

# Changes in Twelfth District Local Banking Market Structure during a Period of Industry Consolidation\*

Elizabeth S. Laderman

*Economist  
Federal Reserve Bank of San Francisco*

A main public policy concern regarding the massive consolidation of the banking industry between 1984 and 2003 is the consolidation's potential effect on competition in local banking markets. Examining this period for the Twelfth Federal Reserve District, I find, on the whole, moderate increases in concentration in urban markets and decreases in concentration in rural markets, although a number of local markets have shown large increases in concentration to high levels. However, consistent with antitrust enforcement and competition, I find negative and highly statistically significant effects of concentration on the long-run change in concentration and, for high enough levels of initial concentration, actual decreases in concentration.

## 1. Introduction

An enormous number of depository institutions have merged in this country since the early 1980s.<sup>1</sup> The scale of consolidation is such that the number of independent bank and thrift organizations operating in the United States has been cut almost in half in the past 19 years, from 15,439 to 7,878.<sup>2</sup> In the Twelfth Federal Reserve District, the relative decline has been nearly as large, from 1,089 to 577.

Banking industry consolidation may occur for various reasons, not all of them mutually exclusive. For example, depository institutions may merge because they expect to take advantage of economies of scale or economies of scope to increase profits. Alternatively, one depository in-

stitution may acquire another simply because the managers expect that running a larger firm would increase their own pecuniary or nonpecuniary compensation.

Alternatively, a depository institution may merge with another in the same banking market because the surviving institution expects to increase profits through the reduction of competition that results from increasing concentration. According to the "structure-conduct-performance" paradigm in industrial organization theory, highly concentrated markets, in which the share of output is concentrated in a few large firms, are less competitive than markets in which there are numerous smaller firms with roughly equal market shares. Banks in less competitive markets would be expected to pay out lower deposit interest rates and collect higher loan interest rates than banks in more competitive markets, thereby earning higher profits.

Following the structure-conduct-performance paradigm, the perspective taken in this paper and by regulators in evaluating bank merger proposals is that, regardless of the expected benefits of consolidation, one result of that consolidation, if concentration reaches high enough levels, could be decreased competition. Empirical research has shown a negative correlation between the strength of competition and local banking market concentration (Pilloff and Rhoades 2002, Rhoades 1992, and Berger and Hannan 1989). But it appears that it is mainly among more highly concentrated markets that subsequent increases in concentration reduce the level of competition (Laderman 2003). Indeed, antitrust enforcement limits increases in concentration in markets with higher levels of concentration but not

---

\*I wish to thank Fred Furlong and Simon Kwan for many valuable comments and Chishen Wei for excellent research assistance. Any errors are my own.

1. The decline in the number of depository institutions (bank holding companies, thrifts, and independent banks) largely is due to mergers, but also results from failures. Historically, the failure rate for savings and loan associations and savings banks has been much higher than that for banks, but both reached a recent peak during the late 1980s and early 1990s.

2. This is for 1984–2003. Source: Author's calculations, based on Federal Deposit Insurance Corporation Summary of Deposits and Office of Thrift Supervision Branch Office Survey of OTS Regulated Institutions. Industrial loan banks are excluded. Here and throughout this paper, I use the term "consolidation" to refer to the disappearance of a depository institution due to a merger and the amassing of the deposits of the surviving institution and the nonsurviving institution on the books of the surviving institution.

in markets with lower levels of concentration. Given the empirical evidence and the policy concerns, a main purpose of this paper, then, is to investigate the changes in concentration in local banking markets in the Twelfth District between 1984 and 2003. In addition, given that empirical research also has found a positive correlation between competition and the number of depository institutions in local markets independent of concentration (Pilloff and Rhoades 2002), the paper also investigates changes in the number of depository institutions.<sup>3</sup>

This paper finds that concentration in urban local markets across the Twelfth District has increased moderately, while concentration in rural markets has decreased. However, changes in concentration have varied widely, and quite a few markets have shown relatively large increases in concentration. In addition, most local markets have shown decreases in the number of depository institutions.

But I also find that, despite the effects of consolidation on concentration to date, inexorably larger or more widespread local banking market concentration increases are not inevitable. This is because the change in concentration depends in part on how concentrated a market is to begin with—specifically, more highly concentrated markets should see smaller increases in concentration than less concentrated markets. Two forces tend to lead to such an outcome. First, as mentioned above, antitrust enforcement tends to constrain increases in concentration when they would result in high levels. Second, highly concentrated markets should attract entry, thereby decreasing concentration. Indeed, I find a negative and statistically significant relationship between concentration and the change in concentration across Twelfth District local banking markets.

In addition, the estimated relationship implies actual decreases in concentration for sufficiently high initial concentration levels, and I observe numerous instances of concentration decreases in my sample. Redistributions of market shares toward equality appear to be more important than net new entry in explaining these instances.

The remainder of the paper is organized as follows. Following a brief discussion of related research in Section 2, Section 3 provides a perspective on changes at the local level with a discussion of changes at the national and Twelfth District state levels. I find that the banking industry has consolidated less at the Twelfth District state level than at the national level, and I attribute this difference in part to interstate mergers. Analogously, I find that the degree of consolidation at the local level within Twelfth District

states has tended to be less than at the state level. However, the extent of consolidation at the local level is, in general, positively correlated with the extent of consolidation at the state level. Section 4 contains the presentation and analysis of changes in local banking markets, and Section 5 concludes the paper.

## 2. Related Research

Despite the dramatic decline in the number of depository institutions in the nation since the early 1980s, previous research that focused only on bank deposits has shown that local market concentration either has decreased or has increased only modestly. For example, using only deposits of banks and excluding deposits of thrifts (that is, savings and loan associations and savings banks), Pilloff (2001, p. 238) finds that urban banking market concentration, as measured by the median of the Herfindahl-Hirschman Index (HHI), decreased from 1,852 in 1980 to 1,822 in 1998.<sup>4,5</sup> He finds that median rural banking market concentration decreased from 3,757 to 3,474. Mean urban concentration increased modestly from 1,953 to 1,975, while mean rural concentration decreased from 4,451 to 4,090.

However, when thrift deposits are included, urban local banking market concentration increases appear more substantial. Using bank deposits weighted at 100 percent and thrift deposits weighted at 50 percent (which is the same weighting used in this study for local banking markets), Rhoades (2000) finds that mean urban banking market concentration increased from 1,366 in 1984 to 1,666 in 1998, while mean rural banking market concentration increased from 3,781 to 3,816.

Previous research has found an empirical connection between initial concentration and the change in concentration. Using metropolitan statistical areas (MSAs) and non-MSA counties as banking markets, Rhoades (2000) finds, for local banking markets across the country as a whole, a negative and statistically significant effect of initial concentration on the change in concentration. However, the relationship between initial concentration and the change in concentration is not a focus of Rhoades' paper.

A combination of two other papers yields indirect evidence of a relationship between initial concentration and the change in concentration. Pilloff and Rhoades

3. Other aspects of banking market structure besides concentration and the number of firms may include the number of buyers, the degree of product differentiation, the extent of barriers to entry, the type of cost structure, and the degree of vertical integration. (Scherer 1980, p. 4.)

