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Cost stickiness in the Italian Mutual Banks and comparison among Less Significant Banks

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Abstract

This study investigates cost stickiness in the Italian banking system, with a specific focus on Less Significant (LS) banks, including Mutual Banks (MBs), during the period 2006-2019. The research seeks to identify whether LS banks exhibit asymmetric cost behavior, particularly in response to income and credit risk level variations. Utilizing a unique dataset of 5,446 observations and applying econometric models adapted from the seminal work of Anderson et al. (2003), this study provides a novel analysis of cost stickiness within a banking context, an area that has been underexplored in the existing literature. The results reveal significant cost stickiness across all LS banks, with MBs demonstrating more pronounced stickiness than other LS banks. Additionally, the findings show that higher levels of credit risk exacerbate cost stickiness, while greater efficiency mitigates this effect. These insights underscore the importance of tailored cost management strategies in the banking sector, particularly for MBs, and contribute to understanding the unique challenges LS banks face in Italy. The research's originality lies in its focused examination of cost behavior within a distinct subset of the Italian banking system, providing new perspectives on how smaller, regionally-focused banks manage financial pressures.

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Introduction

Cost behavior is asymmetric when an increase in costs, associated with an increase in income, is greater than the decrease in costs that occurs when income declines (Bruggen and Zehnder, 2014; Serdaneh, 2014). Sticky costs generated by this asymmetry are a topic of particular interest that requires management awareness both to improve profitability and competitiveness and to avoid inadequate strategic decisions (Venieris et al. 2015).

Over the past two decades, interest in cost stickiness has grown significantly. Foundational studies by Anderson et al. (2003), Balakrishnan and Gruca (2008), Cannon (2014), and Holzhacker et al. (2015) have demonstrated how increases or decreases in income differently influence the cost-volume-revenue relationship. Subsequent research by Banker and Chen (2006), Weiss (2010), and Balakrishnan et al. (2014) has further investigated cost stickiness using various econometric models. However, most of these studies have focused on non-financial firms, with limited attention to the financial sector (notable exceptions include Hall, 2016; Belina et al., 2019).

This study aims to fill this gap by examining cost stickiness in the Italian banking industry, specifically focusing on Less Significant (LS) banks, including Mutual Banks (MBs). LS banks are smaller financial institutions that fall under national supervision rather than the direct oversight of the European Central Bank (ECB). Most of the Less Significant Institutions (LSIs) consist of small banks whose assets do not exceed 30 billion euros. Although these banks are not systemically important on a European scale, they play a crucial role in their local economies. They offered tailored financial services to regional markets and in Italy, a significant subset of LS banks comprises MBs, which operate on a cooperative basis. Unlike larger banks, MBs are owned and governed by their members—who are also their customers. This unique governance structure, coupled with the reforms introduced by Italian Legislative Decree 18/2016 (transformed into Law 49/2016), which came into effect in 2020 and organized Italian MBs into two major Cooperative Banking Groups, highlights the importance of understanding cost behavior within these institutions.

Investigating cost stickiness in the banking industry is particularly important for four reasons. First, the balance between costs and income is essential for the stability and credit activities of banks (Di Tommaso and Pacelli, 2022). Second, understanding cost behavior informs strategic decisions, particularly as banks increasingly engage in green finance, which, while beneficial, also incurs costs (Del Gaudio et al., 2022). Third, given the high proportion of fixed costs in banking, managing variable costs becomes a

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primary tool for maintaining economic balance. Finally, the industry is heavily influenced by regulation, making it imperative to understand how these factors interact in cost management.

The Italian banking system, characterized by its considerable number of MBs, offers a unique context for studying cost stickiness. Unlike the larger, nationally dominant banks found in many other countries, Italian LS banks—particularly MBs—provide insight into regional banking practices and their implications for financial stability and cost management. This study is especially relevant given the critical role these banks play in supporting local economies and SMEs, a role less emphasized in other banking systems (Coccorese and Shaffer, 2020).

For these reasons, this study investigates cost stickiness specifically in MBs, comparing them with other LS banks with similar characteristics. By analyzing cost stickiness in these banks, the study seeks to better understand their cost structure, identify areas for operational efficiency improvements, and adapt to changing market conditions. These considerations have become even more critical considering the COVID-19 pandemic and the ongoing digital transformation, both of which have further pressured interest margins and bank profitability.

The empirical analysis, based on a sample of MBs and other LS banks for the period 2006-2019, aims to answer the following research questions: 1) Is there cost stickiness with reference to total costs? 2) Does credit quality influence cost stickiness? 3) Is there a tendency toward manipulative cost management in the presence of capital constraints and high levels of non-performing loans? 4) Does the efficiency level contribute to modifying this stickiness?

The results of this study will contribute to a broader understanding of financial management in diverse banking environments, highlighting the importance of tailored cost management strategies and the role of local banking practices in ensuring financial stability.

The rest of the paper is organized as follows. Section 2 provides an overview of the existing literature and the development of study hypotheses. Section 3 presents the data sample and methodology. Section 4 reports the empirical results. Section 5 presents the main conclusions.

1. Literature review and hypotheses development

Incorporates, fixed and variable costs coexist, with the former not changing as activity volumes increase or decrease. Consequently, variations in costs are linked to the performance of variable costs, which traditional literature assumes to be perfectly symmetric. By contrast, the behavior of sticky costs empirically demonstrates that an increase in costs associated with an increase in income is greater than a decrease in costs associated with an

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equivalent decrease in income (Noreen and Soderstrom, 1994; Cooper and Kaplan, 1999; Ratnawati and Nugrahanti, 2015, Balakrishnan and Gruca, 2008, Ghaemi and Nematollahi, 2012). The literature has expanded significantly: from 1994 to 2020, more than 80 articles have been published in 36 journals (Ibrahim et al., 2022).

