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The Financial Crisis, the Collapse of Bank Entry, and Changes in the Size Distribution of Banks

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The recent financial crisis has had an enormous impact on the banking industry. There were numerous bank failures, bank bailouts, and bank mergers. One of the more striking effects was the decline in the number of banks. At the end of 2007, as the recent financial crisis was developing, there were 6,153 commercial banks in the United States. At the end of 2013, as the direct effects of the crisis were wearing off, the number of banks had dropped 14 percent, reaching 5,317.[1]

The purpose of this article is to document the size and scope of these recent changes to the size distribution of banks, particularly among the smaller banks, and explain the sources of these recent changes. In doing so, we also update the work of Janicki and Prescott (2006), who studied the size distribution in the banking industry from 1960–2005.

Our most significant finding is that the recent decline in the number of banks is *not* due to exit from banking. Despite the financial crisis, the exit rate—the percentage of active banks that disappeared due to

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[1] There were even larger percentage declines in the number of savings institutions (savings and loans and savings banks) and credit unions. In 2007, there were 1,250 savings institutions and 8,268 credit unions. In 2013, there were 936 savings institutions and 6,687 credit unions, drops of 25 percent and 19 percent, respectively. (Sources: Savings institution numbers are from the Federal Deposit Insurance Corporation [FDIC] State Banking Performance Summaries. Credit union numbers are from NCUA Quarterly Call Reports.)

failure or merger with another bank—over the period 2008–2013 is not that different from 2002–2007. There are significant differences in how banks exited—in the earlier period virtually all of the exit was due to acquisitions and mergers, while in the later period there were also many failures—but mechanically it is the number of exits, not the reason for them, that matters for calculating the total number of banks.

Instead, nearly two-thirds of the recent decline is due to the collapse of entry into commercial banking. Very few new banks have started since 2008 and most of these are thrifts or credit unions changing their charter or, in a smaller number of cases, banks that were spun out of multi-bank holding companies. Entry by newly created banks, commonly called *de novo* banks, has been minimal and was actually zero in 2012. This is unprecedented over the last 50 years. Even during the previous banking crisis of the late 1980s and early 1990s when large numbers of banks failed or merged, there was still substantial entry.

The recent lack of entry has large implications for the number of banks and bank size distribution. Most new banks start small, so without that flow into banking, the number of small banks will decline. Indeed, we find that the biggest drop is in the smallest size class, those with less than $100 million in assets, and that two-thirds of this decline can be attributed to the lack of entry. This drop is of potential concern because small banks are considered to have a comparative advantage in small business, relationship-type lending (Berger and Udell 2002). For better or worse, a drastic change in the bank size distribution could have an impact on the allocation of credit to different sectors in the economy.[2]

To demonstrate the importance of entry for the future number of banks, we provide forecasts of the number of banks based on different assumptions about entry rates and show how these depend on the degree to which entry recovers to historical rates. Finally, we discuss various reasons for why entry has been so low.

1. DATA

Historically, in the United States there have been many legal and regulatory limits on bank size. For example, in the 1960s banks could not branch across state lines, and in some states banks were required to be unit banks, that is, they could not even have a branch. These limits were removed gradually starting in the 1970s, more rapidly in the 1980s, and mostly eliminated in the 1990s with the Riegle-Neal

[2] Bank size distribution should have an effect on bank productivity as well, but it is difficult to measure bank productivity.

Interstate Banking and Branching Efficiency Act of 1994. This law allowed bank holding companies to acquire banks in different states and allowed interstate bank mergers.[3]

A bank holding company is a company that directly or indirectly owns at least 25 percent of a bank's stock, controls the election of a majority of a bank's directors, or is deemed to exert controlling influence over a bank's policy by the Federal Reserve (Spong 2000). Often, a bank holding company will have multiple banks—or even another bank holding company—under its control. Historically, this structure was used to avoid some of the restrictions on bank branching (Mengle 1990) while still allowing the bank holding company to jointly manage many activities. For this reason, we follow Berger, Kashyap, and Scalise (1995) and treat all banks and bank holding companies under a bank holding company as a single banking entity. For convenience, we will call one of these entities a bank.

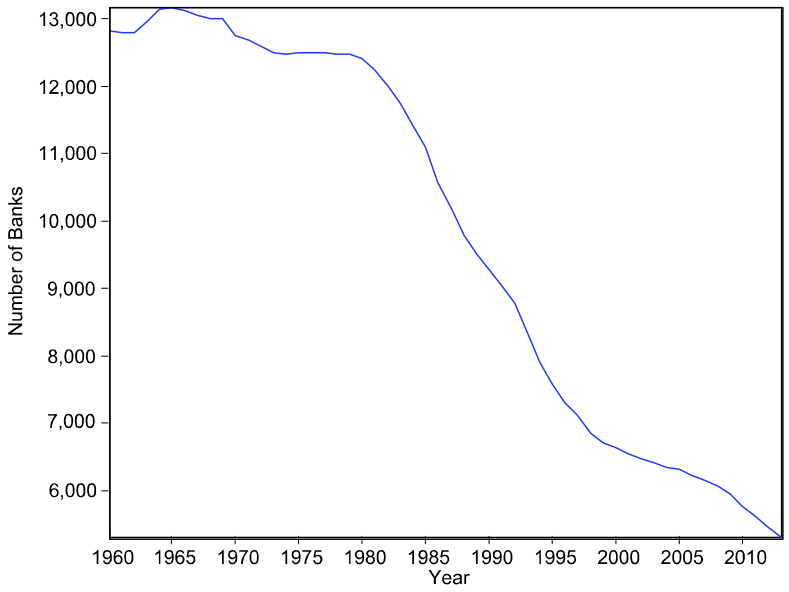
Bank structure and bank size data are measured at the end of each year from 1960–2013. Data on bank structure are taken from the Federal Reserve's National Information Center bank structure database. We only include commercial banks and exclude savings and loans, savings banks, and credit card banks.

Bank size data comes from the Reports on Condition and Income (the "Call Report"), which is collected by federal bank regulators. Bank size is measured by assets, though in a few places we use additional size measures. For the analysis, assets are also adjusted by off-balance sheet items starting in 1983. Starting in that period, banks, and larger banks in particular, began to undertake numerous activities like providing lines of credit, supporting securitizations, and issuing derivatives that expose a bank to risk but are not reported on a traditional balance sheet. These adjustments significantly increase the size of the largest banks. The Appendix contains more information on these adjustments.