4. The HHI is the sum of the squares of the percent market shares of the market participants, where market shares are measured using deposits in branches in the market.

5. Following most research in this area, Pilloff defines urban markets as metropolitan statistical areas (MSAs) and rural markets as counties that are not in any MSA. In contrast, this paper uses Federal Reserve banking market definitions.

(2002) find that local market concentration is positively and significantly related to profitability, while Amel and Liang (1997) find that entry is more likely in markets that have high profits, and entry tends to decrease market concentration.<sup>6</sup>

Amel and Liang (1990) offer a related model of the long-run change in concentration as a negative function of the *difference* between current concentration and the long-run equilibrium level of concentration. Partial adjustment toward the equilibrium takes place in each period. The authors estimate the model for bank deposits for various subperiods between 1966 and 1986. Amel and Liang hypothesize that the equilibrium level of concentration in a particular market is a negative function of the attractiveness of the market and a positive function of regulatory barriers to entry into the market. They model attractiveness as being dependent on factors such as the size, prosperity, riskiness, and rate of growth of the market.

Although Amel and Liang (1990) do not explicitly discuss how consolidation fits into their model, they appear to think of mergers as exogenous random shocks that boost concentration above its equilibrium level. In the conclusion to their paper, Amel and Liang state, "Over 20 years, market structure adjusts only 45 to 55 percent of the distance to its equilibrium level, so that mergers that increase concentration may raise long-term competitive concerns" (Amel and Liang 1990, p. 383).<sup>7</sup>

However, as shown in this paper, changes in concentration are negatively correlated with initial concentration. From a public policy perspective, then, the slow downward adjustment to positive shocks to concentration that Amel and Liang (1990) find may raise relatively little concern about significantly adverse effects on competition because increases in concentration are likely to be smaller the more concentrated the market.

6. Amel and Liang include what they model as *expected* concentration (represented by past concentration and current exogenous market conditions, such as population and population growth) along with current profits and other variables on the right-hand side of their entry regression. Expected concentration is included with the view that high expected market concentration may, on the one hand, serve as an entry barrier to the extent that it reflects superior product differentiation or a first-mover advantage of incumbents. On the other hand, expected concentration may reflect expected gains from collusion (by implication, beyond what is indicated by current profits). On the whole, the estimated coefficients on expected concentration that Amel and Liang find are not significant.

7. The presence of antitrust enforcement in banking suggests that the Amel and Liang model may be misspecified. Antitrust laws tend to constrain mergers in local banking markets that already are relatively concentrated but not in markets that are less concentrated. Thus, the size of shocks to concentration due to mergers may be negatively correlated with initial concentration, an explanatory variable in the Amel and Liang model.

### 3. Changes at the National and State Levels

As noted in the introduction, the number of depository institutions in the nation fell dramatically between 1984 and 2003. Over the same period, concentration at the national level increased notably. While the number of U.S. depository institutions fell by almost half (Figure 1), the aggregate share of the top five depository institutions (that is, the five largest as ranked by deposits) increased roughly 17 percentage points from about 9 percent to about 26 percent (Figure 2).<sup>8</sup>

The liberalization of laws governing intrastate and interstate branching and merging likely contributed to the consolidation.<sup>9</sup> Mainly during the 1980s, most of the states in the country removed or significantly relaxed restrictions on intrastate branching, which likely encouraged intrastate mergers. In addition, between the mid-1970s and the mid-1990s, states began to allow bank holding companies headquartered in other states to acquire banks in their state. Beginning June 1, 1997, the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 permitted interstate branching. Under the Act, a banking organization in one state that acquired a bank in another state could convert the acquired bank's branches into its own branches, rather than keeping the acquired bank as a separately chartered entity.<sup>10</sup> In addition, banking organizations that had established banks in multiple states could merge these banks. These moves to relax interstate expansion rules encouraged interstate mergers (that is, mergers between depository institutions that do not operate in any of the same states).

The experiences of the Twelfth District states with interstate acquisitions suggest the importance of interstate mergers for reshaping the structure of banking at a national level. Except for in Hawaii, out-of-state depository institutions acquired between roughly 12 percent and 64 percent of individual Twelfth District states' deposits upon initial entry into the state between 1984 and 2003.<sup>11</sup>

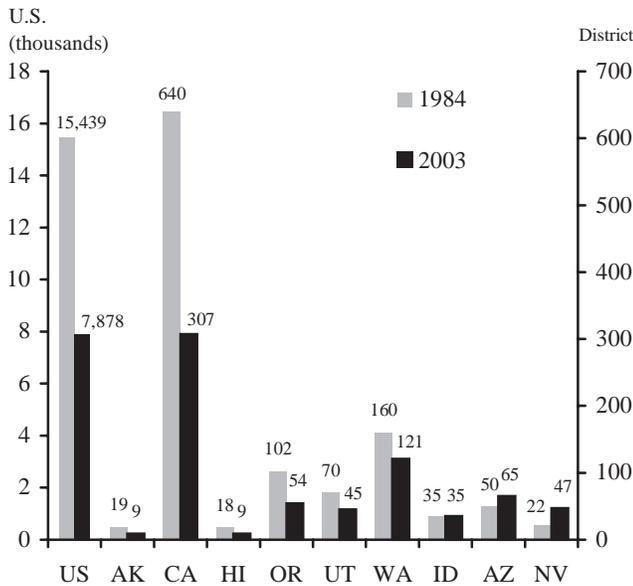
8. For other top groups, the percentage point increases in aggregate shares were: top 10, 26.3 (from 14.3 percent to 37.6 percent); top 25, 29.8 (from 21.9 percent to 51.7 percent), and top 50, 31.4 (from 30.1 percent to 61.5 percent). In calculating these percentages, bank and thrift deposits were weighted at 100 percent. Industrial loan bank deposits were excluded.

9. Jayaratne and Strahan (1998) find that banking industry merger and acquisition activity increased in states after they joined interstate banking agreements.

10. Most states still do not permit *de novo* entry from out of state, only entry by acquisition.

11. The percentages for the individual Twelfth District states are: Alaska, 57.7; Arizona, 63.6; California, 24.7; Hawaii, 0.3; Idaho, 30.1; Nevada, 30.6; Oregon, 32; Utah, 27.4; and Washington, 11.6. These

**FIGURE 1**  
**NUMBER OF DEPOSITORY INSTITUTIONS,**  
**UNITED STATES AND TWELFTH DISTRICT STATES**



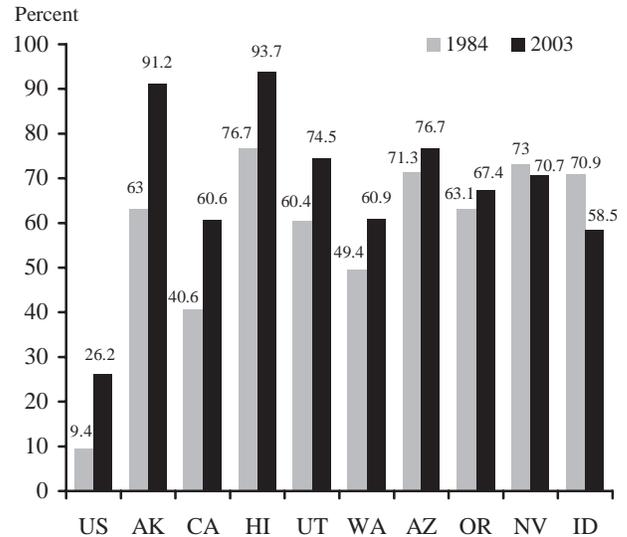
Notes: Includes bank holding companies, thrifts, and independent banks operating in regions indicated; excludes industrial loan banks. States are ranked in ascending order by percent change between 1984 and 2003.