The term “sticky cost” was introduced by Anderson et al. (2003), although some authors in the 1990s had already proposed the first analyses to verify this behaviuor (Noreen, 1991; Noreen and Soderstrom, 1997; Cooper and Kaplan, 1999). From the early 2000s to today, numerous studies have highlighted the determinants explaining this cost behaviour. Guenther et al. (2014) show how costs can exhibit asymmetric behaviors due to managerial decisions related to the inability to reduce costs without facing legal issues or a loss of reputation and employee morale. Banker et al. (2014) and Magheed (2016) emphasize the difficulty in dismissing key employees who are crucial to the team and organizational climate. The replacement cost during expansion periods would be too high, and finding equivalent resources is not guaranteed.

Numerous theories have been used to explain cost stickiness: agency theory (Chen et al., 2012; Chung et al., 2019); signaling theory, analyzing the impact of stickiness on budget settings (Han et al., 2019); stakeholder theory, examining the influence of corporate social responsibility on cost stickiness (Habib and Hasan, 2019).

Since Anderson et al. (2003), several contributions have followed different research streams. The first applied Anderson et al. (2003) work in various contexts and introduced explanatory variables for stickiness (Calleja et al., 2006; He et al., 2010; Weiss, 2010; Chen et al., 2012; Pichetkun and Panmanee, 2012; Banker et al., 2013; Kama and Weiss, 2013), or observed managerial decisions over different time horizons (Weiss, 2010; Dierynck et al., 2012; Banker and Byzalov, 2014; Hsu et al., 2018).

The second research stream analyzed determinants of cost stickyness such as: a) macroeconomic factors influencing a more or less optimistic view of revenue growth (Anderson et al., 2003; Xu and Sim, 2017); b) protective labor market laws (Banker et al., 2013; Zanella et al., 2015); c) firm-specific factors like investment levels or workforce employed (Bugeja et al., 2015; Magheed, 2016), financial leverage (Magheed, 2016; Li and Zheng, 2017), intangible resources (Venieris et al., 2015; Sugiri et al., 2017), intellectual capital (Yang, 2015), past performance (Li and Zheng, 2017; Argilés-Bosch et al., 2023). Additionally, managers tend to be reluctant to reduce resources during growth periods and optimistic about recovery during crises (Li and Zheng, 2017; Lee et al., 2021).

However, most of these contributions have focused solely on non-financial firms (Cohen et al., 2017; Hosomi and Nagasawa, 2018a,b; Ibrahim

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et al., 2022). Although some works have introduced financial companies alongside non-financial ones to highlight the role of the industry in cost stickiness, they did not focus specifically on the banking industry (Subramaniam and Watson, 2016).

In banking, the cost structure is characterized by high levels of fixed costs, making it difficult to respond immediately to changes in market conditions. Specifically, a vast branch network can entail significant fixed costs associated with the management and maintenance of these structures (Drake and Howcroft, 2002). Long-term contracts with employees, suppliers, or business partners can make it challenging to quickly reduce personnel or procurement costs. Additionally, the use of obsolete technologies or complex information technology systems can increase cost stickiness, as significant investments are required to update or replace these systems (Day-Yang et al., 2011). Moreover, the persistence of costs at a relatively fixed level can make it difficult for banks to accurately forecast and plan their budgets, especially during periods of economic volatility.

Banks are also subject to a series of regulations and requirements that demand significant investments in infrastructure and resources. These are costs that cannot be easily reduced or eliminated quickly, even if market conditions change (Papi et al., 2017, Raza et al., 2019). Considering the described difficulties in managing fixed costs, the presence of stickiness in the behavior of the variable component represents a significant lever of flexibility in business management. If, however, cost behavior in financial intermediaries were asymmetric, the management's discretion in adapting the structure to changing market conditions would be reduced.

For the above reasons, verifying the presence of cost stickiness in banks is highly appropriate and plays a crucial role in understanding current operational dynamics and financial challenges. However, contributions to cost stickiness in the financial sector are limited. The first study (Hall, 2016) analyzes the impact of the ownership structure of American banks from 1997 to 2006 on the management of labor costs and, consequently, on their stickiness. The analysis reveals that: 1) publicly traded banks show greater labor cost elasticity compared to non-publicly traded ones, as they face greater investor pressure and tend to reduce labor costs to avoid profit reduction; 2) the use of labor cost variations for managing regulatory capital is more pronounced in non-publicly traded banks compared to publicly traded ones.

The second study (Belina et al., 2019) examines the influence of the Medical Loss Ratio (MLR) on cost stickiness, considering a sample of 22 American health insurance companies from 2002 to 2016. It shows that total cost stickiness significantly decreased after the regulatory introduction of the minimum MLR level, whereby if the MLR falls below a certain threshold,

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insurance companies are required to return a portion of the collected premiums to customers.

While there are few contributions to cost stickiness in banking enterprises, there are none concerning LS banks. In the Italian context, LS banks play a significant role in the local economy (Angelini et al., 1998), and among these, MBs hold a prominent position (Becchetti et al., 2016; Ferri et al., 2019; Minetti et al., 2021).

Regarding this, four hypotheses are presented based on the research objectives.

First Research Hypothesis

The cost structure in LS banks may be influenced by various factors. One of the main elements is the size. Smaller banks tend to have less capacity to achieve economies of scale because fixed costs represent a larger proportion relative to the volume of activities. Consequently, operational costs per unit of activity may be higher compared to larger banks. Additionally, regulatory complexity can be another cost factor for LS banks. These banks must comply with the same regulations as larger banks but may not benefit from the same resources and infrastructure to manage these regulatory requirements. This can result in additional costs to meet regulatory and supervisory demands (Alessandrini et al., 2016).

Within LS banks, MBs have distinctive characteristics that may exacerbate cost rigidity. For instance, MBs must balance the demands of members, who are also clients, depositors, and staff, with operational efficiency and related costs (Piatti, 2014). Member participation in corporate decisions can make the decision-making process more inclusive but may also require more time and resources, reducing managerial flexibility. Strong local community roots, typical of MBs, allow for long-term trust relationships but can also influence costs and the ability to negotiate more favorable pricing. Furthermore, the cooperative governance model, involving broader member participation and a more decentralized organizational structure, can generate a more rigid labor cost structure (Presti, 1998; Zazzaro, 2001).