To facilitate comparison of bank size across years, we report size measures relative to 2010 dollars. Data in other years are scaled by the change in total bank assets between those years and 2010. The resulting number is essentially a market share number, but scaled by the size of the commercial banking industry in 2010. For example, total bank assets in 2000 were 50.5 percent of total bank assets in

[3] See Jayaratne and Strahan (1997) for a history of bank branching restrictions and Kane (1996) for a description of the Riegle-Neal Act.

Figure 1 Total Number of Independent Banks



Notes: All banks and bank holding companies that are under a higher-level holding company are treated as a single independent bank. A more precise definition of an independent bank is given in Section 1.

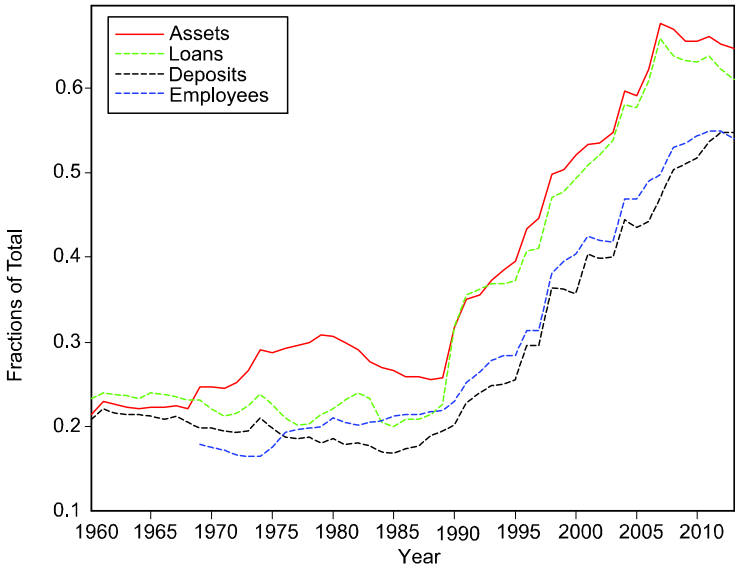
2010. Consequently, we roughly double the size of a bank in 2000 to make it comparable to a bank in 2010.[4]

2. CHANGES IN BANK SIZE DISTRIBUTION

Figure 1 shows the number of banks from 1960 through 2013. Several distinct periods are apparent in the graph. From 1960 to 1980, the number of banks is relatively stable. There is a drop in the early 1970s, which overlaps with the sharp recession of 1973–1975, but compared with future changes this drop is proportionally small. The most dramatic changes start in 1980 and last through the late 1990s. This

[4] An alternative way for scaling the data would be to use a price index like the consumer price index. We do not use this measure because that price index was designed to measure changes in the price of goods and we are interested in changes to the size of a bank's balance sheet, not what it charges to provide bank services. Furthermore, there have been much larger changes in total assets in the banking industry than in price levels.

Figure 2 Market Share of 10 Largest Commercial Banks



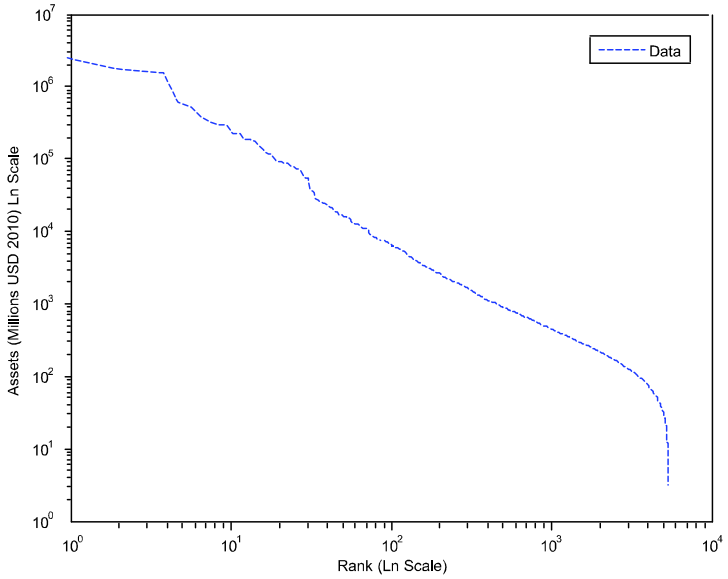
Notes: Market share of the 10 largest commercial banks for four different measures. The number of employees is only reported starting in 1969 because the Call Report did not collect that information until then.

is the era when many regulatory restrictions were removed from bank branching and interstate banking, and there was a commercial banking crisis in the 1980s and early 1990s when many banks failed. These factors led to a large amount of consolidation through both merger and failure. Starting in the late 1990s, however, the decline continues, but the rate of decline slows down. This trend lasts until about 2005, before the crisis, and then the numbers begin to rapidly decline again.

A second phenomenon associated with the latter period of bank consolidation is an increase in concentration, particularly for the largest banks. Figure 2 shows the market share of the 10 largest banks for four different measures of firm size. Interestingly, the big increase in concentration starts around 1990 and continues until the financial crisis, at which point it levels off.

Like many industries, the size distribution of banks consists of a large number of small firms and a small number of large ones. One class of distributions that is often used to fit the size distribution of

Figure 3 Zipf Plot for Bank Size Distribution in 2013



firms is one that is based on a power law, that is, it satisfies the relation

$$f(x) = cx^{-\alpha},$$

where $c > 0$. Power laws also describe a large number of other empirical phenomena in economics as well as in the natural sciences.[5]

In this article, we will look at the data with a Zipf plot, or rank-frequency plot. In our context, this means we rank banks by size and then plot the log of the rank versus the log of the size of the bank. If this relationship is linear, then it satisfies a power law because

$$y_r = cr^{-\alpha},$$

where r is the rank of a bank measured by size and y_r is the size of the rth largest bank. Furthermore, when $\alpha = 1$ (or is close to it), the data is said to satisfy Zipf's Law, that is, size is inversely proportional to rank. In other words, the largest bank would be twice the size of the second-largest bank, three times the size of the third-largest bank, etc.

