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The Effects of Past Entry, Market Consolidation, and Expansion by Incumbents on the Probability of Entry

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Abstract

The threat of entry is an important factor in the evaluation of the potential competitive effects of proposed mergers and acquisitions. In the evaluation of proposed bank mergers, a high probability of entry, or strong potential competition, is often found to mitigate the potential anticompetitive effect of a proposed horizontal merger. Because the probability of entry is not directly observed for each local market, variables such as per capita income, population growth and past entry are typically used to predict the probability of future entry. This study extends previous research on the determinants of entry into local banking markets. In addition to variables considered by past research, such as market demographic characteristics, branching deregulation and past merger activity, this study considers the effects on future entry of past entry and strategic barriers to entry, which are proxied by changes in incumbent branching, the presence of small incumbent firms and market concentration. The analysis uses data that allow a broader definition of entry than that used in most past research. In most of the previous studies, bank entry is defined as the creation of a new banking institution. We show that this definition is problematic and misses entry due to branch network extension by existing banks, which is substantial. Results of our analysis are consistent with past research where past research exists. In addition, we find significant negative relationships between strategic barriers to entry and entry. Assessment of the quantitative significance of the results, however, finds that very large changes in the explanatory variables are needed to cause substantial changes in the probability of entry into banking markets.

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1. Introduction

Entry and potential entry (including contestability, the most extreme form of potential entry) play a central role in the competitive interactions of firms in standard theories of industrial organization. Standard theories posit that greater entry or potential entry leads to more competitive market equilibria. Because theory points to greater competition with an increasing probability of entry, potential entry assumes considerable importance in government regulation through the implementation of antitrust statutes. In antitrust enforcement in the banking industry, for example, the attractiveness of a market for future entry is the most prominent mitigating factor cited when potentially anticompetitive consolidations are allowed. For these reasons, research into the determinants and effects of actual entry has a long history, both in banking and in other industries. This paper extends previous empirical work on entry in the banking industry in two ways. First, it utilizes more complete data on entry than has been used previously. Second, it supplements the determinants of entry examined in previous research to include the effects of past entry and strategic barriers to entry on the probability of current entry into banking markets.

The banking industry is an excellent case study for an analysis of entry. Most previous research, both in the United States and elsewhere, has concluded that the geographic scope of banking markets is local (Group of Ten, 2001) and good data on market presence are available. Hence, large cross-sectional data sets can be analyzed to determine entry patterns. Moreover, significant barriers to entry may exist in the banking industry. Before recent changes in branch and ownership laws, new charter creation was the main method of de novo entry in much of the United States. In the 1990s, however, changes in banking laws – especially the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, which allowed interstate branching, and the Gramm-Leach-Bliley Act of 1999, which allowed the combination of banking with other financial services such as insurance – led to a significant reduction in the legal barriers to entry. The relaxation of legal barriers to entry and an unprecedented merger wave yield an excellent opportunity to analyze the determinants of entry.

Significant strategic barriers to entry into banking markets may still exist, however. Information asymmetries give incumbent banks competitive advantages, such

as first mover advantages, over entering institutions (Berger and Dick, 2007). Fixed costs of entry, including land and building costs, lead to substantial sunk costs. In addition, although legal barriers to entry still exist, because of the costs of charter creation and maintenance and capital requirements, the removal of some legal barriers has eased the way for increased branch expansion by existing banking firms, a possible strategic barrier to entry.

Theoretical and empirical research on entry has shown that a higher probability of entry results in a more competitive market outcome. When barriers to entry exist, however, competitive outcomes are less likely. Most past empirical research on the determinants of entry in the banking industry has focused on demographic measures, such as market growth or size, and on measures of market structure, such as concentration. The focus on demographic measures reflects the notion that a large, growing market may lead to greater profitability for incumbent firms and, hence, greater likelihood of entry by firms seeking to capture some of those excess profits.[1] Concentration is included as a proxy for either profit-making opportunities in noncompetitive markets or as a measure of strategic barriers to entry into a market. Three recent papers considered the effect of mergers and acquisitions on entry and found a positive relationship between past consolidation and current entry.

Using a panel data set covering ten years and nearly 3000 local banking markets, this paper uses a reduced-form model to analyze the factors that predict de novo entry into local markets. This data set allows us to consider factors – such as incumbent branch expansion, horizontal mergers and acquisitions and past entry – that have not been analyzed in most previous research but that may be important factors in market entry. We analyze urban and rural markets separately and find that the entry process is potentially very different in the two market types. Our reduced-form model precludes any conclusions about causation, but the resulting predictions on the likelihood of future entry are, nonetheless, valuable to policymakers seeking to evaluate the likely competitive effects of bank mergers.

[1] Theoretically, growth need not lead to greater profitability and probability of entry; it could lead to a more competitive equilibrium among incumbent firms.

In their enforcement of antitrust statutes, the Department of Justice and the Federal Reserve consider many factors in the evaluation of the competitive effects of a merger. The Federal Reserve's merger policy directly accounts for potential entry through the use of mitigating factors (i.e., market characteristics that are considered likely to lead to a higher probability of entry). According to the Federal Reserve merger policy, a transaction poses a potential competitive problem if the Herfindahl-Hirschman index (HHI) increases by 200 or more points to a level of 1800 or more or if the post-merger market share increases to 35 percent or more.[2] Transactions that exceed one of these criteria require mitigating factors for approval. The most prominent of these mitigating factors is the attractiveness of a market for future entry that could offset the adverse structural effects of a merger.[3]

Growth rates of market income, population and deposits are all considered to be indicators of the likelihood of entry into a market. In addition, the Federal Reserve often cites past entry as a mitigating factor in merger cases with significant competitive effects, implying that past entry is an indicator of a market that will be more likely to attract future entry. This policy stance is not supported by most theoretical models, which indicate that past entry may not lead to additional entry. Theoretically, entry will occur until it is no longer profitable, and past entry may have exhausted the possibility for profitable entry, especially in rural markets where the number of firms and growth rates are lower than in urban markets. One of the contributions of this work is to measure the statistical and economic significance of past entry as a determinant of current entry into both urban and rural markets.