Given the above, it is hypothesized that adjusting costs immediately may be challenging, leading to the following hypotheses:

H_{1a}: LS banks, as a whole, exhibit stickiness in the behavior of total costs.

H_{1b}: MBs exhibit greater stickiness in total costs compared to other LS banks.

Second Research Hypothesis

Credit risk can significantly influence cost stickiness through two distinct but complementary mechanisms. In the first mechanism, an increase in credit risk generates higher costs related to expected losses and the

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management of NPLs, regardless of income obtained. In the second mechanism, credit risk can affect cost stickiness by limiting the supply of credit. When credit risk increases, banks may become more cautious in lending (Al-Abedallat, 2016) thus reducing their income while facing fixed costs associated with infrastructure, personnel, and other expenses (Altunbaş et al., 2003; Parlour and Winton, 2013). Thus, it is hypothesized:
H_2: LS banks, whether MBs or not, exhibit greater stickyness in total costs in the presence of a high level of NPLs.

Third Research Hypothesis

Banks, including LS ones, are subject to a minimum capital amount they must hold to face credit risk. Consequently, in the presence of highly deteriorated loans, a bank might prefer to cut costs to maintain capital adequacy and avoid profit reduction. This way, in the short term, it can ensure that capital does not fall below the regulatory threshold. Essentially, there may be a manipulative cost management tendency. Such behavior may be more prevalent in banks characterized by financial weakness and significant credit risk. Therefore, it is hypothesized:
H_3: LS banks, whether MBs not, with a pronounced credit risk tend to avoid profit reduction by contracting costs.

Fourth Research Hypothesis

Cost stickiness can be reduced where there is greater efficiency. Improving efficiency allows for resource optimization and provides the bank with greater flexibility to adapt to changing external economic conditions. Additionally, a more efficient bank can timely identify abnormal credits and take appropriate measures, contributing to improved credit quality (Piatti and Cincinelli, 2019). Thus, it is hypothesized:
H_4: More efficient banks, whether MBs or not, can counter and neutralize total cost stickiness.

2. Sample and methodology

2.1. Sample

The sample is composed of Italian LS banks for the period 2006-2019. Accounting data from non-consolidated balance sheets were used for these banks. The sample also includes banks that were incorporated or liquidated during the observation period, up to the year of their existence. To analyze potential cost asymmetry differences, the LS bank sample was divided according to legal type into MBs and other-non mutual LS banks. Following Andersen et al. (2003), banks with total costs exceeding total income were excluded. Additionally, data availability issues led to the removal of some banks with incomplete information. Consequently, the final database

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comprises a set of 5,446 observations, as presented in Table 1. In Table 1, the LS bank sample is compared with the overall Italian banking system that includes even non-LS banks. Table 2 provides the sample structure in terms of the percentage of outstanding loans at the end of the year compared to total loans, inclusive of non-LS banks. Within the sample, LS banks account for 32% of the loans in the Italian banking system, of which 10.7% are related to the MBs.

Table 1: Number of banks per year of observation

Description	N. Obs.	Mean	Median	Std.Dev.
LS bank non MBs	1,418	0.60	0.69	0.31
MBs	4,277	0.62	0.67	0.26
All LS banks	5,695	0.61	0.67	0.28

Table 2: Percentage of Outstanding Loans Sample Banks compared to the whole Italian Banking System Loans

Description	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
LS non MBs	21,3%	19,7%	21,8%	22,2%	18,5%	19,0%	18,7%	20,2%	21,7%	22,0%	29,7%	23,2%	24,3%	23,1%	21,7%
MBs	11,8%	11,1%	12,4%	12,2%	9,5%	10,2%	9,0%	8,3%	9,8%	9,4%	11,2%	9,4%	12,8%	13,1%	10,7%
Total LS	33,2%	30,8%	34,2%	34,5%	28,0%	29,2%	27,7%	28,5%	31,5%	31,4%	40,9%	32,6%	37,0%	36,2%	32,4%

2.2. Methodology

The model of Anderson et al. (2003) was applied to investigate the first two research questions. In this regard, Equation (1) allows for determining the impact of a percentage change in total income on the percentage change in total costs:

$$\Delta ln\ (tc)_{i,t} = \beta_0 + \beta_1 \Delta ln(ti)_{i,t} + \beta_2 DEC_t * \Delta ln(ti)_{i,t} + \beta_3 DEC_t * \Delta ln(ti)_{i,t} * ln\left(\frac{GNPL}{ti}\right)_{i,t} + \beta_4 \Delta LTGBy_t * loan_{i,t} + \beta_5 ln\left(\frac{GNPL}{ti}\right)_{i,t} + year_t + \varepsilon_{i,t} \quad (1)$$

where: $\Delta ln\ (tc)_{i,t}$ is the dependent variable measured by the change in total costs in year t of the i-th bank; total costs represent the sum of interest expense, commission expense and operating costs such as labor costs, administrative expenses, depreciation and provisions for risks[1]. $\Delta ln(ti)_{i,t}$ is the change in total income at time t for the i-th bank; total income is defined as the sum of interest income, commission income and generally all other non-financial income The specification in terms of natural logarithm allows for an economic interpretation of the estimated coefficients. DEC_t is a dummy variable (a binary variable used in regression analysis to represent categorical data with values of 0 and 1) that takes the value 1 if total income

[1]The change in total costs expresses the change between year *t* and year *t-1*.