The number of depository institutions tended to decline and concentration tended to increase for individual Twelfth District states, too (see Figures 1 and 2). However, the extent of consolidation, with larger decreases in the number of depository institutions and larger increases in concentration indicating more consolidation, tended to be less at the Twelfth District state level than at the national level. For example, each of the state-level percent declines in the number of depository institutions operating in the state were comparable to or smaller than the national percent decline, and two states, Arizona and Nevada, even saw increases (see Figure 3 later in this paper). Similarly, except in Alaska, the state-level percentage point increases in the top-five shares were comparable to or smaller than the national percentage point increase, and Nevada and Idaho even saw decreases in concentration (see Figure 2).

The relatively smaller impact of consolidation on most of the Twelfth District states than on the nation is not surprising given the prevalence of interstate mergers discussed

numbers are the sum of the percentages of deposits in the state's branches that were acquired upon entry between 1984 and 2003 by depository institutions that were headquartered out-of-state at the time of entry, still were headquartered out-of-state in 2003, and still were operating in the state in 2003. Subsidiaries of foreign banking organizations were assigned the subsidiary's state. Bank and thrift deposits were weighted at 100 percent. Industrial loan bank deposits were excluded.

**FIGURE 2**  
**SHARES OF TOP FIVE DEPOSITORY INSTITUTIONS**  
**IN THE UNITED STATES AND TWELFTH DISTRICT STATES**



Notes: Percentage of deposits that are held by the five largest depository institutions operating in the United States or the state indicated, as ranked by deposits. Bank and thrift deposits are weighted at 100 percent. Industrial loan banks are excluded. States are ranked in descending order by percentage point change between 1984 and 2003.

earlier. An interstate merger would decrease the number of depository institutions in the United States, but not within any state. Similarly, an interstate acquisition by one of the top five depository institutions in the United States would increase the top-five share for the United States, but not for any state.<sup>12</sup> In contrast, intrastate mergers (that is, mergers between depository institutions that operate in at least one of the same states) decrease the number of depository institutions within each shared state and in the nation.

However, it is possible that the extent of acquisition of in-state depository institutions by out-of-state institutions is correlated with changes in the number of depository institutions or changes in concentration within the state.

12. Depository institutions operating in more than one state in 1984 also may have contributed to the United States showing a larger percent decline in the number of depository institutions than each of the individual Twelfth District states. If all mergers were intrastate and each depository institution operated within only one state, then the percent change in the number of depository institutions in the United States simply would be a weighted average of the percent changes in the number of depository institutions in each of the 50 states. (The weights would be each state's respective share of the number of depository institutions in the United States in the initial period.) To the degree that depository institutions operate in more than one state in the initial period, the U.S. decline increases in magnitude, due to the necessary correction to the weighted average decline to account for overcounting of the initial number of

Imagine, for example, that there are a fixed number of attractive acquisition targets within a state and that, if a depository institution is attractive for takeover, it is attractive both for out-of-state acquirers and for in-state acquirers.<sup>13</sup> Then, if an out-of-state depository institution acquires one of those targets, the acquired institution is no longer “in play” and cannot be acquired by an in-state institution. Such circumstances could yield a negative correlation between the extent of acquisition by out-of-state depository institutions and the degree of consolidation within the state.

Alternatively, imagine that interstate acquisitions are, in general, more costly than intrastate acquisitions, perhaps because of greater legal costs stemming from differences in state laws. If a depository institution has overcome these higher costs and entered from out-of-state, that institution is likely to take advantage of its acquisition efficiency through subsequent intrastate acquisitions. Given proportional equivalence across states in the number of *in-state* headquartered depository institutions that have themselves acquired across state lines, such circumstances could yield a positive correlation between the extent of acquisition of in-state depository institutions by out-of-state depository institutions and the degree of consolidation within the state.

Finally, imagine that the motivations for interstate mergers tend to differ from those for in-state mergers. For example, interstate acquirers might primarily be seeking geographic diversification. In contrast, in-state acquirers might be seeking to take advantage of economies of scale. This might yield no correlation between the extent of acquisition of in-state depository institutions by out-of-state depository institutions and the degree of consolidation within the state.

Indeed, the extent of acquisition from out-of-state is not highly correlated with the degree of consolidation at the state level at all: for Twelfth District states, the correlation between the percent of deposits that out-of-state institutions acquired upon entry and the percent change in the

number of depository institutions in a state is only .22, while the correlation between the extent of out-of-state acquisition and the change in the HHI at the state level is only .35.<sup>14</sup> Given these low levels of correlation, the forces discussed earlier that might have yielded a negative or a positive correlation may both be at work, or the motivations for interstate mergers may differ from those for within-state mergers.

On the whole, Twelfth District states showed changes in the number of depository institutions and in concentration that were comparable to those seen in the rest of the country. At 35.7 percent, the median relative decline in the number of depository institutions across the Twelfth District states was comparable to the 37.3 percent median relative decline in the number of depository institutions across the states in the rest of the country.<sup>15</sup> Similarly, at 11.5, the median percentage point increase in the top-five share across Twelfth District states was only modestly less than the median percentage point increase of 14 in the top-five share across the states in the rest of the country.<sup>16</sup>

## 4. Changes at the Local Level

### 4.1. Background

From a public policy perspective, one of the main concerns regarding depository institution mergers is their potential effects on competition within local banking markets. Indeed, antitrust enforcement applied to depository institution mergers focuses primarily on the effects on local banking market concentration. A local banking market typically encompasses a metropolitan area or a number of rural communities that are economically linked. Survey evidence regarding where people do their banking (Amel and Starr-McCluer 2002) and research linking local banking market concentration and prices (Pilloff and Rhoades 2002; Rhoades 1992; and Berger and Hannan 1989) suggest that banking markets have an important local dimension.

---

depository institutions in the United States when some of them operate in more than one state. In contrast, the decline in any individual state is not affected by the presence of multistate depository institutions.

The differences between the percentage point change in the top-five share in the United States and the percentage point changes in the top-five shares in the individual states will be affected by the degree to which, for example, acquisitions by the top five in the United States also constitute acquisitions by the top five in any states.

13. The concept of “attractive” targets does not fit especially well within any of the merger motivations discussed in the introduction. For example, it is natural to think of attractive targets as banking institutions that are mismanaged, but the merger motivations discussed in the introduction are most compelling in a world in which there is no mismanagement.

