

Measuring Structural Change in U.S. Commercial Banks Involved in Agricultural Lending Using Loan Volumes

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JEL Classifications: G21

Keywords: Agricultural bank, Agricultural loan volume, Market share, Midpoint loan volume

Commercial banks are the leading lenders of non-real estate debt to farmers, with \$72 billion debt (41%) of \$174 billion total non-real estate debt, and the second leading lenders of real estate debt, with \$109 billion debt (32%) of \$345 billion total real estate debt in 2023 (USDA-ERS, 2024). Despite the entry of other lenders into the agricultural lending space, commercial banks have maintained their dominant position. Their widespread network of bank branches allows them to have a physical presence in local communities unmatched by other lenders. This physical presence gives them a deep understanding of the agricultural industry and the risks facing their farm patrons' operations.

Over the years, there have been changes in the type of commercial banks that extend credit to farmers (Nam, Ellinger, and Katchova, 2007). Increased consolidation has led to a shift in lending volume from smaller to larger banks. This consolidation has been a decades-long trend for the U.S. banking industry. Between 1984 and 2019, the number of federally insured banks in the United States declined from 17,901 to 5,177, an annual decline of about 2% (FDIC, 2020). The same trend can be observed for agricultural banks; from 2010 to 2019 for instance, the number of agricultural banks also declined by about 2% annually.

Several factors, including technological advancement, financial distress, international consolidation, and deregulation, drove consolidation in the banking sector. The easing of restrictions on interstate and intrastate banking in the 1980s and 1990s significantly encouraged voluntary mergers before 2012 (FDIC, 2012). By 2012, most of the failures associated with the financial crisis and Great Recession had occurred (FDIC, 2020). Thus, after 2012, voluntary mergers between unaffiliated institutions became the primary driver of consolidation, leading to a decline in the number of insured depository institutions. The historically low number of new bank charters between 2012 and 2019 further accelerated this trend with agricultural commercial banks being the

primary target of mergers and acquisitions during this period (Kim and Katchova, 2022).

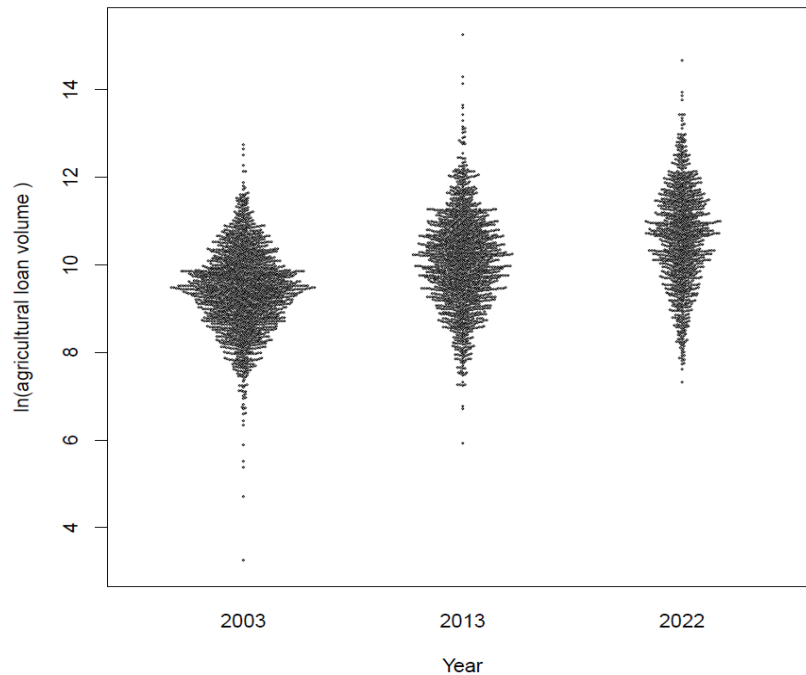
Various studies have examined the changes in the volume of agricultural loans from all commercial and agricultural banks (Regmi et al., 2020; Regmi and Featherstone, 2022; Kim and Katchova, 2022). This study builds on previous research to measure structural change by comparing changes in number of banks agricultural loan volume, and market share for different sizes of agricultural and nonagricultural banks and introducing midpoint loan volume as a measure to evaluate the magnitude of structural change. This article uses data from the quarterly call reports (from years 2003–2022) on commercial banks, released by the Federal Financial Institutions Examination Council (FFIEC, 2023). We define a bank's agricultural loans as the sum of domestic real estate loans secured by farmland and domestic production and other loans to farmers. Banks were classified as agricultural banks if at least 25% of their loans were agricultural loans. This study uses fourth-quarter loan volume as the end-of-year loan volume for each year. The agricultural loan volumes were adjusted for inflation using a gross domestic price deflator from the U.S. Department of Commerce's Bureau of Economic Analysis, Gross Domestic Product Price Index (BEA API series code: A191RG), to convert nominal loan volume to a real or inflation-adjusted, constant-dollar series. The base year was set to 2023 when adjusting the data for inflation.