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decreases in year t compared to year t-1, and 0 otherwise. When total income increases, the dummy variable DEC_t takes the value 0, allowing the coefficient β_1 to measure the percentage change in total costs due to a 1% change in total income. When total income decreases, the dummy variable DEC_t takes the value 1, and thus, the sum of coefficients ($\beta_1 + \beta_2$) measures the percentage change in total costs in response to a 1% decrease in total income. If costs are sticky, their change for a given increase in total income should be greater compared to their change for a decrease in total income. Therefore, the hypothesis of stickiness implies that, contingent on $\beta_1 > 0, \beta_2 < 0$, and $(\beta_1 + \beta_2) < \beta_1$. $\ln(GNPL/ti)_{i,t}$ is the ratio of the natural logarithm of gross Non-Performing Loans (GNPL) to total income at time t for the i-th bank, indicating the intensity of non-performing loans. This ratio summarizes the proportion of a bank's loans that are no longer generating income to the bank's total income. This ratio allows understanding how financial distress leads to different kinds of costs (such as opportunity costs, reputational costs, and risk management costs) that may not be symmetrically affected by a change in total income. $DEC_t*\Delta\ln(ti)_{i,t}*\ln(GNPL/ti)_{i,t}$ captures the interaction between the previous variable and the change in total income interacted with the dummy variable DEC_t: banks with higher credit risk might exhibit more sticky costs, potentially resulting in a negative value of the coefficient β_3. The variable $\Delta LTGBy*loans_{i,t}$ is the interaction at time t between the change in the ten-year long term government bond yield (LTGBy) and the level of loans of the i-th bank at time t. This variable is a proxy for macroeconomic condition (Hall, 2016). Yeart is a set of temporal dummy variables aimed at capturing fixed effects for each year.

Additionally, since since the study aims to compare cost behavior between MBs and other non-mutual LS banks, Equation (1) will be estimated separately for the two legal types of LS banks. It is possible that cost management in the bank might be influenced by the need to maintain an adequate level of capital as required by Basel 3. Particularly, high levels of NPLs, in addition to absorbing capital, imply incurring high costs for provisions and credit losses. High costs decrease capital through the reduction of operating income. As there exists a threshold value below which it is not advisable to fall, banks with high deteriorated loans might cut costs to neutralize their negative impact on profits and consequently on equity. In this perspective, the third research question aims to verify whether high NPL can influence cost management, making costs stickier. This hypothesis was evaluated using Equation (2):

$$\Delta ln\,(tc)_{i,t} = \beta_0 + \beta_1 \Delta ln(ti)_{i,t} + \beta_2 DEC_t * \Delta ln(ti)_{i,t} + \beta_3 DEC_t * \Delta ln(ti)_{i,t} * ln\left(\frac{GNPL}{ti}\right)_{i,t} + \beta_4 \Delta LGGBy_t * loan_{i,t} + \beta_5 ln\left(\frac{GNPL}{ti}\right)_{i,t} + \beta_6 DEC_t *$$

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$$\Delta ln(ti)_{i,t} * DVhighnpl_t + \beta_7 DVhighnpl_t + year_t + \varepsilon_{i,t}$$

(2)

where: $DVhighnpl_t$ is a dummy which takes value 1 if the ratio of gross non performing loans to total gross loans falls within the fourth quartile of the distribution of sample banks, i.e., the quartile characterized by a higher presence of anomalous loans.

Finally, to examine the correlation between cost stickiness and the level of efficiency in the bank, which is the focus of the fourth research question, both MBs and non-Mutual LS bank were further divided into two sub-samples based on the median level of efficiency. Equation (2) was applied to each sub-sample. Regarding bank efficiency, it was estimated using the stochastic frontier whose methodological references are briefly illustrated in the Appendix A. Outliers werw adjusted at the 5th and 95th percentiles.

3. Empirical results

3.1. Descriptive statistics

Table 3 presents the descriptive statistics for the variables highlighted above, comparing overall LS banks, non-Mutual LS Banks and MBs.

Table 3: Descriptive statistics

Variables	Overall less significant banks				Non-Mutual Less significant banks				Mutual banks				T-test non-Mutual LS banks and MBs
	N. Obs	Mean	SD	CV	N. Obs	Mean	SD	CV	N. Obs	Mean	SD	CV	
Total income/000 (ti)	5446	53536	93628	174.9%	1169	164622	148399	90.1%	4277	23173	29185	125.9%	32.41***
Total cost/000 (tc)	5446	43529	74547	171.3%	1169	131406	118396	90.1%	4277	19511	23652	121.2%	32.13***
Total cost/total income (tc/ti)	5446	0.84	0.08	10.5%	1169	0.81	0.08	10.9%	4277	0.85	0.08	10.1%	-15.02***
Total cost/total asset (tc/ta)	5446	0.03	0.01	31.0%	1169	0.04	0.01	31.4%	4277	0.03	0.01	30.7%	-7.9***
Total income/total asset (ti/ta)	5446	0.04	0.01	30.9%	1169	0.04	0.01	30.8%	4277	0.04	0.01	30.9%	-2.65***
Gross NPL/total income =NPL intensity	5446	1.74	1.33	76.5%	1169	1.80	1.34	74.3%	4277	1.72	1.33	77.1%	1.84**
Gross NPL/Gross loans	5446	0.10	0.06	62.4%	1169	0.10	0.06	64.5%	4277	0.11	0.06	61.9%	-1.0004
Equity/Total asset	5446	0.11	0.03	35.5%	1169	0.09	0.03	41.4%	4277	0.11	0.04	33.4%	-13.56***
Efficiency	5446	0.62	0.27	44.2%	1169	0.61	0.30	49.2%	4277	0.62	0.26	42.8%	-0.59
A		0.34				0.31				0.33			
B total income		0.12				-0.12				-0.12			
B total cost		-0.09				-0.10				-0.09			
C total income		0.15				0.16				0.15			
C total cost		0.15				0.15				0.15			