---

14. Analogous correlations for the 1984–1997 (before Riegle-Neal) and 1997–2003 (after Riegle-Neal) subperiods also are low.

15. The median number of depository institutions across the states outside the Twelfth District was 259 in 1984 and 159 in 2003.

Separately, note that, throughout this paper, medians, rather than means, are used. Using means would not affect any of the qualitative results reported here.

16. However, top-five shares started out higher in the Twelfth District than in the rest of the country and remain so. In 1984, the Twelfth District states’ median top-five share was 63.1 percent, versus 35.6 percent in the rest of the country. In 2003, the median top-five share was 70.7 percent in the Twelfth District and 51.3 percent in the rest of the country. The Twelfth District’s long history of statewide branching may have contributed to its higher concentration.

Under the Bank Holding Company Act, the Bank Merger Act, and other statutes, depository institutions must apply for regulatory approval of proposed mergers with other depository institutions. The Federal Reserve, the Department of Justice (DOJ), and other bank regulatory agencies enforce antitrust statutes in banking by reviewing such proposals for acceptable increases in concentration, post-merger levels of concentration, and post-merger market shares. Market shares are measured using deposits. When evaluating the potential effects of proposed mergers on competition, regulators generally weight the deposits of banks at 100 percent and the deposits of thrifts at 50 percent in calculating market shares, with the view that thrifts are partial competitors with banks.<sup>17</sup> Every local banking market in which both the merging parties operate is examined.

Regulators assessing the effects of mergers in local banking markets typically rely on the HHI rather than the share of the top institutions to measure concentration. The HHI gives proportionally greater weight to the market shares of the larger firms, in accord with their relative importance in competitive interactions, and, given the number of firms, the HHI is at a minimum when the market is divided equally among institutions. Holding the market shares of other firms constant, a merger between two firms that both operate in the same market must increase the HHI.

The DOJ divides the spectrum of market concentration into three broad categories: unconcentrated (HHI below 1,000), moderately concentrated (HHI between 1,000 and 1,800), and highly concentrated (HHI above 1,800). The DOJ merger guidelines state that a proposed merger that would result in an HHI increase of more than 200 points to a level of 1,800 or more in any local banking market warrants further analysis of the competitive effects of the transaction in that market.<sup>18</sup>

In such cases, factors are considered that could mitigate potential anticompetitive effects. Mitigating factors are ones that would tend to make a market relatively attractive for entry, such as high population growth rates and high income.<sup>19</sup> Regulatory approval of a merger may require a

divestiture of acquirer or target branches in particular markets to a third party such that the resulting change in concentration is acceptable.

Although antitrust enforcement cannot decrease concentration, it does limit increases in concentration, especially in highly concentrated markets. If a proposed merger would violate the DOJ merger guidelines in one or more local banking markets and there were no mitigating factors and no proposed divestiture, regulators might deny the proposal. By denying some merger applications and by discouraging other potential mergers from ever reaching the application stage in the first place, antitrust enforcement, especially in highly concentrated markets, can prevent mergers. Moreover, because the DOJ merger guidelines indicate a 200-point cap on increases in the HHI in markets with an initial HHI of at least 1,600, but not in less concentrated markets, mergers that *are* approved may tend to increase the HHI less in more highly concentrated markets than in less concentrated markets.

#### 4.2. Local Market Definitions

For this study, I use the 162 local banking markets that are actually used by the Federal Reserve Bank of San Francisco in its analysis of the potential competitive effects of proposed bank, bank holding company, and thrift mergers in the Twelfth Federal Reserve District.<sup>20</sup> For the 61 urban markets, these either are Randomly Metro Areas (RMAs), as defined by Rand McNally, or RMAs and some nearby towns. The 101 Twelfth District rural markets usually do not follow county boundaries; these counties tend to be very large, and rural markets often include only part of a county or may cross county lines.<sup>21</sup>

---

careful comparison of the potential competitive effects of an acquisition versus the potential situation should the acquisition not take place—namely, the target is likely to disappear anyway. Even if denial of the proposal does seem warranted on competitive grounds, approval still might be warranted on the basis of, say, meeting the convenience and needs of the community by preserving customer accounts and even, to some degree, customer-bank relationships that had been built with the failing institution.

20. Given that these markets were defined at a particular time, it is possible that some of them may be slightly redefined in the future as market conditions evolve or in consideration of the particular circumstances of a proposed transaction. Likewise, I use market definitions as of February 2004 in this paper, despite the possibility that, in the past, the geographic boundaries of a few markets may, in reality, have been slightly different. Market definitions can be found at <http://www.frbsf.org/publications/banking/market/index.html>

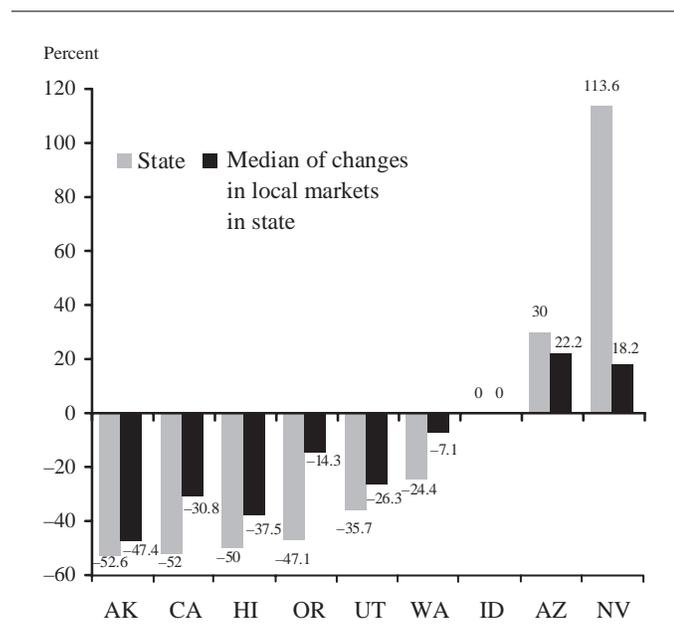
21. Many of these markets, especially in rural areas, were defined to analyze a particular proposed merger. Therefore, there is a tendency for markets with no merger activity nearby, including monopoly markets, to remain undefined and thereby to be excluded from this analysis.

17. When evaluating a proposed acquisition of a thrift organization by a banking organization, the deposits of the thrift are weighted at 50 percent premerger and 100 percent postmerger, to reflect the banking organization's postmerger control over the acquired deposits.

18. Note that this is a two-part test. For example, a proposal that would increase the HHI by more than 200 to a level below 1,800 would not prompt further competitive analysis, nor would a proposal that would increase the HHI by no more than 200 to a level of 1,800 or more.

19. Other factors may influence the assessment of the potential anticompetitive effects of a transaction or outweigh those effects. Consider, for example, the likely imminent failure of a proposed target depository institution. Accounting for a target's being close to failure is part of a

FIGURE 3  
CHANGES IN NUMBER OF DEPOSITORY INSTITUTIONS  
FOR STATES AND LOCAL MARKETS BETWEEN 1984 AND 2003



Note: States are ranked in ascending order by percent change in number of depository institutions in the state between 1984 and 2003.