[5] For a description of the use of power laws in economics, see Gabaix (2009). For a discussion of their use to applications as diverse as word frequency, population of cities, and earthquake strength, see Newman (2005). For examples of their application to firm size, see Axtell (2001) and Luttmer (2007).

Table 1 Ten Largest Banks

Bank	2007 (billions)	Bank	2013 (billions)
JP Morgan Chase	2,503	JP Morgan Chase	2,518
Bank of America	2,096	Bank of America	1,756
Citigroup	1,824	Citigroup	1,614
Wachovia	904	Wells Fargo	1,519
Bank of New York Mellon	823	Bank of New York Mellon	600
State Street	708	State Street	523
Wells Fargo	580	U.S. Bancorp	386
U.S. Bancorp	290	PNC	323
HSBC Holdings	277	Capital One	298
Northern Trust	258	Goldman Sachs	292

Notes: Size of the 10 largest banks measured by assets, expressed in 2010 dollars. The asset measure includes off-balance sheet conversions and only includes activities under the banks' charters.

Janicki and Prescott (2006) found that Zipf's Law did an excellent job of fitting the size distribution of banks in 1960 and 1970, but starting in 1980 it underpredicts the size of the largest banks.

Figure 3 shows the Zipf plot for 2013. The graph suggests that Zipf's Law still underpredicts the size of the largest banks and, furthermore, there are different ranges of the size distribution where bank size is proportional to rank, but these proportions differ along different segments of the size distribution. Furthermore, it is obvious that the size distribution of the smallest banks is poorly described by a power law and therefore needs to be described by some other distribution.[6]

Interestingly, despite the severity of the financial crisis, the Zipf plot for 2007 (not shown) looks virtually identical to Figure 3. One reason is that changes among the distribution of smaller banks are hard to see in the curve and, as we will see, there were significant changes there. However, the other reason is that there were not significant changes in concentration among the largest banks. This is apparent in Figure 2, which shows that the market share of the 10 largest banks levels off after the crisis.

[6] It is common in applications that the bottom part of the distribution is not well described by a power law distribution, so scientists typically leave this part out of their analysis. For example, when looking at bank size distribution, Janicki and Prescott (2006) only consider the largest 3,000 banks when they assess how Zipf's Law fits the size distribution of banks. Recent work by Goddard et al. (2014) develops a more general formulation by fitting a distribution in which there is a power law for the largest banks, a lognormal distribution for small banks, and an endogenous cutoff between the two classes of banks. See also Goddard, Liu, and Wilson (2014) for an analysis of bank growth rates.

Table 2 Drop in Number of Banks by Size Class

Size Class (millions)	2007	2013	Change	% Change
< 100	2,538	1,771	−767	−30.2
100–500	2,706	2,634	−72	−2.7
500–1,000	455	453	−2	−0.0
1,000–5,000	338	333	−5	−1.5
5,000–10,000	48	50	2	4.2
10,000–50,000	39	44	5	12.8
> 50,000	29	32	3	10.3
Total	6,153	5,317	−836	−13.6

While the size distribution among the largest banks did not change much, there were significant changes among the relative size of the largest banks. Table 1 lists the size of the largest 10 banks in 2007 and 2013. The top three largest banks did not change, but Wachovia ceased to exist after being acquired by Wells Fargo. Northern Trust and HSBC exited the top 10 list, while PNC, Capital One, and Goldman Sachs entered it.

There are two features of these numbers worth noting. First, off-balance sheet activities have a large effect on the size of some of these firms. For example, Wachovia is listed as having about $900 billion in assets in 2007. Nearly a third of that number ($269 billion) came from the off-balance sheet adjustments.[7] See Appendix A for figures showing how big this adjustment is for the banking sector as a whole. Second, by using Call Report data we are only measuring assets (and off-balance sheet assets) that are held under a bank holding company's commercial bank charters.[8] For some financial institutions, this matters. For example, most of Goldman Sachs' activities are done outside its bank charter. In 2013, its balance sheet was about $912 billion (FR Y-9C), which is much larger than the $292 billion reported in Table 2. For others it is less important. A traditional commercial bank like Wells Fargo has most of its assets under its commercial bank charters.

The largest changes in the bank size distribution have occurred among smaller banks, which is something that the Zipf plot does not show that well. Consequently, we break banks into size classes and look at the number of banks in each class. Table 2 reports these

[7] The four largest off-balance sheet equivalents for Wachovia were unused loan commitments with an original maturity exceeding one year ($74 billion), securities lent ($59 billion), derivatives ($50 billion), and financial standby letters of credit ($40 billion).

[8] For an analysis of how the activities of large bank holding companies have changed over the crisis, see Ennis and Debbaut (2014).

Table 3 Drop in Number of Small Banks by Size Class

Size Class (millions)	2007	2013	Change	% Change
< 50	1,230	725	−505	−41.1
50–100	1,308	1,046	−262	−20.0
100–200	1,407	1,357	−50	−3.6
200–300	687	678	−9	−1.3
300–400	359	372	13	3.6
400–500	253	227	−26	−10.3
500–750	290	296	6	2.1
750–1,000	165	157	−8	−4.8

numbers. Not surprisingly, the biggest drop in the number of banks is in the smallest class of banks because the majority of banks are small. More interesting, however, is the percentage change. The biggest such change is in banks that hold less than $100 million in assets. The drop in this size class is about 30 percent in just five years. This is an extraordinarily large decline. In the next three size classes, the number of banks does not change that much, while there are increases in the three largest categories.[9]

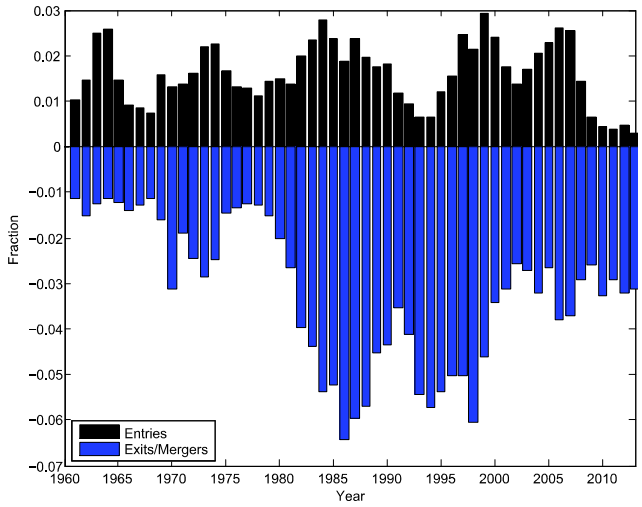
A closer look at banks that hold less than $1 billion further illustrates that the smallest banks are disappearing. Table 3 breaks down the size classes even further. There is an enormous drop of about 40 percent in the number of banks that hold less than $50 million. In the $50–$100 million range, there is a smaller, but still large, percentage drop of 20 percent. Above $100 million, the change is more mixed. In some categories, the number of banks increases and in others it decreases.

