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# Cost asymmetry in the Italian Mutual Banks and comparison among Less Significant Banks

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**Abstract**

In this paper, we study the cost asymmetry in the Italian banking system. The analysis is conducted on a sample of Italian Less Significant Banks (including Mutual banks) during 2006-2019 time period. We find that asymmetric behavior in total costs, among Less Significant Banks, is higher in Mutual ones, and that the asymmetry in total costs significantly varies with different levels of credit risk. We also find that more efficient banks, whether Mutual Banks or not, mitigate total cost asymmetry.

**Keywords:** Cost Asymmetry, Mutual banks, Less Significant Banks, Efficiency, Credit Risk

## 1. 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. Cost asymmetry is a topic of particular interest that requires management awareness both to improve profitability and competitiveness and to avoid inadequate strategic decisions.

Over the past decade, the interest in cost stickiness has grown significantly. Based on the results of works by Noreen and Soderstrom (1994; 1997), Cooper and Kaplan (1998), and Anderson et al. (2003), it has been demonstrated how increases or decreases in income differently influence the cost-volume-revenue relationship. Subsequent studies by Banker and Chen (2006), Weiss (2010), and Balakrishnan et al. (2014) have investigated cost asymmetry using various econometric models. However, all these studies, with two exceptions (Hall 2016; Belina et al. 2019), focus on non-financial firms. This study aims to fill this gap by examining cost asymmetry in Italian Less significant (LS) banks as a whole and specifically for Mutual Banks (MBs).

The investigation of cost asymmetry in banking is of interest for several reasons. First, the balance between costs and income is essential for their stability and their ability to conduct credit activities (Di Tommaso and Pacelli, 2022). Second, understanding cost behavior influences strategic decisions, particularly in light of banks'involvement in developing green finance, which, alongside its undeniable advantages, also generates costs (Del Gaudio et al., 2022). Third, banks, having a high amount of fixed costs, manage variable costs as the primary dimension to maintain economic balance. Finally, the bank's cost structure is significantly influenced by regulation. Additionally, the Italian banking system, characterized by its significant number of MBs, presents a unique landscape for studying cost asymmetry. Unlike larger, nationally dominant banks found in many other countries, Italian LS banks, particularly MBs, offer a closer look at regional banking practices and their implications for financial stability and cost management. The study of these banks is particularly relevant given their critical role in supporting local economies and SMEs, a role less emphasized in the banking systems of other countries (Coccorese and Shaffer, 2020).

The 2008 financial crisis was faced by Italian MBs without the ability to implement operational and territorial diversification strategies and without access to capital markets. During the financial crisis, MBs accumulated significant amounts of Non-Performing Loans (NPLs) with initially lower coverage rates compared to the system in general. They also showed higher cost incidence and lower profitability (Montanaro and Tonveronachi, 2017). The recent reform[1], establishing two Cooperative Banking Groups, aims to overcome these limitations by improving governance (Weber, 2017). Although the underlying cooperative goals remain unchanged, the reform

[1] See Law n. 49/2016 and the provisions of the Bank of Italy of 2 November 2016 ("Cooperative Banking Group"), which came into effect in 2020. The Italian MBs are organized with two Cooperative banking groups (BCC Iccrea Cooperative Banking Group and Cassa Centrale Cooperative Banking Group) and with an Institutional Protection Scheme. Each of MBs has its own banking license and own board of directors democratically elected by the members among the members. MBs control, on an equity basis, most of the capital (at least 60%) of the parent company of the Gruppo Bancario Cooperativo. The parent company controls and guarantees, on a contractual basis, the individual MBs.

may not be sufficient without a thorough understanding of cost behavior mechanisms.

For these motivations, this study aims to investigate cost stickiness specifically in MBs, comparing them with other Less Significant Banks (LS) with similar characteristics. Analyzing cost stickiness in these banks helps to better understand their cost structure, identify areas for operational efficiency improvements, adapt to changing market conditions and maintain a balance between the needs of shareholders and financial stability. These considerations are even more important for LS banks considering that the COVID-19 pandemic and the development of digitalization have further pressured interest margins and bank profitability. Having adequate capital relative to their risk level makes LS banks more exposed to cost management aimed at reducing credit risk provisions to preserve primary capital.

The findings contribute to the broader understanding of financial management in diverse banking environments. More specifically, this paper highlights the importance of tailored cost management strategies and the role of local banking practices in financial stability.

