and exit by the various banking regulators. That is, the number of bank entries and exits fell below those that would have naturally occurred in an unregulated banking industry.[5]

Finally, exits encompass two different events—failures and mergers. Failing banks cannot freely exit; they must place themselves in the hands of the regulators. In addition, experience shows, except during the Great Depression, that the predominant form of exit occurs through merger, not failure. In other words, the regulatory environment probably increased the number of mergers and reduced the number of failures relative to an unregulated banking industry.

This article focuses on important elements of those events—births (new charters), deaths (failures), and marriages (mergers)—in the U.S. commercial banking industry. We use pooled cross-sectional time-series data, employing robust pooled tobit and random-effects tobit specifications with bootstrap estimation techniques. Our analysis contains two foci. First, we consider the effects, if any, of regulatory control over the evolution of the U.S. banking industry by examining births, deaths, and marriages in each state. Specifically, variables that capture the effects of intrastate and interstate branching and merger regulation may possess important effects on the dynamic evolution of the banking industry. Moreover, we condition the findings on private business decisions such as balance-sheet, income-statement, and state-specific business-cycle effects. One finding stands out. The more permissive intrastate and interstate branching regulation, especially interstate, correlates positively with mergers but does not significantly correlate with new charters and failures.

2. Our data on mergers, however, include only unassisted mergers while failures include government-assisted mergers and outright failures. See DeYoung (1999) for the life-cycle of new bank entrants.

3. For example, Canada's six largest domestic banks dominate the banking markets. The United States, on the other hand, had 7,360 banks at the end of 2004.

4. Goldfeld and Chandler (1981, p. 194) state that "full-fledged (banking) panics in 1873, 1884, 1893, and 1907; ... most banks suspended payments for periods of varying lengths; ... and business activity suffered."

5. The chartering process restricts bank entries. Moreover, government regulators' willingness to assist troubled and failing banks provides another brake on bank exits.

Second, we also employ temporal causality tests to consider the timing relationships between births, deaths, and marriages. We find that mergers temporally lead new charters and failures. The first result (i.e., mergers leading new charters) supports the findings of Berger et al. (1999), Keeton (2000), and Seelig and Critchfield (2003).[6] In addition, the long-run effects of this temporal causality imply that more mergers lead to more new charters and fewer failures.

The article progresses as follows. Section II provides an overview of regulatory and structural change over the past 25 years. Section III examines the existing literature that considers new charters, failures, and mergers. Section IV offers an intuitive explanation of bank births, failures, and marriages; describes the database; and outlines the empirical tests. Section V discusses the empirical findings. Section VI concludes.

II. REGULATORY AND STRUCTURAL CHANGE: AN OVERVIEW

The regulatory environment within which the U.S. commercial banking industry operates has undergone significant adjustment in the past 25 years, including but not limited to the Depository Institution Deregulation and Monetary Control Act of 1980, the Depository Institution Act of 1982, and the Interstate Banking and Branching Efficiency Act of 1994.[7] Because of its regulatory history, the U.S. banking industry possesses many more independent institutions than is the norm in the rest of the world.

Early in U.S. banking history, commercial banks received their charters from individual states and could not operate across state lines. The passage of the National Banking Act of 1864 established the chartering of national banks by the Comptroller of the Currency, but this new legislation, although silent on the issue of branching by the national banks, was interpreted as conforming to existing prohibitions against branching across state borders. The McFadden Act of 1927 and the Banking Act of 1933 in principle prohibited branching across state lines.[8]

Turning our attention to intrastate banking, state legislation has generally liberalized its rules on branch banking within states' borders. Historically, states were divided into three groups: (1) those states that permitted statewide branching with few restrictions, (2) those states that permitted limited statewide branching with numerous restrictions, and (3) those states that permitted only unit banking with essentially no branching activity. Legislative activity gradually reduced the number of states to a very few that have unit banking or limited branching.[9]

Branching and merger restrictions were originally promulgated to prevent banking institutions from monopolizing credit markets. That same legislation, however, frequently granted local monopoly power to smaller community banks. Thus, the relaxation of restrictions on interstate and intrastate banking and branching may lead to the acquisition of a large number of small community banks. Such a prospect provides an important policy concern associated with the probable effect on the supply of credit to small businesses,

6. Conventional wisdom argues that the unemployed officers of a merged bank frequently acquire a charter and open a new bank, providing a rationale for the mergers lead new charters finding.

7. Our historical discussion of banking regulation relies heavily on Kane (1996) and Kroszner and Strahan (1999).

8. Several loopholes existed, however, in the legal landscape. First, a number of banks already operated across state lines at the time of the McFadden Act legislation. Those institutions' operations were grandfathered. But second, and more important, bank holding companies were permitted to acquire banks across state lines. The Douglas Amendment to the Bank Holding Company Act of 1956 partially closed that second loophole, unless such cross-state acquisitions by bank holding companies were explicitly permitted by the states involved. Maine first mined that remaining loophole in 1975 when it adopted legislation permitting out-of-state bank holding companies to acquire Maine banks, if reciprocity existed in the states of the acquiring holding companies. But substantial movement did not really begin until 1982 when New York passed similar reciprocity legislation and Massachusetts passed regional reciprocity legislation restricted to the New England states. The overtures by New York and Massachusetts led to a patchwork of regional reciprocity pacts over the following few years. Most states participated in one or more regional pacts with California, New York, and Texas as notable exceptions (exclusions). Based around regional financial centers, regional pacts arose in New England, the Southeast, the Midwest, and the Northwest. Although banks were permitted to acquire failed thrift institutions across state lines as a result of the savings and loan crisis, the bulk of bank mergers across state lines still proceeded through bank holding companies. Finally, and most recently, the Interstate Banking and Branching Efficiency Act of 1994 permitted banks to acquire banks in other states.

9. For example, Kroszner and Strahan (1999, pp. 1239–42) describe the "origins and demise" of banking and branching regulations.

organizations that many regard as the real engines of growth (Ely and Robinson 2001).

In summary, economic events, individual bank performance, and regulatory changes have produced merger and failure activity in the U.S. commercial banking industry not seen since the Great Depression. Furthermore, many new commercial banks entered the market with new charters, tending to moderate the decline in the number of banking institutions.

III. LITERATURE REVIEW

Although a number of publications explore the recent activity in new charters, failures, and mergers, few consider all three activities together. Amos (1992) examines the regional pattern of commercial bank failures during the 1980s (i.e., 1982 to 1988). He uses the state as his level of observation and generates a cross-section sample of 50 observations by averaging the bank failure data across the 1982–88 period. He introduces regulatory (e.g., dummy variables for branching regulation) and state-level macroeconomic variables (e.g., gross state product, sectoral composition of gross state product) to explain the pattern of bank closings. He concludes that a state experiences higher failure rates when the state's economy possesses a larger share in oil and gas extraction and more volatility in economic variables. He finds little evidence suggesting that failures correlate with the branching status dummy variables or states with higher concentrations of farming or manufacturing.

Cebula (1994) modifies and improves Amos's (1992) analysis in three ways. He introduces bank financial variables in addition to the state-level economic and regulatory variables. He also extends the sample through 1992 and adjusts the regression analysis for heteroskedasticity. Following Amos (1992), he averages the data over the 1982 –92 period and performs cross-section regressions with 50 observations. He derives several additional general conclusions. States with higher capital ratios and lower net charge-offs to loans correlate with lower failure rates. More limited evidence suggests that easier regulation on branching and a higher average cost of funds associates with a higher bank-closing rate.