3. ENTRY AND EXIT

The recent decline in the number of banks shown in Figure 1 appears to be a continuation of a trend that started around 1980 and, when measured solely by the number of banks, that view would be correct. However, there is a significant difference from any previous period. Figure 4 reports the number of entries and exits into commercial banking expressed as a fraction of the banking population.

[9] To check the robustness of this result we also performed this analysis on other measures of bank size including on-balance sheet assets, deposits, and loans, both scaled and unscaled (nominal). Qualitatively, the results were similar for all these measures except for scaled loans.

Figure 4 Banks that Enter and Exit by Fraction of Total Banks



Notes: Entry and exit of banks expressed as a percentage of banks existing in each year.

The most striking observation from Figure 4 is the unprecedented collapse of bank entry since 2009. Entry rates are on the order of 0.05 percent, which is much smaller than the long-term average of 1.5 percent. Furthermore, as we will see in the next section, entry is actually weaker than these numbers indicate. The only period that is at all close to this is 1993 and 1994, which followed the previous banking crisis and the recession of the early 1990s.

The other striking observation from Figure 4 is that despite large numbers of exits in different periods, like the mid-1980s and the mid-1990s, entry was usually strong. For example, in 1984, when more than 5 percent of banks exited because of failure or merger, there were so many entrants that they equaled 3 percent of the banks that operated at the beginning of that year. The late 1990s were similar. During the merger wave of that period, there was a lot of entry.

It is also apparent from Figure 4 that despite the financial crisis, exit rates during the crisis are very similar to those from the 2002–2007 pre-crisis period. The one significant difference between these periods

Table 4 Commercial Bank Exit by Reason since 2002

Year	Total Exits	Failures	Acquisition/Mergers
2002	169	7	162
2003	176	1	175
2004	206	3	203
2005	169	0	169
2006	240	0	240
2007	232	1	231
2008	180	17	163
2009	158	98	60
2010	195	126	69
2011	168	80	88
2012	181	37	144
2013	171	18	153

Notes: Failed banks were obtained from the FDIC's Historical Statistics on Banking and then compared with our calculated list of exits. Banks that did not fail were treated as an acquisition/merger. Because we are measuring a bank at the holding company level and multiple failed banks can be part of the same holding company, we report fewer failures than the FDIC.

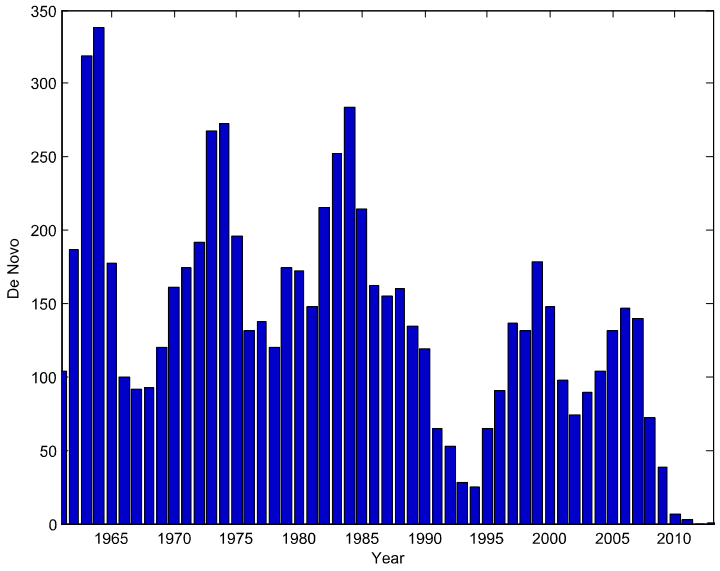
is the reason for exit. Table 4 lists bank exits by reason from 2002–2013. Before the crisis, almost all exit was due to an acquisition or merger while, during 2009–2010, failure was the most common reason for exit. Starting in 2011, failure accounts for about half of all exits, after which the rate of failure quickly declines.

The entry and exit rates demonstrate that the normal dynamics of the banking industry are *not* such that there is a fixed stock of banks from which banks exit over time. Instead, it is of a dynamic industry with lots of entry and exit in both good and bad economic times. By these perspectives, the collapse of entry is what is so striking about the last few years.

4. A DEEPER LOOK INTO ENTRY (OR THE LACK THEREOF)

A deeper look into the source of entry implies that entry in recent years is actually weaker than the numbers suggest. In our data, we can identify three distinct types of entry. First, there is a charter conversion, that is, a savings and loan, a savings bank, or a credit union that changes its charter to a commercial banking charter. Second, there is a spinoff, which is a bank that was formerly part of a holding company but has become independent. Third, there is a *de novo* entrant, which is a newly formed bank.

