

Employee training and bank stability

Abstract

Using a unique dataset of Italian banks covering the 2011 to 2019 period, this study investigates the influence of human resource training on bank stability and examines whether this relationship is affected by bank efficiency and credit risk. In line with the resource-based view (RBV) of the firm, our findings suggest that employee training exerts a positive impact on bank stability. Credit risk and bank efficiency are also identified as potential drivers in this relationship. Importantly, our results remain robust when addressing endogeneity issues and considering alternative model specifications. This study offers novel insights into the impact of employee-related variables on bank performance. The practical implications of our findings hold relevance for both banks and regulatory authorities, as human resource training can profoundly influence the effectiveness of risk management strategies and, ultimately, the sound and prudent management of banks.

Keywords: *Banks, Human Resources, Employee training, Bank stability, Bank efficiency, Credit risk.*

JEL codes: G20, M53

1. Introduction

The crisis events that have occurred over the last decade have emphasized the necessity of rigorously scrutinizing financial institutions' risk-taking behaviours (Beck et al., 2013). This has prompted policymakers to enact stricter regulatory frameworks aimed at ensuring the safety and soundness of the banking system while enhancing financial stability. Notably, there is a lack of consensus regarding the definition of banking stability (Goodhart & Segoviano Basurto, 2009). Some policymakers tend to conceptualize banking stability as the absence of banking crises. However, academics concur that the determinants of banking stability are multifaceted, with excessive risk-taking, mismanagement, and deficiencies in banking supervision being factors that contribute to the fragility of financial institutions, thus leading to recent banking failures (Cohn et al., 2017; Diamond & Rajan, 2009).

According to the European Central Bank (ECB, 2007), the financial stability of the banking system reflects its ability to withstand shocks and resolve financial imbalances. Therefore, supervisory authority has emphasized the critical importance of banks' adoption of organizational and governance structures with adequate resilience to potential risks. In particular, management bodies are expected to define the bank's strategic

objectives in terms of profitability and risk appetite. Moreover, governing bodies are entrusted with developing a risk-aware culture and raising awareness among bank staff regarding their responsibilities for the effectiveness of risk management practices and approaches (European Banking Authority, 2018, 2020). Interestingly, the supervisory authority has highlighted the key role of banking staff education and knowledge of the banking business (ECB, 2021). For instance, the guidance on nonperforming loan management recommends that banks implement “adequate dedicated NPL training and staff development plans to quickly build in-house expertise” (ECB, 2017, p. 24). The guidelines on loan origination and monitoring, which are crucial to the day-to-day management of the bank’s activities, are stated in paragraph 26 as follows, “institutions should cultivate a credit risk culture as part of the overall risk culture through policies, communication, and staff training.” Furthermore, in paragraph 81, it is noted that “staff involved in credit granting, including credit decision-making, credit risk management, and internal control, should receive frequent and appropriate training” (EBA, 2020, pp. 20 and 32). Therefore, from a supervisory perspective the development of efficient and skilled personnel is fundamental to taking a proper risk management approach.

Despite these supervisory expectations and the importance of human resource training, the relationship between human resource management practices (HRMPs)—specifically, the impact of human resource training—and bank stability has not been extensively explored in the banking literature.

This paper aims to contribute to financial literature in several ways. While the determinants of bank stability have been explored in several studies, very few have focused on the impact of employee-related variables (Nguyen et al., 2021). Therefore, we aim to shed light on the mechanisms through which employee training influences bank stability. First, based on resource-based view of the firm (Wernerfelt, 1984) and employing a mediation framework (Baran & Forst, 2015; Pevzner et al., 2015), we examine whether employee training, as measured by the average training hours provided to each employee of bank i in year t , enhances bank efficiency and the capacity to manage credit risk (the two mediators), which, in turn, increases bank stability. Second, we verify the robustness of our findings against potential endogeneity issues by employing both dynamic estimators (GMMs) and an IV-2SLS estimation. Finally, on a subsample of banks that publish nonfinancial reports (Directive 2014/95/UE), we investigate at which hierarchical level (executives, middle management, and employees) training is the most effective at promoting bank stability.