For those determinants of entry that have been analyzed previously, our results tend to match those of previous research. We find that, in both urban and rural markets, entry is more likely in larger, faster growing, or wealthier banking markets. We also find that past entry is associated with a greater probability of future entry in both urban and rural markets, a result that points to potential unobserved variables driving the entry decisions of banks. We find that entry is less likely in more concentrated rural markets,

[2] The HHI is the sum of the squares of the market shares of all firms in the market, with shares measured in percentage terms. The HHI for a monopoly is 10,000, and the index asymptotically approaches 0 in an atomistically structured market.

[3] Other mitigating factors concern market share measurement issues and special circumstances surrounding the merging parties or other competitors.

but that this relationship is not significant in urban markets, which tend to be less concentrated. Unlike the results for other explanatory variables, the relationship of concentration to entry is sensitive to the specification. We also find that the expansion of branch networks by incumbents is negatively correlated with de novo entry in rural markets, evidence of strategic barriers to entry. We find that past mergers are associated with greater entry into urban banking markets, with a marginally significant effect of merger activity in rural markets, where horizontal mergers are less common. Lingering effects of past legal restrictions on geographic expansion by banks are significantly related to the probability of entry, and the presence of numerous small bank competitors in a market is negatively related to entry, either because acquisition of such firms is a substitute for entry or because such firms would be particularly close competitors of new entrants. Finally, the paper examines the economic significance of these results by measuring the marginal effects on the probability of entry into a market of changes in each of the explanatory variables. The results indicate that, in general, reasonable changes in demographic or structural variables have very modest effects on the likelihood of entry into a market. The policy implications of these results are then discussed.

The paper is organized in the following manner. Section 2 reviews the previous literature on the determinants of entry in the U.S. banking industry. Section 3 discusses the model, including both its theoretical underpinnings and empirical implementation. Section 4 describes the data, and section 5 discusses the results. Section 6 includes conclusions and a policy discussion.

2. Previous Literature

Siegfried and Evans (1994) conducted a survey of the literature on the determinants of entry, focusing on entry into manufacturing industries. They found that entry is encouraged by higher past profitability, more rapid growth, lower capital costs of entry and lower levels of concentration. Results for other potential structural or behavioral barriers to entry tended to be ambiguous.

One of the earliest studies of entry into the banking industry was by Hanweck (1971). Focusing on new bank formations in a sample of 220 urban banking markets over 1968 and 1969, he found that larger and less concentrated banking markets had

significantly more entry. Measures of branch density (population per banking office), legal restrictions on bank branching and the likelihood of bank regulators to deny applications for new charters had insignificant or ambiguous coefficients.

Two other early papers on banking entry, by Boczar (1975) and Rose (1977), focused on very restrictive samples. Boczar looked at entry by acquisition into fifteen Florida banking markets over 1967-72 and found that market income and past bank profitability were the only significant determinants of entry. Rose focused on new banks with federal deposit insurance in twenty urban markets in Texas over 1962-73 and found evidence that higher past profits, larger market size, higher rates of market growth and lower market concentration encourage entry into these markets.

Relaxation of legal restrictions on bank branching and interstate expansion led to a merger wave in the 1980s and 1990s, but also made it more difficult to measure market-specific profitability as banks increasingly operated in multiple local markets. Amel and Liang (1997) adjust for this by assuming, in an equation explaining market profits, heteroskedasticity related to the percentage of market deposits controlled by multi-market banks. They introduce a recursive structural model in which entry depends upon lagged market profitability and profitability depends on current entry. Using a large cross-section of both urban and rural markets over 1977-88, they find that entry is more likely into larger, faster growing and more profitable markets, while market concentration generally has an insignificant effect on entry. Legal barriers to entry in the form of restrictive branching laws reduce entry, especially in rural banking markets. Unlike earlier work, Amel and Liang's entry variable includes entry by both new banks and new branches.

More recent articles move beyond standard demographic and structural variables to consider the effect of mergers on bank entry. Seelig and Critchfield (2003), Berger et al. (2004) and Keeton (2000) focus on the effect of mergers on the creation of new charters in urban markets. Seelig and Critchfield look at entry into over 300 urban markets over 1995-98 and measure entry by the number of new bank and thrift charters. They find that market size and market growth and in-market merger activity all stimulate entry, while market concentration and market unemployment discourage entry. Berger et al. (2004) also find that past merger activity encourages creation of new bank charters in

all three types of markets they study: rural markets, small metropolitan areas and large metropolitan areas. Unlike previous work, they find no effect of market growth on entry through new charter creation.

Keeton (2000) critiques the data used in the other two studies. He notes that Seelig and Critchfield do not distinguish between bank and thrift entry, despite the fact that most thrifts do not compete with banks for small-business customers. In addition, they measure merger activity by a count, ignoring the relative sizes of the firms involved in the transactions. Seelig and Critchfield also fail to count as consolidations those deals in which the acquired firm retains a separate charter under a multi-bank holding company (MBHC). Berger et al., on the other hand, include the deposits of the acquiring bank in their measure of the scale of merger activity. They also include corporate reorganizations involving mergers of different subsidiaries of the same MBHC in some of their measures of merger volume. Using a measure of merger activity that accounts for the size of the acquired banks and includes only consolidations among unaffiliated firms, Keeton finds a significant positive relationship between past consolidation and entry. Looking more carefully at different types of mergers, Keeton finds that new bank formation comes mainly in response to mergers that shift ownership from small, local banks to larger banks that are headquartered at a distance from the market entered.