Amos (1992) and Cebula (1994) both consider the effect of intrastate branching regulation on the bank failure rate. Amos includes dummy variables for statewide and unit branching states, finding no significant effects. Cebula substitutes a dummy variable for limited branching states, implying that statewide and unit banking states come from the same specification. He finds that the failure rate was significantly lower in limited branching states. Cebula also includes a dummy variable for those states that prohibited interstate banking, but the coefficient on that interstate banking dummy variable is not significant.

Chou and Cebula (1996) perform a similar analysis of the failure rates across states for the savings and loan industry. They consider savings and loan failures in each state over the 1985–88 period relative to the average number of savings and loans in operation from 1984 to 1988. Because some of the observations on the failure rate are zero, they use the tobit model with heteroskedastic errors. They find that four types of variables correlate significantly with the failure rate—regional economic conditions (e.g., the average growth rate of gross state product), financial variables (e.g., the average cost of funds), regulatory structure (e.g., federally chartered stock institutions to all FSLIC-insured institutions), and political variables (e.g., dummy variables indicating that states had representation on the Senate Banking, Housing, and Urban Affairs Committee or the House Banking, Finance, and Urban Affairs Committee). Their most robust findings include the following: failure rates associate negatively with the growth rate of gross state product, positively with the average cost of funds, positively with the proportion of stock (rather than mutual) associations, and negatively with federally chartered (rather than state chartered) stock associations.

Stiroh and Strahan (2003) consider the effects of intrastate and interstate branching and banking deregulation on exit dynamics, by which they mean mergers and failures. They find some evidence that the exit (merger plus failure) rate rose after deregulation of intrastate and interstate branching and banking. Their findings, unlike Amos (1992), Cebula (1994), Chou and Cebula (1996) or our article, do not control for other possible correlates with the exit rate.

In a series of publications, DeYoung (1999, 2003a,b) explores various aspects of the life cycle of de novo banks in the United States since 1980. He (1999, 2003b) finds that newly chartered banks possess lower failure rates

than existing commercial banks during the first few years of operation. But their failure rate rises to exceed that of existing banks after those first few years and then converges back to the failure rate of established banks over time. DeYoung then proposes a simple life-cycle model of de novo bank failure and tests the theory with hazard and duration models for a sample of newly chartered banks. The initial capitalization of de novo banks explains their initial lower failure rate, when they earn negative net incomes. The capital cushion, however, disappears before net income becomes positive and stable enough to stave off failure for those de novo banks that do fail. DeYoung concludes that if the policy objective focuses on eliminating the failure of newly chartered commercial banks, then regulators should increase the initial capital requirements for de novo entry. Significant increases of capital requirements, however, may too severely restrict the number of de novo entries in DeYoung's view. In other words, regulators should not prevent all bank failures.

DeYoung (2003a) expands his analysis of de novo bank failures to consider de novo bank exits (i.e., failures, acquisitions, and branch conversions). He finds that de novo bank acquisitions (and conversions) occur at a higher rate than for established banks, although the difference falls below that for de novo bank failures relative to established banks. De novo bank acquisitions also respond more to local economic conditions and regulatory regimes rather than bank-specific financial information.

Amel and Liang (1997) apply a two-equation model of entry and performance (profitability) to the U.S. commercial banking industry. They examine the hypothesis that bank entry limits persistent above-average profits in a competitive environment. By *entry*, they mean new banks (new charters) or new branches. Their database includes the entry of new banks and new branches into local banking markets from 1977 to 1988—over 4,000 entries into 2,300 local banking markets. They conclude that the competitive process exists in the U.S. commercial banking industry, where higher profits attract entry and entry reduces profits. Moreover, market size and growth, measured by population and its growth, correlate positively with bank entry. Finally, legal branching restrictions play a minor role in explaining bank entry.

Another group of publications consider the temporal relationship between new entrants and mergers. Berger et al. (1999), Keeton (2000), and Seelig and Critchfield (2003) investigate whether new bank entrants fill a void left by bank mergers. That is, new entrants provide services to small businesses and other bank customers formerly provided by banks that have now merged into larger organizations.[10] That conventional wisdom argues that bank mergers lead to new entrants. Berger et al. (1999) support conventional wisdom with their empirical results. Keeton (2000) also finds support for the mergers-imply-new-entrants hypothesis. Moreover, he criticizes the methods of the previous paper and offers an improved method. Keeton (2000) concludes that "new bank formations may offset some of the harmful effects of mergers, making it more likely that banking consolidation is beneficial on balance" (p. 35). Most recently, Seelig and Critchfield (2003) also support the mergers-lead-to-new-entrants hypothesis.

IV. DESCRIPTIVE MODEL, DATABASE, AND EMPIRICAL TESTS

Descriptive Model

The dynamic structure of industries evolves as firms enter, exit, and merge. Entry and exit of firms provide the key elements to the efficient operation of a competitive market.[11] In the banking industry, the experience of the nineteenth century shows that many recessions associate with bank (financial) panics, where the private sector lost confidence in the banking industry. Although free entry and exit makes most markets work efficiently, such freedom can lead to a loss of confidence in the banking industry and precipitate a banking panic. Thus, traditionally regulators control entry into, exit from, and merger within the banking industry.

Competitive markets experience the entry (birth) of new firms, the exit (death) of existing

10. Keeton (2000) uses that cause-and-effect argument. An alternative hypothesis views increased merger activity as a signal that bank charters go at a premium. Thus, new entrants acquire a bank charter solely to have it acquired by another bank through merger.

11. Jayaratne and Strahan (1998) argue that for the U.S. banking industry "severe restrictions imposed on the geographic scope of banks retarded the natural process of selection whereby better-managed, lower-cost banks expand at the expense of inefficient ones" (p. 240).

firms, and the merger (marriage) of existing firms as a consequence of the individual performance of the firms in an industry as well as the aggregate performance of the overall economy. In other words, births, deaths, and marriages of firms within an industry depend on the general state of the economy as well as managerial decisions within firms that produce those firms' performances. Better average individual firm performance and a more vibrant overall economy probably generates more births and fewer deaths but produces an ambiguous effect on marriages.

In the banking industry, we must consider the effects of regulation, in addition to the performances of the average individual bank and the overall economy. The deregulation instituted over the past 25 years in the United States weakened restrictive policies that permitted many mergers both within and between states. As banks merged and grew bigger, a niche opened for new bank entry, which the new, more relaxed regulatory environment aided and abetted. Since deregulation increases competition, competitive pressures force weak, poorly performing banks to improve their performance or leave the industry through mergers or failures.[12] In sum, deregulation should, holding other things constant, generate increases in births, deaths, and marriages. Our empirical work examines the effects of individual bank performance (more precisely the average performance of banks within each state), the state economy's performance, and deregulation on births, deaths, and marriages in the U.S. commercial banking industry. Reiterating our main focus, we consider how deregulation affects the process of births, deaths, and marriages.

Database

The Federal Deposit Insurance Corporation (FDIC) reports balance sheet and income statement data aggregated for each state and the District of Columbia.[13] We supplement these data with state-level macroeconomic information on population and the unemployment rate.[14] Our cross-sectional, time-series database includes the 50 states and the District of Columbia over 27 years from 1978 to 2004—a pooled data set of 1,377 observations. We also perform temporal causality tests between new charter, failure, and merger rates using data over 36 years from 1969 to 2004 across the 50 states and the District of Columbia—a pooled data set of 1,836 observations.