We tested our hypotheses using a hand-collected database of 398 Italian banks covering the period of 2011 to 2019. The Italian context merits attention for two primary reasons. First, Italy presents a bank-oriented financial system (Levine, 2002; Rajan & Zingales, 2003; Rinaldi & Spadavecchia, 2021). This characteristic underscores the central role that banks play in the country’s economy. Additionally, credit risk has more impact on banks than market risk or other risk types. Second, Italian firms are predominantly small and medium-sized enterprises (SMEs) (D’Amato, 2020). Compared to larger firms, SMEs tend to be informationally opaque, and in an assessment of their creditworthiness, hard information (processed by automated systems, such as scoring or rating systems) is less important. The key element in SMEs financing is the accumulation of soft information (Berger & Udell, 2002). Therefore, the human skills, experience, and training of banking staff play crucial roles in SME credit assessment.

Our empirical analyses reveal a positive association between bank stability and human resource training. In other words, an increase in employee training leads to greater bank stability. Furthermore, mediation analyses indicate that bank efficiency and credit risk partially mediate the relationship between employee training and bank stability. In essence, employee training enhances bank stability by improving bank efficiency and reducing credit risk. These results remain robust under various controls and model specifications (2SLS and GMM) designed to address endogeneity concerns.

Expanding our analysis, we delve into more specific aspects of training using detailed information from a subsample of banks that are required to disclose nonfinancial information (Directive 2014/95/UE). Through these additional analyses, we discovered that the positive effect of training on bank stability can be specifically attributed to the training of bank office workers, as opposed to the training of middle managers or executives.

Based on our findings, we offer several managerial and policy recommendations to enhance the available approaches to bank risk management. We advocate for continuous investments in employee training as a means of mitigating risk through the enhancement of product and process knowledge. From a supervisory perspective, employee training policies provide regulators with an additional tool for assessing a bank's commitment to prudent risk management.

The remainder of the paper is structured as follows: Section 2 presents the theoretical background and research hypotheses. Section 3 outlines the research design and empirical analysis methods employed. Section 4 presents the main results and robustness tests. Section 5 highlights the additional analysis. Finally, Section 6 offers a discussion of the research findings and concludes the paper.

2. Theoretical background and research hypotheses

2.1 Motivation of the study

Employee training has received much attention in the management and organizational literature, which highlights its implications for firm competitiveness and performance. In banking literature, this topic remains largely underdeveloped. However, bank human resources are pivotal for providing satisfactory services to bank customers to maintain long-lasting relationships and to better manage bank credit risk. Indeed, as a financial services provider, the success of a bank hinges on two essential aspects: people (both the workforce and the customers) and the capacity for effective risk management. To deliver satisfactory customer service and acquire soft information, trust-based relationships, high-quality personnel, interpersonal skills, effective communication, and leadership are indispensable. These personal aspects form the foundation for the establishment of trust between the bank and its customers. Hence, a skilled workforce is crucial for nurturing enduring customer relationships and better managing credit risk (Kirsch & Wailes, 2012).

While the relevance of employee training in the banking sector is crucial in supporting the business model and managing associated risks, comprehensive examinations of human capital in the banking sector that focus on professional competencies and skills are noticeably lacking in the literature (Wang et al., 2014). Surprisingly, prudent regulation in banking supervision underscores the critical role played by human skills in ensuring the sound and prudent management of financial intermediaries. This approach

emphasizes the fundamental need for continuous professional development to ensure that intermediaries operate in compliance with regulations, are aware of the risks they assume, and prioritize customer protection (European Banking Authority, 2018, 2020). Similarly, there is a paucity of relevant studies that deeply delve into the relationship between human resources training and bank stability, which is a fundamental objective of supervision aimed at ensuring the sustainability of financial intermediaries. Does human resource training influence bank stability, and if so, through what mechanisms?

To answer these questions, we focus on the Italian banking system. Italy is a well-known case of a bank-oriented financial system (Rajan & Zingales, 2003; Rinaldi & Spadavecchia, 2021) given the pivotal role played by banks in supporting and influencing the country's economy. Notably, credit risk takes precedence as the primary concern, overshadowing market risks and other risk categories. Therefore, examining the impact of employee training on credit risk and bank stability provides valuable insights into the specific challenges and dynamics faced by Italian banks. Additionally, the Italian economy is characterized by the predominance of SMEs (D'Amato, 2020). The prevalence of SMEs introduces complexity into the credit assessment process. SMEs, which are often informationally opaque, pose challenges that are distinct from those encountered in the assessment of larger firms. The traditional reliance on automated systems for hard information processing becomes less effective in this context, thus necessitating a nuanced understanding of the relevance of human resources involved in credit assessment. In conclusion, investigating these aspects not only contributes to a deeper understanding of Italy's financial intricacies but also provides valuable insights for financial research, risk management, and policymaking.