The empirical analysis is based on a sample of MBs and other LS banks for the period 2006-2019 and investigates whether: 1) there is asymmetry with reference to total costs; 2) credit quality may influence cost stickiness; 3) there is a tendency to manipulative cost management in the presence of capital constraints with high levels of non-performing loans; 4) efficiency level may contribute to modifying this asymmetry.

The results are summarized as follows: 1) LS banks exhibit asymmetric behavior in total costs, which is more pronounced in MBs; 2) the level of credit risk contributes to increase cost asymmetry; 3) there is a potential tendency for manipulative cost management in the presence of significant credit risk; 4) efficiency represents a strong antidote to cost asymmetry.

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.

## 2. Literature review and hypotheses development

In corporates, 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 phenomenon 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 equivalent decrease in income (Cooper and Kaplan, 1999). 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 phenomenon (Noreen, 1991; Noreen and Soderstrom, 1997; Cooper and Kaplan, 1999). From the early 2000s to today, numerous studies have highlighted the determinants explaining this phenomenon. 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 (Anderson et al., 2003; Calleja et al., 2006; Weiss, 2010; Chen et al., 2012; Banker et al., 2013; Kama and Weiss, 2013), or observed managerial decisions over different time horizons (Weiss, 2010; Banker and Byzalov, 2014; Hsu et al., 2018).

The second research stream analyzed determinants of cost asymmetry 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), 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 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 (e.g., 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). Considering the described difficulties in managing fixed costs, the presence of symmetry 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 on 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, insurance companies are required to return a portion of the collected premiums to customers.

While there are few contributions on cost stickiness in banking enterprises, there are none at all 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. 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; Lopes, 2001; 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 asymmetry in the behavior of total costs.*

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

*Second Research Hypothesis*

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

## 3. Sample and methodology

### 3.1. 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 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 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Tot. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LS non MBs | 111 | 110 | 108 | 110 | 107 | 104 | 96 | 85 | 80 | 69 | 59 | 48 | 46 | 36 | 1,169 |
| MBs | 368 | 373 | 372 | 355 | 331 | 359 | 318 | 267 | 297 | 274 | 233 | 229 | 254 | 247 | 4,277 |
| Total LS | 479 | 483 | 480 | 465 | 438 | 463 | 414 | 352 | 377 | 343 | 292 | 277 | 300 | 283 | 5,446 |
| Total Italian banking system | 497 | 501 | 498 | 484 | 457 | 481 | 433 | 371 | 395 | 360 | 308 | 298 | 318 | 297 | 5,695 |
| % LS/banking system | 96,4 | 96,4 | 96.4 | 96.1 | 95.8 | 96.3 | 95.6 | 94.9 | 95.4 | 95.3 | 94.8 | 93 | 94 | 95.3 | 95.6 |

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

## 3.2. Methodology

We apply the model of Anderson et al. (2003) 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:

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

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[2]; $\Delta ln(ti)_{i,t}$ is the change in total income[3] at time *t* for the *i*-th bank. The specification in terms of natural logarithm allows for an economic interpretation of the estimated coefficients. $DEC_t$ is a dummy variable "decrease", that takes the value 1 if total income 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 $\beta_1$ to measure the percentage change in total costs due to a 1% change in total income. When total income decreases, the

[2]Total costs represent the sum of interest expense, commission expense and operating costs such as labor costs, administrative expenses, depreciation and provisions for risks. The change in total costs expresses the change between year *t* and year *t-1*.

[3]Total revenue is defined as the sum of interest income, commission income, and generally all other non-financial income.

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 $\beta_3$. 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). $Year_t$ is a set of temporal dummy variables aimed at capturing fixed effects for each year.

Additionally, since we aim 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 more sticky. We evaluate this hypothesis using Equation (2):

$$\Delta ln\ (tc)_{i,t} = \beta_0 + \beta_1 \Delta ln(ti)_{i,t} + \beta_2 DEC_t * \Delta ln(ti)_{i,t} + \beta_3 DEC_t * \Delta ln(ti)_{i,t} * ln\left(\frac{GNPL}{ti}\right)_{i,t} + \beta_4 \Delta LGGBy_t * loan_{i,t} + \beta_5 ln\left(\frac{GNPL}{ti}\right)_{i,t} + \beta_6 DEC_t * \Delta ln(ti)_{i,t} * DVhighnpl_t + \beta_7 DVhighnpl_t + year_t + \varepsilon_{i,t} \quad (2)$$

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. Variables are winsorized at the 5th and 95th percentiles to address outlier issues.