Our analysis examines the determinants of birth, death, and marriage rates as measured by the ratio of new charters, failures, and mergers to total banks in each state (and the District of Columbia) for each year.[15] More specifically, births equal the number of new (federal and state) commercial bank charters in state i in year t. Marriages equal the number of commercial banks in state i purchased by unrelated acquiring banks (either in state i or in another state j) during year t. Deaths equal the number of insolvent commercial banks in state i in year t that the FDIC resolves through either a liquidation, an arranged purchase and assumption, or another method. Our explanatory variables fall into three categories—branching and merger deregulatory variables, state-level bank information, and state-level economic data.

12. Winston (1998), in a survey, provides a good discussion of the effects of deregulation on the dynamics of industry structure.

13. The commercial bank balance sheet and income data on a state-by-state basis come from the FDIC (available online at http://www2.fdic.gov/hsob). Critchfield kindly provided the 2003 and 2004 data on changes in the number of commercial banks (i.e., table CB02), which were not yet posted when we updated our database.

14. The Census Bureau (http://www.census.gov/popest/archives/index.html) and the Bureau of Labor Statistics (http://www.bls.gov/lau/home.htm) report population and unemployment rate data, respectively, on a state-by-state basis.

15. The FDIC merger rate includes mergers of banks that belong to the same bank holding company, and thus are regarded as corporate reorganizations that eliminate duplicative boards of directors. Not surprisingly, such mergers increased with the deregulation of restrictions on branching and multibank holding company activity. One referee argued that we should exclude such "common-law marriages" (referee's words) from our analysis. Critchfield of the FDIC kindly provided the necessary merger database and the quarterly Call Report data on all banks that allowed us to separate mergers into common-law and non–common law mergers. Critchfield's willingness to answer numerous questions facilitated the process greatly. Thus, the merger rate for our structural estimations using the 1978–2004 database excludes common-law marriages. We could not carry out the separation for the longer 1969–2004 sample because the merger database did not include data back to 1969. Thus, the causality tests include all mergers reported on the FDIC Web site. Similarly, entries include new charters issued to existing banking organizations but exclude new branches within banking organizations.

Several variables capture the regulatory stance of states with respect to mergers and acquisitions on an intrastate and interstate basis. Two variables capture intrastate deregulation. First, the ratio of branches to banks measures the effective regulatory stance in the state with respect to branching.[16] Second, a dummy variable captures intrastate multibank holding company activity within state borders. Three dummy variables capture interstate deregulatory activity—that is, the regulatory stance in each state vis-à-vis bank mergers through multibank holding companies across states. A state could allow out-of-state bank holding companies to acquire banks within its borders with or without conditions (reciprocity). For example, some states allowed bank holding companies from a given set of other states to acquire a bank within its borders only if that same set of states also allowed bank holding companies from this state to acquire banks within their borders. As described in note 8, several regional compacts emerged that allowed (regional) interstate bank holding company acquisitions. All such regulations became abrogated with the passage of the Interstate Banking and Branching Efficiency Act of 1994 (hereafter the 1994 Act), which permitted bank holding company operations on a national basis without geographic restrictions as well as true interstate banking itself. The first dummy variable equals one, if a state possesses regional reciprocity, zero otherwise; the second equals one, if a state possesses national reciprocity, zero otherwise; and the third equals one, if a state possesses national nonreciprocity, zero otherwise.[17] With the adoption and implementation of the 1994 Act, all states default to the third dummy variable with national nonreciprocity equal to one. That is, a state that allowed bank holding company acquisitions within its borders from any other state (i.e., no regional restrictions) without other states adopting similar legislation with respect to this state (no reciprocity) matches the practical effects of the 1994 Act.

Though the main focus of our analysis considers the effects of deregulation, we also include other control variables—financial variables and state-level economic activity information. The financial variables fall into three categories—portfolio allocation decisions, income and expense factors, and risk variables. Our specification uses crude portfolio allocation decisions—equity to assets, loans to assets, and deposits to assets. In addition, we introduce more refinements to portfolio allocation effects—real estate loans to loans, commercial and industrial loans to loans, consumer loans to loans, and non–interest-earning deposits to deposits.

The income and expense variables include average noninterest cost (noninterest expense to liabilities), noninterest expense to total (interest and noninterest) expense, average noninterest revenue (noninterest revenue to assets), and noninterest revenue to total (interest and noninterest) income. Also, net charge-offs to loans measures the riskiness of the portfolio. Finally, state-level economic information includes the unemployment rate, the total population, and the population growth rate.

Empirical Tests

We extend the analysis of Amos (1992) and Cebula (1994) by employing pooled data, using more information on the balance sheet and income statement data of the banking system, and examining births, deaths, and marriages within the commercial banking industry. Moreover, we adopt pooled and random-effects tobit specifications with robust or bootstrap estimation techniques, respectively.[18]

16. Many studies include dummy variables for unit, limited, and statewide branching regulation. Kaparakis et al. (1994) use the ratio of branches to banks to categorize states into these three categories. We use the actual ratio of branches to banks to capture the branching regulatory effect. This measure captures the actual effect of regulatory practices of state branching regulations.

17. Amel (1993) provides the initial specification for the three dummy variables. Daniels and Tirtirogul (1998) updated Amel's specification through 1995. We extend the dummy variables to 2004, where national nonreciprocity was legislated to become effective in September 1995. We code all states to possess national nonreciprocity in 1996 to 2004.

18. We use Intercooled Stata 9.0 econometric software, which allows robust estimation for the pooled tobit specification. Also, we employ bootstrapping to obtain confidence ranges on the coefficient estimates for the random-effects tobit specification. The tables report the *t*-statistics obtained by dividing the coefficient estimates by either the robust or bootstrap standard errors.

The dependent variables in our regression analysis include the birth rate (new charters to total banks, *ch*/*bk*), the death rate (failures to total banks, *fl*/*bk*), and the merger rate (mergers to total banks, *mg*/*bk*). We collect the banking data in each state (and the District of Columbia) in each year from 1966 to 2004; the state-level economic data cover 1978 to 2004.[19]

For each dependent variable, we implement two different regression analyses—looking for correlates with the dependent variables, and looking for timing relationships between the dependent variables themselves. The first set of regressions runs from 1978 to 2004 and includes the same set of independent variables for each dependent variable. We include branching and merging regulatory variables,[20] portfolio allocation variables,[21] and state-level macroeconomic variables.[22] Table 1 reports summary statistics for the variables used in our econometric work.