Trend in Number of Banks

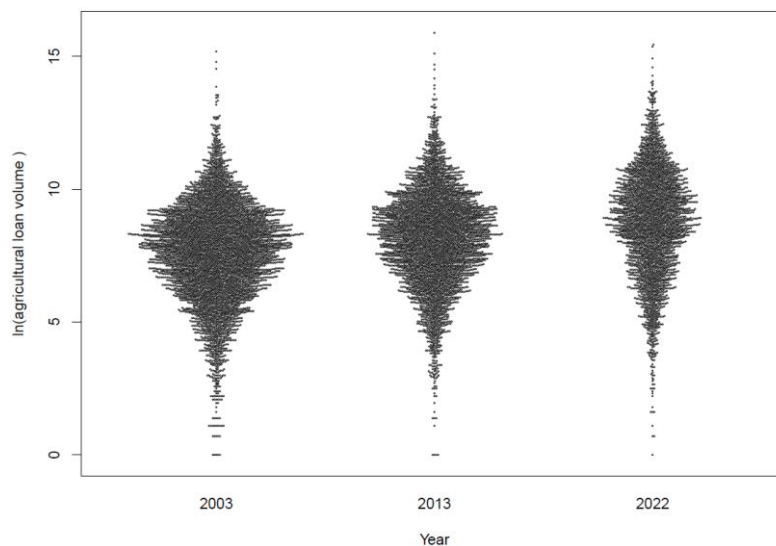
The total number of commercial agricultural and nonagricultural banks that provide agricultural loans to farmers has declined steadily since 2003, by 40% and 41%, respectively (Tables 1 and 2). The decline in the number of banks was more substantial in recent years. To show the decline in the number of banks, we log-transformed individual loan volume from each bank, as the data were highly skewed. Data transformation makes it close to normal for the illustration of the distribution of

Figure 1. Change in Banks' Agricultural Loan Volume (natural log) Every 10 Years, 2003, 2013, and 2022

(a) Agricultural Banks



(b) Nonagricultural Banks



Data source: FFIEC (2023).

loan volume. Figure 1 shows the distribution of agricultural loans among agricultural and nonagricultural banks for 2003, 2013, and 2022. In the figure, each data point represents a bank's loan volume, with the data points on the top representing banks with larger loan volumes and points on the bottom representing banks with smaller loan volumes. A visual comparison of the number of banks in 2003, 2013, and 2022 shows that the largest decline in numbers can be seen on the

bottom and mid-section, representing small and mid-sized banks. Figure 1 suggests that the decline occurred more substantially after 2012.

To analyze the changes statistically, we divided the data into four different sizes of banks based on total agricultural loan volume. We ranked both agricultural and nonagricultural banks according to agricultural loan volume, as follows:

- small banks, with loan volumes of less than \$10 million;
- mid-sized banks, with loan volumes of \$10–\$99 million;
- large banks, with loan volumes of \$100–\$499 million;
- very large banks, with loan volumes of \$500 million and more.