Figure 5 Number of De Novo Entrants by Year



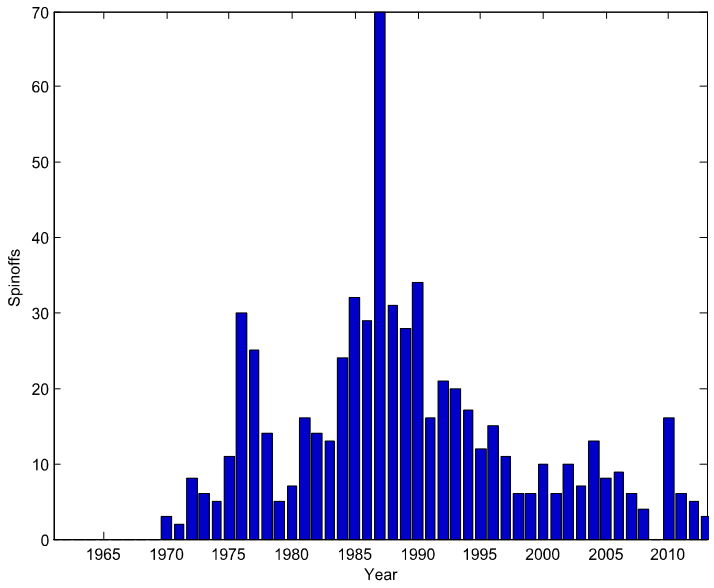
Notes: A *de novo* bank is a newly formed bank.

A *de novo* bank is a good measure of interest in entering banking because it represents new capital, new management, and a new organization. A charter conversion to a degree is just a relabeling of an existing institution since there is overlap between the activities of a commercial bank and other depository institution charters. Similarly, a spinoff is just another way of legally organizing bank assets and managers that are already in the banking sector.

Figure 5 lists the number of *de novo* entries for each year since 1960. The only two periods in which there is a sharp decline in the number of *de novo* banks are the early 1990s and the last few years. The former period coincides with the recession of the early 1990s and the end of a commercial banking crisis, but *de novo* entry numbers quickly rebound. In contrast, the *de novo* entry numbers in the recent period are truly abysmal. In 2011, there were three *de novo* banks;[10] in 2012, there were zero, and in 2013, there was only one. This last

[10] These three banks were Alostar, Cadence, and Certusbank, which were all formed to acquire failed banks.

Figure 6 Number of Spinoffs by Year



Notes: A spinoff is a newly independent bank that used to be part of a bank holding company. We identify a spinoff by taking the bank ID of each new entrant and seeing if that ID was a bank that was in a holding company in the previous year.

one was Bank of Bird-in-Hand, which was formed in Lancaster County, Pa., to serve the Amish community.

Spinoffs are unusual and to our knowledge have not been studied in the banking literature. There are several reasons for why a bank holding company might undertake one. One reason is that a bank holding company might sell one of its healthy bank charters to outside investors because the holding company is in financial trouble. For example, in 2012 the bank holding company Capital Bancorp sold several of its banks to local investors while it filed for Chapter 11 bankruptcy (Stewart 2012). A second reason is that management thinks the bank will be better managed separately rather than jointly. For example, in 2005 Midwest Bank Holdings sold one of its subsidiaries, Midwest Bank of Western Illinois, to local managers and investors because the bank's agricultural lending focus did not fit well with the holding company's Chicago growth strategy (Jackson 2005).

Table 5 Commercial Bank Entry by Type since 2002

Year	De Novo	Spinoff	Conversion
2002	74	10	6
2003	90	7	10
2004	104	13	12
2005	132	8	3
2006	147	9	5
2007	140	6	8
2008	72	4	10
2009	38	0	0
2010	7	16	3
2011	3	6	12
2012	0	5	20
2013	1	3	11

Figure 6 reports the number of spinoffs by year for our data set. In general, spinoffs are unusual, though there was a spike in the mid-1980s and there were 16 in 2009.

The final type of entry that we can identify is a charter conversion. A depository institution may want to switch charters because it wants to expand certain types of lending (e.g., savings and loans and credit unions face limits on the type of lending that they do). Table 5 shows entry by type since 2002, and this makes clear that most entries since 2011 came from charter conversions.

5. DECOMPOSING THE DROP IN THE NUMBER OF BANKS

The two trends we have identified—the decline in the number of small banks and the collapse of entry—are related. As we emphasized earlier, the dynamics of bank growth matter for the size distribution. In particular, the pool of small banks changes over time. Some grow to a new size class and some exit. These factors alone would reduce the number of small banks, so the flow into this pool matters a lot. For the smallest class of banks, *de novo* banks are a critical part of the flow in. Many of these banks start small, so they replenish the stock of small banks, even as other ones are leaving that class.

We can get a sense of just how much the recent decline in small banks is due to the drop in bank entry by running a simple counterfactual. We break banks into the seven size classes of Table 2, calculate the fraction of banks in each size class that move to another size class

Table 6 Annual Transition Probabilities Between Size Classes for 2008–2013

Size Class (millions)	**Exit**	**< 100**	**100–500**	**500–1,000**	**1,000–5,000**	**5,000–10,000**	**10,000–50,000**	**> 50,000**
< 100	0.03	**0.91**	0.06	0.00	0.00	0	0	0
100–500	0.03	0.02	**0.93**	0.02	0.00	0	0	0
500–1,000	0.04	0.00	0.06	**0.84**	0.05	0	0	0
1,000–5,000	0.04	0.00	0.01	0.04	**0.90**	0.01	0	0
5,000–10,000	0.04	0	0	0	0.03	**0.86**	0.06	0.00
10,000–50,000	0.03	0	0	0	0.01	0.04	**0.92**	0.01
> 50,000	0.01	0	0	0	0	0	0	**0.99**

Notes: Entries in bold reflect the fraction that stay in the same size class. Rows may not add to 1 due to rounding.

in each year, and then take the average over the 2008–2013 period.[11] We then use these transition probabilities along with some counterfactual assumptions on entry to see what would have happened to the number of banks under more typical entry conditions.

Table 6 shows the average annual transition probabilities for the 2008–2013 period. Each row takes all the banks in a given size class and reports the fraction of them that are in each size class in the succeeding year. For example, of banks that are less than $100 million, 3 percent exited, 91 percent stayed in the same size class, and 6 percent moved up to the next highest size category.[12]

For our counterfactual experiment, we take the number of banks in each size category in 2007 (column 2 in Table 2) and multiply this by the transition probabilities. For entry, we take the average entry rate over the 2008–2013 period and—for the counterfactual part—we add enough additional entrants so that the number of entrants equals 129, which was the average number of new entrants over the 2002–2007 period. We put these entrants into size categories in the same proportion as new entrants during the 2002–2007 period.[13]

Table 7 reports the number of banks in each size category for 2013 and the number that would have existed under the counterfactual assumption on entry. It also lists the difference, expressed in absolute and percentage terms. With the counterfactual entry, there would have been 567, or 10.7 percent, more banks. There would still be fewer banks than in 2007, when there were 6,153, but a lot more than the actual 5,317 in 2013. The actual number of banks dropped in this period by 836, while under the counterfactual the number would have only dropped by 269. This means that the weaker entry accounts for the rest of the drop, which is about 68 percent of the total.