The specifications for the regressions are as follows:

$$
\begin{aligned}
(1)\qquad ch/bk = {} & \alpha_0 + \alpha_1(br/bk) + \alpha_2(mbh) \\
& + \alpha_3(dreg) + \alpha_4(dnatnr) \\
& + \alpha_5(dnatr) + \alpha_6(eq/a) \\
& + \alpha_7(l/a) + \alpha_8(rel/l) \\
& + \alpha_9(cil/l) + \alpha_{10}(cl/l) \\
& + \alpha_{11}(ncoff/l) + \alpha_{12}(d/a) \\
& + \alpha_{13}(dni/a) + \alpha_{14}(niy/y) \\
& + \alpha_{15}(aniy) + \alpha_{16}(nie/e) \\
& + \alpha_{17}(anie) + \alpha_{18}(lasset) \\
& + \alpha_{19}(unem) + \alpha_{20}(lpop) \\
& + \alpha_{21}(popg) + \varepsilon_1;
\end{aligned}
$$

$$
\begin{aligned}
(2)\qquad fl/bk = {} & \beta_0 + \beta_1(br/bk) + \beta_2(mbh) \\
& + \beta_3(dreg) + \beta_4(dnatnr) \\
& + \beta_5(dnatr) + \beta_6(eq/a) \\
& + \beta_7(l/a) + \beta_8(rel/l) \\
& + \beta_9(cil/l) + \beta_{10}(cl/l) \\
& + \beta_{11}(ncoff/l) + \beta_{12}(d/a) \\
& + \beta_{13}(dni/a) + \beta_{14}(niy/y) \\
& + \beta_{15}(aniy) + \beta_{16}(nie/e) \\
& + \beta_{17}(anie) + \beta_{18}(lasset) \\
& + \beta_{19}(unem) + \beta_{20}(lpop) \\
& + \beta_{21}(popg) + \varepsilon_2;
\end{aligned}
$$

$$
\begin{aligned}
(3)\qquad mg/bk = {} & \gamma_0 + \gamma_1(br/bk) + \gamma_2(mbh) \\
& + \gamma_3(dreg) + \gamma_4(dnatnr) \\
& + \gamma_5(dnatr) + \gamma_6(eq/a) \\
& + \gamma_7(l/a) + \gamma_8(rel/l) \\
& + \gamma_9(cil/l) + \gamma_{10}(cl/l) \\
& + \gamma_{11}(ncoff/l) + \gamma_{12}(d/a) \\
& + \gamma_{13}(dni/a) + \gamma_{14}(niy/y) \\
& + \gamma_{15}(aniy) + \gamma_{16}(nie/e) \\
& + \gamma_{17}(anie) + \gamma_{18}(lasset) \\
& + \gamma_{19}(unem) + \gamma_{20}(lpop) \\
& + \gamma_{21}(popg) + \varepsilon_3; \text{ and}
\end{aligned}
$$

19. As discussed in note 15, we excluded common-law marriages from the merger rates for the 1978–2004 structural analysis. We did not exclude the common-law marriages for the time-series analysis of temporal causality using the 1969–2004 database. Moreover, for the structural regressions, we considered total mergers as well as the breakdown into in-state and out-of-state mergers. The separation into in-state and out-of-state mergers occurred during the analysis to determine common-law marriages at the suggestion of the referee. Finally, the out-of-state mergers concentrated at the end of the 1978–2004 sample period. As a result of too many zero values in the out-of-state merger rate regression, we could not perform those regressions. Thus, we only report merger and in-state merger rate results, where mergers exclude common-law marriages.

20. Variables include the average number of branches per bank (*br*/*bk*), dummy variable when a state introduces multibank holding company activity within its borders (*mbh*), dummy variable for states with regional interstate bank holding company merger legislation (*dreg*) (in all cases save Oregon for several years, the regional bank holding merger legislation involves reciprocity. Oregon does not. We include Oregon with the other states with regional reciprocity legislation.), dummy variable for states with national interstate bank holding company legislation with reciprocity (*dnatr*), and dummy variable for states with national interstate bank holding company legislation without reciprocity (*dnatnr*).

21. Variables include the natural logarithm of average bank assets (*lasset*), loans to assets (*l*/*a*), real estate loans to loans (*rel*/*l*), consumer loans to loans (*cl*/*l*), commercial and industrial loans to loans (*cil*/*l*) deposits to assets (*d*/*a*), non–interest bearing deposits to deposits (*dni*/*d*), and equity to assets (*eq*/*a*); a risk variable—net charge-offs to loans (*ncoff*/*l*); income and expense variables—noninterest income to income (*niy*/*y*), average noninterest income (*aniy*, noninterest income to assets), noninterest expense to expense (*nie*/*e*), and average noninterest expense (*anie*, noninterest expense to liabilities).

22. Variables include the unemployment rate (*unem*), the natural logarithm of population (*lpop*), and the population growth rate (*popg*).

TABLE 1
Summary Statistics on Variables

Variable	Observations	Mean	SD	Minimum	Maximum
Structural regressions					
ch/bk	1377	0.0231	0.0357	0.0000	0.3333
mg/bk	1377	0.0343	0.0412	0.0000	0.3239
ismg/bk	1377	0.0283	0.0364	0.0000	0.3239
fl/bk	1377	0.0048	0.0185	0.0000	0.2857
br/bk	1377	8.5376	7.3941	0.0256	39.2500
mbh	1377	0.9455	0.2270	0.0000	1.0000
dreg	1377	0.1365	0.3435	0.0000	1.0000
dnatnr	1377	0.4161	0.4931	0.0000	1.0000
dnatr	1377	0.1111	0.3144	0.0000	1.0000
eq/a	1377	0.0810	0.0199	0.0403	0.2110
l/a	1377	0.5920	0.0847	0.2056	0.9231
rell/l	1377	0.4345	0.1536	0.0533	0.8788
cill/l	1377	0.2508	0.0858	0.0209	0.5446
cl/l	1377	0.2236	0.1476	0.0110	0.9037
ncoff/l	1377	0.0082	0.0120	−0.0027	0.2842
d/a	1377	0.7751	0.1028	0.1741	0.9125
dnil/d	1377	0.2137	0.0717	0.0309	0.5284
niy/y	1377	0.1609	0.0998	0.0380	0.6423
aniy	1377	0.0161	0.0157	0.0034	0.1186
nie/e	1377	0.4748	0.1304	0.1675	0.8647
anie	1377	0.0376	0.0119	0.0189	0.1196
lasset	1377	12.4937	1.2496	9.9584	17.2314
unem	1377	0.0593	0.0202	0.0228	0.1744
lpop	1377	4.9882	5.4902	0.4019	35.8938
popg	1377	0.0102	0.0127	−0.0384	0.1093
Granger regressions					
ch/bk	1836	0.0223	0.0340	0.0000	0.3333
ch/bk(−1)	1836	0.0218	0.0337	0.0000	0.3333
ch/bk(−2)	1836	0.0217	0.0338	0.0000	0.3333
ch/bk(−3)	1836	0.0215	0.0338	0.0000	0.3333
mg/bk	1836	0.0353	0.0440	0.0000	0.3380
mg/bk(−1)	1836	0.0350	0.0445	0.0000	0.3380
mg/bk(−2)	1836	0.0343	0.0443	0.0000	0.3380
mg/bk(−3)	1836	0.0335	0.0440	0.0000	0.3380
fl/bk	1836	0.0037	0.0162	0.0000	0.2857
fl/bk(−1)	1836	0.0037	0.0162	0.0000	0.2857
fl/bk(−2)	1836	0.0037	0.0162	0.0000	0.2857
fl/bk(−3)	1836	0.0037	0.0162	0.0000	0.2857