For agricultural banks, the number of small and mid-sized banks declined by 83% and 33%, respectively. However, the number of larger banks increased by almost 1,000% (Tables 1 and 2). For nonagricultural banks, only the number of small banks declined, by 59%. The number of mid-sized and larger nonagricultural banks increased by 32% and close to 200%, respectively. Between 2003 and 2022, the magnitude of the decline in the number of small banks and the increase in the number of larger banks was more substantial in agricultural banks compared to nonagricultural banks. This indicates that agricultural banks were more impacted than nonagricultural banks by consolidations and mergers.

Trend in Agricultural Loan Volume

Although there has been a significant decrease in the number of banks—mainly due to acquisitions and mergers in banking sectors—total agricultural loan volume has increased substantially since 2003. The agricultural loan volume has increased by 41% for all commercial banks, 32% for nonagricultural banks, and 56% for agricultural banks (Tables 1 and 2). Small and mid-sized agricultural banks experienced an 88% and 25% decline, respectively, in agricultural loan volumes (Table 1). The decline in the number of banks of these sizes was also reflected in the decrease in total agricultural loan volumes. However, the agricultural loan volumes of large and very large agricultural banks increased by about 719% and 865%, respectively, in 2022 compared to 2004 (Table 1). This resulted in an increase in total agricultural loan volume for agricultural banks. Only small nonagricultural banks witnessed a decrease in agricultural loan volume, by 67%, while agricultural loan volume increased by about 10% for mid-sized nonagricultural banks. Large and very large nonagricultural banks saw increases of 116% and 72%, respectively, in agricultural loan volume (Table 2).

Table 1. Annual Number of Banks and Total Agricultural Loan Volume by Different Bank Sizes for Agricultural Banks

Year	Small Banks		Mid-sized Banks		Large Banks		Very Large Banks		Totals	
	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)
2003	690	6,266	1,057	41,792	20	4,934	0	0	1,767	52,992
2004	620	5,578	1,081	42,936	29	6,866	1	1,055	1,731	56,435
2005	588	5,165	1,064	42,435	32	7,941	1	1,582	1,685	57,123
2006	536	4,616	1,057	42,062	40	9,914	1	2,211	1,634	58,803
2007	491	4,168	1,055	42,383	44	10,783	2	3,452	1,592	60,786
2008	446	3,732	1,057	43,311	53	12,534	3	4,322	1,559	63,899
2009	417	3,456	1,085	45,300	63	14,245	3	4,329	1,568	67,330
2010	384	3,156	1,097	46,386	74	16,454	4	5,909	1,559	71,905
2011	376	3,051	1,078	45,650	86	18,773	5	7,136	1,545	74,609
2012	343	2,683	1,086	46,981	100	22,378	8	11,976	1,537	84,017
2013	315	2,478	1,089	48,635	120	27,152	8	13,823	1,532	92,087
2014	275	2,131	1,096	50,085	133	29,684	11	16,935	1,515	98,835
2015	237	1,831	1,080	50,320	151	33,320	11	17,687	1,479	103,158
2016	204	1,579	1,048	48,799	164	34,940	13	19,895	1,429	105,213
2017	187	1,424	1,012	48,340	178	37,640	12	17,417	1,389	104,821
2018	174	1,297	966	45,732	194	40,280	12	17,705	1,346	105,014
2019	159	1,160	917	43,250	203	42,086	12	12,487	1,291	98,983
2020	143	1,077	823	38,684	186	37,281	11	11,235	1,163	88,278
2021	135	942	778	35,642	199	39,449	9	8,717	1,121	84,750
2022	118	768	711	31,363	214	40,387	11	10,182	1,054	82,699
Change 2003 vs 2022	-83%	-88%	-33%	-25%	970%	719%	1,000%	865%	-40%	56%

Note: Dollar values are inflation adjusted using gross domestic price deflator from the U.S. Department of Commerce's Bureau of Economic Analysis, Gross Domestic Product Price Index (BEA API series code: A191RG) and rebased to 2023. Data source: FFIEC (2023).