## 4. Empirical results

### 4.1. Descriptive statistics

Table 3 reports the descriptive statistics with reference to all the variables highlighted above together with some useful indicators to grasp the differences between the MBs and the other LS banks.

**Table 3:** Descriptive statistics

| Bank types | Variable | N. | Mean | p25 | p50 | p75 | Std. Dev. | A | B | C |
|---|---|---|---|---|---|---|---|---|---|---|
| Less significant banks non MB | Total income/000 (ti) | 1169 | 164622 | 47972 | 111057 | 226910 | 148399 | 0.315 | -0.119 | 0.161 |
| | Total costs/000 (tc) | 1169 | 131406 | 40655 | 91237 | 183638 | 118396 | | -0.100 | 0.158 |
| | Total costs/income (tc/ti) | 1169 | 0.8076 | 0.7570 | 0.8038 | 0.8596 | 0.0879 | | | |
| | Total costs/total asset (tc/ta) | 1169 | 0.0360 | 0.0290 | 0.0367 | 0.0434 | 0.0113 | | | |
| | Total income/total asset (ti/ta) | 1169 | 0.0448 | 0.0363 | 0.0455 | 0.0541 | 0.0138 | | | |
| | Gross NPL /total income =NPL intensity | 1169 | 1.8096 | 0.7520 | 1.4735 | 2.5327 | 1.3453 | | | |
| | Gross NPL/gross loans | 1169 | 0.1062 | 0.0554 | 0.0908 | 0.1403 | 0.0685 | | | |
| | Equity/total asset | 1169 | 0.0955 | 0.0696 | 0.0890 | 0.1084 | 0.0395 | | | |
| | Cost efficiency | 1169 | 0.6115 | 0.4108 | 0.6993 | 0.8656 | 0.3007 | | | |
| Mutual bank | Total income/000 (ti) | 4277 | 23173 | 6563 | 14910 | 28198 | 29185 | 0.333 | -0.118 | 0.150 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total costs/000 (tc) | 4277 | 19511 | 5569 | 12509 | 24557 | 23652 | | -0.096 | 0.149 |
| | Total costs/income (tc/ti) | 4277 | 0.8510 | 0.7978 | 0.8516 | 0.9200 | 0.0857 | | | |
| | Total costs/total asset (tc/ta) | 4277 | 0.0390 | 0.0315 | 0.0384 | 0.0454 | 0.0120 | | | |
| | Total income/total asset (ti/ta) | 4277 | 0.0460 | 0.0367 | 0.0441 | 0.0537 | 0.0142 | | | |
| | Gross NPL /total income =NPL intensity | 4277 | 1.7279 | 0.8771 | 1.4794 | 2.2950 | 1.3316 | | | |
| | Gross NPL/gross loans | 4277 | 0.1085 | 0.0589 | 0.0928 | 0.1428 | 0.0671 | | | |
| | Equity/total asset | 4277 | 0.1131 | 0.0854 | 0.1065 | 0.1347 | 0.0378 | | | |
| | Cost efficiency | 4277 | 0.6172 | 0.4579 | 0.6669 | 0.8447 | 0.2644 | | | |
| Overall less significant banks | Total income/000 (ti) | 5446 | 53536 | 8232 | 19760 | 46442 | 93628 | 0.344 | -0.119 | 0.152 |
| | Total costs/000 (tc) | 5446 | 43529 | 6763 | 16818 | 39721 | 74547 | | -0.097 | 0.151 |
| | Total costs/income (tc/ti) | 5446 | 0.8417 | 0.7886 | 0.8384 | 0.9092 | 0.0880 | | | |
| | Total costs/total asset (tc/ta) | 5446 | 0.0384 | 0.0310 | 0.0379 | 0.0450 | 0.0119 | | | |
| | Total income/total asset (ti/ta) | 5446 | 0.0457 | 0.0366 | 0.0444 | 0.0539 | 0.0141 | | | |
| | Gross NPL /total income =NPL intensity | 5446 | 1.7454 | 0.8497 | 1.4766 | 2.3425 | 1.3348 | | | |
| | Gross NPL/gross loans | 5446 | 0.1080 | 0.0582 | 0.0923 | 0.1422 | 0.0674 | | | |
| | Equity/total asset | 5446 | 0.1093 | 0.0819 | 0.1017 | 0.1304 | 0.0388 | | | |
| | Cost efficiency | 5446 | 0.6160 | 0.4518 | 0.6745 | 0.8491 | 0.2725 | | | |

Column A shows the percentage of banks that experienced a reduction in income. Column B shows the average reduction in income and costs while income decreased. Column C shows the average increase in income and costs against an increase in income.