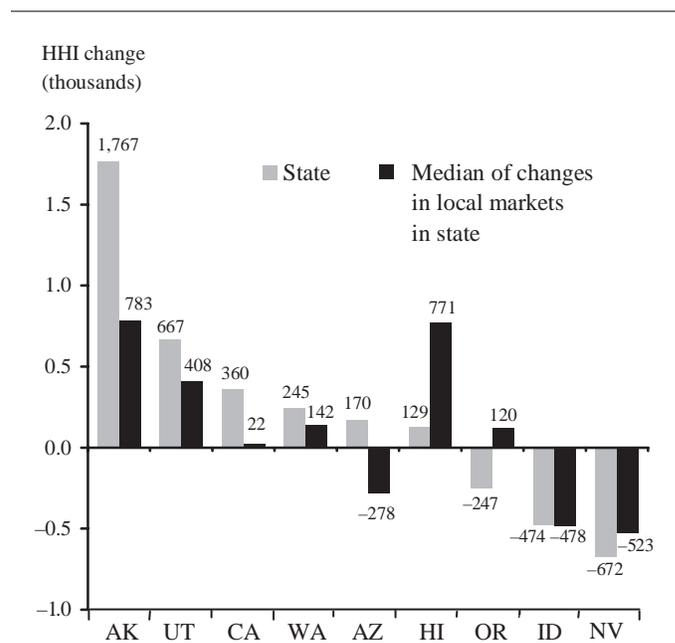
#### 4.3. Relationships between State Level Changes and Local Level Changes within States

Consistent with the national and state level patterns, the number of depository institutions at the local level tended to decline between 1984 and 2003, while concentration, as measured by the HHI, tended to increase (see Figures 3 and 4). However, in general, there was less consolidation at the local level than at the state level, just as there was less consolidation at the state level than at the national level. In particular, in each of the states where the number of depository institutions declined, the percent decline exceeded the median percent decline for that state's local markets (see Figure 3).<sup>22</sup> And in the majority of Twelfth District states, changes in the HHI at the state level were greater than the median of the changes in local market HHIs within the state (see Figure 4). In addition, no state showed HHI increases in every one of its local markets.<sup>23</sup>

22. Note, however, that the three states with stable or increasing numbers of depository institutions (Idaho, Arizona, and Nevada) also had equal or greater changes at the state level than at the local level, which does *not* indicate greater consolidation at the state than at the local level in those states.

23. In contrast, both of Alaska's defined local markets and all five of Hawaii's showed declines in the number of depository institutions.

FIGURE 4  
CHANGES IN HHI FOR STATES AND LOCAL MARKETS  
BETWEEN 1984 AND 2003



Note: States are ranked in descending order by change in state HHI between 1984 and 2003.

Similar to the role interstate mergers play in explaining why national levels surpass state levels of consolidation, "intermarket" mergers likely play a role in explaining why state levels surpass local levels. Although most of the Twelfth District states have permitted statewide branching since at least the early 1960s, many depository institutions still operate only within certain regions of a state.<sup>24</sup> Of course, the many smaller depository institutions operate within just a few local markets in a state. Thus, there is ample scope for mergers to effect consolidation at the state level, but not in any local market.

Another reason that local level consolidation, on average, tends to be less than at the state level is simply that the minimum size for a depository institution branch to be economically viable is too large to permit the less populous local markets to accommodate as many branches of different depository institutions as the more populous local markets.<sup>25</sup> Thus, a merger may contribute to consolidation at

24. Statewide branching became effective in Oregon and Washington in 1985 and in Hawaii in 1986 (Amel and Keane 1986).

25. The contrast between the number of depository institutions in urban local markets versus rural local markets is visible in a supplementary Appendix that is available in the online version of this article; it also is available from the author upon request.

TABLE 1  
TWELFTH DISTRICT CORRELATIONS BETWEEN STATE LEVEL  
AND LOCAL LEVEL MEASURES OF CONSOLIDATION

	Correlation between...			
	% change in depository institutions (DIs) (state level) and...		Change in state level HHI and...	
	% of local markets with decrease in DIs	median % change in local DIs	% of local markets with HHI increase	median change in local HHI
Overall <sup>a</sup>	-0.69	0.83	0.32	0.75
Urban only <sup>b</sup>	-0.87	0.97	0.52	0.95
Rural only <sup>c</sup>	-0.30	0.35	0.80	0.87

<sup>a</sup>State level variables measured across the whole state, including areas not in any defined local market. Local variables measured across only defined urban and rural markets.

<sup>b</sup>State level variables measured across only defined urban local markets.

<sup>c</sup>State level variables measured across only defined rural local markets.

the state level and within some local markets, but very likely not within every local market in the state.<sup>26</sup>

While consolidation at the local level tends to be less than consolidation at the state level, the two do appear to be positively correlated. For example, the correlation between the state level change in the number of depository institutions and the median change in the number of depository institutions in local markets in the state (0.83) is relatively strong (see Table 1). So is the correlation between the state level change in the HHI and the median change in the HHI in local markets in the state (0.75). Consistent with the relatively high degree of correlation between consolidation at the state level and consolidation at the local level, among the Twelfth District states, Arizona, Idaho, and Nevada rank near the bottom on both counts (see Figures 1, 3, and 4).<sup>27</sup>

Given that previous research has found evidence of greater increases in concentration in urban markets than in rural markets, Table 1 also presents correlations between

state and local level changes for urban and rural subsets of markets within the Twelfth District. Five out of eight of the correlations between state and local measures of consolidation for urban and rural subsets of markets are at least .8 in absolute value.

#### 4.4. *Variations in Local Level Consolidation across the Twelfth District and the Role of Initial Concentration*

As mentioned in Section 2, Pilloff (2001) found, using bank deposit data only, that local markets have seen either decreases in concentration or only modest increases in concentration on average. However, using bank and thrift deposits, Rhoades (2000) found that the mean U.S. urban banking market HHI increased by a much larger amount than indicated by Pilloff's statistics and that the mean U.S. rural banking market HHI increased rather than decreased.

Using median changes, bank and thrift deposits, and Federal Reserve banking market definitions rather than MSAs and non-MSA counties, I find changes in concentration for urban and rural markets in the Twelfth District that fall between those found by Pilloff and those found by Rhoades for local markets across the whole country (see Table 2).<sup>28</sup> In particular, this study's median change of 129 in the Twelfth District urban market HHI, while larger than the change that Pilloff finds, is well below the change that Rhoades finds and well below the benchmark 200 points that might trigger antitrust concerns (should the change in concentration result in a highly concentrated market). And the median change in the Twelfth District rural market HHI, while smaller in magnitude than that found by Pilloff, still is negative.<sup>29</sup>

However, this study finds that over a third of both urban markets and rural markets saw increases in the HHI of greater than 200 points. For 32 of these rural markets (31.7 percent of rural markets) and 8 of the urban markets (13.1 percent), the HHI increase of more than 200 was to a level of at least 1,800.<sup>30</sup>

26. As noted in footnote 21, there are areas of each state that are not in any defined local banking market. Therefore, unlike the relative change in the number of depository institutions in the United States, which would be equal to a weighted average of the relative changes in the number of depository institutions in each state, were all mergers intra-state and each institution operating in only one state, the relative change in the number of depository institutions in a state would not be equal to a weighted average of the relative changes in the number of depository institutions in defined local markets in those states, even under analogous circumstances.

