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Profitability of US Small Banks pre-during-post 2008 Global Financial Crisis: Evidence from Ratio Analysis

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Abstract: This study contributes to the banking literature by examining the impact of the 2008 Global Financial Crisis (2008 GFC) on the profitability of U.S. small banks. Using U.S. small banks' financial data from 2001 to 2025, we partition data into three distinct periods: pre-(2001-2006), during- (2007-2011), and post-(2011-2025) 2008 GFC, and utilize several commonly used profitability ratios. The results indicate that the 2008 GFC had a significant negative impact on the profitability of U.S. small banks: The small U.S. banks had high profitability scores pre-2008 GFC, a declining trend that started three years before the 2008 GFC, a sharp decline during the 2008 GFC, and a profitability recovery that started in 2010 and continued until 2025. Two conclusions can be drawn from the results. First, small banks used the low-interest-rate environment during and after the 2008 GFC to sharply reduce their interest expense and remain profitable. This indicates that the Fed's expansionary monetary policy to counter the 2008 GFC, by reducing market interest rates, benefited small banks. Next, the decline in profitability of small banks began three years before the 2008 GFC, and the increase in profitability occurred before the 2008 GFC ended. This suggests that changes in the profitability of U.S. small banks may have predictive value for the start and end of major financial crises.

Keywords: Bank profitability; Ratio Analysis; 2008 Global Financial Crisis.

JEL classification: F65; G01; G21.

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1. INTRODUCTION

The U.S. banking industry has undergone significant changes over the last twenty years. From 2001 to 2025, the banking industry witnessed 563 bank failures with total assets of $1.05 trillion, many of which were small banks. The industry also suffered from several crises, the major one being the 2008 global financial crisis (2008 GFC) meltdown, followed by a wave of bank failures. Most recently, in 2023, the industry witnessed the collapses of Silicon Valley Bank and Signature Bank.

Due to the importance of the banking industry in the economy, the banking regulatory and supervisory agencies such as the Federal Reserve System, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency, as well as state banking regulatory agencies, pay special attention to the safety and soundness of the banking industry. In response to the regulatory and supervisory agencies' attention, an extensive body of literature has been developed in academia to examine banking firms' cost and profit efficiency, productivity growth, and financial performance.

One indicator of banking safety and soundness is profitability (Ahmad *et al.*, 2007) and its change in response to unexpected events such as financial crises. Athari and Bahreini (2023) and Dietrich and Wanzenried (2011) suggest that, given the critical role of banks in facilitating private investment and promoting economic growth, identifying and understanding the primary determinants of their profitability is essential. Nguyen and Le (2022) show there is a positive relationship between banks' profitability and stability. Xu *et al.* (2019) provide evidence suggesting that policymakers should strive to understand the sources of bank profitability better.

Begenau *et al.* (2026), argue that a bank's market value is closely linked to its financial position. In line with this study, we apply key financial ratios such as profit margin (PM), return on assets (ROA), and return on equity (ROE) to investigate the profitability of small banks over 25 years, focusing on three distinct phases: pre-, during, and post- 2008 GFC, with an understanding that the broader economic environment also significantly influences these ratios. This longitudinal analysis enhances our understanding of small banks' profitability in response to the crises.

The financial management strategies of the banking industry have also transformed over the last two decades, as banks have increased their appetite for leverage and loaded their asset portfolios with risky mortgage loans backed by subprime lending. These managerial strategies were justified by corporate finance theory related to the magnification of return on assets and equity and the tax effect of borrowing. However, regarding these strategies, some analysts argue that the causes of the 2008 GFC could be that households increased their appetite for borrowing, particularly risky borrowing to purchase houses. Regardless of the cause of the 2008 GFC, we believe that the 2008 GFC impacted both the asset and liability sides of banks' balance sheets, as well as their profitability. The impact may be more pronounced in the case of small banks because of their peculiar nature of assets and liabilities and their limited access to the financial market.

Small banks play an essential role in the growth of the regional economy and are also major providers of funds to small regional businesses. During the financial crisis, in the absence of government agencies' intervention, the role played by the small banks became even more critical to regional economic growth because many small businesses were denied access to funds provided by larger financial institutions. Therefore, for the policymakers

responsible for providing liquidity in the financial markets and the regional economic architects concerned about the sustainability of their regional economic well-being, it is important to examine the profitability of small banks and changes in profitability in response to an unexpected event because of their essential role in providing liquidity and financing regional economic growth.

While there are many studies on measuring banking performance using cost and profit efficiency measures, only a limited number use financial statement and ratio analysis to evaluate the financial position of banks[1]. Most financial statement and ratio analysis studies focus on the profitability determinants of banks using cross-sectional and time-series data[2].

Short (1979) and Smirlock (1985) examine the relationship between banking industry profitability and market concentration across Canada, Western Europe, Japan, and the United States. Bassell and Brady (2001) investigate U.S. small banks with assets under $331 million from 1985 to 2000, finding that these institutions consistently achieved faster growth in deposits and assets than larger banks, leading to higher profitability. This superior performance is attributed to a lending-focused portfolio strategy.

Nal and Cai (2020) investigate the effects of the 2008 GFC on the four largest U.S. banks using data from 2002 to 2020. Using ROA as a profitability ratio, they show that profit ratios were relatively higher before the crisis, dropped during the crisis, and have since returned to pre-crisis levels. Nippani and Ling (2021) examine the relationship between the size and financial performance of U.S. banks before and after the 2008 GFC using accounting ratios such as return on equity and return on assets. They report that the banks' financial positions deteriorated after the crisis, and the decline in financial position is more pronounced among small banks than among larger banks.

The profitability of the banking industry outside the U.S. and its response to the 2008 GFC have been the focus of many recent studies. For example, Alper and Anbar (2011) examine banks' profitability in Turkey from 2002 to 2010. Using panel data, they provide evidence to indicate that the non-interest income-to-asset ratio and banks' asset size positively and significantly affect banks' profitability in Turkey.