Notes: The variables are defined as follows: *ch/bk* = new bank charters to banks; *mg/bk* = bank mergers to banks; *ismg/bk* = interstate mergers to banks, *fl/bk* = bank failures to banks; *br/bk* = branches to banks; *mbh* = dummy variable equal to 1 if the state introduced acquisitions by multibank holding companies within the state, 0 otherwise; *dreg* = dummy variable for states with regional interstate bank holding company mergers; *dnatnr* = dummy variable for states with national interstate bank holding company mergers with no reciprocity; *dnatr* = dummy variable for states with national interstate bank holding company mergers with reciprocity; *eq/a* = equity to assets; *l/a* = loans to assets; *rell/l* = real estate loans to loans; *cill/l* = commercial and industrial loans to loans; *cll/l* = consumer loans to loans; *ncoff/l* = net charge-offs to loans; *d/a* = deposits to assets; *dnil/d* = non–interest-earning deposits to deposits; *niy/y* = noninterest income to income; *aniy* = average noninterest income (noninterest income to assets); *nie/e* = noninterest expense to expense; *anie* = average noninterest expense (noninterest expense to liabilities); *lasset* = the natural logarithm of average level of bank assets; *unem* = unemployment rate; *lpop* = the natural log of population; and *popg* = population growth rate. The numbers in parentheses after the independent variables stand for the lag length. For example, *fl/bk*(–3) is bank failures to banks lagged three years. Finally, the merger and in-state merger rates in the structural regressions exclude mergers between banks within the same bank holding company (common-law marriages). The merger rates in the Granger regressions include common-law marriages.

$$(4)\quad ismg/bk = \eta_0 + \eta_1(br/bk) + \eta_2(mbh) + \eta_3(dreg) + \eta_4(dnatnr) + \eta_5(dnatr) + \eta_6(eq/a) + \eta_7(l/a) + \eta_8(rel/l) + \eta_9(cil/l) + \eta_{10}(cl/l) + \eta_{11}(ncoff/l) + \eta_{12}(d/a) + \eta_{13}(dni/a) + \eta_{14}(niy/y) + \eta_{15}(aniy) + \eta_{16}(nie/e) + \eta_{17}(anie) + \eta_{18}(lasset) + \eta_{19}(unem) + \eta_{20}(lpop) + \eta_{21}(popg) + \varepsilon_4.$$

The second time-series analysis runs from 1969 to 2004 and regresses each dependent variable onto lagged values of both its own and the other dependent variables. We then perform tests to determine whether the lagged values of other dependent variables significantly explain (Granger-cause) the movement of a given dependent variable. For example, do previous mergers per bank significantly affect charters per bank?[23] Although the Granger temporal-causality test determines whether changes in one variable (e.g., mergers per bank) lead changes in another variable (e.g., charters per bank), it does not determine whether there is an ongoing, long-run effect. Thus, we also test the null hypothesis that the sum of the coefficients equals zero. For example, do previous mergers per bank significantly affect charters per bank on an ongoing, cumulative basis?

The specification of the time-series analysis is as follows:

$$(5)\quad (ch/bk)_t = \delta_0 + \delta_1(ch/bk)_{t-1} + \delta_2(ch/bk)_{t-2} + \delta_3(ch/bk)_{t-3} + \delta_4(fl/bk)_{t-1} + \delta_5(fl/bk)_{t-2} + \delta_6(fl/bk)_{t-3} + \delta_7(mg/bk)_{t-1} + \delta_8(mg/bk)_{t-2} + \delta_9(mg/bk)_{t-3} + \mu_{1,t};$$

$$(6)\quad (fl/bk)_t = \phi_0 + \phi_1(ch/bk)_{t-1} + \phi_2(ch/bk)_{t-2} + \phi_3(ch/bk)_{t-3} + \phi_4(fl/bk)_{t-1} + \phi_5(fl/bk)_{t-2} + \phi_6(fl/bk)_{t-3} + \phi_7(mg/bk)_{t-1} + \phi_8(mg/bk)_{t-2} + \phi_9(mg/bk)_{t-3} + \mu_{2,t};\ \text{and}$$

$$(7)\quad (mg/bk)_t = \theta_0 + \theta_1(ch/bk)_{t-1} + \theta_2(ch/bk)_{t-2} + \theta_3(ch/bk)_{t-3} + \theta_4(fl/bk)_{t-1} + \theta_5(fl/bk)_{t-2} + \theta_6(fl/bk)_{t-3} + \theta_7(mg/bk)_{t-1} + \theta_8(mg/bk)_{t-2} + \theta_9(mg/bk)_{t-3} + \mu_{3,t}.$$

Since the dependent variables each have a number of zero entries, we perform the robust pooled tobit and the random-effect tobit with bootstrap errors.

Bank New-Charter, Failure, and Merger Rates: Structural Regression Results

Table 2 reports the regression results for the birth rate (new charters to total banks, *ch/bk*), the death rate (failures to total banks, *fl/bk*), and the marriage rate (mergers to total banks, *mg/bk*).[24] The marriage rate data incorporate two different adjustments. First, we exclude mergers between banks within the same bank holding company (common-law marriages). Second, we also separate bank marriages into in-state and out-of-state marriages.[25]

Regulatory Variable Results. The branching and regulatory variables possess significant effects, largely in the merger rate regressions. None of the regulatory variables significantly affect bank failure rates. Of these regulatory

23. Berger et al. (1999), Keeton (2000), and Seelig and Critchfield (2003) consider that question as noted in our review of the literature. Our regressions, equations (5), (6), and (7), employ the entire 1966–2004 database, after allowing for three lagged values of the dependent variables.

24. Although the results do not generally change across the pooled and random-effects tobit specifications, instances occur with different significance levels.

25. We use two measures of the merger rate in our structural regressions—total and in-state merger rates. Moreover, these merger rates exclude common-law marriages. See notes 15 and 19 for more details. We cannot perform a regression on the out-of-state merger rate because they do not occur with much regularity until 1997 onward. In fact, if we shorten the sample by leaving out earlier years in a sequential pattern from our 1978–2004 database, the first time that we can actually obtain regression results for the out-of-state-merger specification occurs for a sample from 1997 to 2004 (not reported).

