The Financial Statements of Italian Popular Banks and Their Evaluation: Some Quantitative Elaborations

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Article

The Financial Statements of Italian Popular Banks and Their Evaluation: Some Quantitative Elaborations

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Abstract: This study examines the economic and financial performance of a sample of popular Italian banks that maintained their mutualistic structure after the 2015 reform that imposed the conversion of the largest banks into joint-stock companies. The analysis covers 2013-2023 and employs two financial ratios, profit margin and Tier 1 ratio, to assess the impact of structural transformation and pandemic crisis. First, the size trend is quantified by assessing the asset trend. The methodology integrates balance sheet analysis, variance analysis (ANOVA) and the Tukey-Kramer test to detect significant differences between geographical areas (North, Central and South Italy). The results partially confirm the hypothesis that cooperative banks have grown despite macroeconomic challenges. The Tier 1 ratio confirms the financial stability of the cooperative banks that have remained so. The profit margin, on the other hand, shows territorial variability, suggesting a correlation between bank performance and local socio-economic conditions. These findings contribute to the debate on the sustainability of cooperative banking models. Future research could extend this analysis with additional financial indicators and apply machine learning techniques to improve predictive modelling in performance evaluation.

Keywords: cooperative banks; financial performance; profitability analysis; Tier 1 Ratio; ANOVA; Tukey-Kramer test; financial resilience; banking regulation; economic geography

MSC: 91G50; 62P20; 91B84

1. Introduction

Italian popular banks have a long tradition in the national financial system, dating back to the second half of the 19th century. Inspired by the European mutualist models developed by Friedrich Wilhelm Raiffeisen and Hermann Schulze-Delitzsch (Henzler, 1971), these institutions have played a crucial role in the financing of small and medium-sized enterprises for over a century, adapting their operations to the economic characteristics of their territories of reference (Confalonieri, 1982; De Lucia Lumeno, 2024). However, since the 2000s, the banking sector has undergone a profound transformation process, characterised by concentration phenomena and an evolution of financial regulation on a European scale.

A turning point was Decree-Law No. 3/2015, known as the *Investment Compact*, converted into Law No. 33/2015, which mandated the transformation of the largest cooperative banks into joint-stock companies (Banca d'Italia, 2015). The reform aimed to increase transparency and management efficiency, reducing systemic risks in the context of the European Banking Union (Assonime, 2015). Almost ten years later, it remains crucial to investigate the economic-financial evolution of cooperative banks that have maintained the cooperative form, verifying the extent to which they have preserved their capital soundness and competitiveness in the market.

This study proposes a quantitative analysis of the economic-financial performance of a sample of Italian 'popular' banks over the period 2014-2023, adopting key indicators such as profit margin and Tier 1 ratio, two key metrics to assess the operating profitability and capital strength of banking institutions, respectively (Stock & Watson, 2019). Furthermore, business performance is preliminarily

examined as a proxy for firm size to understand possible correlations between size growth and changes in capital structure.

The methodological approach is based on balance sheet analysis applied to data extracted from Moody's Analytics (formerly Bureau van Dijk) financial databases, supplemented with statistics to validate the results. ANOVA and Tukey-Kramer tests are used to compare performance between different geographical areas (North, Centre, South and Islands) to examine the relationships between location and balance sheet variables (Stock & Watson, 2019). These tools allow for the identification of statistically significant differences between groups.

The analysis aims to answer key questions concerning the sustainability of cooperative banks in the new competitive scenario:

Has the sector's transformation affected the profitability of the remaining cooperative banks?
Has their capital strength improved or worsened over time?
Does geographical location affect key balance sheet indicators?

The empirical evidence provided by the study contributes to the debate on the sustainability of the popular bank model in a context increasingly dominated by large banking institutions, complementing the existing literature on the dynamics of the Italian banking sector (Barra & Ruggiero, 2023; Barra & Zotti, 2020). Moreover, the results obtained may provide valuable indications for the regulation of the sector and the strategic management of these institutions in the long run.

2. Literature Review

2.1. A First Bibliometric Approach

In the face of an innumerable international bibliographic production on credit companies' economy and balance sheets, few contributions focus on popular Italian banks' managerial and accounting aspects.

In March 2025, an initial exploratory search on Scopus using the terms 'Italian AND popular AND banks' identified only 21 papers. Of these, only 10 were related to business, management, accounting, economics, econometrics, and finance.

Production was occasional, focusing more on the pandemic years (Figure 1).
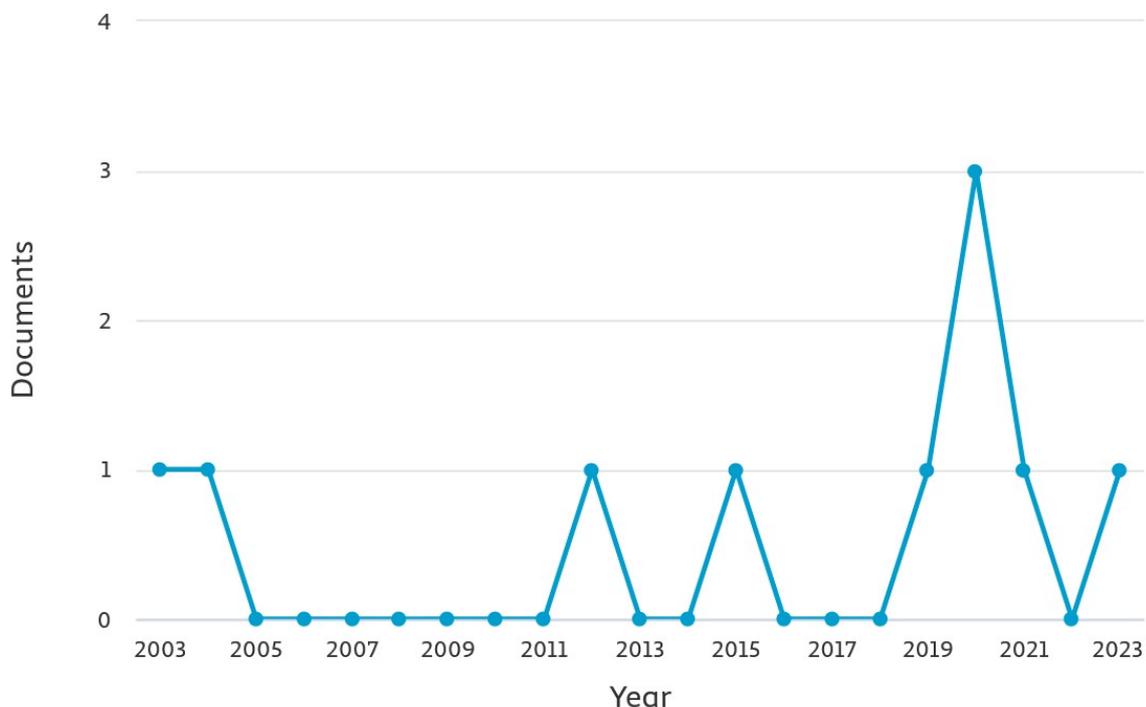
Figure 1. Documents by year. *Source*: Scopus.