Widyastuti *et al.* (2017) studied the profitability of Indonesian banks for the period 2010-2015. They noted that net interest margin, loan-to-deposit ratio, and operating efficiency have a significant impact on bank profitability in Indonesia. However, neither of these two studies focuses on small banks or on the impact of the 2008 GFC on banks' profitability. Verma (2021) examines the financial positions of two Indian banks, HDFC Bank Limited and State Bank of India, using financial ratios. The author provides evidence suggesting that HDFC Bank's financial performance, with total assets of $280 billion in 2022, is superior to that of the State Bank of India, with total assets of $ 624 billion in 2022. Chaki *et al.* (2019) also studied the responsiveness of private and public banks in India during and after the 2008 GFC. They show that before the 2008 GFC, India's banking sector's financial performance was stable. During and after the 2008 GFC, the stability and financial performance of banks declined, reaching a low point by 2014-15. They claim that concerns about the stability and profitability of banks in India led the Reserve Bank of India to intervene by introducing massive corrective measures in 2016. These banks, post-2016, were able to contain the steep fall in financial and soundness parameters.

Banerjee (2018) studies the predictive power of financial ratios for forecasting the financial performance of banks in the United Arab Emirates. The author proposes several financial ratios that may be used to predict banks' future performance. Contrary to this

finding, study by Financial Crisis Insights on Bank Performance (2014) concludes that profitability, as measured by ROE and ROA, is positively associated with the Price/Book (P/B) ratio and the stock price. However, this relationship weakened during the crisis because, in a recession, the cost of equity exceeds ROE. This implies that ROE does not have predictive power for future ROE, and that lower ROE during a recession is associated with a low P/B ratio and a lower stock price. Molyneux and Thornton (1992) and Staikouras and Wood (2004) examine the profitability of European banks in a multi-country setting. The first study claims a significant positive impact of interest rates, bank concentration, and government ownership on banks' profitability measured by the return on equity. The second study reports that bank profitability is positively related to the equity-to-asset ratio and negatively related to the loan-to-asset ratio.

The current literature does not provide adequate information on the impact of the 2008 GFC on the profitability of small banks in the U.S. However, we believe the 2008 GFC negatively affected the profitability of U.S. small banks and increased the volatility of their profitability. Therefore, this paper aims to expand the literature by focusing on the impact of the 2008 GFC on U.S. small banks. Specifically, this study aims to examine the following:

- The trend of profitability ratios of U.S. small banks from 2001 to 2025.
- The impact of the 2008 GFC on the profitability of U.S. small banks.
- Change in the profitability of U.S. small banks pre-, during, and post- 2008 GFC.
- The sources of change in the profitability of U.S. small banks.
- The volatility of change in the profitability of U.S. small banks pre-, during, and post-2008 GFC.

The results indicate that small U.S. banks enjoyed high profitability prior to the 2008 GFC; they experienced a relative decline in profitability three years before the 2008 GFC, and a sharp decrease during the 2008 GFC. The profitability of U.S. small banks began to increase in 2010 and continued through 2025. The rest of the paper proceeds as follows. Section 2 explains the data and methodology. Section 3 presents empirical results, and Section 4 contains a summary and conclusions.

2. DATA AND METHODOLOGY

2.1. DATA

Data for this study were collected from the consolidated Report of Condition (balance sheet) and Report of Income (income statement) published by the Federal Deposit Insurance Corporation (FDIC) website at https://ww7.fdic.gove/sdi/download large list outside asp. The glossary of the variables can also be found at https://www7.fdic.gove/sdi/sitemap.asp. Our period of analysis in this study is 25 years, from 2001 to 2025. Using the FDIC website, we selected a group of small FDIC-insured banks with total assets of less than $200,000,000 from the 2001 Call Report. We limited our sample to small banks at least for two reasons: (1) the portfolio of assets and liabilities of small banks is different from that of medium- and large-sized banks, and (2) because of that, we believe that small banks should respond to a financial crisis differently than medium and large banks. We did not consider the banking corporation's structure or its geographic locations.

To ensure a homogeneous banking sample throughout the study, we further refined our 2001 small bank sample to include only the banks that continued operating through 2025. We

also eliminated a few banks with missing values. Our sample consists of 624 small banks with complete data that continuously operated from 2001 to 2025, with a total of 15,600 year-bank observations[3, 4].

2.2. Methodology

The role of a manager at any privately held or publicly traded small bank, like any other profit-generating institution, is to maximize profit, which in turn maximizes the bank's financial value. Two major methodologies are used to study banking profitability: the Frontier profit efficiency measure (Parametric and non-parametric profit efficiency techniques), and ratio analysis. Each of these profit efficiency techniques has its own advantages and disadvantages. However, combining these techniques may provide a more comprehensive understanding of banking efficiency and its major causes. Elyasiani *et al.* (1994) studied the association between a bank's financial performance, measured by accounting-based ratios, and production performance proxied by efficiency indexes. They report a significant association between financial and production performance. The authors suggest combined use of efficiency indexes and financial ratios in on-site bank examinations.

Financial ratio analysis alone is a valuable and straightforward diagnostic tool that can be used to assess bank performance on a cross-sectional and time-series basis (Lardic and Terraza, 2019). We employ financial ratio analysis on a time series basis to measure the performance of the small banks in our sample. Three widely used bank profitability ratios in the banking literature are Profit Margin (PM), Return on Assets (ROA), and Return on Equity (ROE). We use these commonly used financial ratios and their six components to gauge the profitability performance of the small banks during our sample periods, as discussed below.

Profit Margin (PM) is defined as the ratio of net income available to common stockholders divided by total operating income (sum of interest income and non-interest income)[5]. PM reflects the percentage of each dollar of income from the operation remaining, after all costs and expenses (interest and non-interest expenses and taxes). This ratio is also used to measure cost efficiency and to manage and control expenses.