Table 2. Number of Banks and Total Agricultural Loan Volume by Different Bank Sizes for Nonagricultural Banks

Year	Small Banks		Mid-sized Banks		Large Banks		Very Large Banks		Totals	
	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)	N	Total Agloan (\$millions)
2003	3,955	15,687	783	31,355	58	16,079	11	22,690	4,807	85,811
2004	3,801	14,898	848	33,538	51	13,749	11	25,514	4,711	87,699
2005	3,658	14,065	914	35,590	58	15,379	10	25,911	4,640	90,945
2006	3,537	13,534	953	36,974	66	17,453	11	28,365	4,567	96,327
2007	3,413	13,124	1,020	38,641	79	20,484	11	28,113	4,523	100,362
2008	3,285	12,805	1,056	39,878	88	21,940	13	32,513	4,442	107,136
2009	3,152	12,456	1,057	39,649	87	21,789	13	32,462	4,309	106,355
2010	3,039	11,877	1,010	36,977	83	20,969	12	31,255	4,144	101,078
2011	2,954	11,468	971	34,731	85	21,138	12	30,928	4,022	98,266
2012	3,018	11,340	982	34,688	94	23,150	12	31,040	4,106	100,219
2013	2,848	10,701	986	35,132	93	23,944	12	29,328	3,939	99,106
2014	2,650	9,786	1,001	35,080	103	25,668	16	34,521	3,770	105,056
2015	2,459	9,125	1,030	37,109	106	26,975	20	38,003	3,615	111,212
2016	2,292	8,632	1,049	38,314	113	27,558	21	37,779	3,475	112,283
2017	2,142	8,040	1,064	38,811	122	29,478	23	39,914	3,351	116,243
2018	1,981	7,328	1,060	38,124	134	33,212	22	39,008	3,197	117,673
2019	1,845	6,687	1,042	37,914	132	33,181	23	37,068	3,042	114,850
2020	1,799	6,448	1,041	37,205	151	36,341	23	33,011	3,014	113,004
2021	1,708	5,838	1,012	35,655	155	34,577	29	37,817	2,904	113,886
2022	1,619	5,237	1,032	34,577	167	34,739	32	39,069	2,850	113,622
Change 2003 vs 2022	-59%	-67%	32%	10%	188%	116%	191%	72%	-41%	32%

Note: Dollar values are inflation adjusted using gross domestic price deflator from the U.S. Department of Commerce's Bureau of Economic Analysis, Gross Domestic Product Price Index (BEA API series code: A191RG) and rebased to 2023.
Data source: FFIEC (2023).

Market Share of Agricultural and Nonagricultural Banks

Of the total agricultural loan volumes, nonagricultural banks hold more than 60% of the share of agricultural loan volume. The increase in the number of larger banks and the decline in small and mid-sized banks indicates the consolidation of the smaller banks to the larger banks. This is a major contributor to the increase in the share of the larger banks in total agricultural lending. Table 3 shows that the composition of agricultural banks market share in agricultural lending has declined for small and mid-sized banks and increased for larger banks (\$100 million and more in agricultural loan volume) from 2003 to 2022.

The substantial change in the agricultural lending share in agricultural banks was observed for small, large, and very large banks. Large agricultural banks in 2022 provided about 54% of agricultural loans, up 30% from 2003. Though there has been an increase in the market share of very large agricultural banks, nonagricultural

banks remain the primary providers of agricultural loans, accounting for 80% of total agricultural lending in this bank size.

Change in Midpoint Loan Volume

In this study, in addition to mean and median, the midpoint measure was evaluated to measure the magnitude of structural change in agricultural and nonagricultural banks in terms of agricultural loans. Midpoints, also known as weighted medians, are different from simple medians and are calculated by weighing each observation by total. The midpoint loan volume is the loan volume at which half of the total loan volume is for banks with loan volume above the midpoint, and half of the total loan volume is for banks with loan volume below the midpoint. This definition closely follows that of McDonald, Korb, and Hoppe (2013).