Another strain of the extant literature considers the endogeneity of market structure and, hence, indirectly examines the role of entry. These articles use the framework developed by Bresnahan and Reiss (1991), where the number and types of competitors in a local market is analyzed in an ordered probit model.[4] Cohen (2004) tests the substitutability of banks and thrifts by analyzing the numbers of banks and thrifts in a market. Cohen and Mazzeo (2004) hypothesize that incumbents build extensive local market branch networks ("over-branching") as a deterrent to entry. They find that incumbent banks do expand their networks in an effort to deter de novo entry. Their research indicates that strategic barriers to entry may exist in small, rural banking markets. Feinberg (2005) finds that the presence of a top bank holding company, defined as being among the 50 largest in the nation, in a rural market increases the probability of

[4] Earlier papers used changes in market structure as a proxy for entry. See, for example, Amel and Liang (1990).

entry in that market. Feinberg suggests a positive relationship between mergers and acquisitions and entry.

These papers using the Bresnahan and Reiss (1991) methodology also show segmentation across institution types in consumer demand. This result has also been shown in models of consumer demand using logit type models. For example, Adams, Brevoort and Kiser (2007) find that competition is much more intense among similar depository institutions than among dissimilar firms, where depositories are split into four groups based on whether they are commercial banks or thrift institutions and on whether they are multi-state organizations or local firms. This study of entry considers market demand segmentation through the role of small institutions in a market.

Stiroh and Strahan (2003) find that legal barriers to entry have effects for a surprisingly long time after their repeal. This suggests that past branching restrictions may affect entry over our sample period, even though it comes several years after most geographic restrictions on branching were eliminated. Using state-level data, Jeon and Miller (2007) find that intrastate branching restrictions – but not interstate banking – have significant effects on entry into banking markets.

3. Model

The standard model of a firm's decision to enter a market is based on profitability. Following Amel and Liang (1997), the decision to enter a market is a function of long-run expected profits and entry-forestalling profits. Entry-forestalling profits represent the level of profits below which no firm will choose to enter. Entry-forestalling profits are a function of entry barriers and market characteristics. High entry barriers and sunk costs raise overall entry costs and, hence, the level of profits incumbent firms can earn without attracting entry. Barriers to entry may be defined by exogenous restrictions such as branching laws and charter restrictions or determined by strategic choices of incumbent firms (Sutton, 1991; Cohen and Mazzeo, 2004). Entry by new charter creation differs from entry by branch expansion because obtaining a bank charter is more costly than obtaining permission to open a new branch. Entry via a new charter is also higher risk than entry through expansion of a branch network, because the new institution's brand is

unknown. Furthermore, strategic behavior by incumbents may increase risk more for a new bank than for an existing firm branching into a new market.

This basic model of firm entry relies on measuring bank profitability. However, profitability in a local banking market cannot be accurately measured for banks that operate in more than one local banking market, since all banking balance sheet data other than deposits – including profits – are collected at the firm level. Amel and Liang (1997) overcome this difficulty by measuring profitability using data from only single market institutions. This methodology has become more suspect over time, because the share of deposits held by multi-market institutions has been increasing over time. The reduction in single market deposit holdings makes accurate, unbiased measures of local market profitability more difficult to obtain. Any measure obtained from single market institutions and applied to local markets will be potentially biased, because the sample is changing over time and remaining single-market banks are atypical firms.[5]

Because we cannot observe local market profitability, we consider a reduced-form model of bank entry that models entry as a function of observable market characteristics. Our analysis focuses on the determinants of entry for urban and rural markets using annual market-level data from 1998-2005.[6] We estimate an ordered-probit model of bank entry, where the dependent variable is 0 for no entry, 1 for single entry and 2 for multiple entries:[7]

$$E_{m,t} = f(M_{m,t}, IB_{m,t}, HHI_{m,t-3}, Past_{m,t}, Merger_{m,t}, Dereg_{m,t}, SmComp_{m,t}, Y_m) + \varepsilon_{m,t},$$

where E represents entry in market m and time t, M is a vector of market-level demographic characteristics, IB is the change in the number of branches operated by

[5] In rural markets, the share of branches controlled by multi-market institutions increased from 26 percent in 1996 to 37 percent in 2003, and by 2005 single-market banks controlled only 14 percent of the deposits of rural markets. In urban markets, the branch share of multi-market institutions increased from 32 percent in 1996 to 51 percent in 2003, and by 2005 single-market banks controlled only 11.2 percent of the deposits of urban markets.

[6] Our analysis starts in 1998, because we use information from the previous three years in the creation of some explanatory variables. We cannot use entry data past 2005, because demographic data on market characteristics are not available past that date.

[7] In order to ensure that all categories of entry have ample variation, we include all markets with multiple entries in one category. For robustness purposes, we also estimate standard probit and logit models with simple entry dummies as the dependent variables, a Poisson model with the number of entrants as the dependent variable and a Tobit model with the number of new entrants divided by the lagged number of competitors in the market as the dependent variable.

incumbent banks in the market, *HHI* is our measure of market concentration, *Past* represents the number of new entrants into the market over the prior three years, *Merger* represents horizontal merger activity in the market over the prior three years, *Dereg* measures the number of years since the state in which the market is located allowed full intrastate branching,[8] *SmComp* is the percentage of market deposits held by firms with total assets of less than $1 billion, and *Y* is a vector of yearly dummy variables. Demographic characteristics include current population, a measure of market size, average population growth over the last three years, and per capita income.[9] *HHI* is lagged three years, so that market concentration is measured prior to the effects of the variables capturing past entry and horizontal mergers. *SmComp* measures the presence of firms in the market that would be particularly strong competitors and whose acquisition would be a viable alternative to entering a market de novo.

In line with the results of past research, we expect the demographic variables and the measure of market merger activity to be positively related to entry. In keeping with Cohen and Mazzeo (2004), we expect incumbent branching to be negatively related to entry. HHI would have a positive coefficient if it captures the greater potential profits of an entrant into a less competitively structured market; HHI would have a negative coefficient if it serves as a proxy for strategic barriers to entry into a market. The deregulation variable should have a negative coefficient, if markets that are recently deregulated experience a surge of entry to make up for past restrictions on entry. Following Adams, Brevoort and Kiser (2007), greater presence by small incumbent bank competitors is expected to have a negative relationship with de novo entry. Finally, we expect past entry to be positively related to current entry, if it captures unobserved market characteristics that make an area attractive to new banks. On the other hand, if past entry has filled the opportunities for profitable firms in a market, then past entry may be negatively correlated with current entry; this result may be more likely in small, rural markets than in larger, urban markets.