2.2 Theoretical background and research hypotheses

The vulnerabilities and rapid transformations that characterize contemporary business landscapes, which are driven by factors such as globalization, digital technology advancements, sustainability imperatives, and geopolitical conflicts, underscore the critical role of competent, knowledgeable, and adaptable human resources in fostering organizational competitiveness.

In prior management studies, HRMPs, particularly employee training, have garnered substantial attention due to their implications for competitiveness, innovation, and company performance (Cooper et al., 2023). Several authors have emphasized that training represents an investment in human capital that delivers tangible value to the organization (Barney, 1991; Ostroff & Bowen, 2000; Prahalad & Hamel, 1990; Wernerfelt, 1984).

As articulated by Becker (1993), human capital theory posits that employees can enhance their production capabilities by augmenting their skills through higher education and training. Moreover, from a resource-based perspective, employees possessing unique and difficult-to-replicate skills constitute a pivotal resource in the effort to sustain a competitive advantage over time (Barney, 1991; Wernerfelt, 1984). Training programs equip employees with industry-specific skills and knowledge, thereby bolstering their job performance and, in turn, enhancing organizational outcomes. This perspective views employees not merely as components of a company's technical structure but also as integrated, socialized contributors to the organization's culture. Their skills become less readily available in the labor market, thus differentiating them from physical assets that

depreciate over time. Training also enhances employees' capacity to integrate knowledge and skills, enabling them to address novel situations and challenges, thus cultivating distinctive competencies that are challenging for rivals to replicate (Apascaritei & Elvira, 2022). In essence, scholars widely regard training as a cornerstone practice that underpins a firm's sustainable competitive advantage and, consequently, higher organizational and financial company performance (Pereira & Bamel, 2021; Peteraf, 1993).

The empirical literature has consistently demonstrated the influence of training, and more generally of HRMPs, on firm performance, including productivity (Aragón-Sánchez et al., 2003; Bartel, 1994; Delery & Doty, 1996). Training initiatives are shown to exert an impact on employee productivity, profitability, and shareholder value, both in the short and long term. For instance, Russell et al. (1985) underscored the significant effect of the percentage of trained employees on organizational outcomes.

However, it is worth noting that the positive relationship between training and performance is not unequivocally supported in the literature. Tharenou et al. (2007) proposed that training initiatives can be implemented for purposes other than performance enhancement, including legal compliance, employee retention, reward systems, or adherence to training fads.

Nevertheless, scholars predominantly view training as a 'universalist' or 'excellent' policy that exerts a favorable impact on business outcomes (Pfeffer, 1998). More recently, Brixiová et al. (2020) examined how individual aspects, such as the gender gap and human capital development, can bolster company performance, while Campanella et al. (2023) highlighted the effects of varying levels of human capital skills in shaping innovative financial business models, including fintech. Furthermore, Ozdemir et al. (2023) demonstrated how highly qualified workers foster virtuous collaborative relationships with company stakeholders, thereby cultivating more innovative and competitive business ecosystems.

Therefore, given that employees represent a key driver of competitiveness in the banking sector, we hypothesize that training can exert a positive impact on bank stability. Specifically, the enhancement of employee skills and professionalism that can be achieved by training equips employees to assess and respond to business and associated risks, thereby facilitating the efficient management of internal organizational processes more effectively. Therefore, we formulate our first hypothesis:

H1: Employee training exerts a positive impact on bank stability.

Why does employee training lead to an improvement in bank stability, and which facets of banking activity would benefit the most from such training? In the subsequent discussion, we endeavor to investigate the potential mechanisms through which training exerts an influence on bank stability.

The stability of a bank is contingent upon numerous variables, with the extant literature predominantly highlighting the credit process as a pivotal determinant that shapes stability due to the inherent risks associated with credit provision (DeYoung & Torna, 2013). The extension of credit to unreliable borrowers heightens credit risk, consequently eroding the overall stability of the bank (European Banking Authority, 2020). Empirical evidence substantiates the claim that credit risk constitutes one of the main drivers of banking stability and, by extension, influences the probability of default (Ben Abdesslem et al., 2022; Imbierowicz & Rauch, 2014).