Looking at Table 3, it can be seen that MBs, compared to other LS banks, are characterized by a lower average size, a higher cost incidence, a lower NPLs intensity and higher capitalization levels.

### 4.2. Empirical analysis

The empirical results of applying Equation (1) are presented in Table 5. We find that coefficients $\beta_1$ and $\beta_2$ are both significant, with $\beta_1$ being positive and $\beta_2$ negative. This pattern confirms hypothesis $H_{1a}$, indicating the presence of cost stickiness for all less significant banks. Particularly, the value of coefficient $\beta_1$ (second column of Table 5) 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., $\beta_1+\beta_2$=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 $H_{1b}$.

**Table 5:** Estimation of asymmetric cost behavior using Equation (1)

| **Dependent variable: $\Delta ln(TC)_{i,t}$** | | | |
|---|---|---|---|
| **Specifications** | **All LS banks** | **LS bank non MBs** | **Mbs** |
| $\Delta$ln(ti)$_{i,t}$ *($\beta 1$)* | 0.9311*** | 0.9738*** | 0.9197*** |
| | (0.0238) | (0.0505) | (0.0236) |
| DEC$_t$*$\Delta$ln(ti)$_{i,t}$ *($\beta 2$)* | -0.0622* | -0.1061** | -0.0994* |
| | (0.0381) | (0.0529) | (0.0572) |
| DEC$_t$*$\Delta$ln(ti)$_{i,t}$*ln(GNPL/ti)$_{i,t}$ *($\beta 3$)* | -0.1382*** | -0.1852*** | -0.0771** |
| | (0.0298) | (0.0376) | (0.0389) |
| $\Delta$LTGBy$_t$*loans$_{i,t}$ *($\beta 4$)* | 0.0000 | -0.0000 | 0.0000*** |
| | (0.0000) | (0.0000) | (0.0000) |
| ln(GNPL/ti)$_{i,t}$ *($\beta 5$)* | -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 5 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 presence of credit risk significantly contributes to cost stickiness. Coefficient $\beta_3$ is indeed significant and negative, creating a barrier to cost reduction in proportion to the decrease in income. 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 considerably 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).

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. Let us consider Table 6 (first two columns), which presents empirical results obtained from the application of Equation (2). Observing Table 6, the findings substantiate what has been previously stated. Additionally, coefficient $\beta_6$, 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 seems to be higher for non-MBs.

**Table 6:** Estimation of asymmetric cost behavior using Equation (2)

| **Dependent variable: $\Delta ln(TC)_{i,t}$** | | |
|---|---|---|
| **Specifications** | **LS bank non MBs** | **Mbs** |
| $\Delta$ln(ti)$_{i,t}$ *($\beta 1$)* | 0.9747*** | 0.9231*** |
| | (0.0502) | (0.0233) |
| DEC$_t$ *$\Delta$ln(ti)$_{i,t}$ *($\beta 2$)* | -0.1120** | -0.1530*** |
| | (0.0527) | (0.0469) |
| DEC$_{i,t}$*$\Delta$ln(ti)$_{i,t}$*ln(GNPL/ti)$_{i,t}$ *($\beta 3$)* | -0.1869*** | -0.0937** |
| | (0.0388) | (0.0416) |
| $\Delta$LTGBy$_t$*loans *($\beta 4$)* | -0.0000 | 0.0000*** |
| | (0.0000) | (0.0000) |
| ln(GNPL/ti)$_{i,t}$ *($\beta 5$)* | 0.0056 | -0.0051 |
| | (0.0094) | (0.0046) |
| DEC$_t$*$\Delta$ln(ti)$_{i,t}$*DVhighnpl$_t$ *($\beta 6$)* | 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 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). 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 asymmetric cost behavior. 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 7 highlights the results of the analysis on total costs for these subsamples with reference to cost efficiency. Banks with efficiency levels above the median, regardless of their legal form, exhibit cost stickiness closely tied to credit risk ($\beta_2$ is not significant while $\beta_3$ is significant and negative), partially confirming hypothesis $H_4$. In other words, greater efficiency allows for a more flexible cost structure, capable of neutralizing asymmetric cost behavior, but only for the portion not generated by credit risk. On the other hand, less efficient banks present a contradictory situation. In less efficient MBs, there is cost stickiness in total costs not influenced by credit risk. However, in other LS banks, cost behavior asymmetry seems to be conditioned solely by credit risk. In essence, less efficient MBs exhibit natural cost stickiness regardless of the level of abnormal credits.