Among size classes, the biggest difference among banks is in the less than $100 million size class. In the counterfactual, there are 22 percent more banks. Much of this difference is directly accounted for by the lack of entry. Under the counterfactual entry assumptions, 129 banks enter per year, and most of them enter the smallest size class. Furthermore, in each year, 91 percent of those new entrants stay in this class, so over time new entry adds a lot of banks to this size class.

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[11] See Adelman (1958), Simon and Bonini (1958), and Janicki and Prescott (2006) for more information about transition probabilities and how they can be used to assess the dynamics of an industry.

[12] Appendix B contains some more analysis of the transition matrix.

[13] In the 2002–2007 period, 81 percent of new entrants started in the under $100 million size category, 15 percent started in the $100–$500 million size category, 2 percent started in the $500–$1,000 million size category, and 2 percent started in the $1,000–$5,000 million size category.

Table 7 Number of Banks by Size Class with Counterfactual Entry

Size Class (millions)	Data 2013	Counterfactual 2013	Difference	% Difference
< 100	1,771	2,276	505	28.5%
100–500	2,634	2,711	77	2.9%
500–1,000	453	448	−5	−1.1%
1,000–5,000	333	329	−4	−1.2%
5,000–10,000	50	48	−2	−4.0%
10,000–50,000	44	40	−4	−9.1%
> 50,000	32	32	0	0.0%
Total	5,317	5,884	567	10.7%

Notes: Number of banks in each size class in 2013 compared with numbers under the counterfactual assumption that the number of entrants in 2008–2013 is the same as in 2002–2007.

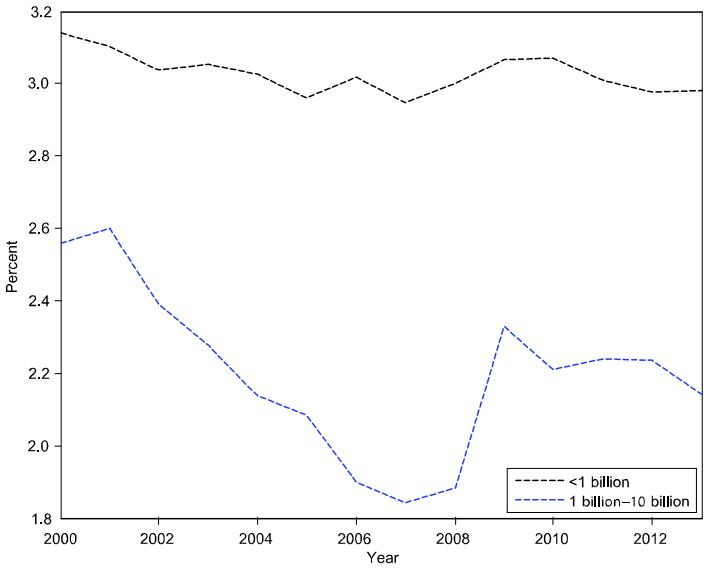
6. WHAT ACCOUNTS FOR THE LACK OF ENTRY?

The literature on bank entry has identified three main factors that are positively correlated with bank entry. The first is that entry is more likely in fast-growing, profitable, and concentrated markets (Dunham 1989; Moore and Skelton 1998), presumably because potential profits are higher in this type of market. The second is that entry is more likely after recent mergers (Dunham 1989; Keeton 2000; and Berger et al. 2004). Starting a bank requires experienced bankers and there are more people available after a merger since mergers often involve layoffs.[14] The third factor is that entry is more likely when regulatory restrictions on entry are relaxed (Ladenson and Bombara 1984; Lindley et al. 1992), presumably because any decrease in entry cost will make it more profitable for a potential bank to enter.

Analysis and discussion of the recent lack of entry have focused on the poor economic conditions and the increase in regulatory compliance costs. The recent economic recovery has been very weak, which has certainly reduced the potential return from entering. Adams and Gramlich (2014) examine entry at the county level with an ordered probit model estimated on U.S. data from 1976 to 2013. Based on this model, they conclude that 75 percent to 80 percent of the decline in bank entry over the last few years is due to low interest rates and a lack of demand for banking services. They point out that community bank profits are heavily dependent on the net interest margin, that is, the

[14] At a longer time horizon, an industry with frequent mergers may create an incentive to start a bank with the goal of selling it in the future.

Figure 7 Non-Interest Expense as a Percentage of Assets for Banks with Less $1 Billion in Assets and with $1 Billion to $10 Billion in Assets

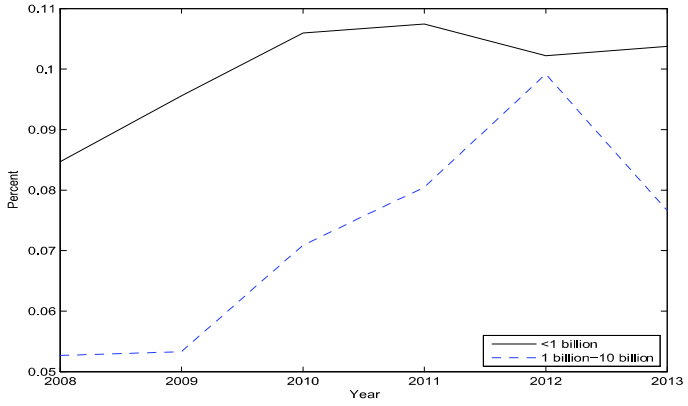


Notes: Nominal value of expenses and assets are used.

spread between deposit rates and lending rates, and with present Federal Reserve monetary policy pushing lending rates down, this margin is relatively small.