Notably, empirical findings reveal that, particularly within smaller and more opaque enterprises, conventional credit scoring systems are often ineffective in discerning the creditworthiness of customers, primarily due to their reliance on complex information. In such instances, the credit assessment process relies more substantially on soft information, and the capacity to gather and judiciously employ these qualitative data in credit processes emerges as pivotal (Berger et al., 2005). In this context, drawing upon the tenets of resource dependence theory, positive experiences rooted in strategic behavior and corporate governance are advocated. Such experiences serve to heighten the awareness of trained employees regarding organizational culture and the amelioration of banking risk, thereby leading to prudent top-level decision-making (Bhatia & Gulati, 2021).

A second critical determinant of bank stability is bank operational efficiency, specifically a bank's ability to curtail its operating costs (excluding interest-related expenditures) (Schaeck & Cihák, 2014). Given the substantial ramifications of efficiency for overall performance (Fiordelisi & Molyneux, 2010), banks with a capacity for efficient cost management generally face less volatile outcomes, both at the individual and sectoral levels. This attribute acquires heightened significance during periods of crisis and increased market vulnerability. Empirical findings presented by Wheelock & Wilson (2000) reveal the negative statistically significant association between efficiency scores and bank failure, which underscores efficiency as an indicator of management quality and highlights its linkage with bank stability. Further empirical evidence lends support to the hypothesis of 'excellence in cost management', wherein a demonstration of superior managerial aptitude in cost control corresponds with a diminished likelihood of bank insolvency (Fiordelisi & Mare, 2013).

Considering the aforementioned factors, we contend that employee training can exert a positive influence on critical dimensions of banking operations, specifically by enhancing the credit management process (thus mitigating credit risk) and optimizing overall bank efficiency (thereby reducing general costs), which ultimately contributes to heightened banking stability. First, training serves to elevate the competencies and proficiencies of the employees involved in credit origination and monitoring. Training bolsters the aptitude of bank personnel to adeptly navigate customer relationships and gather vital soft information, which is essential for sound creditworthiness evaluations. Consequently, employee training plays an instrumental role in improving banks' ability to prudently manage credit risk. Second, training enhances employee skill sets, thereby empowering employees to more efficiently streamline and execute banking organizational processes. This translates into a heightened capacity for cost control and the development of more resource-effective production solutions. As a result, we emphasize that employee training has a positive association with a bank's ability to curtail organizational expenses and achieve enhanced levels of operational efficiency.

Therefore, employee training serves as a pivotal catalyst for enhancing both the credit management process and the overall level of bank efficiency. These improvements, in turn, contribute to the overarching objective of ensuring greater banking stability. Thus, we propose the following hypotheses:

H2: Credit risk mediates the relationship between employee training and bank stability, such that an increase in employee training lowers the level of credit risk, which in turn leads to greater bank stability.

H3: *Bank efficiency mediates the relationship between employee training and bank stability, such that an increase in employee training improves bank efficiency, which in turn leads to greater bank stability.*

3. Research design

3.1 Sample

Our empirical analysis is based on a sample of Italian banks and covers the period of 2011 to 2019. To ensure data reliability, we have established a criterion that requires banks to have at least two consecutive years of available data (Pathan, 2009) to be included in our sample.

We collected demographic information, including bank name, location, and age, from the official website of the Bank of Italy. Financial data for the banks were obtained from the BankFocus database. Employee-related information was hand-collected from annual financial statements and nonfinancial documents on bank websites.

However, importantly, due to limitations in the availability of employee-related information, the final sample comprises 97 banks and includes approximately 600 bank-year observations.

3.2 Variables

We employed the Z score as a proxy for our dependent variable, namely, bank stability, which is a commonly used measure in the banking literature (Goetz, 2018; Laeven & Levine, 2009; Schaeck & Cihák, 2014). The Z-score is calculated by summing the equity-to-asset ratio and the return on average assets (ROAA) divided by the standard deviation of ROAA. However, due to the skewness of the Z score, we applied a log transformation to mitigate extreme values (Bermpei et al., 2018; Laeven & Levine, 2009). In our robustness test section, we use the standard deviation of ROAA as an alternative measure of bank risk.

To test our main hypotheses, we used the average number of training hours per bank employee as a proxy for our independent variable (employee training). Specifically, we computed the variable employee training as the ratio of the total number of training hours divided by the total number of bank employees for bank i in year t . In the robustness section, we used training investments computed as the ratio of training costs to operating income as an alternative measure of our independent variable. In evaluating the mediating effect, we employed the overhead ratio to gauge operational bank efficiency and the ratio of nonperforming loans (NPL) to equity as a proxy for credit risk, thereby reflecting the quality of a bank's loan portfolio. The overhead ratio was calculated as the ratio of total noninterest expenses to total assets, providing insights into the bank's operational efficiency (Demirgüç-Kunt et al., 2004; Yin, 2021). An increase in the overhead ratio, all else being equal, suggests higher noninterest expenses and reduced efficiency in the management of overhead costs.