Return on Assets (ROA) is defined as the ratio of net income available to common stockholders to total assets. This ratio shows the dollar amount of operating income generated per dollar of assets and indicates how well a bank's assets are utilized to generate net income. The link between the PM and ROA ratios is the Asset Utilization (AU) ratio, which is the ratio of total operating income to total assets. The AU ratio provides information on productivity and efficient utilization of assets. This ratio is a sign of managerial efficiency and indicates management's success in generating income per dollar of assets. Therefore, more efficient banks are expected to generate higher operating income per dollar of assets and higher net income per dollar of operating income through cost efficiency. The calculation of PM, ROA, and AU can be summarized as follows:

$$PM = \text{Net Income/ Total Operating Income}$$

$$AU = \text{Total Operating Income/Total Assets}$$

$$ROA = (PM)\ (AU) = (\text{Net income/Total Operating Income})\ (\text{Total Operating Income/Total Assets}) = \text{Net Income/Total Assets.}$$

The third profitability ratio used in the banking literature is the return on equity (ROE), defined as net income available to common stockholders divided by the book value of

common equity. ROE is the most comprehensive indicator of profitability because it reflects all the bank's activities and decisions during the year. ROE conveys information on how equity capital is used to generate net income. ROE reflects a bank's operating and investment decisions as well as the bank's financing and tax-related decisions. Cole (1972) decomposes the ROE into its components as follows:

ROE = (ROA)(EM) = (PM)(AU)(EM), or ROE = (Net Income Available to Common Stockholders / Total Operating Income) (Total Operating Income / Total Assets) (Total Assets / Common Equity)

ROE = Net Income Available to Common Stockholders / Common Equity.

Where EM stands for equity multiplier and is defined as the ratio of Total Assets to Common Equity. This ratio measures a bank's capital structure. The benefit of using the extended form of the ROE ratio is that it allows financial analysts to explain the source(s) of volatility in ROE. Although ROA and ROE are used extensively as measures of bank profitability, they represent different measures of profitability: ROE represents the net return on capital invested by shareholders, whereas ROA is the net return on all assets financed by debt and equity, and it is also a good measure of managerial efficiency. Athanasoglou *et al.* (2005) argue that ROA is a better measure of profitability because it accounts for the risks associated with leverage. However, Goddard *et al.* (2004) argue that ROE is a better measure of bank profitability because ROA does not include off-balance-sheet items. This argument may not be relevant to this study, since small banks have very few off-balance-sheet items.

3. EMPIRICAL RESULTS

We first examine the profitability of US small banks from 2001 to 2025 using time-series data. Next, to examine the impact of the 2008 GFC on small banks' profitability, we develop a {6, 4, 15} event window: 6 years before the 2008 GFC, 4 years during the 2008 GFC, and 15 years post-2008 GFC. The period of 2001-2006 refers to the profitability of banks in the six-year pre-2008 GFC with a sample size of 3,744 bank-year observations; 20007-2010 refers to the profitability of banks during the 2008 GFC with a sample size of 2,496 bank-year observations; and finally 2011-2025 refers to the post-2008 GFC period with a sample size of 9,360 bank-year observations.

According to Jahan (2020), bank profitability is influenced by both internal and external factors. Empirical studies mostly indicate that internal factors under bank management's control provide a better explanation of bank profitability (Yuan *et al.*, 2022). Therefore, in explaining changes in the profitability of US small banks from pre- to during and post-2008 GFC, this study considers internal factors that influence these changes. Using the ratios explained in the methodology section, we calculate the values for the three profitability ratios (PM, ROA, and ROE) and the internally controllable components (AU, EM, IER, NIER, IIR, and NIIR). Tables no. 1-3 present per-year summary statistics (Mean, Max, Min, and STD) for profitability ratios and their six components for the pre-, during-, and post-2008 GFC periods, respectively. The summary statistics of the profitability ratios (and their six components) for each of the entire three periods (pre-, during, and post-) are also given in bold at the end of each table. Figure no. 1 presents the graphical representation of the mean values of three profitability ratios (ROE, ROA, and PM) over the entire study period from

2001 to 2025. The data is divided by vertical lines to distinguish among the three periods: pre-2008 GFC, during the 2008 GFC, and post-2008 GFC.

Table no. 1 – Statistics of the Profitability Ratios and Their Components Pre 2008 GFC (2001-2006)

Year	Statistic	ROE (%)	ROA (%)	PM (%)	EM	AU (%)	IER (%)	NIER (%)	IIR (%)	NIIR (%)
	Mean	8.78	0.98	12.96	9.43	7.58	42.23	39.24	6.96	0.62
	STD	6.55	0.69	8.62	2.74	1.09	8.03	9.4	0.89	0.46
2001	Max	36.2	4.04	50.11	17.34	17.14	73.97	87.97	16.19	4.77
	Min	-47.26	-4.13	-56.23	2.85	1.54	14.57	15.35	1.17	0.04
	N	624	624	624	624	624	624	624	624	624
	Mean	9.18	1.04	15.59	9.21	6.67	32.61	45.47	6.03	0.64
	STD	7.07	0.69	9.93	2.61	1.06	8.11	10.73	0.88	0.47
2002	Max	36.94	4.12	63.82	17.65	14.19	72.78	88.34	13.56	4.39
	Min	-55.93	-3.55	-52.07	3.16	0.93	8.39	19.77	0.84	-0.11
	N	624	624	624	624	624	624	624	624	624
	Mean	8.9	1	16.67	9.29	6.02	26.53	50.83	5.35	0.67
	STD	7.07	0.7	10.92	2.59	1.1	7.95	12.11	0.9	0.51
2003	Max	34.51	3.62	50.29	17.72	12.35	62.43	105.82	11.33	5.87
	Min	-70.24	-4.85	-72.74	3.24	0.29	3.48	18.87	0.2	0.04
	N	624	624	624	624	624	624	624	624	624
	Mean	9.69	1.08	18.34	9.26	5.84	22.68	53.22	5.17	0.67
	STD	6.68	0.71	10.77	2.58	1.16	7.45	11.75	0.94	0.52
2004	Max	46.21	5.96	63.92	19.47	17.99	58.19	95.78	15.79	5.4
	Min	-29.75	-2.7	-46.59	3.24	1.04	2.94	7.76	0.93	-0.14
	N	624	624	624	624	624	624	624	624	624
	Mean	10.02	1.1	17.96	9.34	6.13	25.81	50.79	5.46	0.67
	STD	7.44	0.81	12.3	2.67	1.09	7.5	11.17	0.86	0.5
2005	Max	39.35	5.6	81	20.14	17.11	54.1	130.88	14.72	5.78
	Min	-71.82	-9.23	-152.47	3.44	1.25	2.71	8.8	1.02	-0.05
	N	624	624	624	624	624	624	624	624	624
	Mean	9.72	1.1	16.08	9.2	6.68	32.75	46.36	6.03	0.65
	STD	7.4	0.73	10.57	2.67	1.1	8.64	10.26	0.88	0.49
2006	Max	35.48	4.89	50.19	18.91	13.46	77.44	115.34	10.91	5.2
	Min	-92.01	-7.01	-93.06	3.45	0.39	4.55	8.25	0.38	-0.37
	N	624	624	624	624	624	624	624	624	624
	Mean	**9.38**	**1.05**	**16.27**	**9.29**	**6.49**	**30.44**	**47.65**	**5.83**	**0.65**
	STD	**7.05**	**0.72**	**10.72**	**2.64**	**1.25**	**10.21**	**11.87**	**1.07**	**0.49**
PRE GFC	**Max**	**46.21**	**5.96**	**81**	**20.14**	**17.99**	**77.44**	**130.88**	**16.19**	**5.87**
	Min	**-92.01**	**-9.23**	**-152.47**	**2.85**	**0.29**	**2.71**	**7.76**	**0.2**	**-0.37**
	N	**3744**	**3744**	**3744**	**3744**	**3744**	**3744**	**3744**	**3744**	**3744**