[8] For those urban markets that cross state lines, the market is assigned to the state containing the plurality of that market's population. For markets in states that had not fully deregulated branching by the date of an observation, *Dereg* is set to zero.

[9] We also measured market size and growth with deposits, but we found that these variables are highly correlated with population and population growth and produce similar results if included in place of population measures. Using measures based on deposits has the drawback of introducing potential endogeneity into the estimation.

4. Data

We use the Summary of Deposits (SOD) data to measure local market entry for banks and thrifts.[10] From 1994 through 2006, we track individual branches using branch identifiers and branch addresses. New branches are identified by taking two passes at the data. First, a new branch is identified when the branch identifier first appears in the data at a specific address. These branch observations are then compared to branches from the previous year that do not have a matching branch identifier in the current year (i.e., branches that may represent exit from the market). If an address matches from one year to the next in these data sets, then we assume that the branch is not new.[11] For institutions appearing in the SOD for the first time, we check to see whether the institution existed before as an institution that was not required to report on the SOD.[12] If the financial institution was in existence more than one year before the branch opened, then we assume that the branches are not new, but rather that the financial institution converted its charter and must now report to the SOD. One example of such an event is the conversion of a credit union to a bank or a thrift institution. The resulting data set consists of new branches opened in a market between SOD filing dates. De novo entry in a local market occurs when a new branch or head office is established in a market where the financial institution does not already have a presence. Local markets are defined as either Metropolitan Statistical Areas or rural counties.

We capture as de novo entry both the creation of a new institution and the expansion of existing institutions into new geographic markets. As noted in section 2, this definition of entry is more complete than that used in other recent banking entry papers. Most other papers define de novo entry by the creation of new charters (e.g., Berger et al., 2004, Seelig and Critchfield, 2003, and Keeton, 2000). These studies do

[10] The Summary of Deposits has been supplemented with thrift information from the Branch Office Survey collected by the Office of Thrift Supervision.

[11] We make two passes at the data because branch identifiers are missing for thrifts and can be inconsistent for banks. Unmatched branch observations are double-checked to determine their accuracy. In addition, there are cases where new branches are opened in locations where a branch existed previously. This occurs because the infrastructure for a branch (e.g., a vault) is already in place at that location. These new branches rarely open in the same year in which the old branch was closed. Furthermore, there are cases where branches move locations. Hypothetically, a moved branch could be measured as de novo entry, but we do not treat a relocation of an existing branch by an incumbent bank to another location within the same local market as entry.

[12] In other words, we check to see if the financial institution was reported in the National Information Center data in the years previous to the appearance of the institution in the SOD.

not capture de novo entry through branch network expansion of existing institutions. While it can be difficult to measure, entry by branch expansion is very significant during our sample period. The removal of branching restrictions has made it easier for existing institutions to expand their branch networks.

The number of new charters reported in this paper differs substantially from the number reported in some previous research. Errors in the measurement of de novo entry by new charter creation can occur in several ways. First, existing institutions can change charters for various reasons, and a charter change may be recorded as an exit and a new entry. Second, for legal or tax reasons, mergers are sometimes structured in a way that results in the elimination of two existing charters and creation of a new charter. Third, some studies appear to count conversions of already existing financial institutions into institutions required to report on the SOD as de novo entry.[13] To our knowledge, the only previous paper that attempts to control for charters that do not reflect true entry and for entry via new branches is Amel and Liang (1997), who measure de novo entry over the time period 1997-88 in four, three-year cross-sections.

Tables 1-3 show the breakdown of de novo entry between new charter creation and branch expansion.[14] Table 1 displays the basic breakdown between branch expansion and new charter creation. It is evident that branch expansion dominates new charter creations. In every year of our sample, the number of de novo entries through branch expansion is at least double the number of entries through new charter creation. Table 2 shows that the dominance of entry through branch expansion holds in both urban and rural markets. The pattern is most pronounced in rural markets, where branch expansion happens five to ten times more often than new charter creation. Finally, table 3 shows how many urban and rural markets experience entry. In a given year, approximately 50 percent of urban markets and 8 percent of rural markets experience entry. Conditional on entry already having occurred in a market, 85 percent of urban and

[13] Berger et al. (2004) account for conversions by subtracting from their count of entries all new charters where the new financial institution has over $1 billion in assets in its first year.
[14] Entry with new charter creation very seldom occurs in multiple markets for the same charter. In our sample, 97 percent of new charters enter in only one market, about 3 percent enter in two markets, and only once does a new charter enter in three markets.

30 percent of rural markets experience subsequent entry over our ten-year sample period.[15]

Other explanatory variables include the change in the number of incumbent branches, market concentration, the presence of small banking organizations and the number of non-surviving entities involved in horizontal mergers.[16] The change in the number of incumbent branches is simply defined as the total change in the number of branches in a market over three years minus the number of branches of new entrants opened during that period. Mergers are identified using National Information Center data. Our definition of a merger is not transaction based, but rather based on changes in ownership.[17] A merger occurs when firms with different high-holder institutions have the same high-holder institution in the next period. Our definition rules out reorganizations, where the high-holder institution remains the same and the subsidiaries change charter, or changes in charter, where a single organization is connected to a new high holder in the next period. Our primary measure of mergers is the number of surviving organizations in overlap markets, i.e., the number of firms (involved in a merger) remaining after horizontal mergers. For robustness checks, we use other definitions, including the number of non-surviving entities of horizontal mergers and the ratio of the number of non-surviving entities to the total number of depository institutions in a market.[18]

Market population and income data are from Bureau of Economic Analysis estimates. Means, standard deviations, minima and maxima of all variables are given in table 4 for urban markets and rural markets.

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[15] Of the 303 MSA markets that experience entry, entry occurs in 257 of these markets in subsequent years. In rural markets, 928 experience entry and 282 experience entry multiple times.