While these results are suggestive, they are far from definitive. There are plenty of periods where net interest margins declined, yet entry did not collapse. Morris and Regehr (2014) study the historical pattern of net interest income in community banks after recessions since the mid-1970s. They observe significant drops in this revenue source during all recessions and argue that the recovery in net interest income after the recent recession is not that different from the 2001–2002 recession and is actually higher than in the 1981–1982 recession. Furthermore, as we showed in Figure 4, entry rates were much higher after *every* earlier recession. Indeed, the Adams and Gramlich (2014) model includes a dummy variable for the post-crisis period (2010 and after) that is also important for explaining the recent lack of entry. Their model also predicts that, even if the net interest margin and the economy recovered to 2006 levels, there would still be almost no entry.

Figure 8 Legal Fees, Accounting, Auditing, Consulting, and Advisory Expenses to Asset Ratio



Notes: Combined legal fees and expenses, accounting and auditing expenses, and consulting and advisory expenses measured as a percentage of assets for banks with less than $1 billion in assets and with $1 billion to $10 billion in assets. Nominal values of expenses and assets are used.

It seems then that while the net interest margin is important, there may be other factors at work.

The other line of analysis is that regulatory costs are discouraging entry. There are two distinct, but often mixed together, arguments used here. The first argument is that the general increase in regulations resulting from the implementation of the Dodd-Frank Act of 2010 have made banking significantly more costly by requiring more resources to be used for complying with regulations and that, furthermore, there are economies of scale in complying with these regulations.

Peirce, Robinson, and Stratmann (2014) surveyed community bankers about compliance costs. The bankers responded that their median number of compliance staff increased from one to two.[15] Other than for the smallest banks, this is not a big increase in number of employees, but there are other sources of compliance costs that could be reflected in the non-interest expense category of the Call Report income statement.

[15] For an analysis of potential increases in costs to community banks of hiring additional compliance staff, see Feldman, Schmidt, and Heineche (2013).

Figure 7 shows non-interest expense as a percentage of assets for banks with less than $1 billion in assets and for those with $1 billion to $10 billion in assets. For the smaller class, this ratio did not change much between 2007 and 2013, and while it is higher for the larger class, it is still lower than it was in 2000. If compliance costs are really increasing, then they are being swamped by changes in other expenses.

The non-interest expense number does not break out expenses between compliance and non-compliance costs, but starting in 2008 the Call Report added some subcategories of expenses, including costs related to legal fees, auditing, consulting, and advisory expenses. Presumably, some of these costs are related to the costs of complying with regulations. Figure 8 shows these costs measured as a percentage of assets for banks with less than $1 billion in assets.

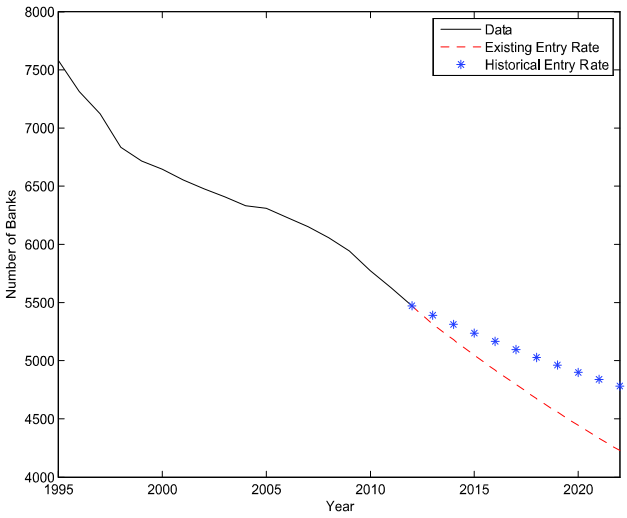
There is an increase in these expenses from 2008 to 2011, but the increase is relatively small and, more importantly, the size of these expenses is just too small to have a big effect on bank profitability. For example, entirely eliminating these expenses would only increase the return on assets by 10 basis points.

Based on this data, if regulatory costs are significantly impacting bank expenses and profitability, it is because other costs are declining to offset the increase or regulatory costs are affecting the operations of banks in such a way that less revenue is being generated. For example, many community bankers say that their leaders spend a lot of their time reading, interpreting, and reacting to the rules, and that for small banks, in particular, this pulls them away from things like making loans and managing their staff.[16] This kind of cost is not something we can measure in the Call Report data.

The second argument related to regulatory change is that the costs of entry have increased due to regulations. To start a bank in the United States, organizers are required to get a banking charter from either a state or the federal government and to obtain deposit insurance from the FDIC. Once the organizers pass these hurdles, the *de novo* bank is under heightened supervision for a period of time. One way in which these costs have gone up is that the intensity of supervision of newly chartered banks has increased. In 2009, the FDIC raised the period from three to seven years under which FDIC-supervised, newly insured depository institutions are subject to higher capital requirements and more frequent examinations. Furthermore, FDIC approval is now required for changes in business plans during this seven-year period (Federal Deposit Insurance Corporation 2009).

[16] Personal conversations with bankers by the second author.

Figure 9 Trends



Notes: Forecasts of the future number of banks assuming existing transition rates between size classes and with existing entry rates and historical entry rates.

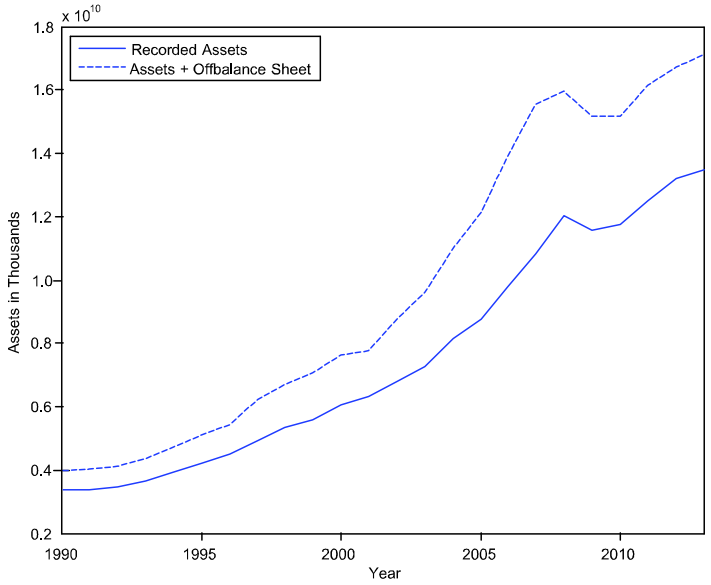
A second way in which these entry costs may have gone up is that the application process has lengthened, become more rigorous, and gotten more expensive. There have been so few *de novo* banks the last few years that there is not much direct data on this cost. However, organizers of the one *de novo* bank in 2013 claim that the application process was significantly longer and more intensive than in the past (Peters 2013).