Note: This table reports descriptive statistics for the 624 sample banks over the 2001–2006 period: Pre GFC. Annual statistics are calculated separately for each year, while the period statistics are pooled across all bank-year observations from 2001 through 2006. Variable definitions are ROE is net income divided by total equity capital; ROA is net income divided by total assets; PM is net income divided by total operating income; EM is total assets divided by total equity capital; AU is total operating income divided by total assets; IER is interest expense divided by total operating income; NIER is noninterest expense divided by total operating income; IIR is interest income divided by total assets; and NIIR is noninterest income divided by total assets. All ratios are reported as percentages except the equity multiplier (EM).

Table no. 2 – Statistics of the Profitability Ratios and Components During 2008 GFC (2007-2010)

Year	Statistic	ROE (%)	ROA (%)	PM (%)	EM	AU (%)	IER (%)	NIER (%)	IIR (%)	NIIR (%)
	Mean	9.02	1.05	14.94	9.08	6.95	36.52	44.07	6.3	0.65
	STD	7.34	0.74	9.6	2.63	1.13	8.79	10.22	0.92	0.49
2007	Max	32.25	4.68	57.41	19.72	13.18	81.62	108.78	12.31	5.18
	Min	-70.42	-3.57	-46.98	3.1	0.36	4.12	10.11	0.34	-0.02
	N	624	624	624	624	624	624	624	624	624
	Mean	7.11	0.83	13.01	9.21	6.42	32.5	48.07	5.77	0.65
	STD	9.86	0.92	13.82	2.72	1	8.33	11.25	0.75	0.55
2008	Max	34.56	4.67	52.29	24.51	12.38	63.79	102.15	9.18	6.59
	Min	-90.59	-6.39	-91.81	3.28	2.98	4.29	10.53	2.6	-0.41
	N	624	624	624	624	624	624	624	624	624
	Mean	4.53	0.59	10.29	9.39	5.7	25.95	55.7	5.11	0.59
	STD	12.39	1.03	18.16	2.76	0.99	8.37	13.46	0.78	0.5
2009	Max	35.12	3.15	47.07	23.61	10.17	58.71	137.42	8.96	4.45
	Min	-125.47	-8.33	-165.84	3.27	2.75	3.74	10.82	2.55	-0.89
	N	624	624	624	624	624	624	624	624	624
	Mean	5.21	0.65	12.04	9.55	5.3	21.22	59.03	4.73	0.57
	STD	11.43	0.95	18.39	2.86	1.03	7.41	14.8	0.84	0.48
2010	Max	34.82	4.29	56.64	29.26	10.4	53.96	179.64	8.65	3.69
	Min	-118.4	-7.48	-167.93	3.2	0.16	3.57	17.73	0.15	-0.95
	N	624	624	624	624	624	624	624	624	624
	Mean	**6.47**	**0.78**	**12.57**	**9.31**	**6.09**	**29.05**	**51.72**	**5.48**	**0.61**
	STD	**10.57**	**0.93**	**15.5**	**2.75**	**1.22**	**10.12**	**13.89**	**1.02**	**0.51**
During GFC	**Max**	**35.12**	**4.68**	**57.41**	**29.26**	**13.18**	**81.62**	**179.64**	**12.31**	**6.59**
	Min	**-125.47**	**-8.33**	**-167.93**	**3.1**	**0.16**	**3.57**	**10.11**	**0.15**	**-0.95**
	N	**2496**	**2496**	**2496**	**2496**	**2496**	**2496**	**2496**	**2496**	**2496**

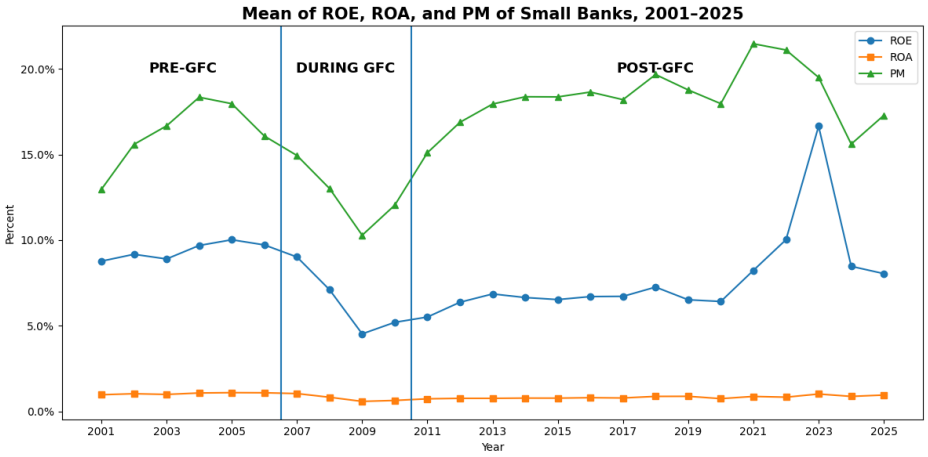
Note: This table reports descriptive statistics for the 624 sample banks over the 2007–2010 period: During GFC. Annual statistics are calculated separately for each year, while the period statistics are pooled across all bank-year observations from 2007 through 2010. Variable definitions are provided in Table no. 1.