[16] We weight the deposits of thrift institutions at 100 percent when computing the HHI and other measures of market structure.

[17] We are not able to identify individual mergers. Our measure of a merger is equivalent to a transaction level measure when a single merger occurs for the merging institutions, but we cannot identify cases where a firm is involved in several mergers in a single year. Multiple acquisitions by the same institution in a given year are rare.

[18] Our primary measure represents a lower bound on merger activity, while the first robustness check represents an upper bound, with the only difference between the two measures caused by cases in which a firm acquires more than one other firm in the same market in one year.

5. Results

We estimate our empirical model for MSA and rural markets separately. Results are in table 5. Similarities exist between the results in our two estimations and between these results and the results of previous research on entry in banking markets. Population, per capita income, and population growth all are positively correlated with the probability of entry. Coefficients for these variables are all significant at the 1 percent level for both the urban and rural samples. In addition, the coefficients for past entry are positive and significant at the 1 percent level. This result is a bit surprising in rural markets, where the low average number of incumbent competitors suggests that the number of potentially profitable entry slots would be very low. However, a closer analysis of those rural markets that experience entry indicates that, on average, they have characteristics that make them look more "urban" than the typical rural market. On average, they have a larger population, greater population growth, and higher per capita income than rural markets with no entry. Rural markets that experience entry are less concentrated with more competitors (even at the beginning of our sample).[19] Almost 40 percent of rural markets that experience entry would be defined as micropolitan areas by the U.S. Census Bureau, while only 16 percent of markets that do not experience entry would qualify as micropolitan markets.[20]

In line with past research, entry is significantly less likely into both urban and rural markets the longer the time period since branching was deregulated by the state in which that market is located. This result is attributed to a surge in entry after deregulation that gradually diminishes over time.[21] In addition, the presence of small, incumbent competitors has the expected negative correlation with entry in both urban and rural samples, suggesting that the presence of a large number of potential acquisition targets may serve as a substitute for de novo entry or that a larger presence by firms that are likely to be the closest strategic competitors to de novo banks deters entrants.

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[19] In the 1330 rural markets that do not experience entry, mean population is 17,006, mean population growth is 0.0008, mean per capita income is $21,724, and mean HHI is 4150. In the 928 rural markets that do experience entry, the mean population is 35,472, mean population growth is 0.0065, mean per capita income is $22,577, and mean HHI is 3049.

[20] A micropolitan area is defined as a county or counties with an urban cluster with a population of at least 10,000 but with total population of less than 50,000.

[21] In both the urban and rural samples, adding a dummy variable for those states that have not yet fully deregulated branching yields an insignificant coefficient and has no effect on the results for other variables.

The results for the variables measuring the change in incumbent branches, concentration, and past mergers differ across the two samples. Both incumbent branches and concentration have negative coefficients, and the coefficients are significant at the 1 percent level in rural markets but insignificant in MSA markets in both cases. These results support the notion of strategic barriers to entry in rural markets, but give less support for MSA markets. The coefficient estimates may vary across samples for two reasons. First, the ranges of concentration and incumbent branching differ dramatically between the two samples. For example, average concentration for rural markets is over 3000, while the average for MSA markets is below 1500, and very few urban markets have an HHI greater than 2000. Second, it is possible that our geographic markets are not correctly defined and that concentration and incumbent branching matter significantly in smaller areas of MSA markets. This may be true for rural markets as well. We consider alternative geographic market definitions in the robustness checks below.

Our results reaffirm the conclusion of past research that mergers increase the probability of subsequent entry in MSA markets. The coefficient on the number of surviving firms in horizontal mergers is positive and significant at the 1 percent level. However, we are less confident that the same relationship holds in rural markets; while the coefficient is also positive in rural markets, it is only marginally significant. Berger et al. (2004) find a more significant relationship between past mergers and entry in rural markets, a difference most likely caused by how de novo entry was defined and calculated in their study. Coefficients on yearly dummies measure differences relative to the omitted year of 1998. These coefficients tend to be negative but follow no clear pattern over time.

We check the robustness of our results in several ways. First, we estimate the model using probit, logit and Poisson distributions (with suitably altered dependent variables) and find very little difference in the results.[22] We also estimate the model used by Keeton (2000) and find similar results. Keeton (2000) estimates a Tobit model with entry weighted by the number of firms in the market. In this model, the independent

[22] In both the probit and logit regressions, the coefficient on SmComp is insignificant in the urban regression and that on past mergers is insignificant in the rural regression. Past mergers have an insignificant effect on entry in the rural Poisson regression, but there are no other changes in significance of any of the explanatory variables.

variables of interest are all in percentage terms or relative to the number of firms in the market. For example, we weight the number of horizontal mergers by the number of firms in the market. This model does not result in substantially different results for urban markets, but it performs less well in rural markets, perhaps because the dependent variable is highly concentrated around zero with a small number of significant outliers on the upper tail.[23]

Other robustness checks involved changes to the demographic measures and our measure of past mergers included in the base model of table 5. Because of its skewed distribution, we replace market population with the logarithm of population or, alternatively, add a quadratic population term to the regression. The one variable that is affected substantially by these changes is HHI; its coefficient becomes insignificant or even significantly positive in rural markets when the population variable is supplemented by a quadratic term or replaced by the logarithm of population.[24] Replacing all three demographic variables by analogous measures that use total market deposits in place of market population causes total deposits and deposits per capita to lose significance in the urban regression, though all remain significant in the rural regression. As stated above, the potential endogeneity of these measures makes them inferior, in our judgment, to the population measures used in the base regression.

We replace our measure of past merger activity with three alternative measures.[25] In most cases, these alternatives maintain significant positive coefficients and their use has no effect on the significance of the other explanatory variables, but one of the alternatives causes degradation in the results for the rural sample and a different measure is significant at the 10.1 percent level in the urban sample.