A few interdisciplinary profiles are identified mainly with the social sciences, while other areas are in the minority (Figure 2).
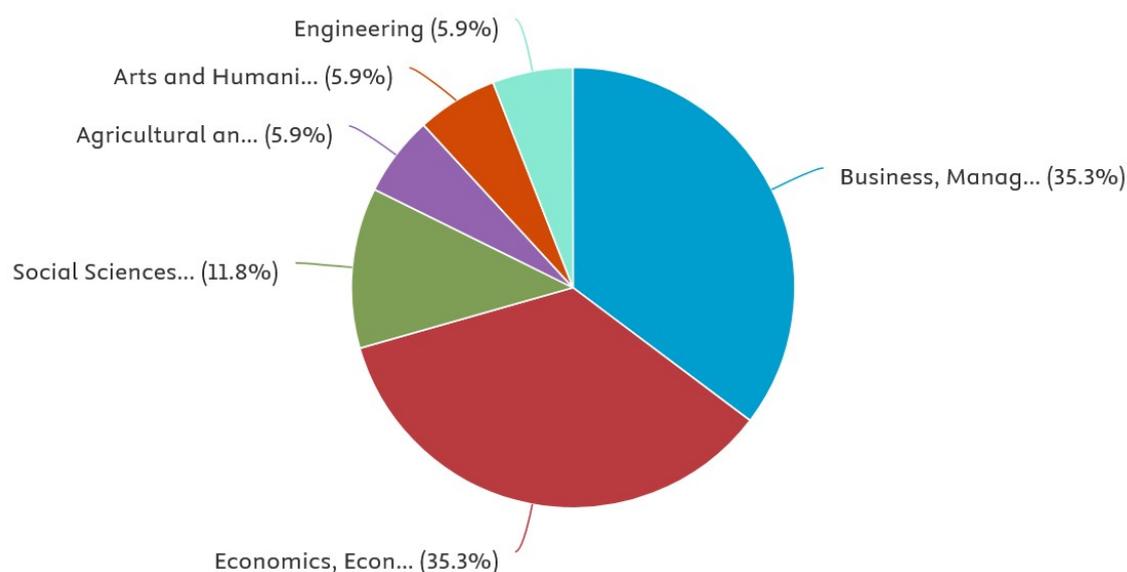
Figure 2. Documents by subject area. *Source*: Scopus.

The most widely cited paper dates back more than twenty years: Girardone et al. (2004), which analysed the determinants of bank efficiency. It is a fundamental reference for all studies on the subject (Table 1).

Table 1. Most cited documents.

N.	Document	Citations
1	Girardone et al. (2004)	187
2	Altman et al. (2020)	52
3	Barra & Zotti (2020)	8
4	Ambrosio & Coccorese (2015)	7
5	Illia et al. (2021)	7
6	Barra & Ruggiero (2023)	3
7	Sharma & Thakur (2019)	1
8	Ielasi (2012)	0
9	Solari (2020)	0

Source: Our elaboration on VOSviewer data

Following at a distance, but still often cited, is the work of Altman et al. (2020), which analysed the creditworthiness assessment of Italian SMEs and mini-bond issuers. The other papers were much more rarely considered worthy of attention by researchers.

The small number of researchers who have ventured into the topic and the frequency of citations concentrated on a few papers makes the ranking of the most cited authors very similar to the previous one (Table 2).

Table 2. Most cited authors.

Author	Documents	Citations
Gardener, Edward P.M. Girardone, Claudia Molyneux, Philip	1	187
Altman, Edward I. Esentato, Maurizio Sabato, Gabriele	1	52
Barra, Cristian	2	11
Zotti, Roberto	1	8
Ambrosio, Rachele Anna	1	7

Coccorese, Paolo		
Colleoni, Elanor		
Illia, Laura	1	7
Meggiorin, Katia		
Ruggiero, Nazzareno	1	3
Sharma, Neetu	1	1
Thakur, Shivani		
Ielasi, Federica	1	0
Solari, Stefano	1	0

Source: Our elaboration on VOSviewer data

More interesting for identifying the most frequently discussed topics is the list of keywords characterising the publications (Table 3).

Table 3. Popular keywords.

Keyword	Occurrences	Total Link Strength
Banking	2	11
Financial Services	2	11
Italy	2	11
Accumulate	1	5
Bank Regulation	1	3
Bank-Specific Factors	1	3
Banking Risks	1	3
Basel Iii	1	3
Business Outcomes	1	2
Buying	1	6
Capital Requirements	1	3
Capitalism	1	5
Clearing Houses	1	3
Consumer Evaluation	1	2
Cooperative And Non-Cooperative Banks	1	3
Crease Resistance	1	6
Credit Provision	1	4
Credit Risk	1	3
Degradation	1	5
Economy Of Scale	1	7
Efficiency Measurement	1	7
Eurasia	1	7
Europe	1	7
Exploitation Repression	1	5
Fashion	1	6
Financial Stability	1	3
Financial Unbalances	1	3
Lending Behavior	1	4
Local Banks	1	3
Luigi Luzzatti	1	3
Manufacturer	1	6
Market Efficiency	1	3
Market Power	1	3
Market Structure	1	3
Mini-Bonds	1	3

|		
Modelling Credit Risk For Smes	1	3
Monetary System	1	3
Pillar Ii	1	3
Price	1	6
Revolution	1	5
Sme Finance	1	3
Socialism	1	5
Southern Europe	1	7
Suit	1	6
Twitter	1	2
Wool Fabric	1	6

Source: Our elaboration on VOSviewer data

It is not possible to identify relevant common topics. There is too much dispersion among the proposed terms. Only three words were used twice: Banking, Financial Services, and Italy.

More interesting is the observation of each term's Total Link Strength (TLS), which is the sum of the 'strength' of all the connections of a keyword (node). A node may have few links but a high strength if its links to other nodes are significant[1].

The TLSs of the most cited keywords have the highest value. However, some terms have significant strength, even with only one citation.

The dispersion of authors and the considerable diversity of searches is also evident in Figure 3, which illustrates the co-occurrence among all keywords.
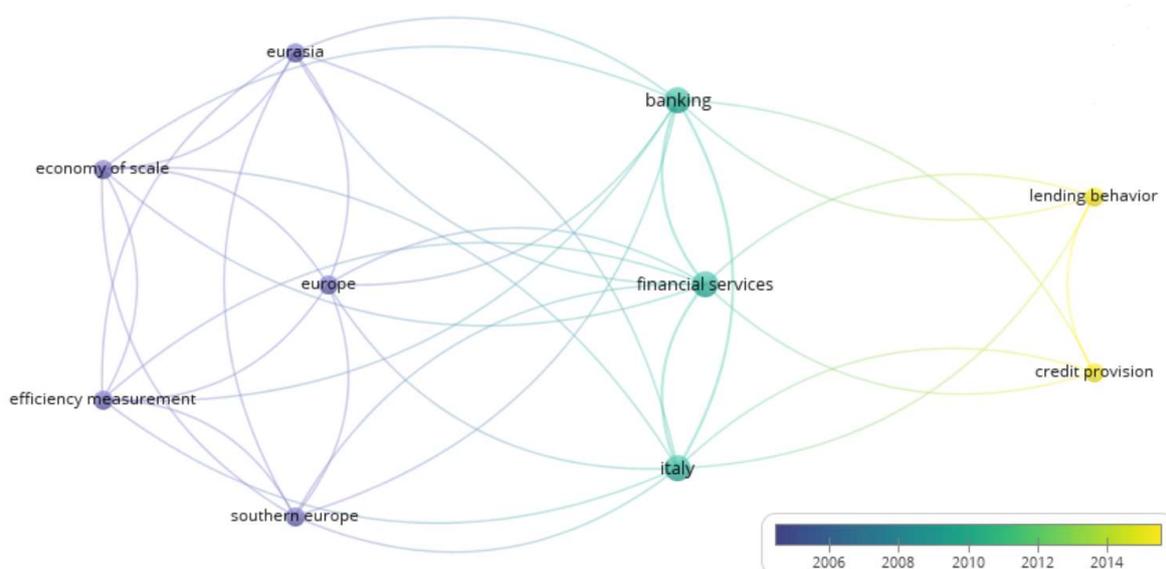
Figure 3. Co-occurrence between all keywords. *Source*: VOSviewer.