The table reports the descriptive statistics of the variables used in Equation (1). The coefficient of variation (CV) is a relative standard deviation computed as the ratio between the standard deviation and the mean. This provides a standardized measure of dispersion relative to the mean, allowing for easier comparison across variables with different units or scales. A= shows the percentage of banks that experienced a reduction in revenue. B = shows the average reduction in revenue and costs in response to a decrease in revenue. C= highlights the average increase in revenue and costs in response to an increase in revenue. ***; **; * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The data reveal significant differences between MBs and non-MBs. MBs exhibit a significantly lower average total income and costs than non-MBs, as evidenced by the mean values and the T-test results, which show statistically significant differences between the two groups. However, MBs display a higher coefficient of variation (CV) for total income and total costs than non-MBs. This indicates more significant relative variability in these financial measures for MBs, suggesting that MBs experience more pronounced fluctuations in economic performance relative to their size. In terms of NPL intensity (Gross NPL/Total Income), the T-test value indicates a significant difference between MBs and non-MBs, with MBs showing slightly lower NPL intensity but more significant variability (CV = 77.1%) compared to non-MBs (CV = 74.3%). This suggests that while MBs might have lower average exposure to non-performing loans, the dispersion of this exposure is wider, indicating potential volatility in their risk profiles. Cost efficiency shows similar average levels between MBs and non-MBs, but MBs have a slightly lower CV (42.8%) than non-MBs (49.2%), indicating less variability in efficiency among MBs. Additionally, MBs are characterized by higher equity-to-total asset ratios with a lower CV (33.4%) than non-MBs, suggesting more consistent capitalization levels within MBs.

These findings highlight the distinct financial characteristics of MBs within the broader category of LS banks. The higher variability in income and costs, combined with more stable equity levels and varying risk profiles, underscores the unique challenges and opportunities MBs face in managing their financial performance.

3.2. Empirical analysis

The empirical results of applying Equation (1) are presented in Table 4. We find that coefficients β_1 and β_2 are both significant, with β_1 being positive and β_2 negative. This pattern confirms hypothesis H_{1a}, indicating the presence of cost stickiness for all less significant banks. Particularly, the value of coefficient β_1 (second column of Table 4) shows a 0.93% increase in total costs for a 1% increase in income. Conversely, in the case of a 1% decrease in income, costs decrease only by 0.87% (i.e., β_1+β_2=0.93-0.06). Analyzing the data further, greater cost stickiness is observed in MBs compared to other LS banks: a 1% reduction in income corresponds to a cost decrease of only 0.82% in MBs compared to 0.87% in other LS banks. The findings confirm hypothesis H_{1b}.

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Table 4: Estimation of asymmetric cost behavior using Equation (1)

Dependent variable: $\Delta ln(TC)_{i,t}$			
Specifications	**All LS banks**	**Non-Mutual LS banks**	**MBs**
Δln(ti)$_{i,t}$ (β_1)	0.9311***	0.9738***	0.9197***
	(0.0238)	(0.0505)	(0.0236)
DEC$_t$*Δln(ti) $_{i,t}$ (β_2)	-0.0622*	-0.1061**	-0.0994*
	(0.0381)	(0.0529)	(0.0572)
DEC$_t$*Δln(ti)$_{i,t}$*ln(GNPL/ti)$_{i,t}$ (β_3)	-0.1382***	-0.1852***	-0.0771**
	(0.0298)	(0.0376)	(0.0389)
ΔLTGBy$_t$*loans$_{i,t}$ (β_4)	0.0000	-0.0000	0.0000***
	(0.0000)	(0.0000)	(0.0000)
ln(GNPL/ti) $_{i,t}$ (β_5)	-0.0041	0.0044	-0.0056
	(0.0037)	(0.0102)	(0.0044)
Constant	0.0141**	0.0089	0.0161**
	(0.0060)	(0.0123)	(0.0064)
Fixed effect	Yes	Yes	Yes
N. Obs	4614	1021	3593
R^2 *Adjusted*	0.8406	0.8717	0.8353

Table 4 presents the estimation results based on the relationship between $\Delta ln(tc)_{i,t}$, $\Delta ln(ti)_{i,t}$, and other control variables, with reference to Equation (1). The variable $\Delta ln(tc)_{i,t}$ is represented by total costs. The OLS estimation method (with fixed effects both at the bank and time levels) is applied to unbalanced panel data. $\Delta ln(ti)_{i,t}$ is the natural logarithm of the variation in total income; $DEC_t*\Delta ln(ti)_{i,t}$ is the interaction term between the variation in the natural logarithm of income and a dummy variable DEC_t, which takes a value of 1 if income decrease and 0 if income increase; $DEC_t*\Delta ln(ti)_{i,t}*ln(GNPL/ti)_{i,t}$ is the interaction between the previous variable and the logarithm of the ratio of gross NPLs to total income; $\Delta LTGBy_t*loans_{i,t}$ is the product of the variation in yields on 10-year long term government bonds and the level of loans. Robust standard errors are in parentheses. ***; **; * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The adjusted R^2 values reflect the explanatory power of the models, adjusting for the number of predictors and sample size. The variation in adjusted R^2 across different specifications indicates the relative fit of the model for all LS banks, non-Mutual LS banks, and MBs, with values of 0.8406, 0.8717, and 0.8353, respectively.

The presence of credit risk significantly contributes to cost stickiness. Coefficient β_3 is indeed significant and negative, creating a barrier to cost reduction in proportion to the decrease in income. This coefficient represents the interaction among the intensity of NPLs, the logarithmic variation in revenues, and the dummy variable DEC. The negative and significant value of β_3 indicates that the percentage reduction in costs, in response to a 1% decrease in revenue, is even lower than the sum of $\beta_1 + \beta_2$. This confirms that $(\beta_1 + \beta_2 + \beta_3) < (\beta_1 + \beta_2)$, highlighting the additional impact of credit risk. The presence of credit risk, generated by NPLs, increases the rigidity of the cost structure. Consequently, these costs cannot be easily reduced in line with revenue changes, supporting hypothesis H_2. However, there is a difference within the LS banks, specifically between MBs and the other ones. For the latter, cost stickiness generated by credit risk is higher than for MBs. The better performance of MBs in this case is justified by their improved credit monitoring efficiency, as shown in Piatti and Cincinelli (2019). These findings align with the seminal work of Anderson et al. (2003), which introduced the concept of cost stickiness. While Anderson et al. focused on general administrative costs in a broader corporate context, the current study demonstrates that similar asymmetric cost behaviors exist within the banking sector, particularly among smaller financial institutions like LS banks and MBs. This research expands upon their model by incorporating specific variables relevant to the banking sector, such as credit risk (as proxied by non-performing loans), which has been shown to exacerbate cost stickiness.