TABLE 2
Structural Regressions: Birth, Death, and Marriage Rates

	Bank Birth Rates		Bank Death Rates		Bank Marriage Rates		Bank In-State Marriage Rates	
Variable	**Pooled Robust**	**RE Bootstrap**	**Pooled Robust**	**RE Bootstrap**	**Pooled Robust**	**RE Bootstrap**	**Pooled Robust**	**RE Bootstrap**
Constant	−0.0152	0.0308	0.0571	0.0330	0.0452	0.0444	0.0225	−0.0179
	[−0.26]	[0.39]	[0.83]	[0.40]	[0.56]	[0.58]	[0.30]	[−0.25]
br/bk	0.0013*	0.0013**	−0.0009	−0.0007	0.0011*	0.0013**	−0.0002	−0.0004
	[3.22]	[2.14]	[−1.46]	[−1.44]	[2.59]	[2.21]	[−0.30]	[−0.80]
mbh	0.0146**	0.0090	0.0038	0.0025	0.0236**	0.0241	0.0210	0.0219
	[2.21]	[1.39]	[0.52]	[0.29]	[2.08]	[1.66]	[1.85]	[1.58]
dreg	0.0038	0.0004	0.0059	0.0068	0.0342*	0.0334*	0.0328*	0.0306*
	[0.53]	[0.08]	[0.82]	[0.94]	[5.39]	[3.84]	[5.37]	[3.76]
dnatnr	0.0013	0.0085	−0.0068	−0.0068	0.0429*	0.0428*	0.0305*	0.0285*
	[1.41]	[0.97]	[−0.74]	[−0.74]	[5.04]	[3.92]	[3.60]	[3.01]
dnatr	−0.0047	−0.0041	0.0022	0.0082	0.0254*	0.0253*	0.0231*	0.0225*
	[−0.67]	[−0.65]	[0.32]	[1.12]	[3.49]	[3.00]	[3.23]	[2.99]
eq/a	−0.0498	−0.0077	−0.6447**	−0.6397**	−0.3685**	−0.2753	−0.5719*	−0.4340**
	[−0.24]	[−0.04]	[−2.35]	[−2.03]	[−2.36]	[−1.63]	[−3.67]	[−2.40]
l/a	0.0923*	0.0777*	−0.0335	−0.0028	−0.0083	0.0021	−0.0040	0.0033
	[3.38]	[2.82]	[−0.97]	[−0.09]	[−0.28]	[0.06]	[−0.14]	[0.10]
rell/l	−0.0230	−0.0454	−0.0029	−0.0040	0.0384	0.0018	0.0143	−0.0251
	[−0.68]	[−1.12]	[−0.08]	[−0.11]	[1.23]	[0.06]	[0.50]	[−0.87]
cil/l	−0.0104	0.0284	0.0002	0.0004	0.0008	−0.0247	−0.0227	−0.0625
	[−0.20]	[0.57]	[0.00]	[0.01]	[0.02]	[−0.48]	[−0.50]	[−1.35]
cl/l	0.0196	−0.0453	−0.0332	−0.0312	0.0286	−0.0028	0.0064	−0.0223
	[0.61]	[−1.19]	[−0.93]	[−0.72]	[0.82]	[−0.07]	[0.18]	[−0.56]
ncoff/l	0.1422	0.0745	1.4735*	1.3580**	−0.5425*	−0.4254	−0.9270*	−0.8563*
	[0.52]	[0.25]	[2.95]	[2.20]	[−2.79]	[−1.37]	[−2.96]	[−2.99]
d/a	0.0235	0.0189	−0.0377	−0.0188	−0.0210	−0.0298	−0.0272	−0.0257
	[0.74]	[0.60]	[−0.88]	[−0.36]	[−0.51]	[−0.74]	[−0.72]	[−0.62]
dnl/d	0.0456	−0.0012	−0.0938**	−0.1008**	−0.2235*	−0.2388*	−0.2274*	−0.2466*
	[1.19]	[−0.04]	[−2.07]	[−2.05]	[−6.43]	[−5.42]	[−6.96]	[−5.38]
niy/y	0.1262	0.0944	0.4264*	0.4227*	0.0596	0.0263	0.1491**	0.1083
	[1.55]	[1.25]	[3.53]	[3.75]	[0.94]	[0.44]	[2.28]	[1.88]
aniy	0.1171	0.3603	−4.9193*	−4.4803*	−0.6821	−0.8723	−1.8116*	−1.9563*
	[0.21]	[0.56]	[−5.07]	[−4.12]	[−1.11]	[−1.58]	[−3.06]	[−3.58]
nie/e	−0.1098*	−0.1025*	−0.0934*	−0.1008*	−0.0185	−0.0110	−0.0331	−0.0268
	[−2.86]	[−3.00]	[−2.68]	[−2.84]	[−0.64]	[−0.33]	[−1.36]	[−0.92]
anie	−0.8120	−0.8627**	2.8684*	2.4975*	1.2541**	1.6120*	2.0578*	2.3893*
	[−1.87]	[−2.28]	[5.19]	[3.42]	[2.30]	[3.26]	[3.82]	[4.62]
lasset	−0.0027	−0.0014	−0.0034	−0.0029	−0.0040	−0.0029	0.0008	0.0051
	[−0.69]	[−0.33]	[−0.87]	[−0.75]	[−0.97]	[−0.62]	[0.22]	[1.29]
unem	0.1467	−0.0695	0.2164	0.2485	0.1253	0.1436	0.1213	0.1532
	[1.06]	[−0.61]	[1.52]	[1.64]	[1.22]	[1.31]	[1.13]	[1.50]
pop	0.0004	−0.0004	0.0012*	0.0011	0.0010*	0.0011	0.0010*	0.0012**
	[1.01]	[−0.44]	[3.57]	[1.51]	[2.57]	[1.90]	[2.84]	[2.32]
popg	1.1125*	0.6600*	−0.3176	−0.6814**	−0.1008	−0.1012	−0.1090	−0.1235
	[5.63]	[3.83]	[−1.39]	[−2.16]	[−0.54]	[−0.46]	[−0.66]	[−0.65]

Notes: See notes to Table 1. The dependent variables include new bank charters to banks (*ch/bk*), bank failures to banks (*fl/bk*), total bank mergers to banks (*mg/bk*), and in-state bank mergers to banks (*ismg/bk*). Regressions include pooled tobit with robust errors and random-effects tobit with bootstrap errors. Finally, we report *t*-statistics using robust SEs pooled tobit specification and bootstrap SEs for the random-effects tobit specification. *means significantly different from zero at the 1% level. **means significantly different from zero at the 5% level.

variables, only the branches to banks (*br/bk*) and the multibank holding company dummy variable (*mbh*) exhibit significant effects on the new charter rate regressions. In this case, more permissive branching regulation and multibank holding company activity within a state correlates with a higher new charter rate. The magnitudes of the effects from branches to banks and the within-state multibank holding company dummy variable equal about 25% and 10%, respectively. These percentages mean that a one-standard-deviation increase in the independent variable produces an x% of the standard deviation increase in the dependent variable.[26]

The existence of bank holding company merger legislation at the regional or national level with or without reciprocity uniformly associates with higher merger rates. The magnitudes of the coefficients differ between the total and in-state merger rates regressions only for the national interstate bank holding company legislation without reciprocity, suggesting that out-of-state merger rates may respond to this regulatory variable.[27] More specifically, the magnitudes of the three interstate branching and banking regulatory dummy variables—regional interstate bank holding company activity (*dreg*), national interstate bank holding company activity without reciprocity (*dnatnr*), and national interstate bank holding company activity with reciprocity (*dnatr*)—equal around 30%, 45%, and 20%, respectively. In a similar way, branches per bank significantly affect the total merger rate (*mg/bk*) with a magnitude equal to about 10%, but not the in-state merger rate (*ismg/bk*). That is, more permissive branching rules correlates with higher merger rates, which probably reflects out-of-state mergers. And also, states that permit multibank holding company activity experience higher merger rates, significant at the 5% or 10% levels, with a magnitude equal to 13%.

Financial Variables. A small number of financial variables significantly relate to new charter, failure, and merger rates. Higher loans to assets (*l/a*), lower noninterest expenses to total expenses (*nie/e*), and lower average noninterest expenses (i.e., noninterest expense to total liabilities, *anie*) associate with higher new charter rates, with magnitudes equal to 20%, 40%, and 28%, respectively. That is, the financial signals from the existing banking community for more new charters include states with higher profitability (i.e., higher income and lower expenses).[28] Similar variables on the revenue side do not send significant signals. What does this imply? Revenue plays an important role in new charters, as indicated by the significance of the loan to asset ratio, but the distribution of the revenue between interest and noninterest sources does not affect that decision. The deposit to assets ratio (*d/a*) does not prove significant, but both the distribution of expenses between interest and noninterest and the average noninterest expense do significantly affect that decision.