There is no polarisation on specific terms. There is only evidence that, over time, there has been a progressive shift towards specific topics.

2.2. The Main Topics Covered

The bank performance analysis is based on various financial indicators to assess credit institutions' profitability, capital strength and operational efficiency. The balance sheet represents the primary source of information for studying these phenomena, allowing quantitative models to be applied to identify trends and anomalies in banks' financial behaviour (Stock & Watson, 2019).

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[1] A high TLS value indicates, for instance, that an article is highly connected and thus has a central relevance in the network.

Numerous studies have investigated banks' economic and financial performance determinants, adopting advanced financial analysis tools. For example, the modified DuPont model was used to break down bank profitability into elementary components, identifying the specific contribution of operating margins, leverage, and asset turnover (Mahdawi et al., 2021). In parallel, research on business cycles has demonstrated the procyclicality of credit, highlighting how changes in macroeconomic growth rates affect lending and banks' capital strength (Ibáñez-Hernández et al., 2014).

The stability and capitalisation of banks were also the subject of in-depth analyses concerning the effects of institutional reforms and financial globalisation. Andries et al. (2014), for example, assessed the impact of market opening on the banking systems of 17 Central and Eastern European countries, finding that increased monetary and financial freedom, while fostering the growth of the banking sector, has accentuated the volatility of profitability in times of crisis. The Z-score model, developed to measure banking stability, has also been applied to understand the risk of failure of different financial institutions, demonstrating the greater resilience of cooperative banks compared to commercial banks (López-Espinosa et al., 2013).

The performance of Italian cooperative banks was investigated mainly from the point of view of governance and financial stability. Barra and Zotti (2020) analysed the relationship between market power and financial stability, showing a non-linear U-shaped relationship between the sector's concentration level and systemic risk. In other words, an overly fragmented market and a high concentration of banks can lead to inefficiencies. In addition, subsequent studies have shown that cooperative banks tend to adopt more prudent credit strategies than commercial banks, particularly after the global financial crisis and the implementation of Basel regulations (Barra & Ruggiero, 2023).

Statistical methodologies used to analyse banks' performance have included data envelopment analysis (DEA) approaches to measure banking efficiency (Avkiran, 2011). This technique, combined with the Malmquist Productivity Index, made it possible to assess changes in efficiency over time, highlighting the differences between banking institutions with different ownership structures. These quantitative methods have also been applied to the Italian context, where the effects of digitisation and banking concentration have been studied to understand the variations in operational efficiency between banks of different sizes (Fiordelisi et al., 2011).

The effects of recent economic crises on bank performance have been the subject of extensive empirical literature. During the financial crisis of 2008-2009, bank ownership and lending policies significantly impacted lenders' resilience (Coleman & Feler, 2015). More recently, the COVID-19 outbreak has put additional pressure on the banking sector, reducing profitability and increasing levels of credit risk (Risfandy & Pratiwi, 2022). Amrani and Najab (2023) compared the responsiveness of Islamic and conventional banks between 2006 and 2020, highlighting that differentiated governance models affected the ability to absorb exogenous shocks. These studies suggest that the structural characteristics of banks, including their legal form and governance, are key determinants of their ability to adapt in crisis scenarios.

The analysis of Italian cooperative banks that have remained in cooperative form is a field of research that is still relatively little explored in the international literature, especially concerning the evolution of capital solidity in the post-reform context. The transformation of the largest cooperative banks into joint-stock companies, imposed by the 2015 legislation (Banca d'Italia, 2015), has redefined the sector's structure, raising questions about the sustainability of the banks that have remained cooperative. The analysis of the Tier 1 ratio, a key measure of bank capital strength, makes it possible to verify whether the cooperative base reduction has affected the ability of these institutions to maintain adequate levels of capitalisation (Menicucci & Paolucci, 2023).

One of the key aspects of the Italian banking system is the relationship between capital strength and credit stability. Recent studies have shown that, despite the growing concentration of the sector, cooperative and cooperative banks maintain an important function in supporting SMEs, showing more excellent stability in times of crisis than commercial banks (Carbó-Valverde et al., 2019). This result is consistent with Tier 1 ratio data, which correlates with higher capitalisation and lower volatility in bank yields (Bongini et al., 2021).

The effect of the 2015 cooperative banking reform has been widely debated in the economic literature. The legislation imposed the transformation into joint-stock companies for cooperative banks with assets above a certain threshold, changing their governance and operational strategies. Empirical studies have shown that banks that have maintained the cooperative form have recorded reduced employment and greater prudence in granting credit, but they have shown a significant deterioration

in profitability (Ciocchetta et al., 2020). An econometric analysis based on panel data confirmed that the reform's effect varies depending on geographical location, with banks in the South having a more significant impact on self-financing capacity than those in the North and Centre (Anolli et al., 2021).

Finally, a crucial aspect of the Italian banking sector is operational efficiency. Recent studies have used the Malmquist Productivity Index to analyse the evolution of the productivity of Italian banks, showing that the digitisation and automation of services have helped improve commercial banks' efficiency more quickly than cooperative and cooperative banks (Bos et al., 2020). However, cooperative banks maintained positive profitability thanks to prudent credit risk management.

This brief literature analysis provides a more detailed quantitative picture of the evolution of Italian cooperative banks, highlighting the factors that influence their profitability and capital solidity. This study, therefore, aims to contribute to the debate by applying advanced quantitative models to assess these institutions' profitability and capital strength in 2013-2023. Statistical techniques such as ANOVA and Tukey-Kramer tests make it possible to identify significant patterns in the data, offering new evidence on the economic and financial sustainability of these realities in the changed regulatory and market context.

We therefore want to verify the following hypotheses:

H1: Italian cooperative banks have increased their size despite the pandemic economic crisis and the spread of online banking;

H2: profitability has tended to grow in recent years;

H3: the higher quality capital component of the capital that guarantees depositors from any losses with the consequent liquidation of the institution's capital has been improved;

H4: location influences profitability and capitalisation, being linked to the characteristics of the territory in which cooperative banks operate.

3. Methodology

The empirical analysis was conducted through a quantitative approach based on processing financial data extracted from Moody's Analytics (formerly Bureau van Dijk) databases, which provide detailed information on Italian banks. The dataset covers 2013-2023 and includes key variables such as geographical location, total assets and two main balance sheet ratios. Therefore, the study's subject is a sample of Italian cooperative banks that have maintained their cooperative configuration without transforming into joint-stock companies following the 2015 reform.

The analysis focuses on three fundamental dimensions:

1. Company size is measured through the trend of total assets to identify expansionary trends or operational contractions.
2. Profitability is assessed through the Profit Margin, which expresses the bank's ability to generate profit compared to revenues. This Margin provides a direct measure of earning capacity, allowing the sustainability of cooperative banks to be compared with broader banking contexts (Fiordelisi et al., 2011).
3. Capital strength, analysed through the Tier 1 ratio, is a key indicator for measuring the bank's ability to absorb financial shocks and comply with regulatory capital requirements. The choice of the Tier 1 ratio responds to the growing academic focus on capital stability as a key element for the financial resilience of banking institutions (Berger et al., 2016).

The quantitative analysis was structured on several levels to ensure methodological robustness and statistical validity. The research hypotheses were tested by analysis of variance (ANOVA) and the Tukey-Kramer test.