The degree of cost stickiness might be influenced by regulatory pressure on banks with a high volume of NPLs, approximated by placing the bank in the last quartile of the credit risk distribution. Table 5 (first two columns) presents empirical results obtained from the application of Equation (2). Observing Table 5, the findings substantiate the previous statements. Additionally, coefficient β_6, associated with banks in the last quartile of the GNPLs to total gross loans, is positive and significant. This suggests that both types of LS banks, that is MBs and non-Mutual LS banks, when facing high credit risk, tend to adjust total costs significantly, in case of revenue reduction, to avoid a larger income reduction that could result in a decrease in necessary capital to address risk. In other words, banks more subject to supervisory scrutiny due to their higher riskiness tend to mitigate the impact of credit risk on stickiness. This form of mitigation can also be seen as a potential signal of moral hazard. It is reasonable to assume that such banks, to prevent further income contraction, might act by incorrectly accounting for provisions, delaying the emergence of new non-performing loans, or extending further credit to less creditworthy customers. The intensity of this behavior is higher for non-MBs. The findings of this study build upon the work of Hall (2016) and Belina et al. (2019), who examined cost stickiness in the financial sector, by focusing specifically on LS banks and the distinctive structure of MBs, areas they did not address.

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Table 5: Estimation of asymmetric cost behavior using Equation (2)

Dependent variable: $\Delta ln(TC)_{i,t}$		
Specifications	**Non-Mutual LS banks**	**MBs**
Δln(ti)$_{i,t}$ (β_1)	0.9747***	0.9231***
	(0.0502)	(0.0233)
DEC$_t$ *Δln(ti)$_{i,t}$ (β_2)	-0.1120**	-0.1530***
	(0.0527)	(0.0469)
DEC$_{i,t}$*Δln(ti)$_{i,t}$*ln(GNPL/ti)$_{i,t}$ (β_3)	-0.1869***	-0.0937**
	(0.0388)	(0.0416)
ΔLTGBy$_t$*loans (β_4)	-0.0000	0.0000***
	(0.0000)	(0.0000)
ln(GNPL/ti)$_{i,t}$ (β_5)	0.0056	-0.0051
	(0.0094)	(0.0046)
DEC$_t$*Δln(ti)$_{i,t}$*DVhighnpl$_t$ (β_6)	0.3274**	0.1534***
	(0.1555)	(0.0511)
DVhighnpl$_t$	-0.0133	0.0003
	(0.0333)	(0.0070)
Constant	0.0097	0.0158**
	(0.0123)	(0.0067)
Fixed effect	Yes	Yes
N. Obs.	1.021	3.593
R^2 *Adjusted*	0.8720	0.8366

Table 5 shows the results of estimates based on the relationship between $\Delta ln(tc)_{i,t}$, $\Delta ln(ti)_{i,t}$, and other control variables, as per Equation (2). The variable $\Delta ln(tc)_{i,t}$ is represented by total costs. The OLS estimation method (with fixed effects both at the bank and time levels) is applied to unbalanced panel data. $\Delta ln(ti)_{i,t}$ is the natural logarithm of the variation in total income; $DEC_t*\Delta ln(ti)_{i,t}$ is the interaction term between the variation in the natural logarithm of income and a dummy variable DEC_t, which takes a value of 1 if income decrease and 0 if income increase; $DEC_t*\Delta ln(ti)_{i,t}*ln(GNPL/ti)_{i,t}$ is the interaction between the previous variable and the logarithm of the ratio of gross NPLs to total income; $\Delta LGGBy_t\ loans_{i,t}$ is the product of the variation in yields on 10-year long term government bond yield and the level of loans; $DEC_t*\Delta ln(ti)_{i,t}*DVhighnpl_t$ is the interaction term between the variation in the natural logarithm of income and a dummy variable DEC_t and the dummy variable $DVhighnpl_t$, which takes a value of 1 for banks whose ratio of gross NPLs to total gross loans is in the last quartile of the distribution. Robust standard errors are in parentheses. ***; **; * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

It is interesting to observe whether the greater or lesser cost efficiency in banks may influence the cost stickiness. In this regard, two sub-samples have been derived: the first relates to banks with cost efficiency equal to or above the median of this score, and the second includes banks with cost efficiency below the median. Table 6 highlights the results of the analysis of total costs for these subsamples with reference to cost efficiency. The data reveal different behaviors among the banks in the sample, where one of the coefficients, β_2 or β_3, is negative and significant. Specifically, for banks with efficiency levels above the median, coefficient β_2 is not significant, while β_3

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is significant and negative. This suggests that cost stickiness in these banks is closely tied to credit risk, meaning that in the absence of significant credit risk, these banks can adjust their costs more flexibly. In these cases, stickiness depends solely on credit risk management.

On the other hand, for less efficient MBs, coefficient β_2 is significant and negative, indicating the presence of cost stickiness. However, β_3 is not significant, implying that this stickiness is not influenced by credit risk. In contrast, for other LS banks, β_2 is not significant, but β_3 is significant and negative, indicating that cost behavior is indeed influenced by credit risk. In this ambiguous situation, to provide a comprehensive view of this stickyness, the coefficients β_1, β_2, and β_3 have been summed (Table 6 of the paper). The sum of these three coefficients represents the percentage change in costs in response to a 1% decrease in income. It is immediately apparent that for more efficient banks, regardless of whether they are MBs or not, the degree of stickiness is lower compared to less efficient banks. Based on these results, we can definitively confirm Hypothesis H_4. Even among the more efficient banks, MBs exhibit a lower degree of stickiness compared to non-mutual LS banks.