We found that the mean and median agricultural loan volumes for agricultural banks increased by about 160% and 120%, respectively, while the midpoint loan volume

Table 3. Share of Agricultural Lending by Different Bank Sizes, 2003 and 2022

Bank by Agricultural Loan Size	Agricultural Bank	Nonagricultural Bank
2003		
Small banks	16.7%	83.3%
Mid-sized banks	57.1%	42.9%
Large banks	23.5%	76.5%
Very large banks	0.0%	100.0%
All	34.3%	65.7%
2022		
Small banks	2.2%	97.8%
Mid-sized banks	47.6%	52.4%
Large banks	53.8%	46.2%
Very large banks	20.7%	79.3%
All	36.6%	63.4%

Data source: FFIEC (2023).

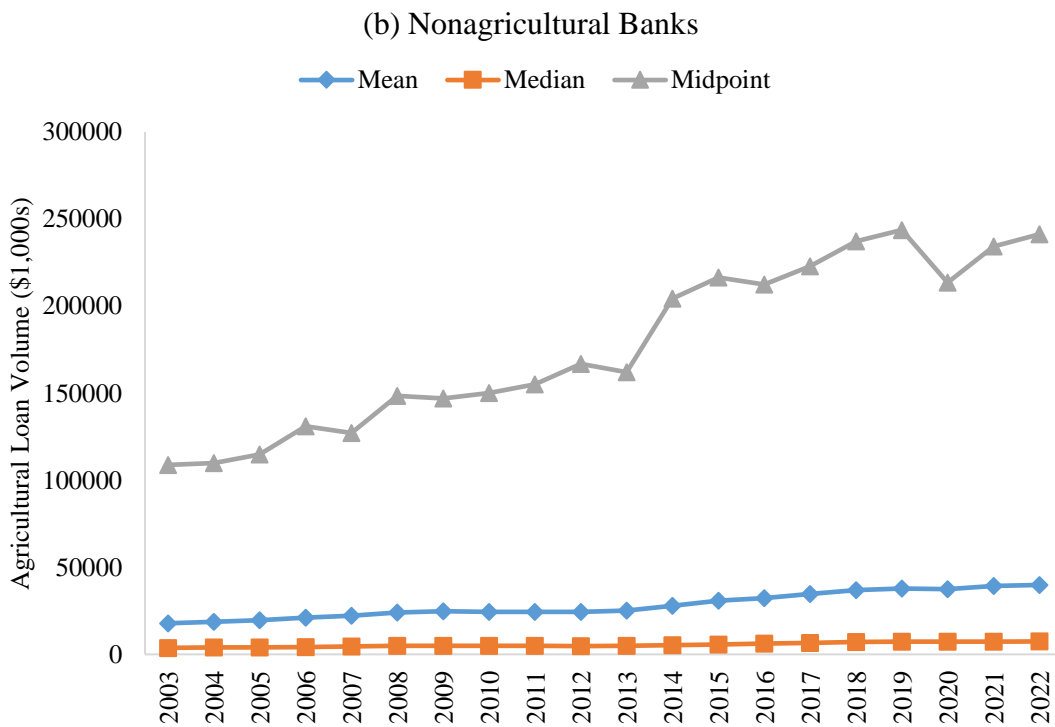
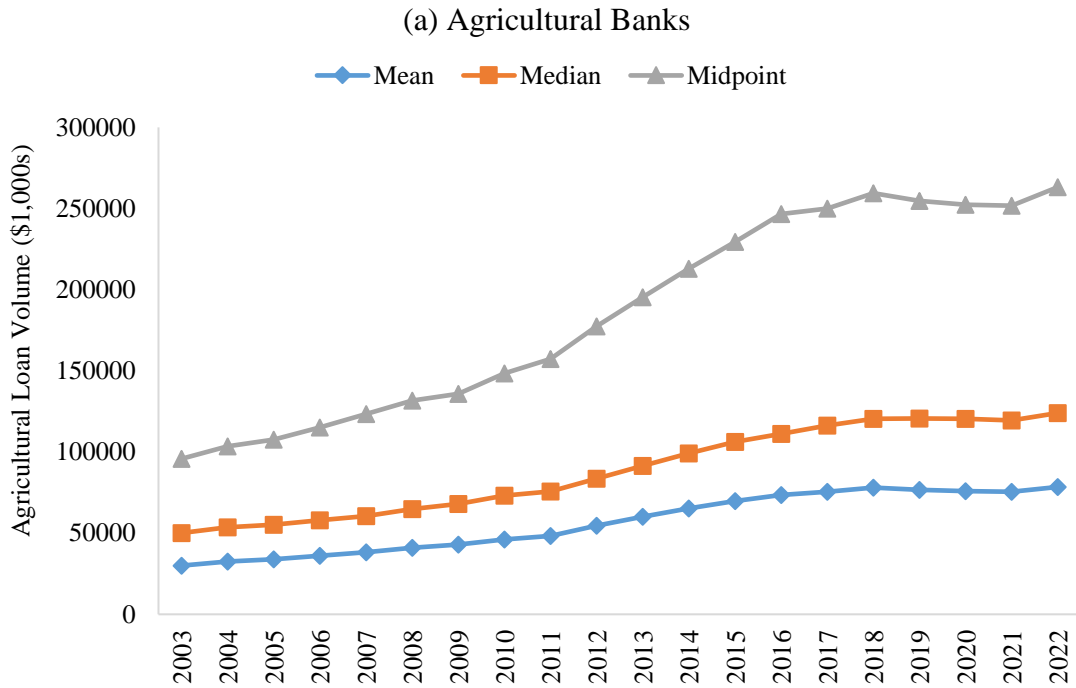
increased by about 200% in 2022 compared to 2003 (Figure 2a) in inflation-adjusted dollars. The midpoint loan volume also increased about 200% for nonagricultural banks (Figure 2b). The midpoint measure shows that the magnitude of increase in agricultural loan volume was substantial from 2003 to 2022, indicating that the midpoint measure may better capture the magnitude of the change in agricultural loan volume than the traditional measures.