One-factor ANOVA: this technique was used to verify whether there are statistically significant differences between the three Italian macro-regions (North, Centre, South and Islands) concerning the two budget indicators considered. ANOVA allows the evaluation of intra-group and intergroup variation, comparing the averages of the different subsamples to identify any systematic divergences in the performance of cooperative banks (Kutneret al., 2005).

Tukey-Kramer test: In the case of ANOVA significance, this post hoc test was used to determine which groups differ from each other accurately. The Tukey-Kramer test is beneficial in financial

studies to avoid the problem of Type I error accumulation when making multiple comparisons (Montgomery, 2019).

The combined use of ANOVA and Tukey-Kramer is justified by the need to obtain a rigorous quantitative picture of the performance of cooperative banks, with a focus on territorial differences and structural dynamics of the particular segment of the Italian banking sector investigated.

This methodology makes it possible to answer research questions, verify the related hypotheses, identify any critical issues and strengths of Italian cooperative banks, contribute to the literature on banking performance dynamics and assess the implications of financial regulation.

4. The Banks Analysed

There are 15 Italian cooperative banks under study, located as follows: 2 in the North, 6 in the Centre and 7 in the South and the major islands (Table 4).

Table 4. List of banks.

N.	Name	Location	Macro-region
1	Banca popolare etica	Veneto	North
2	Sanfelice 1893 banca popolare	Emilia-Romagna	North
3	Banca popolare del frusinate	Latium	Center
4	Banca popolare di Fondi	Latium	Center
5	Banca popolare del Cassinate	Latium	Center
6	Banca popolare di Lajatico	Tuscany	Center
7	Banca popolare del Lazio	Latium	Center
8	Banca popolare di Cortona	Tuscany	Center
9	Banca agricola popolare di Ragusa	Sicily	South and Islands
10	Banca popolare di Puglia e Basilicata	Apulia	South and Islands
11	Banca popolare pugliese	Apulia	South and Islands
12	Banca di credito popolare	Campania	South and Islands
13	Banca popolare Sant'Angelo	Sicily	South and Islands
14	Banca popolare delle province molisane	Molise	South and Islands
15	Popolare Valpadana (*in liquidation*)	Sicily	South and Islands

Source: Our elaboration.

The Popolare Valpadana Institute was not included in the analysis as it is currently in liquidation, thus reducing the adequate sample to 14 cooperative banks. In addition, data availability was not uniform for all the institutions examined.

The dynamics of cooperative banks reflect the transformations imposed by the current regulatory framework, which has led many companies in the North to convert into joint-stock companies. As a result, the concentration of banks that have retained the cooperative structure is higher in the central and southern regions, where credit institutions tend to be smaller and operate in markets characterised by less structured economic environments.

In the South, the situation is further complicated due to the difficulties in accessing credit for small and medium-sized enterprises, influenced by less financial transparency and higher insolvency rates (Corvino & Coppola, 2019; Angelini, 2022). In this context, cooperative and credit banks play a fundamental role, providing more flexible financial solutions than large banking institutions bound by strict supervisory and risk management criteria.

All the banks included in the analysis have confirmed the legal form of Limited Liability Cooperative Company for Shares by the regulations currently in force in the banking sector.

Their size was determined by analysing the trend of the Total assets (Table 5).

Table 5. Total Active trend.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Italy	2.552.428	2.215.432	1.994.455	2.002.364	2.309.128	2.170.116	2.270.518	2.883.830	2.921.520	2.780.583	1.892.419
North	1.371.068	1.658.297	2.095.804	2.204.134	2.386.974	3.375.983	3.323.417				
Center	1.078.532	1.003.372	1.028.873	1.049.913	1.210.828	1.181.046	1.429.250	1.785.473	1.732.279	1.687.260	387.652

South and Islands	3.780.675	3.225.482	2.903.004	2.853.418	3.259.931	2.988.671	3.092.377	3.900.161	4.043.779	3.838.724	2.895.597

Source: our elaboration

Depending on the ten-year values, a graph is drawn up that highlights the *trend* (Figure 4).
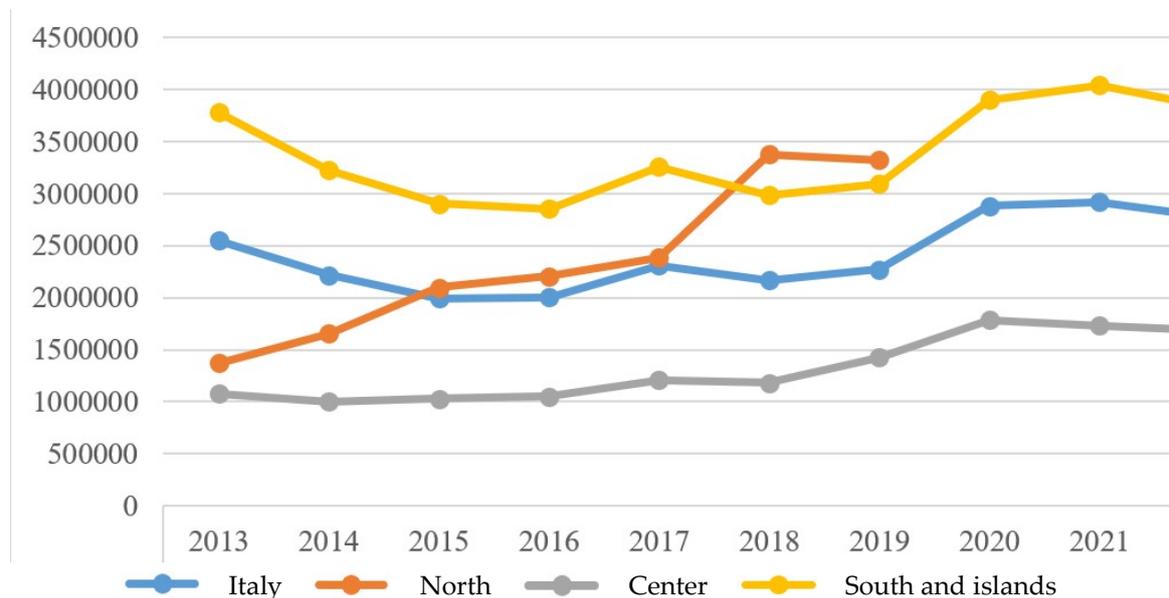

Figure 4. Graphic trend of total assets 2013-2023. *Source*: Our elaboration.

Over the years, the amount of assets in the historical series maintains a non-constant trend. The North is the only one to present an anomaly in the period considered, as in recent years, it has not recorded positive values, which are always available for the Centre, South and Islands.

The trend is varied everywhere. In the years 2020-21, there is a peak in growth, which then decreases. It should be remembered that 2020-2022, Italy was hit by the Covid-19 pandemic, causing an intense economic and financial crisis. Paradoxically, these are the years characterised by the highest asset amounts: this could be attributable to the high number of loans granted by banks and tiny and medium-sized companies (SMCs) in the pandemic period to cope with the emergence of the health crisis. During the pandemic period, small and medium-sized companies were able to receive loans more quickly as a result of the "Liquidity Decree", which provided for the guarantee of the Guarantee Fund for SMCs, 100% up to 30,000 euros, automatically, free of charge and without evaluation, therefore without waiting for the outcome of the investigation (Ceroni, 2024).

5. The Trend of the Main Ratios

5.1. The Profit Margin

The profit margin is a profitability index that measures the bank's ability to control expenses and, therefore, the ability to produce net profit from its operating revenues, i.e. those of core operations (Alemanni et al., 2015). This index is used in financial statement analysis as it helps identify expenses that should be reduced and products or services with inadequate performance that may need to be discontinued. Additionally, it allows for highlighting the business's top-performing products and services that contribute to the growth and, consequently, improve the profit margin. The formula is:

Profit Margin = Net Profit/Net Sales

For this indicator, the descriptive statistics shown in Table 6 were calculated for the different groups that comprise the sample under analysis.