7. LOOKING AHEAD

The future number of banks will depend on the conditions under which bank entry rates recover. If the main reason for the lack of entry is the low net interest margin, then entry numbers should recover when the economy improves and the Federal Reserve raises interest rates. If regulatory costs are the main reason for the lack of entry, then it will depend on how these change over time.

Regardless of the reason for the lack of entry, until entry recovers (and assuming that exit does not decrease) the number of banks will

Figure 10 Total Banking Assets With and Without Off-Balance Sheet Adjustment



continue to decline. To illustrate how this drop could be affected by changes in entry rates, we ran two experiments similar to the counterfactual that we ran earlier. In both, we divided the banking industry into the same seven size categories we used earlier. Like in the earlier counterfactual experiment, we took the annual transition probabilities between size categories, exit rates from each category, and the entry rate for the 2008–2013 period. We then took the size distribution of banks in 2013 and calculated what the number of banks would be in 10 years if these transition rates did not change. We then took the same transition probabilities and only raised the entry rate to match the historical average of 1.5 percent and then calculated what the number of banks would be in 10 years under this more typical entry rate.[17]

Figure 9 shows the number of banks through 2013 and then the two different forecasts. While both forecasts predict a continued decline in the number of banks, there is a substantial quantitative difference

[17] There are obvious limitations to this exercise. In particular, entry and exit decisions are determined simultaneously in a market. Nevertheless, we think this simple exercise is useful because exit rates did not change that much from before the crisis to after it, so this assumption is plausible.

Table 8 Off-Balance Sheet Items and Credit Equivalents as of 2013

Item	Conversion Factor
Financial Standby Letters of Credit	1.00
Performance and Standby Letters of Credit	1.00
Commercial Standby Letters of Credit	0.20
Risk Participations in Bankers' Acceptances	1.00
Securities Lent	1.00
Retained Recourse on Small Business Obligations	1.00
Recourse and Direct Credit Substitutes	1.00
Other Financial Assets Sold with Recourse	1.00
Other Off-Balance Sheet Liabilities	1.00
Unused Loan Commitments (maturity >1 year)	0.50
Derivatives	—

Notes: Conversion factors used by regulators for determining credit equivalents of off-balance sheet items in 2013. The source is FFIEC 041 Schedule RC-R www.ffiec.gov/forms041.htm. Credit equivalents for derivatives do not have a direct conversion factor but instead are based on the current and future possible credit exposure.

between them. The number of banks under the existing trend drops another 1,000 banks over 10 years, while it only drops by about 500 banks under historic entry rates.

8. CONCLUSION

Since the financial crisis began, the biggest change to the size distribution of banks has been the decline in the number of small banks. We document that much of this decline is due to the lack of entry. We discussed several reasons for why there might be less entry, including macroeconomic conditions, regulatory costs, and regulatory barriers to entry. Regardless of the reasons for the decline, however, it is clear that to a large degree the number of banks as well as the size distribution of banks in the future will depend on whether entry recovers.

APPENDIX A: OFF-BALANCE SHEET ITEMS

Banks can make commitments that are not directly measured by a traditional balance sheet. For example, a loan commitment is a promise to make a loan under certain conditions. Traditionally, this kind of

promise was not measured as an asset on a balance sheet. As documented by Boyd and Gertler (1994), providing this and other off-balance sheet items has become an important service provided by banks, which means that traditional balance sheet numbers do not accurately report some of the implicit assets and liabilities of a bank.

We account for loan commitment and other off-balance sheet items like derivatives by converting them into *credit equivalents* and then adding them to on-balance sheet assets. We use the weights used by regulators to determine credit equivalents for capital purposes. Some of these adjustments are made starting in 1983, but many are added in 1990. The weights as of 2013 are reported in Table 8. Figure 10 demonstrates the importance of the adjustment starting in 1990 by plotting aggregate assets and loans with and without the adjustment.

APPENDIX B: TRANSITION MATRIX

One interesting thing that can be done with the transition matrix is to calculate the steady-state distribution of bank size. If the size distribution at time t is vector s_t and P is the transition matrix (also commonly called a Markov matrix), then the size distribution at $t+n$ is

$$s_{t+n} = P^n s_t.$$

If the transition matrix has the property that a bank starting in any category has a positive probability of moving to any other size category in a finite number of steps, then several theorems can be proven. In particular, there exists a unique stationary size distribution, that is, there exists s, such that $s = Ps$. Furthermore, regardless of the initial distribution, the size distribution will converge to this unique distribution.

For the transition matrix in Table 6, Table 9 shows the stationary distribution. There is a large fraction of banks in the over $50 billion size category. The reason for this concentration is that in the transition probabilities over the 2008–2013 period, 99 percent of banks in the largest size category stayed in it each year. Consequently, if a bank enters this category, it is very unlikely to leave, so banks accumulate there. In the recent period, this reflects the lack of merger activity among the largest banks and that the largest banks were prevented from failing by the federal government during the crisis. In past periods, transition probabilities for the largest size class were very different. For

Table 9 Stationary Distribution based on Transition Probabilities between Size Classes for 2008–2013

Size Class (millions)	Stationary Distribution	Distribution in 2013 Data
< 100	0.23	0.33
100–500	0.45	0.50
500–1,000	0.10	0.09
1,000–5,000	0.10	0.06
5,000–10,000	0.02	0.01
10,000–50,000	0.03	0.01
> 50,000	0.06	0.01

Notes: Columns do not add to 1 due to rounding.

example, over the 2000–2005 period, only 91 percent of banks in the largest size class stayed there.

The stationary distribution is useful for illustrating what direction the transition probabilities are taking the size distribution. As a long-term forecast, however, it is less valuable. It can take many iterations for a distribution to converge to its stationary distribution (over 200 in this case) and, as Janicki and Prescott (2006) show, properties of transition matrices for the banking industry have changed several times over the last 50 years.

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