It should be noted that coefficient β6 is positive and significant only for less efficient banks, whether be 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 7:** 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** | **LS bank non MBs** | **Mbs** | **LS bank non MBs** | **Mbs** |
| | **above or = median efficiency** | | **below median efficiency** | |
| Δln(ti) (*β1*) | 0.9635*** | 0.9121*** | 0.9688*** | 0.9193*** |
| | (0.0371) | (0.0365) | (0.0675) | (0.0370) |
| DEC x Δln(ti) (*β2*) | -0.0987 | -0.0266 | -0.1347 | -0.3123*** |
| | (0.0657) | (0.0667) | (0.0856) | (0.0839) |
| DEC x Δln(ti)x ln(GNPL/ti) (*β3*) | -0.1607*** | -0.0790* | -0.2748*** | -0.0724 |
| | (0.0323) | (0.0428) | (0.0459) | (0.0679) |
| ΔLTGBy*loans (*β4*) | 0.0000 | 0.0000 | 0.0000 | 0.0000*** |

| | | | | |
|---|---|---|---|---|
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| ln(GNPL/ti) ($\beta 5$) | 0.0161 | -0.0204*** | 0.0075 | 0.0020 |
| | (0.0135) | (0.0062) | (0.0249) | (0.0068) |
| DEC x Δln(ti)xDVhighnpl ($\beta 6$) | 0.5094 | 0.0246 | 0.4325* | 0.2336*** |
| | (0.3341) | (0.0554) | (0.3182) | (0.0664) |
| Dvhighnpl ($\beta 7$) | -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*** |
| | (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 |

Table 7 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; $DEC_t * \Delta ln(ti)_{i,t}$ 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.

## Conclusions

The paper investigated the behavior of total costs in Less significant Italian banks. Using a sample of 5,446 LS banks of which 4,277 Mutual Banks during the period 2006-2019, the study analyzed: 1) the existence of cost asymmetry in LS banks overall and in Mutual Banks specifically; 2) the sensitivity of cost asymmetry 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 asymmetry based on the banks' cost efficiency levels. The empirical analysis highlighted the presence of cost stickiness in all LS banks. However, asymmetry is more pronounced in MBs. Additionally, credit risk amplifies the asymmetry of total cost. It was also found that the lower the credit quality, the more both MBs and other LS banks tend to use cost-manipulative methods to avoid reducing profits by relieving pressure on own funds. This behavior, however, is less clear for MBs than for other LS banks. Finally, the level of efficiency can affect cost behavior; in particular, the most efficient banks show a lower degree of asymmetry and in the MBs this phenomenon is more pronounced.

The results of the empirical analysis underscore the importance of strategic cost management and credit risk management in LS banks. The observed differences between MBs and non-mutual LS banks also highlight the need for tailored approaches that consider the specificities of each type of bank. For managers, this implies adopting flexible and proactive strategies for managing costs and risks. Naturally, making costs more flexible in a sector characterized by a high incidence of fixed costs, such as banking, represents a significant challenge for managers. In this regard, without claiming to be exhaustive, some virtuous paths can be considered. For example: 1) digitalization and automation of repetitive processes: these not only contribute to reducing variable costs but can also make some fixed costs more adaptable; 2) outsourcing of non-core functions, which would allow transforming fixed costs into variable costs, enabling the bank to adapt more quickly to changes in demand; 3) diversification and innovation in products that require lower fixed costs. 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 empirical analysis also highlights another perhaps more traditional but nonetheless significant aspect: the management of non-performing loans (NPLs). Improving this process is a necessary condition for impacting cost asymmetry. It is worth noting that simply reducing the stock of non-performing loans, by itself, does not reduce the level of inefficiency (Piatti and Cincinelli, 2019). On the contrary, it is necessary to make the monitoring process more efficient by improving the underwriting standards and introducing early warning mechanisms that facilitate the early identification of financial difficulties.

The main limitation of this study is the analysis of a period that, although long, ends in 2019. The choice was motivated by the change in the governance system that MBs had to manage starting in 2020. On the base of Italian Law 49/2016 (see note 1) came into effect in 2020, updating to the latest available financial data would have made it difficult to compare pre and post-Law 49/2016 results.

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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 $\varepsilon_i$ 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:

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

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 |