Consistent with the banking literature, we included a set of bank-level characteristics as control variables, including bank size, liquidity, the ratio of loans to total assets as a

measure of the business model, debt in the interbank market, the equity-to-total assets ratio, and the cost-to-income ratio (Abuzayed et al., 2018; Berger et al., 2005; Elnahass et al., 2021; Goetz, 2018). Additionally, we considered a set of employee-related control variables for each bank i in year t , including the proportion of graduate employees (those with a college degree) and employees' average tenure, as measured by the average number of years employees served within a given bank. Appendix A presents a detailed description of the source and variable definitions. All models are estimated with bank and year fixed effects to control for unobserved time-invariant heterogeneity at the bank level and any changes in the time-dependent conditions.

3.3 Summary statistics

In this section, we present the main descriptive statistics for the variables used in the analysis (Table 1) and the correlation matrix (Table 2).

< Insert Table 1 >

Table 1 shows that the sampled banks exhibit an average total asset value of 28.1 billion euros. They predominantly adhere to a traditional business model, which is characterized by a loans-to-total-assets ratio of 61.4%. The average credit risk, as proxied by the average NPLs on total equity, is approximately 108%. The cost-to-income ratio averages 66.4%, and the overhead ratio is 2.81%. Interestingly, the banks provided, on average, 44.66 training hours per capita to their employees. However, the investment in training (as a percentage of operating income) is relatively modest, with an average of 0.176%.

< Insert Table 2 >

Table 2 presents the correlation coefficients among the variables employed in our analysis. Notably, bank stability exhibits a positive association with training, both in terms of hours per capita ($\rho = 0.102$, $p < 5\%$) and investments ($\rho = 0.109$, $p < 5\%$). Conversely, training (in both hours and investments) has a negative impact on the NPL ratio, as well as on the volatility of the ROAA, as expressed through the standard deviation of the ROAA.

3.4 Methodology

To test our hypotheses, we estimate the following panel regression:

$$\text{Bank stability}_{i,t} = \theta_i + \lambda_t + \beta \text{Training}_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Bank stability is proxied by the Z score. On the right-hand side of the equation, our variable of interest is training (measured as the average training hours per employee for bank i in year $t-1$). $X_{i,t-1}$ represents a matrix of time-varying controls at both the bank and employee levels for bank i in year $t-1$. β and γ denote vectors of variable coefficients. To

account for time-invariant heterogeneity specific to each bank, we include bank fixed effects (θ_i). λ_t represents time fixed effects, while $\varepsilon_{i,t}$ is the error term.

To gain deeper insights into the relationship between training and stability, we investigate the mechanisms through which training initiatives can influence stability. Holding other factors constant, a bank's ability to reduce operational costs and credit risk enhances its stability. Therefore, if training enhances bank efficiency and mitigates credit risk, we can intuitively infer that employee training may enhance stability through the promotion of cost efficiency and the reduction in credit risk. Consequently, we estimate the following models:

$$\text{Bank efficiency}_{i,t} = \theta_i + \lambda_t + \beta \text{Training}_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$\text{Credit risk}_{i,t} = \theta_i + \lambda_t + \beta \text{Training}_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

In equation (2), bank efficiency is proxied by the overhead ratio, while in equation (3), credit risk is represented by the NPL ratio. On the right-hand side, training represents the average training hours per employee for bank i in year $t-1$, and $X_{i,t-1}$ represents a matrix of time-varying control variables at both the bank and employee levels for bank i in year $t-1$. β and γ denote vectors of variable coefficients. Regarding the control variables, we control for bank size, business model, and exposure to the interbank market through debt volume, liquidity, and leverage. At the employee level, we consider the proportion of graduate employees and employees' average tenure. Additionally, in equations (2) and (3), we introduce bank and year fixed effects.