Table no. 3 – Statistics of the Profitability Ratios and Components Post 2008 GFC (2011-2025)

Year	Statistic	ROE (%)	ROA (%)	PM (%)	EM	AU (%)	IER (%)	NIER (%)	IIR (%)	NIIR (%)
	Mean	5.52	0.74	15.1	9.46	4.91	17.06	61.72	4.36	0.55
	STD	20.47	0.91	19.4	4.2	1.03	6.77	14.55	0.84	0.48
2011	Max	31.08	4.02	67.76	72.14	9.55	71.55	150.78	9.15	3.47
	Min	-452.06	-7.3	-230.26	3.43	2.01	2.93	19.95	1.77	-1.11
	N	624	624	624	624	624	624	624	624	624
	Mean	6.38	0.77	16.88	9.4	4.53	13.62	64.86	4	0.53
	STD	10.8	0.84	17.65	2.78	1.04	6.19	15.39	0.85	0.48
2012	Max	30.43	4.5	59.36	30.58	10.01	71.08	166	8.22	4.85
	Min	-134.16	-5.35	-119.46	3.47	0.62	2.19	17.92	0.56	-0.92
	N	624	624	624	624	624	624	624	624	624
	Mean	6.86	0.77	17.94	9.83	4.36	11.01	66.76	3.82	0.54
	STD	8.3	0.73	16.47	2.96	1.04	5.34	15.17	0.85	0.47
2013	Max	31.6	4.46	72.07	25.84	9.58	54.72	146.62	7.88	4.33
	Min	-70.58	-5.45	-184.27	3.71	1.26	1.84	20.77	1.1	-0.54
	N	624	624	624	624	624	624	624	624	624
	Mean	6.65	0.79	18.37	9.32	4.28	9.51	67.73	3.77	0.51
	STD	8.15	0.73	15.8	2.64	0.97	4.79	15.75	0.8	0.42
2014	Max	30.1	3.8	59.87	26.35	8.48	47.6	154.54	7.59	3.32
	Min	-117.43	-7.63	-147.93	3.59	0.14	1.43	19.58	0.13	-0.22
	N	624	624	624	624	624	624	624	624	624
	Mean	6.54	0.78	18.36	9.2	4.27	8.79	68.41	3.76	0.51
	STD	6.99	0.67	14.57	2.76	0.97	4.57	15.54	0.81	0.44
2015	Max	29.96	3.94	60.33	31.72	9.49	49.95	173.23	9.13	4.23
	Min	-47.49	-3.87	-88.3	3.31	1.53	1.32	18.58	1.39	-0.26
	N	624	624	624	624	624	624	624	624	624
	Mean	6.71	0.81	18.64	9.22	4.33	8.58	67.85	3.8	0.53
2016	STD	8.03	0.66	14.12	3.27	1.03	4.33	15.06	0.84	0.5
	Max	33.11	3.36	61.7	51.35	10	39.02	148.69	9.19	5.93

Year	Statistic	ROE (%)	ROA (%)	PM (%)	EM	AU (%)	IER (%)	NIER (%)	IIR (%)	NIIR (%)
	Min	-98.64	-3.15	-67.65	3.34	0.48	1.16	18.29	0.47	-0.82
	N	624	624	624	624	624	624	624	624	624
	Mean	6.72	0.79	18.2	8.98	4.38	8.94	67.17	3.85	0.52
	STD	6.43	0.71	15.03	2.59	1.07	4.49	14.52	0.77	0.62
2017	Max	41.57	3.74	54.58	24.69	13.32	39.49	150.1	8.48	8.39
	Min	-47.87	-6.45	-140.88	2.59	1.85	1.13	18.27	1.76	-0.62
	N	624	624	624	624	624	624	624	624	624
	Mean	7.26	0.89	19.66	8.85	4.58	10.71	64.74	4.07	0.52
	STD	8.52	0.79	14.93	2.67	1.11	5.35	14.89	0.76	0.66
2018	Max	27.62	3.96	64.3	31.2	17.71	45.55	175.56	7.64	11.69
	Min	-108.67	-7.07	-82.18	2.35	1.44	0.78	19.96	1.38	-0.38
	N	624	624	624	624	624	624	624	624	624
	Mean	6.52	0.89	18.77	8.47	4.76	13.77	63.12	4.24	0.52
	STD	19.38	0.82	16.96	3.17	1.1	6.61	16.39	0.76	0.68
2019	Max	32.6	4.08	55.55	58.88	16.31	54.03	250.18	7.1	11.55
	Min	-447.25	-7.6	-171.03	2.35	0.44	1.08	18.98	0.41	-1.78
	N	624	624	624	624	624	624	624	624	624
	Mean	6.42	0.75	17.97	9	4.15	12.36	66.16	3.64	0.5
	STD	9.82	0.79	17.97	2.78	1.1	6.09	19.25	0.76	0.75
2020	Max	46.49	4.56	63.14	33.15	12.02	40.69	329.87	6.77	8.43
	Min	-176.75	-8.06	-180.78	2.39	1.15	0.42	20.35	1.1	-0.37
	N	624	624	624	624	624	624	624	624	624
	Mean	8.24	0.88	21.46	9.49	3.93	8.19	67.1	3.37	0.57
	STD	6.99	0.77	18.9	2.88	1.26	4.46	19.33	0.96	0.76
2021	Max	51.07	5.36	68.48	42.9	12.13	33.38	320.58	10	9.24
	Min	-67.13	-7.39	-255.74	2.34	0.46	0.36	22.33	0.43	-0.08
	N	624	624	624	624	624	624	624	624	624
	Mean	10.03	0.84	21.1	12.32	3.97	8.53	66.76	3.47	0.5
	STD	43.64	0.74	18.45	41.26	1.42	4.61	19.29	0.77	1.06
2022	Max	547.92	3.85	60.68	505.61	27.4	25.56	359.65	7.62	22.43
	Min	-864.96	-9.18	-290.03	-793.2	1.31	0.53	23.52	0.84	-0.08
	N	624	624	624	624	624	624	624	624	624
	Mean	16.65	1.02	19.5	89.82	5.16	20.82	55.69	4.52	0.64
	STD	160.06	0.96	15.15	1971	2.95	9.73	15.05	1.66	2.31
2023	Max	4000	7.08	57.93	49246	58.15	57.62	193.71	38.2	51.96
	Min	-103.09	-5.24	-143.62	-123.77	1.9	0.2	20.38	1.77	-0.15
	N	624	624	624	624	624	624	624	624	624
	Mean	8.48	0.88	15.61	10.38	5.71	28.6	51.83	5.19	0.52
	STD	10.21	0.89	15.31	10.51	4.13	10.92	15.57	3.69	1.84
2024	Max	41.15	4.92	58.99	100.2	94.1	63.56	185.75	93.86	42.48
	Min	-146.62	-6.04	-121.43	-193.46	0.91	1.53	21.92	0.87	-0.15
	N	624	624	624	624	624	624	624	624	624
	Mean	8.05	0.96	17.28	9.55	5.79	27.04	51.38	5.27	0.51
	STD	15.47	0.93	16.11	4.09	4.33	10.03	15.92	4.11	1.3
2025	Max	36.04	3.84	69.65	58.92	105.34	78.54	171.9	105	25.71
	Min	-284.13	-6.13	-114.16	2.38	1.11	1.29	21.32	0.93	0
	N	624	624	624	624	624	624	624	624	624
	Mean	**7.8**	**0.84**	**18.32**	**14.89**	**4.61**	**13.83**	**63.42**	**4.08**	**0.53**
	STD	**44.23**	**0.8**	**16.61**	**509.05**	**2.06**	**9.26**	**17.12**	**1.74**	**1.01**
Post GFC	**Max**	**4000**	**7.08**	**72.07**	**49246**	**105.34**	**78.54**	**359.65**	**105**	**51.96**
	Min	**-864.96**	**-9.18**	**-290.03**	**-793.2**	**0.14**	**0.2**	**17.92**	**0.13**	**-1.78**
	N	**9360**	**9360**	**9360**	**9360**	**9360**	**9360**	**9360**	**9360**	**9360**