It should be noted that coefficient β_6 is positive and significant only for less efficient banks, whether MBs or not. This seems to suggest that managers of less efficient and risky banks tend to implement cost-reduction strategies to prevent capital reduction.

Table 6: Estimation of asymmetric cost behavior using Equation 1, considering bank positioning in terms of median cost efficiency

Dependent variable: $\Delta ln(TC)_{i,t}$				
Specifications	**Non-Mutual LS banks**	**MBs**	**Non-Mutual LS banks**	**MBs**
	above or = median efficiency		**below median efficiency**	
Δln(ti)$_{i,t}$ (β_1)	0.9635***	0.9121***	0.9688***	0.9193***
	(0.0371)	(0.0365)	(0.0675)	(0.0370)
DEC$_t$ *Δln(ti)$_{i,t}$ (β_2)	-0.0987	-0.0266	-0.1347	-0.3123***
	(0.0657)	(0.0667)	(0.0856)	(0.0839)
DEC$_{i,t}$*Δln(ti) $_{i,t}$*ln(GNPL/ti) $_{i,t}$ (β_3)	-0.1607***	-0.0790*	-0.2748***	-0.0724
	(0.0323)	(0.0428)	(0.0459)	(0.0679)
ΔLTGBy$_t$*loans (β_4)	0.0000	0.0000	0.0000	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ln(GNPL/ti) $_{i,t}$ (β_5)	0.0161	-0.0204***	0.0075	0.0020
	(0.0135)	(0.0062)	(0.0249)	(0.0068)
DEC$_t$*Δln(ti) $_{i,t}$*DVhighnpl$_t$ (β_6)	0.5094	0.0246	0.4325*	0.2336***
	(0.3341)	(0.0554)	(0.3182)	(0.0664)
Dvhighnpl (β_7)	-0.0168	0.0020	0.0021	-0.0011
	(0.0656)	(0.0111)	(0.0484)	(0.0118)
Constant	0.0198	0.0103	-0.0125	0.0456***

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	(0.0144)	(0.0095)	(0.0252)	(0.0157)
Fixed effect	Yes	Yes	Yes	Yes
N. obs.	531	1725	490	1868
R^2 *Adjusted*	0.8375	0.8776	0.8515	0.7924
$(\beta_1+\beta_2+\beta_3)$	0.8028	0.8331	0.694	0.607

Table 6 shows the results of estimates based on the relationship between $\Delta\ln(tc)_{i,t}$, $\Delta\ln(ti)_{i,t}$, and other control variables, as per Equation (2). In particular, Equation (2) is applied separately to four subsamples: the first includes LS banks excluding MBs positioned above the median of the cost efficiency distribution; the second, similar to the first, but specific to MBs; the third and fourth respectively highlight non-MBs LS banks and MBs positioned below the median of the distribution in terms of efficiency. The variable $\Delta\ln(tc)_{i,t}$ is represented by total costs. The OLS estimation method (with fixed effects both at the bank and time levels) is applied to unbalanced panel data. $\Delta\ln(ti)_{i,t}$ is the natural logarithm of the variation in total income; $DECt*\Delta\ln(ti)_{i,t}$ is the interaction term between the variation in the natural logarithm of income and a dummy variable DEC_t, which takes a value of 1 if income decrease and 0 if income increase; $DEC_t*\Delta\ln(ti)_{i,t}*\ln(GNPL/ti)_{i,t}$ is the interaction between the previous variable and the logarithm of the ratio of gross NPLs to total income; $\Delta LGGBy_t*loans_{i,t}$ is the product of the variation in yields on 10-year long term government bond yield and the level of loans; $DEC_t*\Delta\ln(ti)_{i,t}*DVhighnpl_t$ is the interaction term between the variation in the natural logarithm of income and a dummy variable DEC_t and the dummy variable $DVhighnpl_t$, which takes a value of 1 for banks whose ratio of gross NPLs to total gross loans is in the last quartile of the distribution. Robust standard errors are in parentheses. ***; **; * denote statistical significance at the 1%, 5%, and 10% levels, respectively. $(\beta_1+\beta_2+\beta_3)$ is the sum of these three coefficients and represents the percentage change in costs in response to a 1% decrease in income.

Conclusions

The paper investigated the behavior of total costs in Italian LS banks. Using a sample of 5,446 LS banks of which 4,277 MBs during the period 2006-2019, the study analyzed: 1) the existence of cost stickiness in LS banks overall and in Mutual Banks specifically; 2) the sensitivity of cost stickiness in the presence of credit risk; 3) the potential tendency for manipulative cost management in the face of financial vulnerability and significant credit risk; 4) the sensitivity of cost stickiness based on the banks' cost efficiency levels.

The empirical analysis highlighted the presence of cost stickiness in all LS banks, with stickiness being more pronounced in MBs. Additionally, credit risk was found to amplify the stickiness of total costs. It was also observed that lower credit quality correlates with a tendency among both MBs and other LS banks to employ cost-manipulative methods to avoid reducing profits and alleviate pressure on capital. This behavior, however, is less evident in MBs than in other LS banks. Finally, the level of efficiency was shown to influence cost behavior, with more efficient banks exhibiting a lower degree of stickiness, particularly among MBs.