27. Some of the numbers for the individual Twelfth District states that were used to calculate the correlations in Table 1 appear in Figures 1, 3, and 4. All of them are available from the author upon request.

28. Note that the length and timing of the sample period differs somewhat among the three studies: 19 years for this study (1984–2003), 18 years for Pilloff (1980–1998), and 14 years for Rhoades (1984–1998).

29. With respect to the contrast between urban and rural markets, note also that the median percent decrease in the number of depository institutions in urban markets exceeds that in rural markets (Table 2).

30. A somewhat higher percentage of urban markets (41 percent) than rural markets (34.7 percent) showed an HHI increase of more than 200, but rural markets tended to start out with higher levels of concentration, which increased the likelihood of their ending the sample period with an HHI of at least 1,800. (These data are available in the supplementary Appendix in the online version of this article and also are available from the author upon request.) Note that an HHI increase of more than 200

TABLE 2  
CHANGES IN CONCENTRATION AND  
NUMBER OF DIs IN THE TWELFTH DISTRICT,  
URBAN AND RURAL BANKING MARKETS, 1984–2003

	Urban banking markets		Rural banking markets	
	≤ 1,800	>1,800	≤ 1,800	>1,800
Median change in DIs	–33.3%		–10%	
Median change in HHI	129		–147	
1984 HHI	≤ 1,800	>1,800	≤ 1,800	>1,800
Markets	49	12	22	79
# with DI decrease <sup>a</sup>	43 (87.8%)	7 (58.3%)	15 (68.2%)	42 (53.2%)
# with HHI increase <sup>b</sup>	40 (81.6%)	1 (8.3%)	13 (59.1%)	29 (36.7%)
Median change in DIs	–35%	–13.3%	–9.5%	–12.5%
Median change in HHI	178	–256	136	–146

<sup>a</sup>Some markets had no change in the number of DIs. Therefore, the number of markets with an increase in the number of DIs is less than the total number of markets minus the number with a decrease in the number of DIs.

<sup>b</sup>One rural market had no change in the HHI.

But the presence of such increases should not signal inexorably larger or more widespread local banking market concentration increases in the future, even should the underlying consolidation trend of the past 19 years continue. As a market becomes more concentrated, two forces should, at least in the long run, slow its increase in concentration. First, as explained earlier, antitrust enforcement tends to limit increases in concentration due to mergers, especially for highly concentrated markets. Second, assuming that rising concentration increases profitability, highly concentrated markets should, through competition, attract new entry, thereby at least partially countering any increases in concentration due to mergers.

Indeed, consistent with antitrust enforcement and competition-driven new entry, Table 2 shows that only one of the 12 urban markets that were highly concentrated to begin with in 1984 saw an increase in concentration, whereas 40 of the 49 urban markets that were not highly

points to a level of at least 1,800 over 19 years does not indicate a breach of the DOJ merger guidelines. The guidelines apply to individual transactions. Therefore, a series of changes of less than 200 that bring the HHI up to at least 1,800 is quite possible. In addition, as discussed earlier, the presence of mitigating factors may result in approval of a transaction that increases the HHI by more than 200 to a level of at least 1,800.

concentrated to begin with saw an increase in concentration. Similarly, a lower proportion of rural markets that were highly concentrated in 1984 saw an increase in concentration than did rural markets that were not highly concentrated in 1984. And, for both urban and rural markets, the median change in concentration for highly concentrated markets was lower than the median change for markets that were not highly concentrated.

Not only did highly concentrated markets tend to see smaller increases in concentration, the majority of highly concentrated markets saw actual concentration decreases. Likewise, the median change in concentration for markets that were highly concentrated in 1984 was negative.

The presence of concentration decreases in initially highly concentrated markets suggests that antitrust enforcement cannot be the only influence linking initial concentration to the change in concentration. Antitrust enforcement can only limit increases in concentration, it cannot decrease concentration. Two other forces *could* result in concentration decreases, though: more entries than exits, that is, positive net entry, or a redistribution of market shares toward equality without net new entry.<sup>31</sup> The theoretical links between high concentration, competitive market forces, and market share redistributions with no net new entry are not well established in the research literature and are not pursued in this article.<sup>32</sup> It is sufficient for the purpose of explaining the empirical presence of decreases in concentration to note only that net new entry and market share reallocations both decrease concentration, whereas antitrust enforcement does not.<sup>33</sup>

The data in Table 2 for changes in the number of depository institutions do not appear to indicate a strong tendency toward net new entry in highly concentrated markets. Among both urban and rural markets, a lower proportion of markets that were highly concentrated to begin with in 1984 did see a net decrease in the number of depository institutions than markets that were not highly concentrated to begin with. This is consistent with antitrust

31. Given two markets with the same number of depository institutions, the market with a more even distribution of market shares has lower concentration. It also is possible for a market with fewer depository institutions but a more even distribution of shares to have lower concentration than a market with more depository institutions but a more uneven distribution of shares.

32. Such an exploration might begin with the observation that reallocations of market shares toward a more even distribution of shares may also be thought of as a type of “entry,” wherein the market shares of the “entrants” increase from nonzero levels.

33. Unless otherwise specified, here and for the rest of the paper, a “reallocation” or “redistribution” of market shares means a redistribution of market shares toward equality such that concentration decreases without any net new entry.

## Box 1

## THE EFFECT OF INITIAL CONCENTRATION ON THE CHANGES IN CONCENTRATION AND IN THE NUMBER OF DEPOSITORY INSTITUTIONS

I estimate models of the change in concentration and the change in the number of depository institutions, with demographic conditions in addition to initial concentration as explanatory variables. Previous researchers have found that markets that are larger, more prosperous, and more rapidly growing are more attractive for entry (see Amel (1989) and Amel and Liang (1997)).

However, note that more populous markets, which contain more depository institutions to begin with, are more likely than less populous markets to contain both of the parties involved in a merger. Thus, during the period since 1984, more populous markets may have experienced, on net, a larger decrease in the number of depository institutions than less populous markets, controlling for differences in other factors.

For the change in concentration, I estimate the following equation:

$$(1/n)(HHI_{t+n} - HHI_t) = \alpha + \beta_1 HHI_t + \beta_2 PCI_t + \beta_3 POP_t + \beta_4 PCIG_{t,t+n} + \beta_5 POPG_{t,t+n} + \epsilon.$$

The dependent variable is the average annual change in concentration in the market over the sample period  $t$  to  $t + n$ .  $PCI_t$  is per capita income in the market in year  $t$  (in thousands of dollars), and  $POP_t$  is population in the market in year  $t$  (in thousands).  $PCIG_{t,t+n}$  is average annual per capita income growth in the market over the sample period (measured as a ratio, not a percent).  $POPG_{t,t+n}$  is average annual population growth in the market over the sample period (measured as a ratio).<sup>1</sup> I expect  $\beta_1$  to be negative and statistically significant. I expect  $\beta_2$ ,  $\beta_4$ , and  $\beta_5$  to be negative also, although the signs and statistical significance of these coefficients are not a focus of this paper. The coefficient  $\beta_3$  could be positive or negative. The variable  $\epsilon$  is an error term. I estimate the regression for three time periods: 1984–2003, 1984–1997, and 1997–2003.