Note: This table reports descriptive statistics for the 624 sample banks over the 2011–2025 period: Post GFC. Annual statistics are calculated separately for each year, while the period statistics are pooled across all bank-year observations from 2011 through 2025. Variable definitions are provided in Table no. 1.



Note: The figure presents annual standard deviation values of return on equity (ROE), return on assets (ROA), and profit margin (PM) for the 624 sample banks. The sample period is divided into the pre-GFC period (2001–2006), during-GFC period (2007–2010), and post-GFC period (2011–2025). Variable definitions are provided in Table no. 1.

Figure no. 1 – Mean of ROE, ROA, and Profit Margin of Small Banks, 2001–2025

As is evident from Tables no. 1-3 and the corresponding Figure no. 1, the three profitability ratios increased from 2001 to 2004 but began to decline in 2005, three years before the 2008 GFC. This declining trend continued through the 2008 GFC period and into 2009, then reversed upward beginning in 2010). Ozgur and Gorus (2016) also report that the 2008 GFC hurt the profitability of Turkish banks. The upward trend that began in 2010 continued through 2023.

To examine the sources of changes in profitability, we use the extended ROE formula (ROE = ROA * EM) discussed in section 2.2. As shown by Tables no. 1 and no. 2, the sharp decline in the mean value of ROE from the pre- (9.38%) to the during (6.47%) 2008 GFC period was the result of a decline in ROA (from 1.05% to 0.78%) rather than a change in EM. Because of capital adequacy requirements, the mean EM for the pre-, and during, 2008 GFC periods remained relatively stable, ranging from 9.29 to 9.30. The sharp decline in ROA (ROA = PM *AU) in turn was the result of a sharp decline in PM (from 16.27% to 12.57%) and a slight decline in AU (from 6.49% to 6.09%).

Contrasting the mean ROE values during and after the 2008 GFC reveals a sharp increase (from 6.47% to 7.8%). The increase in ROE was the result of increases in ROA (from 0.78% to 0.84%) and EM (from 9.31 to 14.89), and, in turn, the increase in ROA was the result of an increase in PM (from 12.57% to 18.32%). This implies that small banks were able to improve their profitability by implementing better cost-control policies and increasing leverage. Putting together the results from the above analysis indicates that a sharp decline in PM from the pre- to the during 2008 GFC periods and a gradual increase in PM from the during 2008 GFC to the post- 2008 GFC periods are the major contributors to the overall change in the ROE of small US banks in response to the 2008 GFC.

We tested the mean differences among the three profitability ratios across the three sub-periods: pre-2008, during the 2008 financial crisis, and post-2008. All three pairwise differences are statistically significant. The methodology used and the detailed results of the mean differences are presented in the Annex.

To further analyze the sources of changes in PM (PM = Net Income / Total Operating Income) from pre-, during and post-2008 GFC, we examine the sources of operating income and operating expenses (IIR, NIIR, IER, and NIER)[6] that shape the PM ratio. The IIR and NIIR are measures of the effective utilization of assets and show the extent to which banks' assets are used to generate interest and noninterest income[7]. The IER and NIER measure the proportion of total operating income used to pay interest and noninterest expenses. Comparing the IIR and NIIR for the pre-, during-, and post-2008 GFC clearly indicates that the major source of income for small U.S. banks has been interest income rather than noninterest income. Further, both the interest and non-interest income generated per dollar of assets have been steadily declining. The sum of IIR and NIIR ratios pre-2008 GFC is 6.48% (5.83% for IIR and 0.65% for NIIR), meaning that, on average, U.S. small banks could produce 6.48 cents in revenue per dollar of assets. The same ratios for the periods during and post-2008 GFC are lower, at 6.09% and 4.61%, respectively[8].