Conclusions

This study examines the trend in the lending landscape of commercial banks in terms of agricultural loans, number of banks, and market share for different sizes of agricultural and nonagricultural banks. Agricultural banks are those that lend over 25% of their loans to the agricultural sector and have a special focus on the agricultural industry. This study shows that small banks (less than \$10 million in agricultural loan volume) have seen a decrease in both the number of banks and in

agricultural loan volumes, while larger banks (\$100 million and more in agricultural loan volume) have seen a dramatic increase in both the number of banks and in agricultural loan volumes in both agricultural and nonagricultural banks. However, the magnitude of the decline in both the number and loan volumes of small and mid-sized banks (less than \$100 million agricultural loan volume) and the increase in loan volumes and number of larger banks was substantially higher in agricultural banks. This indicates that agricultural banks could have been the primary targets of mergers and consolidations in the commercial banking sector. The market share of agricultural banks in agricultural lending has declined for small and mid-sized banks and increased for larger banks from 2003 to 2022. The midpoint agricultural loan volume was also substantially higher than the mean and median, indicating that midpoint measures may capture the magnitude of change in agricultural loan volumes over time better than the traditional measures.

Figure 2. Trends in Mean, Median, and Midpoint Agricultural Loan Volume, 2003–2022



Note: Values are inflation adjusted using gross domestic price deflator from the U.S. Department of Commerce's Bureau of Economic Analysis, Gross Domestic Product Price Index (BEA API series code: A191RG) and rebased to 2023.
Data source: FFIEC (2023).

For More Information

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Acknowledgments: This research was supported by the U.S. Department of Agriculture, Economic Research Service. We thank the anonymous reviewers for their feedback. We also thank Jeffery Hopkins, Chief of the Farm Economy Branch, and Krishna Paudel, Deputy Director for Research and Communication, of the ERS-USDA for their review and feedback. The findings and conclusions in this publication are those of the authors and should not be construed to represent any official USDA or U.S. Government determination or policy.