Table 6. Profit Margin—Descriptive statistics.

	ITALY										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Average	10,018	9,0374	8,4314	7,8876	-1,6478	8,8562	14,764	9,6638	15,966	17,817	41,285

Standard deviation	13,945	22,267	18,301	14,762	30,627	20,272	9,7391	14,365	13,404	11,998	55,549
Sample Variance	194,45	495,82	334,92	217,91	938,03	410,96	94,85	206,35	179,66	143,95	3085,7
Minimum	-12,321	-56,069	-40,958	-28,112	-83,457	-30,025	1,689	-22,137	-7,595	-1,541	-21,561
Maximum	36,278	30,034	31,001	32,399	31,679	41,763	34,279	35,399	41,892	41,961	100
Sum	120,22	108,45	109,61	102,54	-21,421	115,13	206,7	135,29	207,56	249,44	206,42
Available data	12	12	13	13	13	13	14	14	13	14	5

NORTH

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Average	7,345	-56,069	6,2845	10,338	-35,088	-7,591	11,4	-1,0445	26,013	18,761	11,944
Standard deviation			8,0476	10,969	68,405	31,726	13,733	29,829		8,0087	
Sample Variance			64,764	120,33	4679,2	1006,6	188,59	889,79		64,139	
Minimum	7,345	-56,069	0,594	2,581	-83,457	-30,025	1,689	-22,137	26,013	13,098	11,944
Maximum	7,345	-56,069	11,975	18,094	13,282	14,843	21,11	20,048	26,013	24,424	11,944
Sum	7,345	-56,069	12,569	20,675	-70,175	-15,182	22,799	-2,089	26,013	37,522	11,944
Available data	1	1	2	2	2	2	2	2	1	2	1

CENTER

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Average	19,395	18,773	14,701	15,605	13,583	23,19	18,568	15,661	23,554	24,896	(100)
Standard deviation	11,831	10,186	15,553	10,68	10,331	16,954	10,78	15,06	13,233	13,095	
Sample Variance	139,96	103,74	241,9	114,07	106,74	287,42	116,21	226,79	175,1	171,47	
Minimum	7,497	10,901	-8,519	5,749	7,068	8,581	5,104	0,111	8,752	5,577	(100)
Maximum	36,278	30,034	31,001	32,399	31,679	41,763	34,279	35,399	41,892	41,961	(100)
Sum	96,974	93,863	73,503	78,024	67,914	115,95	111,41	93,967	141,33	149,37	(100)
Available data	5	5	5	5	5	5	6	6	6	6	1

SOUTH AND ISLANDS

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Average	2,6495	11,776	3,9227	0,64	-3,1933	2,394	12,082	7,2358	6,7027	10,423	31,493
Standard deviation	12,701	7,5014	23,06	16,813	23,408	13,831	7,8844	5,971	7,989	7,992	62,236
Sample Variance	161,32	56,271	531,78	282,67	547,92	191,29	62,164	35,653	63,824	63,872	3873,4
Minimum	-12,321	0,208	-40,958	-28,112	-34,389	-17,301	7,283	0,197	-7,595	-1,541	-21,561
Maximum	15,007	20,399	21,654	23,607	23,414	22,948	27,437	17,518	15,522	19,833	100
Sum	15,897	70,655	23,536	3,84	-19,16	14,364	72,493	43,415	40,216	62,539	94,479
Available data	6	6	6	6	6	6	6	6	6	6	3

Source: Our elaboration

The trends in the average profit margin of the credit institutions under analysis can be better observed in Figure 5.
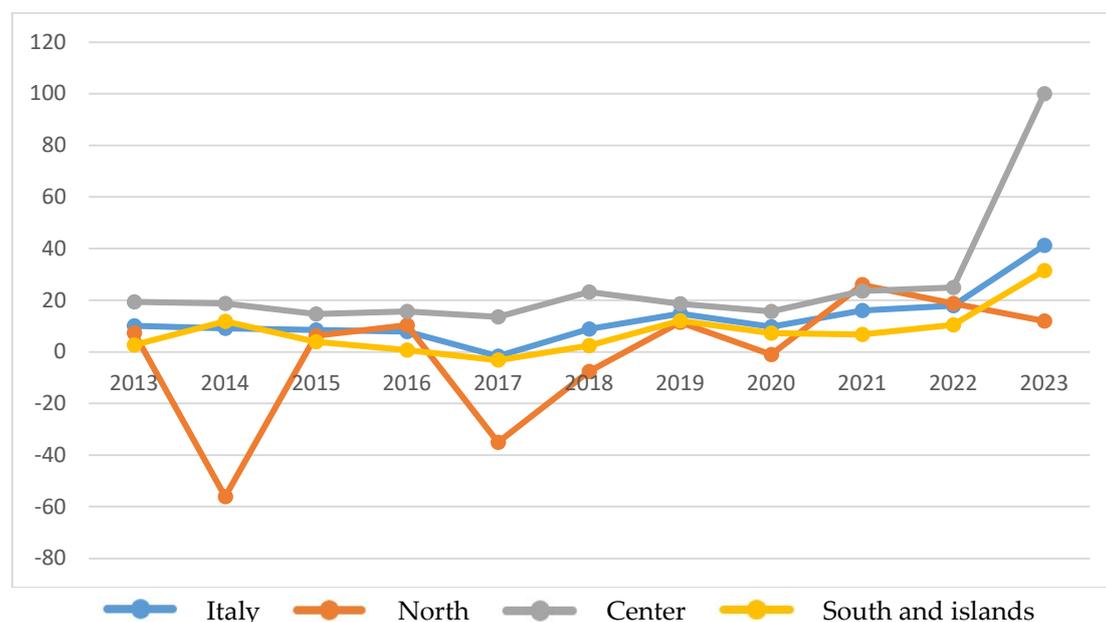

**Figure 5.** Profit Margin—Chart Trend. *Source*: our elaboration.

For a better graphical representation of the trends employing interpolating curves, it is necessary first to identify the interpolating equation of the arithmetic mean: the most expressive is the polynomial of order six that maximises R^2 (Table 7).

Table 7. Profit Margin—Interpolating equations.

Group	Equation	R^2
Italy	$y = 0{,}0025x^6 - 0{,}0736x^5 + 0{,}7795x^4 - 3{,}5347x^3 + 6{,}2415x^2 - 3{,}1922x + 9{,}5281$	0,93
North	$y = 0{,}005x^6 - 0{,}1466x^5 + 1{,}6236x^4 - 8{,}6253x^3 + 23{,}246x^2 - 31{,}59x + 35{,}166$	0,98
Center	$y = 0{,}0322x^6 - 1{,}209x^5 + 17{,}675x^4 - 126{,}63x^3 + 458{,}59x^2 - 767{,}75x + 424$	0,66
South and Islands	$y = -0{,}0013x^6 + 0{,}077x^5 - 1{,}5214x^4 + 13{,}754x^3 - 59{,}522x^2 + 112{,}25x - 62{,}48$	0,96
Source: our elaboration.		