On the expense side, during the periods of pre-, during-, and post-2008 GFC, the IER has been steadily decreasing, while NIER has been steadily increasing. At the same time, the values of NIER are much higher than those of IER, indicating a larger portion of the revenue generated by U.S. small banks is used to pay for non-interest expenses[9]. The sum of IER and NIER ratios for pre- 2008 GFC is 78.09, meaning that 78.09 percent of the small banks' operating income is used to pay for interest (30.67) and noninterest expenses (47.65). The sum of the same ratios for the during, and post-2008 GFC are 80.77% (29.05% for IER and 51.73% for NIER) and 77.25% (13.83% for IER and 63.42%for NIER), respectively[10]. The analysis of the income and expense ratios shows a declining trend in the IIR, NIIR, and IER, while the NIER is rising. Overall, the summary of the six components of profitability ratios, illustrated in Figure no. 1, reveals a U-shaped trend in profitability from 2001 to 2024, with the lowest point in 2009. Notably, in 2025, profit margins (PM) increase while return on equity (ROE) decreases.

We calculate the standard deviation of profitability ratios to measure the volatility of profitability. The data indicates that the standard deviation remained stable until 2007; after the 2008 GFC, it rose sharply from 2007 to 2010. Following that period, it declined until 2019, leading to high volatility in profitability ratios. The standard deviation of the profitability ratios was stable until 2007, but sharply increased from 2007 to 2020 and then began to decline until 2019. We tested the STD differences of the three profitability ratios across the three sub-periods: pre-, during, and post-2008 financial crisis. The methodology used and the results of the mean differences are presented in the Annex.

4. SUMMARY AND CONCLUSIONS

This paper investigates the financial performance of small U.S. banks from 2001 to 2025, with special attention to the impact of the 2008 GFC on their profitability. We partition the period of study into three periods: pre-, during, and post-2008 GFC, and investigate the profitability performance of the U.S. small banks over time and in response to the 2008 GFC. While small commercial banks may hold minimal U.S. banking assets and even less market share, these banks perform a crucial function in the U.S. economy by offering financial services to small and medium-sized companies that are important to regional economic growth. Given the importance of small banks to the regional economy, the banking regulatory and supervisory agencies, as well as the local and regional authorities responsible for regional economic growth, should pay special attention to the safety and soundness of regional banks.

The study used 624 of the same small banks from 2001 to 2025 to examine their profitability pre-, during, and post-2008 GFC. Three measures of ROE, ROA, and PM, along with their six component ratios, are considered. On a time-series basis, the results indicated that the profitability trend follows a flat U (saucer) pattern: high profitability from 2001 to 2005, declining profitability from 2005 to 2009, and gradually increasing profitability after 2009. The major source of profitability change was PM, rather than AU or EM. In turn, the major cause of the change in PM has been a continuous decline in interest and noninterest income, a sharp decline in interest expense, and an increase in noninterest expense. Concerning the impact of the 2008 GFC on small banks' profitability, two conclusions emerge. First, small banks were able to take advantage of the low-interest-rate environment during and after the 2008 GFC to reduce their interest expense sharply and remain profitable. This indicates that the Fed's expansionary monetary policy to counter the 2008 GFC by reducing market interest rates benefited small banks. Next, the decline in profitability of small banks began three years before the 2008 GFC, and the increase in profitability occurred before the 2008 GFC ended. This leads us to suspect that changes in the profitability of U.S. small banks may have predictive value for the start and end of major financial crises.

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ANNEX

Tests of Differences Across GFC Periods

Methodology

To examine whether bank profitability differs across economic periods, the sample is divided into three subperiods: the pre-GFC period (2001-2006), the GFC period (2007-2010), and the post-GFC period (2011-2025). The analysis focuses on return on equity (ROE), return on assets (ROA), and profit margin (PM). The sample contains 624 banks observed annually over 2001-2025, yielding 15,600 bank-year observations.

Differences in Mean Profitability

Differences in mean profitability across the three periods are examined using the following regression:

$$Ratio_it = Intercept + b1 \times During_GFC_t + b2 \times Post_GFC_t + Error_it \quad (1)$$

where Ratio_it represents ROE, ROA, or PM for bank i in year t. During_GFC equals one for observations from 2007-2010 and zero otherwise, while Post_GFC equals one for observations from 2011-2025 and zero otherwise. The pre-GFC period (2001-2006) is the reference category. Therefore, the intercept represents the mean profitability ratio during the pre-GFC period, b1 measures the difference between the GFC and pre-GFC periods, and b2 measures the difference between the post-GFC and pre-GFC periods.

Because the same banks are observed repeatedly over time, standard errors are clustered at the bank level. A linear restriction test comparing b1 and b2 is additionally used to test whether mean profitability differs between the GFC and post-GFC periods.

Differences in Profitability Dispersion (standard deviation test)

The analysis also examines whether the dispersion of bank profitability differs across the three periods. Because the profitability ratios, particularly ROE, contain extreme observations, a Brown-Forsythe-type approach based on deviations from the median is used.

First, the absolute deviation of each bank-year observation from the median of its corresponding period is calculated as:

$$Absolute\ deviation_it = |\ Ratio_it - Median\ ratio\ for\ the\ corresponding\ period\ | \quad (2)$$

The resulting absolute deviations are then estimated using:

$$Absolute\ deviation_it = Intercept + b1 \times During_GFC_t + b2 \times Post_GFC_t + Error_it \quad (3)$$

The pre-GFC period again serves as the reference category. A positive coefficient indicates greater profitability dispersion relative to the pre-GFC period, whereas a negative coefficient indicates lower

dispersion. Standard errors are clustered at the bank level. A linear restriction test is used to compare dispersion during the GFC with dispersion in the post-GFC period. The values used in this test are mean absolute deviations from the period-specific median and should not be interpreted as the actual standard deviations of the profitability ratios.

RESULTS

Mean Profitability

Table no. A1 reports the results of the mean-comparison tests. Mean profitability differs significantly across the three periods for all three profitability measures. ROE averages 9.38% in the pre-GFC period and declines to 6.46% during the GFC, a statistically significant reduction of 2.92 percentage points. ROE subsequently increases to 7.80% in the post-GFC period but remains 1.58 percentage points below its pre-GFC level. The post-GFC mean is also significantly higher than the GFC-period mean.

ROA follows a similar pattern. Average ROA declines from 1.05% before the GFC to 0.78% during the GFC and then increases to 0.84% after the GFC. Although the post-GFC level represents a statistically significant improvement relative to the GFC period, it remains significantly below its pre-GFC level.