These findings contribute to the existing literature on cost stickiness by focusing on a previously underexplored banking industry, specifically LS banks and MBs in Italy. This study corroborates and extends the foundational work of Anderson et al. (2003) by applying their model within the banking industry, revealing that similar asymmetric cost behaviors observed in general corporate settings also occur in financial institutions. Moreover, our results

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complement the findings of Hall (2016) and Belina et al. (2019), who explored cost stickiness in different financial contexts but did not address the unique dynamics within LS banks or MBs. In contrast to the studies by Banker and Chen (2006) and Weiss (2010), which primarily examined cost variability in non-financial sectors, our study contributes to this body of knowledge by highlighting the significant role of credit risk and operational efficiency in shaping cost stickiness in the banking industry. Additionally, the observed differences between MBs and non-mutual LS banks underscore the need for tailored approaches to cost management that consider the specific governance structures and operational contexts of these institutions. This research fills a critical gap by providing empirical evidence on cost stickiness within a cooperative banking model, a topic that previous literature, such as the works by Presti (1998) and Zazzaro (2001), discussed primarily from a theoretical perspective.

For managers, these results imply the need to adopt flexible and proactive strategies for managing costs and risks. Making costs more flexible in a sector characterized by a high incidence of fixed costs, such as banking, represents a significant challenge. To address this, strategies such as digitalization, outsourcing non-core functions, and innovating in product offerings that require lower fixed costs could be considered. On another front, the complexity of the cost structure and production processes in banks makes the application of traditional cost management strategies, which assume a clear distinction between fixed and variable costs and distinct production processes for each service or product, more challenging. The nature of financial services, which often emerge from joint production processes, and the difficulties in pricing these services add further layers of complexity to cost management. Cost management in the banking context cannot overlook an activity-based approach that can help more accurately identify costs associated with specific processes and services.

Furthermore, since the distinction between fixed and variable costs in banks is blurred, it might be appropriate to focus on the distinction between direct and indirect costs. This classification allows identifying areas where costs can be optimized or more effectively redistributed. Finally, the analysis and review of joint production processes can reveal opportunities for efficiency, such as reducing redundant steps or automating manual activities.

The analysis also highlights the importance of effective NPLs management as a means to mitigate cost asymmetry. Merely reducing the stock of NPLs is insufficient; enhancing the efficiency of credit monitoring and implementing early warning systems are crucial for maintaining financial stability and reducing inefficiencies (Piatti and Cincinelli, 2019).

The main limitation of this study is the focus on a period ending in 2019. Although this period was chosen to avoid the confounding effects of the

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significant governance changes introduced by Italian Law 49/2016, future research could extend this analysis to include post-2020 data to assess the impact of these reforms on cost behavior.

By integrating these findings with existing literature, this study not only confirms the presence of cost stickiness in the financial sector but also provides new insights into the factors that influence this behavior in the context of LS banks and MBs. This contributes to a deeper understanding of cost management challenges in banking and offers practical implications for improving financial stability and operational efficiency.

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Appendix A: Methodology for estimating cost efficiency

We estimate cost efficiency using the stochastic frontier methodology proposed by Aigner et al. (1977) and Meeusen and Van Der Broeck (1977). The stochastic frontier uses data from various banks to construct an efficient cost frontier, consisting of points identifying the minimum production cost for each level of output, given the inputs—factor prices and the qualitative-quantitative characteristics of the existing technology. The distance between empirical observations and the benchmark allows measuring and comparing cost efficiency of various banks over time. In cross-section analysis, the cost function is as follows:

$$lnTC_i = lnTC(y_i, w_i; \beta) + \varepsilon_i \ (A1)$$

where: $lnTC_i$ represents the logarithm of the total cost of the *i*-th bank; y_i is the vector of bank output; w_i is the vector of inputs used; and ε_i is the error term of the estimation. This error is represented by the following sum: $\varepsilon_i = v_i + u_i$ where the error term v_i captures the effect of statistical variability in the sample and is typically assumed to be independent and identically distributed over the entire sample according to a normal distribution $N(0, \sigma^2 v)$. The term u_i, on the other hand, is a random variable assumed to be independent of both v_i and other regressors. The error component u_i represents technical inefficiency, i.e., the deviation of the observation from the efficient cost frontier after accounting for statistical variability.

Following Meeusen and Van den Broeck (1977), it is assumed that u_i follows an exponential distribution, leading to: $u_i \sim exp(\sigma_u)$. We use the translog function. For input and output definitions, the value-added approach as in Fiordelisi et al. (2011) was followed, with the addition of the natural logarithm of equity. Specifically, three inputs and three outputs were considered. The inputs factor costs are: [i] personnel costs relative to total assets (w_1); [ii] depreciation relative to fixed assets (w_2); [iii] cost of funds relative to total funds collected (w_3). The outputs are: [i] deposits to total assets (y_1); total loans to total assets (y_2); [iii] other income assets, with the exception of loans, to total assets. We also normalize total costs and all other input prices and ensure linear homogeneity, the cost of funds (w_3) was used.

The cost function, given the above assumptions and characteristics, is the follow:

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$$ln\left(\frac{TC_i}{TA_i}\right) = \beta_0 + \sum_{i=1}^{3} \beta_i ln(y_i) + \sum_{i=1}^{3} \alpha_i ln\left(\frac{w_i}{w_3}\right) + \tau_1 ln(E) + \frac{1}{2}\sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{i,j} ln(y_i) ln(y_j) + \ + \frac{1}{2}\sum_{i=1}^{3}\sum_{j=1}^{3} \gamma_{i,j} ln\left(\frac{w_i}{w_3}\right) ln\left(\frac{w_j}{w_3}\right) + \frac{1}{2}\sum_{i=1}^{3} \theta_i ln\left(\frac{w_i}{w_3}\right) ln(E) + u_i + \varepsilon_i \qquad (A2)$$

where: TC_i is the total cost; y_i (i=1, 2, 3) are the outputs; w_i (i=1, 2, 3) are the input prices; *ln(E)* is the natural logarithm of equity capital; u_i is the cost inefficiency component. Equation (A1) is computed for each year of the analyzed period.

Table A1: Cost efficiency by banks types

Description	N. Obs.	Mean	Median	Std.Dev.
LS bank non MBs	1,418	0.60	0.69	0.31
MBs	4,277	0.62	0.67	0.26
All LS banks	5,695	0.61	0.67	0.28