The R^2 values are excellent for each area, except for the Center, which is still acceptable. It is, therefore, possible to represent the interpolating curves of the profit margin (Figure 6).
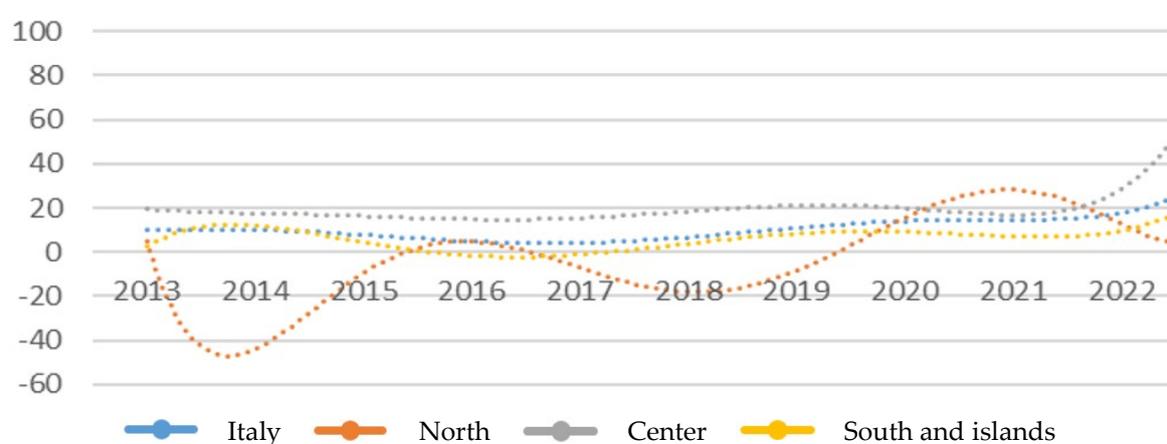
Figure 6. Profit Margin—Interpolating curves. *Source*: Our elaboration.

It is denoted that the index trend is relatively irregular in all areas.

The results recorded by the cooperative banks of Central Italy are the best, and they are always positive. They assumed values close to 20% from 2013 to 2017, then rose slightly in 2018 and fell again in 2019 and 2020. The value of 2023, which is equal to 100%, referable to a single bank, is insignificant. It was, therefore, taken into account only for graphical representation purposes but not for the subsequent Anova and Tukey-Kramer tests.

A similar trend, but with lower values, characterises the trend of South and Island banks. The improvement of this index over the years can be seen, also recording the highest profit margin value in 2023 of 31.49%, but referring to only half of the companies, only three, compared to six in previous years.

A very different situation emerges for northern banks. The trend is, in fact, uneven, with even negative values in the years 2014 and 2017. The situation, however, has improved significantly in 2021 and 2022.

In order to assess the presence of statistically significant differences between the macro-regions, we move on to the analysis of the variance with one factor, ANOVA, which produced the results outlined in Table 8.

Groups	Count	Sum	Average	Variance		
North	11	-7,707	-0,7006364	592,9803597		
Center	10	187,926	18,7926	15,94689982		
South	11	86,1254	7,82958182	84,67994274		
ANALYSIS OF VARIANCE						
Origin of the variation	SQ	dof	MQ	F	Significance value	F crit
Between groups	1994,489461	2	997,244731	4,179129232	0,025419379	3,33

In groups	6920,125123	29	238,625004
Total	8914,614584	31	

Source: Our elaboration

Table 8. Profit Margin—ANOVA test.

From the results of the ANOVA method, the H0 hypothesis is rejected, and the alternative H1 hypothesis is accepted because the value of F>F is critical. This indicates significant differences between the various groups, to be detected with the Post-Anova test (Table 9).

Table 9. Profit Margin—Tukey-Kramer test.

Average North	-0,700636364
Variance Nord	592,9803597
n Nord	11
Average Center	18,7926
Variance Center	15,94689982
n Center	10
Average South and Islands	7,829581818
Variance South and Islands	84,67994274
n South and Islands	11
N (total number)	32
Smallest group size	10
Number of groups	3
Pooled variance (common)	238,6250042
Degrees of Freedom	29
Q	3,49
Comparison North and Center	
Average difference North and Center	19,49323636
Critical value	17,04839117
	Significant difference
Comparison North and South and Islands	
Average difference North and South and Islands	8,530218182
Critical value	16,25500319
	Difference NOT significant
Comparison Center and South and Islands	
Average difference Center and South and Islands	10,96301818
Critical value	16,25500319
	Difference NOT significant
Source: Our elaboration	

The test identifies significant differences in the comparison between North and Centre, confirming what can already be guessed by observing the previous graphs: the North recorded the worst value of all the trends of the different territories; on the contrary, the Centre was characterised by much better values, always positive.

5.2. Tier 1 Ratio

The Tier 1 ratio is the "core capital" of a bank, a fundamental element in assessing the "financial strength" of all financial institutions. This indicator is crucial because it provides information on a bank's ability to absorb losses without jeopardising its operations and the safety of customer deposits.

The Tier 1 ratio is the ratio of Tier 1 capital (which includes Core Tier 1 and eligible hybrid capital instruments) to Risk-Weighted Assets (RWAs), the aggregate value of assets a bank holds, weighted according to their credit, market and operational risk.

In summary, more simply:

Tier 1 ratio = Core capital/Risk-weighted assets

It is referred to in the Notes to the Financial Statements, Part F, Section 2, 2.2 Capital Adequacy, B. Quantitative information, item C.2 Core capital/Tier 1 Capital Ratio, in the Bank of Italy's circular governing the financial statements of banks in Italy[2].

The ideal Tier 1 Ratio level is 8%. Suppose banks do not reach the required level of capital ratio. In that case, the Supervisory Authorities require the latter to increase their capital to restore a healthy balance between financial sources and uses so that the stability and continuity of the credit institution

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[2] Banca d'Italia, *The bank balance sheet: schemes and compilation rules*, Circular no. 262 of 22 December 2005 and subsequent amendments.

over time can be guaranteed. In general, a healthy core capital ratio indicates that a bank has a sound capital base and is better able to absorb losses without damaging its financial stability.Table 10 shows the descriptive statistics of the index.

Table 10. Tier 1 Ratio—Descriptive statistics.

ITALY											
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Average	15,41	16,253	16,071	16,309	15,073	14,635	15,463	16,28	16,339	16,556	18,708
Standard deviation	4,9551	4,0906	3,6264	3,4814	4,0515	3,3437	2,8313	2,9223	3,1019	2,5097	2,4988
Sample Variance	24,553	16,733	13,151	12,12	16,415	11,18	8,0163	8,54	9,622	6,2986	6,244
Minimum	7,32	10,82	11,18	12,27	8,01	11,11	11,33	13,4	12,9	14,3	16,38
Maximum	23,82	22,95	24,303	24,85	24,7	21,38	21,86	24,02	24,35	22,01	21,8
Sum	184,92	195,04	208,92	195,71	165,81	175,62	201,02	211,64	196,07	215,22	74,83
Available data	12	12	13	12	11	12	13	13	12	13	4
NORTH											
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Average	21,22	18,63	14,58	14,99	13,96	12,46	13,656	14,815	15,56	15,505	16,38
Standard deviation			3,6628	3,8467		0,6505	0,4179	0,0778		0,1202	
Sample Variance			13,416	14,797		0,4232	0,1746	0,006		0,0145	
Minimum	21,22	18,63	11,99	12,27	13,96	12	13,36	14,76	15,56	15,42	16,38
Maximum	21,22	18,63	17,17	17,71	13,96	12,92	13,951	14,87	15,56	15,59	16,38
Sum	21,22	18,63	29,16	29,98	13,96	24,92	27,311	29,63	15,56	31,01	16,38
Available data	1	1	2	2	1	2	2	2	1	2	1
CENTER											
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Average	15,636	16,354	16,454	16,083	13,965	15,055	15,684	16,075	16,2	16,746	17,01
Standard deviation	3,1187	2,5696	2,2804	1,9502	3,5114	3,6454	1,9453	1,9397	2,1515	2,7466	#DIV/0!
Sample Variance	9,7264	6,6027	5,2002	3,8034	12,33	13,289	3,7842	3,7625	4,6291	7,544	#DIV/0!
Minimum	12,82	14,03	13,97	13,39	8,01	12,57	13,71	14,22	13,52	14,3	17,01
Maximum	19,67	19,14	18,89	18,36	17,105	21,38	18,53	19,34	19,79	22,01	17,01
Sum	78,18	81,77	82,27	80,413	69,825	75,275	94,101	96,451	97,202	100,47	17,01
Available data	5	5	5	5	5	5	6	6	6	6	1
SOUTH AND ISLANDS											
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Average	14,253	15,773	16,249	17,064	16,404	15,085	15,922	17,112	16,662	16,748	20,72
Standard deviation	6,1504	5,4876	4,8626	4,9174	4,9648	3,8094	4,1599	4,349	4,5126	2,9681	1,5274
Sample Variance	37,828	30,113	23,645	24,18	24,649	14,512	17,305	18,914	20,363	8,8099	2,3328
Minimum	7,32	10,82	11,18	12,78	12,56	11,11	11,33	13,4	12,9	14,4	19,64
Maximum	23,82	22,95	24,303	24,85	24,7	20,326	21,86	24,02	24,35	21,22	21,8
Sum	85,52	94,64	97,493	85,32	82,02	75,426	79,61	85,56	83,31	83,74	41,44
Available data	6	6	6	5	5	5	5	5	5	5	2