In the failure rate regressions, higher net charge-offs to loans (*ncoff/l*, 90), lower equity to assets (*eq/a*, 70), lower non–interest bearing deposits to total deposits (*dni/d*, 40), higher noninterest income to total income (*niy/y*, 225), lower noninterest expense to total expenses (*nie/e*, 70), lower average noninterest income (i.e., noninterest income to total assets, *aniy*, 175), and higher average noninterest expenses (i.e., noninterest expense to liabilities, *anie*, 400) all associate with higher failure rates, where numbers in parentheses equal magnitudes in percent. Troubled banks exhibit higher net charge-offs to loans and lower equity to assets. Thus, the correlation between net charge-offs to loans and equity to assets confirms conventional wisdom. In addition, banks with higher interest-bearing deposits to total deposits will experience a higher cost of funds, which at the margin makes banks more susceptible to failure. Further, higher correlations of the average noninterest revenue and average noninterest expenses with

26. This calculation and those that follow concerning the magnitudes of effects rely on the data in Table 1 in combination with the coefficient estimates. The magnitude effects reported below use the same notation—"magnitude equals x%". For example, the 25% magnitude comes from multiplying the coefficient of branches to banks (i.e., 0.0013) by a one-standard-deviation change in branches to bank (i.e., 7.3941) and dividing the result by a one-standard-deviation change in new charter rate (i.e., 0.0397) time 100.

27. This dummy variable includes the implementation of the Interstate Banking and Branching Efficiency Act of 1994.

28. One referee offers another rationale for the expense variables effect. To wit, if higher expenses signal higher product and service quality or strategic differentiation, then this makes entry more difficult.

the failure rate also seem logical, whereby lower revenue and higher expenses associate with higher failure rates. The finding that higher noninterest income to total income correlates with higher failure rates runs counter to conventional wisdom.[29] That is, banks that generate revenue through noninterest sources may possess operating difficulties. Note that we just reported that higher average noninterest revenue correlates with lower failure rates. The coefficient on non-interest income to total income holds the average noninterest revenue constant. Thus, the increase in noninterest income to total income probably reflects a fall in interest income, because noninterest revenue to assets does not change. As a consequence, higher noninterest income to total income associates with a higher failure rate, because interest income falls. Using a similar argument, higher noninterest expense to total expenses correlates with lower failure rates. To the extent that the higher noninterest expense to total expenses reflects lower interest expense and not higher noninterest expense, this finding appears reasonable. Note that the evaluation of the coefficient of noninterest expense to total expense holds average noninterest expense constant. Finally, the magnitude of the effects of the significant independent variables in the failure rate specification equals several multiples of the magnitudes of the effects in the new charter and merger rate specifications. That is, the failure rate responds more to the independent variables than the new charter and merger rates.

Consider the merger regressions. Higher net charge-offs to loans (*ncoff/l*) correlate with lower merger rates. The magnitudes of the effect equal around 30% and 15% for the in-state (*ismg/bk*) and total (*mg/bk*) merger rate specifications, respectively.[30] This relationship proves significant in all case except for total merger rates in the random-effects tobit specification with bootstrap errors. Viewing the level of net charge-offs to loans as measure of the riskiness in the lending market, then merger activity diminishes when the market gets riskier. Holding net charge-offs to loans constant, the larger the fraction of deposits that pay interest (i.e., the smaller noninterest deposits to total deposits, *dni/d*), the higher the merger rate with a magnitude of that rises from around 40% for the total merger rate specification to nearly 50% for the in-state merger rate specification. In other words, holding banking market risk constant, a higher fraction of interest-bearing deposits to total deposits implies that the profitability of banking falls at the margin. Thus, merger activity increases. Similarly, lower equity to assets (*eq/a*) associates with higher merger rates, holding the riskiness of the banking market constant. Here, the magnitude rises from about 15% for the total merger rate specification to just over 30% for the in-state merger rate specification. This latter effect proves significant in every case, except the total merger specification with bootstrap errors. Finally, higher average noninterest expense (*anie*) correlates with a higher merger rate in both the total and in-state merger rate specifications. For the in-state merger specification, lower average noninterest income (*aniy*) and higher noninterest income to total income (*niy/y*) correlates with higher (in-state) merger rates, with magnitudes equal to about 80% and 35%, respectively.

We note a close correspondence between the failure and merger rate specifications, especially the in-state merger rate specification, results with respect to effects of the financial variables. Net charge-offs (*ncoff/l*) provides the exception that proves the rule. That is, higher net charge-offs to loans correlates with more failures but fewer mergers. The other financial variables possess the same signs and significance. Another way to view mergers more broadly encompasses assisted and unassisted mergers, where the assisted mergers represent failures. In other words, failures represent government-assisted mergers. The major difference in findings relates to the magnitude of the effects, where the failure rate specification responds more to changes in independent variables than do the new charter and merger rate specifications.

State-Level Macroeconomic Variables. The state-level macroeconomic variables exhibited several significant effects in the new charter, failure, and merger rate specifications. The strongest effect occurs in the new charter rate

29. Conventional wisdom suggests that banks reduce their risk when they diversify from only interest income to interest and noninterest income. But Stiroh (2002) and DeYoung and Roland (2001) also find that noninterest income leads to riskier bank operations.

30. The magnitudes prove uniformly larger for the in-state merger rate specifications when compared to the total merger rate specification.

(*ch*/*bk*) specification, where the population growth rate (*popg*) positively associates with the new charter rate with a magnitude equal to about 30%, implying that states with growing populations require a growing banking sector partly facilitated by new charters. The unemployment rate (*unem*) did not significantly affect any of the dependent variables, although it approaches significance at the 10% level in the failure rate specification with a positive correlation. The natural log of population (*lpop*) significantly associates with failure and merger rates for most specifications with a magnitude equal to around 15%. Higher population correlates with higher failure and merger rates.

Summary of Results. Bank failure rates respond to financial and state-level macroeconomic variables but not to branching and merger regulatory variables. Bank merger rates respond to all of the branching and merger regulatory variables. Finally, new charter rates respond only to a few banking and merger regulatory, financial, and state-level macroeconomic variables. The failure rate and merger rate, especially the in-state merger rate, specifications exhibit many similarities in our findings. The new charter rate specification differs significantly from the failure and merger rate specifications.

New Charter, Failure, and Merger Rates: Time-Series Causality Tests

Table 3 reports the timing (Granger causality) results as well as the accumulation of lagged effects for new charter, failure, and merger rates.[31] Strong evidence exists that mergers within a state precede new charters and failures. That mergers temporally lead new charters supports the results reported in Berger et al. (1999), Keeton (2000), and Seelig and Critchfield (2003). The evidence also suggests that bank failures per bank lead new bank charters.[32]

Table 3 also reports results for the long-run, cumulative effects. Here, the findings suggest that more mergers per bank lead to a cumulative increase in new charters per bank and a cumulative decrease in failures per bank. That is, more mergers reduce the potential supply of weak banks that may fail and opens the door to new entrants. Moreover, more new charters per bank also lead to a cumulative increase in failures per bank. Many new banks fail within a few years of opening their doors (DeYoung 1999, 2003a,b), which proves consistent with this timing result.

V. CONCLUSION

Regulatory reform not seen since the Great Depression swept the U.S. banking industry beginning in the early 1980s and culminating with the Interstate Banking and Branching Efficiency Act of 1994. Banking analysts anticipated dramatic consolidation with large numbers of mergers and acquisitions. Less well documented but equally important was the continuing entry of new banks, tempering the decline in the overall number of banking institutions.