[23] In the urban regression, the HHI has a marginally significant positive coefficient, while all other coefficients maintain the significance of table 5. In the rural regression, past entry and the presence of small competitors all have insignificant coefficients, while HHI has a significant positive coefficient. Keeton does not estimate his model on a rural sample.

[24] The coefficient on the presence of small competitors becomes marginally insignificant in the urban regression that includes the logarithm of population as a regressor, but no other variables change significance level. In the quadratic estimation, population has a significant positive coefficient, while the square of population has a significant negative coefficient.

[25] These alternatives include the two measures noted on page 13 and an indirect measure of merger activity constructed using the number of firms in the market at times t and (t-3) and the number of entrants into the market in the three year interval.

To check whether our results are caused by extreme observations, we drop, in turn, the 5 percent of the MSA sample with the most extreme positive values for population, change in incumbent branches, lagged HHI, past entry and number of past horizontal mergers. In none of these five cases do any of the explanatory variables with significant coefficients become insignificant, while the two variables with insignificant coefficients in the base regressions remain insignificant in every case but one in which the change in incumbent branches becomes marginally significant. Dropping the most populous 5 percent of the rural sample causes the coefficients on lagged HHI and past mergers to become insignificant but does not affect the other coefficients.

Two alternative sets of rural market definitions are tested. Using micropolitan areas, where they exist, in place of counties causes the deregulation coefficient to become insignificant and the coefficient on past mergers to become significant. Replacing rural counties by labor market areas as defined by the Bureau of Labor Statistics causes no differences in significance from the model presented in table 5.

As a final robustness check on the urban results, we define geographic markets as urban counties rather than as MSAs. While this has no effect on the smaller MSAs that comprise only one county, it substantially shrinks the definition of the geographic market in most urban areas. The only change in the results from table 5 is that HHI has a significant negative coefficient in the altered regression. This could indicate that large MSAs cover too large an area to be accurate definitions of local banking markets. Alternatively, the increase in significance could simply be due to the increase in the number of observations from roughly 2200 to 5700 as a result of the definitional changes.[26]

We now turn to the marginal effects of our model. Evaluated at the means of the independent variables, the predicted probability of single entry in MSA markets is 36 percent and the predicted probability of multiple entries is 18 percent. In order to evaluate the marginal effects of a change in one variable, we hold every variable but one at its mean, and evaluate one variable at its minimum value in the sample, at its 25th

[26] The change is not due to the presence of large, headquarters branches in the central business districts of large MSAs. In some cases, very large volumes of deposits are booked at these offices and, as a result, HHI measures for counties including large central cities can be quite high. Setting the deposits of all branches with more than $1 billion to zero has no effect on the significance of any of the explanatory variables.

percentile, at its median, at its 75th percentile and at its maximum value in the sample.[27] We do this for all of the explanatory variables other than the yearly dummies; results are shown in tables 6 and 7 for urban and rural markets, respectively. In MSA markets, when the number of past entrants is increased from the mean of 3 to the 75th percentile of 4, the predicted probability of a single entry increases to 37 percent and that for multiple entries to 21 percent. A decrease in the number of entrants to the minimum value of 0 reduces the probability of a single entry to 32 percent and of multiple entries to 12 percent.[28] These results suggest that rather large changes in the amount of past entry are associated with modest effects on the probability of current entry into an urban market.

The marginal effects on the probability of entry of changes in other explanatory variables are similarly small. For example, an increase in the change in the number of incumbent branches from 5 to 6 (75th percentile) or decrease to -2 (25th percentile) results in virtually no change in the predicted probabilities of entry. This result is expected since the coefficient for incumbent branching is insignificant in MSA markets. If the number of horizontal mergers in an MSA market falls from the mean of 2.3 to 0, the predicted probability of a single entry decreases from 36 percent to 34 percent and that of multiple entries decreases from 18 percent to 15 percent. Substantial changes in the probability of entry result only when the values of explanatory variables are near their maxima.

For rural markets (table 7), the predicted probabilities evaluated at the means of the independent variables are much lower than the MSA probabilities. The predicted probability of single entry is 6.5 percent and the predicted probability of multiple entries is 0.44 percent. If we evaluate the marginal effect by increasing past entry to its maximum value of 6 from the mean of 0.3, then the predicted probability of single entry increases to 13 percent and the probability of multiple entries rises to 1.4 percent. For many other explanatory variables, even an increase in value to the sample maximum leaves the probability of entry into the market at 10 percent or less.

While all of the independent variables significantly correlate with entry in an least one of our two samples, the marginal effects for both urban and rural markets clearly

[27] An alternative approach would be to evaluate the variable of interest at one standard deviation above and below the mean. We did not take this approach, because in some cases, because of the skewed distribution of the variable, one standard deviation places the variable outside of its range in the sample.

[28] If the number of past entrants is increased to its maximum value of 32, the probability of single entry actually declines, because multiple entries would be projected to occur 96 percent of the time.

indicate that, due to the small parameter values, relatively large changes in these variables are associated with small changes in the predicted probability of entry. This is especially true for rural markets, where the changes in predicted probabilities are minimal, even after significant changes in the independent variables.

6. Summary and Policy Implications

We analyze two forms of de novo entry in the U.S. banking industry: new charter creation and branch expansion. While some other recent studies of de novo entry focus solely on new charter creation, we find that, over the past decade, branch expansion has been the most frequent mode of entry into new banking markets. We estimate a reduced-form model of entry to analyze the effects of demographic variables, market structure, past entry, horizontal mergers, and incumbent branch expansion on the probability of entry. We find that consolidation in MSA markets is associated with a greater probability of entry, but any such relationship is marginal in rural markets. Moreover, we find that significant strategic barriers to entry exist in rural markets. Our proxies for these barriers, market concentration, incumbent branch expansion and the presence of small incumbent banks, are correlated with a decreased probability of entry. Most of these proxies are not significantly related to entry in MSA markets. Finally, we find that past entry is associated with a higher probability of entry in both urban and rural markets. This result is unexpected in rural markets, because past entry was expected to reduce the chance for additional profitable entry in such small markets.