As shown in the third row of Table 3, panel A, the initial HHI has a highly statistically significant negative effect on the change in the HHI.

The regression equation also was estimated with the annualized rate of change in the number of depository institutions from the initial year to the terminal year of the relevant sample period as the dependent variable (measured as a ratio). These regressions yielded the expected positive coefficients on initial concentration, but the initial concentration coefficient was statistically significant only in the urban market regression. It is also notable that the coefficient on population is negative, and, in the urban market regressions, highly statistically significant. This suggests that, controlling for other factors, more populous markets were much more likely during the sample period to have experienced mergers than were less populous markets, purely by virtue of the larger markets having a higher probability of containing both of the merging parties (see Table 3, panel B).

1. Amel (1989) and Amel and Liang (1986) include population per capita income, and population growth in their regressions. I add per capita income growth as a reasonable additional control variable.

enforcement, that is, fewer exits through mergers, and with higher entry in highly concentrated markets.<sup>34</sup>

However, even among highly concentrated markets, less than half saw a net increase in the number of depository institutions, and median changes in the number of depository institutions were negative.<sup>35</sup>

Data (not shown) also indicate that net new entry does not play the most important role in explaining the tendency

toward declines in concentration in highly concentrated markets. Among highly concentrated markets that decreased in concentration, only 36.4 percent of urban ones and 34.7 percent of rural ones showed a net increase in the number of depository institutions.

To further examine the relationships between concentration and the change in concentration or in the number of depository institutions and what forces might contribute to those relationships, I estimate simple regression models of these changes as functions of initial concentration and demographic control variables. Given the change in regulations affecting bank mergers following the Riegle-Neal Act in 1997, I estimate the models for 1984–1997 and for 1997–2003, as well as for the entire 1984–2003 period. It is possible that the statistical significance of these relationships depends on which of the two subperiods is being

34. In contrast, note that, although the median percent decline in the number of depository institutions in highly concentrated urban markets was less than that in urban markets that were not highly concentrated, the same was not true for rural markets.

35. Only 33.3 percent of highly concentrated urban markets and 24.1 percent of highly concentrated rural markets had a net increase in the number of depository institutions.

TABLE 3  
REGRESSION RESULTS

A. CHANGE IN LOCAL MARKET CONCENTRATION									
Observations	All			Urban			Rural		
	162			61			101		
	1984–2003	1984–1997	1997–2003	1984–2003	1984–1997	1997–2003	1984–2003	1984–1997	1997–2003
Adjusted $R^2$	0.207	0.081	0.291	0.299	0.593	0.212	0.16	0.032	0.352
Intercept	825** (2.33)	642 (1.55)	725*** (2.81)	1,328*** (3.03)*	1,519*** (3.17)	1,654*** (3.94)	921* (1.66)	907 (1.48)	697*** (2)
HHI <sup>a</sup>	-0.271*** (-6.48)	-0.218*** (-4.24)	-0.22*** (-6.91)	-0.463*** (-5.42)	-0.92*** (-9.45)	-0.43*** (-3.32)	-0.285*** (-4.6)	-0.161** (-2.23)	-0.256*** (-6.51)
Population <sup>a</sup>	-0.000001 (0)	0.007 (0.09)	-0.052 (-1.23)	-0.005 (-0.13)	-0.06 (-1.31)	0 (-0.66)	-4.37 (-0.79)	-0.913 (-0.14)	-5.58** (-2.2)
Per capita income	-8.03 (-0.46)	-11.7 (-0.5)	19.7 (1.56)	-15 (-0.87)	6.29 (0.29)	-0.025 (-0.66)	-5.25 (-0.18)	-38.8 (-1.08)	39.1** (2.38)
Population growth	-3,058 (-1)	-3,038 (-0.85)	-1,946 (-0.8)	-4,110 (-0.97)	-6,431 (-1.37)	-5,593 (-1.34)	-2,878 (-0.69)	-830 (-0.18)	898 (0.28)
Per capita income growth	-1,054 (-0.17)	8,268 (1.3)	-13,955*** (-3)	-6,998 (-0.91)	5,581 (0.73)	-14,042* (-1.77)	-398 (-0.05)	3,598 (0.43)	-14,813*** (-2.58)
B. RATE OF CHANGE IN NUMBER OF DEPOSITORY INSTITUTIONS IN LOCAL MARKETS									
Adjusted $R^2$	0.881	0.908	0.266	0.888	0.911	0.478	0.098	0.11	0.086
Intercept	-5.97** (-2.01)	-3.88* (-1.82)	-2.88* (-1.86)	-27*** (-2.92)	-13.5** (-2.03)	-16*** (-3.32)**	-0.653 (-0.48)	-1.54 (-1.57)	0.021 (0.03)
HHI <sup>a</sup>	0.0004 (1.17)	0.0007*** (2.62)	-0.00003 (-0.17)	0.003* (1.79)	0.003** (2.33)	0.003** (2.5)	0.00007 (0.42)	0.0001 (1.29)	6E-07 (0.01)
Population <sup>a</sup>	-0.017*** (-32.6)	-0.015*** (-37.2)	-0.002*** (-6.61)	-0.017*** (-20.2)	-0.015*** (-22.8)	-0.002*** (-4.6)	-0.024* (-1.77)	-0.023** (-2.26)	-0.0001 (-0.02)
Per capita income	0.075 (0.51)	-0.023 (-0.19)	0.037 (0.48)	0.599 (1.63)	0.206 (0.67)	0.195 (1.01)	-0.081 (-1.14)	0.007 (0.12)	-0.085** (-2.36)
Population growth	33.8 (1.31)	14.2 (0.77)	29.9** (2.04)	152* (1.7)	21.5 (0.33)	121*** (3)	19.7* (1.9)	13.5* (1.85)	8.54 (1.2)
Per capita income growth	93.4* (1.83)	34.6 (1.06)	60.3** (2.15)	364** (2.26)	134 (1.27)	167** (2.17)	25.3 (1.19)	14.9 (1.12)	30.7** (2.43)

Notes: t-statistics are in parentheses.

<sup>a</sup> In first year of sample period.

\*significant at 10%.

\*\*significant at 5%.

\*\*\*significant at 1%.

examined. The details of the regressions are discussed in Box 1, with results reported in Table 3.

As seen in the third row of Table 3, panel A, for urban and rural markets I find evidence consistent with antitrust enforcement and competition-driven entry: negative and highly statistically significant effects of the HHI on the change in the HHI. These results hold for the entire 1984–2003 period and for the two subperiods.