Source: Our elaboration

Figure 7 illustrates the trend of the index's average over the 2013–2023 time frame.
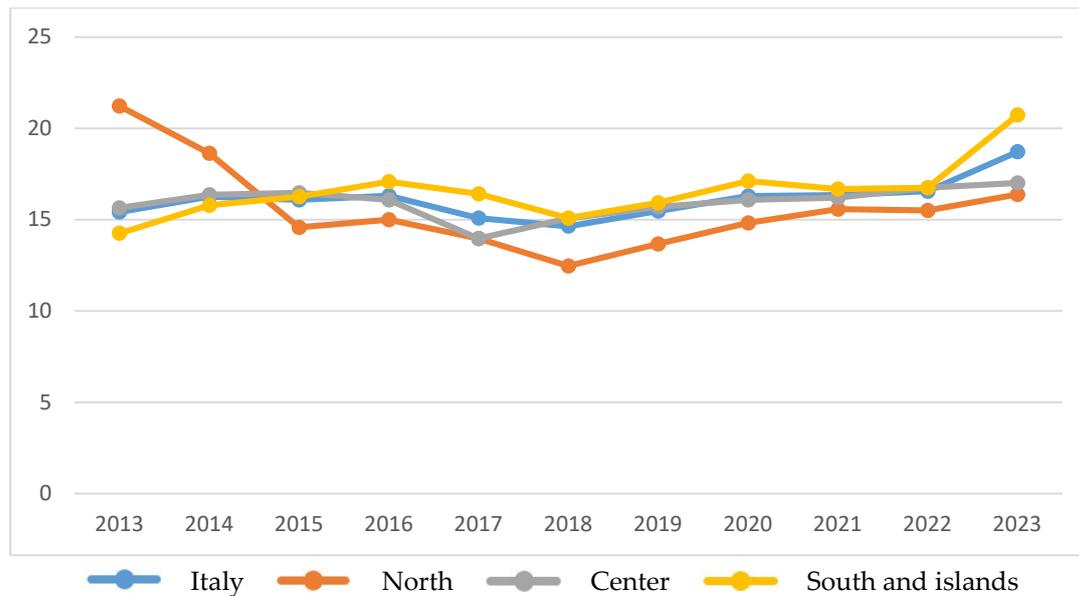
**Figure 7.** Tier 1 Ratio—Chart Trend. *Source*: our elaboration.

To better represent the trend, it is necessary to identify the interpolating equation of the arithmetic mean. Again, the polynomial of order 6 allows a better representation because it maximises the values of R^2 (Table 11).

Table 11. Tier 1 Ratio—Interpolating equations.

Group	Equation	R^2
Italy	$y = 0{,}0008x^6 - 0{,}0274x^5 + 0{,}3558x^4 - 2{,}1714x^3 + 6{,}2291x^2 - 7{,}383x + 18{,}435$	0,96
North	$y = 0{,}0003x^6 - 0{,}0124x^5 + 0{,}1678x^4 - 1{,}1179x^3 + 4{,}1742x^2 - 10{,}265x + 28{,}407$	0,94
Center	$y = 0{,}0004x^6 - 0{,}0126x^5 + 0{,}1462x^4 - 0{,}7036x^3 + 1{,}025x^2 + 0{,}9672x + 14{,}166$	0,79
South and Islands	$y = 0{,}0013x^6 - 0{,}0444x^5 + 0{,}5903x^4 - 3{,}7643x^3 + 11{,}578x^2 - 14{,}822x + 20{,}778$	0,96
Source: our elaboration		

The R^2 values are excellent for every area except for the Center; however, they are outstanding. It is, therefore, possible to represent the interpolating curves of the profit margin (Figure 8).
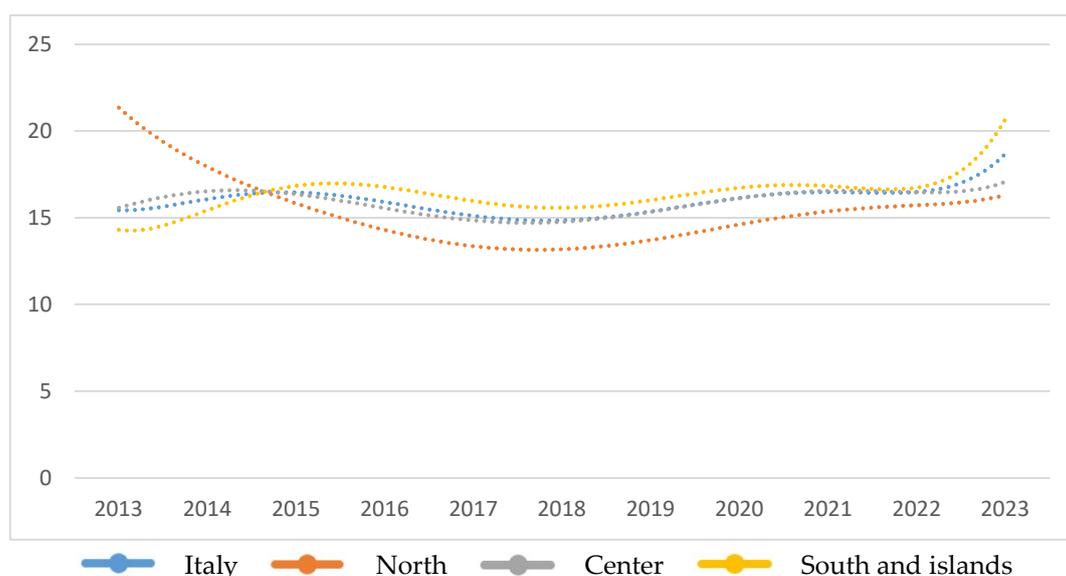
Figure 8. Tier 1 Ratio—Interpolating curve. *Source*: Our elaboration.