The policy relevance of these results for antitrust policy in banking is considerable, since these variables are among the factors thought to mitigate the large structural effects of merger transactions that exceed the Department of Justice structural guidelines for antitrust analysis. Our results give evidence that past entry must be considerable to warrant its use as a mitigating factor in a merger transaction, even though it is significantly correlated with new entry. The same is true for changes in incumbent branching, past horizontal merger activity, and other variables used as proxies for strategic barriers to entry or the attractiveness of a market for entry. While all of these variables are significantly correlated with the predicted probability of entry, a very large

change in these variables must occur in order to significantly change the probability of entry.

One path for future research is to extend this analysis of total entry by differentiating between the type of entry (new charter or branch expansion) and type of entrant (commercial bank or thrift institution, large or small firm). Several recent papers have shown that market structure and institution type matter. Keeton (2000) indicates that the institutional characteristics of the entering firm may matter. Cohen (2004), using the Bresnahan-Reiss (1991) endogenous market structure methodology, shows that institution type matters in the competitive equilibrium. Adams, Brevoort and Kiser (2007) show significant market segmentation among institutions of different types in consumer demand. These studies all indicate that the type of institution that enters may be relevant for policy concerns.

7. References

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Table 1: Entry Totals by Type

Year	Total Entry	New Charters	Branch Expansion
1995	305	35	270
1996	410	69	341
1997	500	112	388
1998	569	122	447
1999	617	186	431
2000	586	194	392
2001	532	117	415
2002	426	81	345
2003	399	75	324
2004	435	101	334
2005	506	111	395

Table 2: Entry Totals by Type

Year	Total Entry	New Charters	Branch Expansion
	MSA markets		
1995	159	26	133
1996	222	57	165
1997	272	91	181
1998	291	94	197
1999	392	156	236
2000	356	157	199
2001	310	90	220
2002	258	64	194
2003	250	58	192
2004	264	79	185
2005	321	88	233
	Rural markets		
1995	146	9	137
1996	188	12	176
1997	228	21	207
1998	278	28	250
1999	225	30	195
2000	230	37	193
2001	222	27	195
2002	168	17	151
2003	149	17	132
2004	171	22	149
2005	185	23	162

Table 3: Number of Markets that experience entry

Year	Total	MSA	Rural
1995	254	117	137
1996	315	139	176
1997	350	153	197
1998	413	163	250
1999	386	188	198
2000	378	177	201
2001	367	162	205
2002	301	146	155
2003	274	138	136
2004	301	143	158
2005	330	161	169

Table 4: Data Means

Variable	Mean	Std.	Min	Max
		MSA markets		
Total Entrants	0.98	1.48	0	15
Entrants	0.73	0.8	0	2
Population (in 0000s)	725.5	1,216.3	56.9	9,941.2
Population Growth	0.01	0.01	-0.02	0.06
Per capita Income (in 000s)	28.4	5.8	12.5	63.1
Δ Incumbent Branches	4.8	24.4	-208	499
Lagged HHI	1494	658	258	7661
Past Entrants	2.8	3.4	0	32
Number of Overlap Mergers	2.3	3.4	0	29
Years since Deregulation	15.3	9.74	0	35
Small Institution Deposits	0.074	0.077	0	0.55
		Rural Markets		
Total Entrants	0.09	0.32	0	4
Entrants	0.09	0.31	0	2
Population (in 000s)	24.7	24.0	0.4	202.1
Population Growth	0.003	0.01	-0.07	0.11
Per capita Income (in 000s)	22.5	4.7	7.5	89.0
Δ Incumbent Branches	-0.04	1.1	-10	12
Lagged HHI	3682	2232	608	10000
Past Entrants	0.28	0.61	0	6
Number of Overlap Mergers	0.11	0.37	0	5
Years since Deregulation	12	9.63	0	35
Small Institution Deposits	0.13	0.20	0	1

Table 5: Ordered Probit Estimation

Variable	Coefficient Estimates	
	Rural	MSA
Population	0.0095***	0.00017***
	(0.00061)	(0.00005)
Population Growth	9.46***	22.11***
	(1.14)	(2.70)
Per capita Income	0.011***	0.030***
	(0.0032)	(0.0054)
Change in Incumbent Branches	-0.031***	-0.0005
	(0.010)	(0.0017)
Lagged HHI	-0.000027***	-0.000032
	(8.3e-06)	(0.00004)
Past Entrants	0.076***	0.090***
	(0.020)	(0.012)
Number of Overlap Mergers	0.054*	0.060***
	(0.033)	(0.015)
Years since Deregulation	-0.0070***	-0.0079***
	(0.0016)	(0.0027)
Small Institution Deposits	-0.21***	-1.01***
	(0.080)	(0.34)
Year Dummy 1999	-0.13***	0.24***
	(0.052)	(0.095)
Year Dummy 2000	-0.13**	0.037
	(0.053)	(0.097)
Year Dummy 2001	-0.098*	-0.12
	(0.053)	((0.10)
Year Dummy 2002	-0.24***	-0.23**
	(0.056)	(0.10)
Year Dummy 2003	-0.32***	-0.30***
	(0.058)	(0.10)
Year Dummy 2004	-0.25***	-0.22**
	(0.058)	(0.11)
Year Dummy 2005	-0.21***	-0.12
	(0.059)	(0.11)
R squared	0.075	0.17
Log likelihood	-5177	-2198
Number of Observations	18037	2544

Table 6
Marginal Effects of Changes in Explanatory Variables in MSA Markets
Predicted value of the probability of entry (value of explanatory variable)