In addition, consistent with the data presented in Table 2, the estimated regression equations for the change in concentration suggest that concentration does decline for the higher initial concentration levels in the sample. The fitted

relationships for 1984–2003 imply that, at sample means for the other explanatory variables, the HHI declines if it starts out above 1,836 in urban markets or above 2,435 in rural markets. Concentration levels for 1984 that are above these respective cutoffs appear in 18 percent of District urban markets and 47.5 percent of rural markets.<sup>36</sup>

Also consistent with Table 2, the regression estimates suggest that the declines in concentration in the highly

36. The difference between these percentages may be related to why District urban markets have tended to see a concentration increase and rural markets a concentration decrease since 1984.

concentrated markets in the sample do not tend to be the result of net new entry. For example, the fitted relationship for the change in the number of depository institutions for 1984–2003 for urban markets derived from the results shown in Table 3, panel B implies that the number of depository institutions decreases only if the HHI starts out above 4,883. Only one urban market had an HHI above 4,883 in 1984. Given that declines in concentration in highly concentrated markets in our sample are not primarily the result of net new entry, they must largely be the result of market share redistributions.

The overall regression evidence regarding the effect of concentration on exit and entry is mixed, with a contrast between urban and rural markets. In urban markets, initial concentration has a positive and statistically significant effect on the net change in the number of depository institutions. Therefore, in urban markets, initial concentration may have a negative effect on exit, by way of antitrust enforcement, which would limit the number of mergers and thereby limit the disappearance of the target institutions in highly concentrated markets. Initial concentration also may have a positive effect on entry, by way of the competitive process, which would attract new competitors to highly concentrated and therefore highly profitable markets.

However, initial concentration does not have a statistically significant effect on the net change in the number of depository institutions in rural markets, implying that concentration affects neither exit nor entry in rural markets.<sup>37</sup>

The apparent lack of an effect of concentration on exit in rural markets may largely be because of insufficient sample size. As suggested in Box 1 as a reason for the statistically significant negative effect of population on the change in the number of depository institutions, small markets, with few depository institutions, are relatively unlikely to contain both of the merging parties. Given that small markets have relatively few intramarket mergers, my rural market sample may simply have too few mergers to provide enough sample variation to yield a statistically significant relationship between the change in the number of depository institutions and concentration as well as population. In contrast, a larger sample of rural markets might provide adequate variation.

A reason for the apparent lack of an effect of concentration on new entry in rural markets may be that the size of rural markets is, in general, too small to render a new entrant economically viable.

## 5. Conclusion

The number of depository institutions in the United States fell dramatically between 1984 and 2003, and, consistent with this, concentration at the national level increased markedly. The same trends can be seen at the Twelfth District state level. However, the degree of consolidation, as reflected in the change in the number of depository institutions and the change in concentration, tended to be less at the Twelfth District state level than at the national level. This is not surprising, since interstate mergers contributing to consolidation at the national level would not affect consolidation measured at the state level. Analogously, although the consolidation trend also is evident at the local level, the degree of consolidation appears to be less at the local level within each state than at the respective state level. However, in general, median measures of consolidation at the local level within the states do appear to be positively correlated with measures of consolidation at the state level.

Urban local market concentration across the Twelfth District as a whole has increased moderately, while rural market concentration has decreased. However, more than a few markets have shown relatively large increases in concentration to relatively high levels.

In the long run, highly concentrated markets should tend to show smaller increases in concentration than less concentrated markets. Indeed, this paper finds negative and statistically significant effects of concentration on the long-run change in concentration. In addition, the estimated regression equations imply decreases in concentration in markets with high, but empirically readily observable, initial concentration levels. So, while concentration in some local markets has increased to relatively high levels, these markets should eventually show declines in concentration.

While the negative relationship between concentration and the change in concentration is consistent with antitrust enforcement, this alone cannot explain the tendency for the most highly concentrated markets in the sample to show actual concentration decreases. In addition, while the positive relationship that I find in urban markets between concentration and the change in the number of depository institutions is consistent with higher entry in more concentrated markets, I do not find that net entry plays the most important role in explaining the tendency for the most highly concentrated markets to decline in concentration. Therefore, market share redistributions appear to be more important in explaining declines in concentration.

In two respects, then, this paper presents a somewhat different picture of banking industry consolidation than that suggested by the near halving of the number of depository institutions in the nation during the past 19 years.

37. This conclusion rests on the assumption that an increase in concentration does not increase exit nor, alternatively, decrease entry.

First, at the local level, which is the focus of competitive concerns, the extent of consolidation in the Twelfth District has been less than at the state level, which, in turn, has been less than at the national level. Second, regulatory forces and a leaning toward an equalization of market shares in highly concentrated markets and, in urban markets at least, competition-driven new entry provide mitigating and even self-correcting tendencies that counter the effect of consolidation on competition in banking.

## References

- Amel, Dean F. 1989. "An Empirical Investigation of Potential Competition: Evidence from the Banking Industry." In *Bank Mergers: Current Issues and Perspectives*, ed. B.E. Gup. Norwell, MA: Kluwer Academic Publishers.
- Amel, Dean F., and Daniel G. Keane. 1986. "State Laws Affecting Commercial Bank Branching, Multibank Holding Company Expansion, and Interstate Banking." *Issues in Bank Regulation* (Autumn) pp. 30–40.
- Amel, Dean F., and Nellie Liang. 1990. "Dynamics of Market Concentration in U.S. Banking, 1966–86." *International Journal of Industrial Organization* 8, pp. 375–384.
- Amel, Dean F., and Nellie Liang. 1997. "Determinants of Entry and Profits in Local Banking Markets." *Review of Industrial Organization* 12, pp. 59–78.
- Amel, Dean F., and Martha Starr-McCluer. 2002. "Market Definition in Banking: Recent Evidence." *Antitrust Bulletin* 47, pp. 63–89.
- Berger, Alan, and Timothy Hannan. 1989. "The Price-Concentration Relationship in Banking." *Review of Economics and Statistics* 71, pp. 291–299.
- Jayarathne, Jith, and Phillip E. Strahan. 1998. "Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking." *Journal of Law and Economics* 49, pp. 239–274.
- Laderman, Elizabeth. 2003. "Good News on Twelfth District Banking Market Concentration." *FRBSF Economic Letter* 2003-31 (October 24). <http://www.sf.frb.org/publications/economics/letter/2003/el2003-31.pdf>
- Pilloff, Steven J. 2001. "Commercial Banking." In *The Structure of American Industry*, 10th ed., eds. W. Adams and J.W. Brock. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Pilloff, Steven J., and Stephen A. Rhoades. 2002. "Structure and Profitability in Banking Markets." *Review of Industrial Organization* 20, pp. 81–98.
- Rhoades, Stephen A. 1992. "Evidence on the Size of Banking Markets from Mortgage Loan Rates in Twenty Cities." Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin* 78, pp. 117–118.
- Rhoades, Stephen A. 2000. "Bank Mergers and Banking Structure in the United States." Board of Governors of the Federal Reserve System, Staff Study 174 (August). <http://www.federalreserve.gov/pubs/staffstudies/2000-present/174sum.htm>
- Scherer, F.M. 1980. *Industrial Market Structure and Economic Performance*, 2nd ed., Boston: Houghton Mifflin Company.