Amos (1992) and Cebula (1994) consider the proximate causes of commercial bank failure rates, using cross-section data across states.[33] Whereas Amos (1992) finds no significant effects of intrastate branching dummy variables, Cebula (1994) discovers that limited branching states experience significantly lower failure rates than statewide or unit branching states. Cebula's results, however, raise questions, because it seems inappropriate to lump statewide and unit branching states under the same "homogenous" umbrella.

In addition to deaths (failures), this article examines births (new charters) and marriages (mergers) in the U.S. commercial banking industry. Our regression analysis employs pooled cross-sectional time-series data, using pooled and random-effects tobit specifications with either robust or bootstrap estimation

31. Although researchers typically apply Granger (temporal) causality tests in a time-series setting, a few researchers adopt Granger causality in a panel data setting. Holtz-Eakin et al. (1988, 1989) provide a good theoretical foundation, and Nair-Reichert and Weinhold (2001) and Podrecca and Carmeci (2001) report useful applications. The null hypothesis that the bank failure rate Granger-causes the new bank charter rate states that $\delta_4 = \delta_5 = \delta_6 = 0$ [see equation (5)]. In addition, the null hypothesis for the long-run cumulative effect of the bank failure rate on the new charter rate states that $(\delta_4 + \delta_5 + \delta_6) = 0$ [see equation (5)].

32. Interested readers can obtain the full regression results from the authors on request.

33. Chou and Cebula (1996) perform similar analysis on the savings and loan failure rate, using a cross-section data across states.

TABLE 3
Granger Causality and Cumulative Sum Tests: Birth, Death, and Marriage Rates

	Pooled Tobit Robust		Random-Effects Tobit Bootstrap	
Lagged Terms	**Granger**	**Sum**	**Granger**	**Sum**
New charter rate regressions				
Charter rate (*ch*/*bk*)		0.7351*		0.5878*
		(203.81)		(62.29)
		[0.0000]		[0.0000]
Failure rate (*fl*/*bk*)	Yes*	−0.2154	Yes**	−0.2594
	(11.93)	(3.26)	(10.29)	(2.33)
	[0.0076]	[0.0710]	[0.0163]	[0.1266]
Merger rate (*mg*/*bk*)	Yes*	0.1277*	Yes*	0.1118*
	(17.8)	(15.38)	(12.75)	(11.54)
	[0.0005]	[0.0001]	[0.0052]	[0.0007]
Failure rate regressions				
Charter rate (*ch*/*bk*)	No	0.1166**	No	0.1166**
	(4.20)	(3.88)	(5.44)	(5.02)
	[0.2404]	[0.0488]	[0.1420]	[0.0251]
Failure rate (*fl*/*bk*)		1.0180*		1.0180*
		(221.92)		(222.53)
		[0.0000]		[0.0000]
Merger rate (*mg*/*bk*)	Yes**	−0.1808*	Yes*	−0.1808*
	(8.20)	(7.88)	(12.86)	(12.36)
	[0.0421]	[0.0050]	[0.005]	[0.0004]
Merger rate regressions				
Charter rate (*ch*/*bk*)	No	−0.0496	No	−0.0789
	(1.92)	(1.60)	(3.50)	(3.08)
	[0.5889]	[0.2060]	[0.3203]	[0.0793]
Failure rate (*fl*/*bk*)	No	0.0712	No	0.0845
	(0.75)	(0.09)	(0.77)	(0.37)
	[0.8616]	[0.7636]	[0.8573]	[0.5435]
Merger rate (*mg*/*bk*)		0.7702*		0.7293*
		(285.55)		(303.46)
		[0.0000]		[0.0000]

Notes: The dependent variables are new charters to banks (*ch*/*bk*), failures to banks (*fl*/*bk*), and mergers to banks (*mg*/*bk*). All regressions employed pooled data and include three lags of each right-side variable. The first row reports whether significant Granger causality exists (Yes or No) and then what the sum of coefficients equals in the long-run test. The null hypothesis that the bank failure rate Granger-causes the new bank charter rate states that $\delta_4 = \delta_5 = \delta_6 = 0$ from equation (5). In addition, the null hypothesis for the long-run cumulative effect of the bank failure rate on the new charter rate states that $(\delta_4 + \delta_5 + \delta_6) = 0$ from equation (5). The test statistics for the Granger causality tests in the pooled tobit regressions are *F*-statistics (3, 1836) and for the Granger causality tests in the random-effects tobit regressions are χ^2 statistics with 3 degrees of freedom. The statistic testing for the sum of the coefficients equal to zero is an *F*-statistic (1, 1836) for the pooled tobit regressions and a χ^2 statistic with 1 degree of freedom for the random-effects tobit regressions. Those tests appear in parentheses. P-values appear in brackets. *means significant at the 1% level. **means significant at the 5% level.

techniques. We perform two regression analyses. The first analysis tests for the correlates with birth, death, and marriage rates from a set of regulatory variables, financial variables, and state-level macroeconomic variables. The second analysis tests the temporal relationships among birth, death, and marriage rates.

Several general findings came to the surface. First, states with more branches per bank and states that permit multibank holding company activity within its borders correlate positively with new charters per bank and mergers per bank. In addition, all three interstate branching and banking regulatory dummy variables exhibit strong and significant positive

effects in each merger rate specification.[34] That is, more permissive intrastate and interstate branching and banking regulation correlates with more new charters and mergers. We find, unlike Cebula (1994), no evidence that intrastate branching regulation correlates with the failure rate. Moreover, Stiroh and Strahan (2003) report significant evidence that intrastate and interstate branching and banking deregulation enhances the exit rate, where exit means mergers and failures. Our results match the Stiroh and Strahan's findings, if their results reflect mergers rather than failures.

The failure rate specification generally exhibits coefficient estimates that imply the largest magnitudes for the financial variables. That is, the failure rate proves much more sensitive to changes in the financial variables than the new charter and merger rates. At the same time, the in-state merger rate specification significantly responds to the same financial variables and in the same direction, albeit with a smaller magnitude, as does the failure rate specification. The difference between an in-state merger and a failure represents a matter of degree rather than kind. Many bank failures are identified as FDIC-assisted mergers. Thus, the same financial variables that signal an in-state merger can also signal a failure. The total merger rate specification experiences some differences in what financial variables significantly affect mergers relative to those that significantly affect failures, suggesting that out-of-state mergers dance to a slightly different tune than either in-state mergers or failures with regard to financial variables. Furthermore, the new charter rate specification exhibits a smaller set of significant explanatory variables than the failure and merger rate specifications. Nonetheless, a few regulatory, financial, and state-level macroeconomic variables do affect the new charter rate.

In addition, mergers temporally lead new charters and failures. The mergers-lead-new-charters result supports the findings of Berger et al. (1999), Keeton (2000), and Seelig and Critchfield (2003). Also, failures temporally lead new charters. In other words, two-way temporal causality exists between failures and new charters, whereby failures open the door to new entry and new entry soon leads to more failures, because many newly chartered banks do not survive beyond a few years.

In summary, intrastate and interstate deregulation of banking and branching activity has promoted significant consolidation, both on a national and state-by-state basis. That consolidation process has proceeded more slowly than many analysts projected, as new bank entry has cushioned the decline in banking institutions.

34. An earlier version of this article employed a 1978–98 sample. In that analysis, we found much weaker evidence of the interstate branching and banking regulatory variables significantly affecting new charter, failure, and merger rates. By including more years under the Interstate Banking and Branching efficiency Act of 1994, those interstate regulatory effects all become highly significant.

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