The previous calculations show a homogeneous index trend in all territorial areas. The values are always higher than 4.5%. Overall, the entire sample of banks considered complies with the

minimum required by Basel. It can, therefore, be deduced that all cooperative banks have a sound capital base. They can, therefore, absorb any losses in the best possible way without damaging their financial structure. Specifically, the best value was recorded by northern banks only in 2013, but in the following years, it fell sharply, from about 22% to about 15% in 2015. From 2018 to 2023, all macro-regions recorded constant growth, unaffected by the Covid-19 crisis.

ANOVA and Post-ANOVA statistical techniques are needed to verify the presence of significant differences between macro-regions. The analysis of one-factor variance yielded the results shown in Table 12.

Table 12. Tier 1 Ratio—ANOVA Test.

Groups	Count	Sum	Average	Variance		
North	11	171,756	15,6141818	5,973917364		
Center	11	175,262	15,9329091	0,717765091		
South	11	181,992	16,5447273	2,655284618		
ANALYSIS OF VARIANCE						
Origin of the variation	*SQ*	*dof*	*MQ*	*F*	*Significance value*	*F crit*
Between groups	4,920019152	2	2,46000958	0,789564002	0,463251481	3,32
In groups	93,46967073	30	3,11565569			
Total	98,38968988	32				
Source: our elaboration						

The H0 hypothesis is accepted because of the F<F value critics: no group variability or difference exists. Italian cooperative banks recorded a similar trend in the eleven years considered. This conclusion is confirmed in the Tukey-Kramer post-Anova test (Table 13).

Table 13. Tier 1 ratio—Tukey-Kramer test.

Average North	15,61418182
Variance Nord	5,973917364
n Nord	11
Average Center	15,93290909
Variance Center	0,717765091
n Center	11
Average South and Islands	16,54472727
Variance South and Islands	2,655284618
n South and Islands	11
N (total number)	33
Smallest group size	11
Number of groups	3
Pooled variance (common)	3,115655691
Degrees of Freedom	30
Q	3,49
Comparison North and Center	
The average difference between North and Center	0,318727273
Critical value	1,857393038
	Difference NOT significant
Comparison of North and South and Islands	
The average difference between North and South and Islands	0,930545455
Critical value	1,857393038
	Difference NOT significant
Comparison Centre and South and Islands	
The average difference between the Center and South and Islands	0,611818182
Critical value	1,857393038
	Difference NOT significant

Source: our elaboration

There is no significant difference between the banking institutions analysed for the Tier 1 Ratio. The result obtained with Anova is confirmed.

6. Discussion and Conclusion

The analysis conducted on the Italian cooperative banks that remained in cooperative form in 2013-2023 made it possible to highlight the economic and financial dynamics that characterise this segment of the banking sector, offering a quantitative perspective on their main balance sheet ratios. The results are part of a line of studies investigating the resilience of cooperative banks, their role in the financial system and the implications of recent regulatory transformations.

Firstly, the H1 hypothesis, relating to the dimensional growth of cooperative banks despite the challenges of the pandemic crisis and digitalisation, is only partially confirmed. The data show growth in total assets in periods of more significant public intervention in support of small and medium-sized companies, consistent with the evidence of Ciocchetta et al. (2020), who pointed out that emergency policies temporarily affected the volume of activity of cooperative banks. However, the subsequent decline in assets in 2023 raises questions about the long-term sustainability of the mutual model, recalling the concerns expressed by Anolli et al. (2021) about the impact of the 2015 reform on the self-financing capacity of cooperative banks, especially in the southern regions.

For profitability (H2), the results confirm a general growth trend, albeit with territorial differences. The profit margin was more stable for banks in the Centre and South, while institutions in the North showed more discontinuous trends, with some years characterised by negative results. This result aligns with studies by Barra and Zotti (2020), which showed a correlation between banking concentration and financial stability. The profitability of the Centre and South seems to reflect a lower exposure to competition from large banks than in the North, where the transformation into joint-stock companies has reduced the number of cooperative institutions, as Rossi (2020) noted.

The analysis of the Tier 1 Ratio confirmed the H3 hypothesis, showing a solid capitalisation of the cooperative banks analysed, with values above the Basel requirements. These data support the literature emphasising the greater prudence in risk management by cooperative banks compared to commercial banks (Carbó-Valverde et al., 2019; Bongini et al., 2021). However, the decline in the Tier 1 Ratio in Northern banks between 2013 and 2015 suggests that the forced transition of some cooperative banks to the form of joint stock companies resulted in an initial impact on their capital capacity, a phenomenon already discussed by Menicucci & Paolucci (2023).

Finally, the H4 hypothesis, relating to the influence of location on financial performance, is confirmed by statistical analysis. The significant territorial variability, with the North recording the most unstable performances, recalls the debate on the persistence of regional imbalances in the Italian banking system, already underlined by Viesti (2021). Banks in the South, while showing increasing profitability, operate in a context characterised by greater credit risk and less financial transparency, consistent with the observations of Corvino and Coppola (2019) and Angelini (2022).

These results have important theoretical and practical implications.

On a theoretical level, the study contributes to the literature on cooperative banks and their role in the financial system, confirming the effectiveness of cooperative governance in maintaining capital solidity and profitability despite a context of increasing digitalisation and competition from large credit institutions (Barra & Ruggiero, 2023). In addition, empirical evidence strengthens the debate on regulating cooperative banks, suggesting that the 2015 reform had differentiated effects depending on geographical areas and company size.

From a practical perspective, these findings can be helpful for banking institutions, regulators and trade associations. Cooperative banks can use this analysis to assess their growth and capitalisation strategies, while policymakers could consider more targeted interventions to support the sustainability of cooperative banks in economically less developed territories. In addition, the academic sector could benefit from further studies that deepen the link between banking performance and institutional characteristics, adopting even broader methodological approaches, as suggested by Al-abbad and Schertler (2022) and Zahid et al. (2023).

In conclusion, the Italian cooperative banks that have remained in cooperative form have shown a good ability to adapt to changes in the economic and regulatory context, albeit with some critical issues related to location and dimensional growth. If financial inclusion policies continue to enhance their role, these institutions can represent a credible alternative to the growing concentration of banks, contributing to the diversification of the financial system and the support of local economies.

This study is part of a larger research project on the financial and economic performance of numerous Italian production sectors, and it is also compared with similar trends in other countries. The results of these studies are summarised in Table 14.

Table 14. Publications related to the "Performance" project.

Indications temporarily omitted to avoid identification of the authors

Source: our elaboration

Author Contributions: This article derives from the paper presented by the authors at the 4th International Scientific Conference on "Inclusion: Tools, Paths and Perspectives" that took place in Benevento (Italy), on 22 October 2024, at the Giustino Fortunato University. The conference proceedings, awaiting publication, analysed the number of employees as an indicator of company size, and two of the primary financial statement ratios: ROE and the debt ratio. The research subsequently developed to compose this article, which investigates another size parameter and two other financial statement ratios. The article is the result of collaboration between the two authors. However, it is possible to attribute the different paragraphs in relation to the prevailing tasks that were carried out. *Guido Migliaccio* was responsible for the design and scientific setting of the work, identifying the banks, outlining the theoretical aspects and the critical analysis of the results. The paragraphs 'Introduction', 'Literature Review' and 'Discussion and Conclusion' are therefore attributable to him. *Francesca Zerillo*, on the other hand, procured and analysed the balance sheet data by statistically processing them and presenting the relevant comments. The paragraphs "Methodology", "The banks analysed" and "The trend of the main ratios" with related subsections are therefore attributed to her.

Data Availability Statement: The data used to support the reported results can be found in the sources indicated in the article.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

MDPI	Multidisciplinary Digital Publishing Institute
DOAJ	Directory of open access journals
TLA	Three letter acronym
LD	Linear dichroism

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