Variable		Mean	Minimum	25th percentile	Median	75th percentile	Maximum
Population	entrants=1	0.3599 (725)	0.3434 (57)	0.3460 (151)	0.3498 (298)	0.3588 (676)	0.2181 (9941)
	entrants=2	0.1805 (725)	0.1528 (57)	0.1565 (157)	0.1624 (298)	0.1783 (676)	0.7302 (9941)
Population Growth	entrants=1	0.3599 (0.010)	0.2110 (-0.024)	0.3370 (0.003)	0.3564 (0.0086)	0.3735 (0.015)	0.3001 (0.062)
	entrants=2	0.1805 (0.010)	0.0484 (-0.024)	0.1439 (0.003)	0.1738 (0.0086)	0.2125 (0.015)	0.5955 (0.062)
Per Capita Income	entrants=1	0.3599 (28)	0.2732 (13)	0.3445 (25)	0.3538 (27)	0.3695 (31)	0.3209 (63)
	entrants=2	0.1805 (28)	0.0834 (13)	0.1544 (25)	0.1693 (27)	0.2017 (31)	0.5545 (63)
Change in Incumbent Branches	entrants=1	0.3599 (5)	0.3724 (-208)	0.3604 (-2)	0.3602 (1)	0.3599 (6)	0.3196 (499)
	entrants=2	0.1805 (5)	0.2095 (-208)	0.1813 (-2)	0.1809 (1)	0.1803 (6)	0.1233 (499)
Lagged HHI	entrants=1	0.3599 (1494)	0.3650 (258)	0.3618 (1053)	0.3604 (1377)	0.3587 (1790)	0.3289 (7661)
	entrants=2	0.1805 (1494)	0.1909 (258)	0.1841 (1053)	0.1814 (1377)	0.1780 (1790)	0.1338 (7661)
Past Entrants	entrants=1	0.3599 (3)	0.3183 (0)	0.3349 (1)	0.3497 (2)	0.3729 (4)	0.0391 (32)
	entrants=2	0.1805 (3)	0.1219 (0)	0.1412 (1)	0.1624 (2)	0.2107 (4)	0.9579 (32)
Number of Overlap Mergers	entrants=1	0.3599 (2.3)	0.3388 (0)	0.3388 (0)	0.3486 (1)	0.3654 (3)	0.1988 (29)
	entrants=2	0.1805 (2.3)	0.1463 (0)	0.1463 (0)	0.1606 (1)	0.1919 (3)	0.7501 (29)
Years since Deregulation	entrants=1	0.3599 (15)	0.3740 (0)	0.3663 (9)	0.3623 (13)	0.3548 (20)	0.3359 (35)
	entrants=2	0.1805 (15)	0.2140 (0)	0.1939 (9)	0.1853 (13)	0.1709 (20)	0.1425 (35)
Small Institution Deposits	entrants=1	0.3599 (0.074)	0.3692 (0)	0.3669 (0.020)	0.3630 (0.051)	0.3564 (0.100)	0.2705 (0.551)
	entrants=2	0.1805 (0.074)	0.2009 (0)	0.1953 (0.020)	0.1867 (0.051)	0.1737 (0.100)	0.0815 (0.551)

Table 7
Marginal Effects of Changes in Explanatory Variables in Rural Markets
Predicted value of the probability of entry (value of explanatory variable)

Variable		Mean	Minimum	25th percentile	Median	75th percentile	Maximum
Population	entrants=1	0.0649 (25)	0.0413 (0.374)	0.0488 (9)	0.0566 (17)	0.0749 (33)	0.4052 (202)
	entrants=2	0.0044 (25)	0.0022 (0.374)	0.0028 (9)	0.0035 (17)	0.0055 (33)	0.1731 (202)
Population Growth	entrants=1	0.0649 (0.003)	0.0145 (-0.070)	0.0566 (-0.0048)	0.0641 (0.0021)	0.0727 (0.0094)	0.2591 (0.107)
	entrants=2	0.0044 (0.003)	0.0005 (-0.070)	0.0035 (-0.0048)	0.0043 (0.0021)	0.0053 (0.0094)	0.0510 (0.107)
Per Capita Income	entrants=1	0.0649 (23)	0.0473 (7)	0.0618 (20)	0.0642 (22)	0.0681 (25)	0.1906 (89)
	entrants=2	0.0044 (23)	0.0027 (7)	0.0041 (20)	0.0043 (22)	0.0047 (25)	0.0276 (89)
Change in Incumbent Branches	entrants=1	0.0649 (-0.035)	0.1104 (-10)	0.0648 (0)	0.0648 (0)	0.0648 (0)	0.0304 (12)
	entrants=2	0.0044 (-0.035)	0.0104 (-10)	0.0044 (0)	0.0044 (0)	0.0044 (0)	0.0014 (12)
Lagged HHI	entrants=1	0.0649 (3682)	0.0754 (608)	0.0701 (2127)	0.0671 (3014)	0.0622 (4551)	0.0468 (10000)
	entrants=2	0.0044 (3682)	0.0056 (608)	0.0050 (2127)	0.0046 (3014)	0.0041 (4551)	0.0026 (10000)
Past Entrants	entrants=1	0.0649 (0.284)	0.0623 (0)	0.0623 (0)	0.0623 (0)	0.0623 (0)	0.1334 (6)
	entrants=2	0.0044 (0.284)	0.0041 (0)	0.0041 (0)	0.0041 (0)	0.0041 (0)	0.0144 (6)
Number of Overlap Mergers	entrants=1	0.0649 (0.11)	0.0642 (0)	0.0642 (0)	0.0642 (0)	0.0642 (0)	0.1033 (5)
	entrants=2	0.0044 (0.11)	0.0043 (0)	0.0043 (0)	0.0043 (0)	0.0043 (0)	0.0093 (5)
Years since Deregulation	entrants=1	0.0649 (11)	0.0753 (0)	0.0725 (3)	0.0654 (11)	0.0621 (15)	0.0473 (35)
	entrants=2	0.0044 (11)	0.0056 (0)	0.0052 (3)	0.0044 (11)	0.0041 (15)	0.0027 (35)
Small Institution Deposits	entrants=1	0.0649 (0.127)	0.0682 (0)	0.0682 (0)	0.0678 (0.014)	0.0633 (0.192)	0.0456 (1)
	entrants=2	0.0044 (0.127)	0.0047 (0)	0.0047 (0)	0.0047 (0.014)	0.0042 (0.192)	0.0025 (1)