Profit margin exhibits a different post-crisis pattern. Average PM decreases from 16.27% before the GFC to 12.57% during the GFC. It then increases to 18.33% in the post-GFC period, exceeding both its pre-GFC and GFC-period levels. All three pairwise differences are statistically significant.

Table no. A1 – Differences in Mean Profitability Across GFC Periods

Ratio	Pre-GFC Mean	GFC Mean	Post-GFC Mean	GFC - Pre	Post - Pre	GFC - Post
ROE	9.38%	6.46%	7.80%	-2.92*** *(p < 0.001)*	-1.58*** *(p = 0.001)*	-1.34*** *(p = 0.008)*
ROA	1.05%	0.78%	0.84%	-0.27*** *(p < 0.001)*	-0.21*** *(p < 0.001)*	-0.06** *(p = 0.010)*
PM	16.27%	12.57%	18.33%	-3.70*** *(p < 0.001)*	+2.06*** *(p < 0.001)*	-5.75*** *(p < 0.001)*

Note: This table reports mean profitability ratios and pairwise differences across the pre-GFC (2001-2006), GFC (2007-2010), and post-GFC (2011-2025) periods. Differences are reported in percentage points. The pre-GFC period is the reference category in the regression. Standard errors are clustered at the bank level. The GFC versus post-GFC comparison is obtained from a linear restriction test. Overall period tests are: ROE, $F = 59.98$ ($p < 0.001$); ROA, $F = 68.13$ ($p < 0.001$); and PM, $F = 113.10$ ($p < 0.001$). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Profitability Dispersion

Table no. A2 reports the results of the mean dispersion tests. ROE dispersion is significantly greater both during and post- 2008 GFC periods relative to the pre- 2008 GFC period. The mean absolute deviation increases from 4.60% before the GFC to 5.81% during the GFC and 5.72% after the GFC. However, there is no statistically significant difference in ROE dispersion between the GFC and post-GFC periods.

ROA dispersion increases significantly during the 2008 GFC, from approximately 0.49% to 0.61%. In the post- 2008 GFC period, it declines to approximately 0.51%, which is not statistically different from its pre- 2008 GFC level. ROA dispersion is also significantly greater during the 2008 GFC than during the post-GFC period.

Profit-margin dispersion increases from 7.33% pre- 2008 GFC to 9.80% during- 2008 GFC and further to approximately 10.52% in the post- 2008 GFC period. Both later periods exhibit significantly

greater dispersion than the pre- 2008 GFC period. In addition, PM dispersion is significantly greater in the post-GFC period than during the GFC.

Overall, the dispersion results indicate that the GFC was associated not only with reductions in average profitability but also with increased heterogeneity in profitability outcomes across banks. The persistence of this increased dispersion varies across profitability measures. ROA dispersion largely returns to its pre-GFC level after the crisis, whereas greater dispersion persists for ROE and becomes even more pronounced for profit margins.

Table no. A2 – Tests of Differences in Profitability Dispersion Across GFC Periods

Ratio	Pre-GFC	GFC	Post-GFC	GFC - Pre	Post - Pre	GFC - Post
ROE	4.60%	5.81%	5.72%	+1.21*** *(p < 0.001)*	+1.12** *(p = 0.032)*	0.09 *(p = 0.860)*
ROA	0.49%	0.61%	0.51%	+0.12*** *(p < 0.001)*	0.02 *(p = 0.195)*	+0.10*** *(p < 0.001)*
PM	7.33%	9.80%	10.52%	+2.47*** *(p < 0.001)*	+3.19*** *(p < 0.001)*	-0.71** *(p = 0.022)*

Note: This table reports mean absolute deviations from the period-specific median and tests whether profitability dispersion differs across the pre-GFC (2001-2006), GFC (2007-2010), and post-GFC (2011-2025) periods. The reported values are measures used in the Brown-Forsythe-type dispersion test and are not standard deviations. Standard errors are clustered at the bank level. Positive pairwise differences indicate greater dispersion in the first listed period. The GFC versus post-GFC comparison is obtained from a linear restriction test. Overall period tests are: ROE, F = 14.25 (p < 0.001); ROA, F = 23.69 (p < 0.001); and PM, F = 53.85 (p < 0.001). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Notes

[1] For a review of the recent studies on the determinants of bank profitability, please refer to Yuan *et al.* (2022).

[2]The study by Berger and Humphrey (1997) comprehensively reviews 130 papers on the banking efficiency frontier techniques study up to 1995. The survey of the most recent studies can be found in Ashton and Hardwick (2000), Casu and Molyneux (2001), Berger (2007), Fethi and Pasiouras (2010), Paradi and Zhu (2013), and Bhatia *et al.* (2018).

[3]The yearly summary statistics of the variables used in the calculations of ratios are also available, but, for the sake of saving space, are not provided; they are available upon request.

[4]Although the yearly samples consisted of almost the same banks, the sizes of those banks varied, which makes the average bank size differ from year to year.

[5]In recent years, banks have increased the non-interest income portion of their total operating income by offering a more diversified set of fee-generating services. However, since this study focuses on small banks, the non-interest income portion of total operating income remains small, averaging about 9.5%.

[6]The Net income (NI) in banking is calculated as NI = (IIR + NIIR) – (IER + NIER) – Provision for Loan Losses -Tax. In this study, we do not consider the riskiness of the earning assets portfolio and its possible tax differential. Therefore, we do not consider the impact of Provision for Loan Losses and Tax in our analysis.

[7]Interest Income Ratio = IIR = Interest Income / Total Assets; NIIR = Non-interest Income Ratio = Non-interest Income / Total Assets; IER = Interest Expense Ratio = Interest Expense / Total Operating Income; NIER = Non-interest Expense Ratio = Non-interest Expense / Total Operating Income.

[8]As expected, a large portion of operating income for U.S. small banks comes from interest income, and only a small portion comes from non-interest income activities.

[9]Employee wages, salaries, and benefits are the most significant expenses.

[10]It is worth noting that interest expense is a smaller share of US small banks' total expenses and has declined from 2001 to 2025. Non-interest expenses account for a much larger share of total expenses. It is not given here, but employee salaries and fringe benefits are a large portion (87%) of non-interest expenses.