To examine whether bank efficiency and credit risk indeed serve as significant channels through which employee training influences stability, we employ a mediation analysis following the approach outlined by Baron & Kenny (1986). This approach involves four steps. In the first two steps, the relationships between training and the mediators (bank efficiency and credit risk) and that between the mediators and the dependent variable (bank stability) are tested. In the third step, the relationship between training and bank stability is estimated without considering the mediators in the model. Finally, the comprehensive model (1) that includes the independent variable (training) and the mediators in assessing the existence of a mediating effect is estimated. The existence of a mediating effect cannot be rejected if the inclusion of the mediator results in a reduction in the magnitude and/or significance of the independent variable coefficient.

The models are estimated using robust standard errors clustered at the bank level to effectively address concerns regarding heteroskedasticity and serial correlation. Moreover, the variables are winsorized at the 1% and 99% levels to mitigate the influence of outliers.

4. Results

In this section, we present the results of our analysis, specifically focusing on Model (1), which incorporates bank and year fixed effects.

Column 6 of Table 3 displays the estimates for Model (1), shedding light on the impact of employee training on bank stability. In terms of the control variables, we observed that bank liquidity ($\beta = 0.0263$, $p < 5\%$) and the equity-to-total assets ratio ($\beta = 0.275$, $p <$

0.1%) both have positive effects on bank stability. Furthermore, as expected, Column 6 reveals a negative association between bank stability and credit risk ($\beta = -1.814$, $p < 5\%$) as well that between bank stability and bank efficiency ($\beta = -0.319$, $p < 0.1\%$). This implies that higher credit risk and lower bank efficiency are linked to lower bank stability. Most importantly, the results displayed in Column 6 provide compelling evidence for a positive association between bank stability and the number of training hours per employee ($\beta = 0.0212$, $p < 1\%$). These findings support Hypothesis 1, suggesting that an increase in employees' training hours can substantially enhance bank stability.

< Insert Table 3 >

Columns 1-6 of Table 3 outline the findings related to our mediation analysis, which investigates the potential pathways through which employee training impacts bank stability. Applying the mediation procedure proposed by Baron & Kenny (1986), Columns 1-6 in Table 3 delineate the distinct steps of the mediation analysis. In columns 1 and 2, we address the first step by evaluating the relationship between the independent variable (training) and the mediators. In Column 1 of Table 4, we show a significant effect of training hours on the overhead ratio, with the expected sign ($\beta = -0.004$, $p < 5\%$). Similarly, Column 2 indicates that training hours significantly reduces credit risk ($\beta = -0.001$, $p < 5\%$). Moving to the second step in column 4, we examine the association between the mediator variables and bank stability. In Column 4, the first mediator, namely, the overhead ratio, exerts a noteworthy negative impact on bank stability ($\beta = -0.291$, $p < 0.1\%$), while the second mediator, credit risk, has a highly significant and negative effect on bank stability ($\beta = -2.232$, $p < 0.1\%$). In Column 3, a statistically significant positive effect of training programs on bank stability can be observed ($\beta = 0.0225$, $p < 1\%$). Subsequently, we perform the fourth step of the mediation analysis. Columns 5 and 6 show the mediator variables individually introduced into the model presented in Column 3. When incorporating the overhead ratio, as shown in Column 5, although this variable remains significant ($\beta = -0.425$, $p < 0.1\%$), there is only a marginal reduction in the magnitude of the independent variable's coefficient (training hours), which falls from 0.0225 (in Column 3) to 0.0221 (Column 5). Consequently, the overhead ratio appears to play a relatively minor role as a mediator in the relationship between employee training and bank stability. Finally, in Column 6, the inclusion of credit risk leads to a reduction in the effect of the training coefficient, which falls from 0.0221 (Column 5) to 0.0212 (Column 6), while credit risk remains statistically significant ($\beta = -1.814$, $p < 5\%$). In summary, it appears that credit risk partially mediates the relationship between training hours and bank stability, whereas the overhead ratio represents a comparatively nonsignificant channel in this mediation process. Consequently, this provides empirical support for hypotheses 2 and 3, which claim that employee training enhances bank stability through the mechanisms of a lower overhead ratio and reduced credit risk.

These results have significant implications for both practitioners and policymakers and provide valuable insights into the pivotal role played by employee training programs in the fortification of bank stability. Furthermore, these outcomes emphasize the importance of considering microlevel organizational variables, such as employee training, in efforts to augment banks' attention to supervisory issues, thereby contributing to the resilience and stability of the banking sector.

Furthermore, acknowledging certain limitations in our study is crucial. Our analysis is grounded in the context of the Italian banking sector. Therefore, future research can extend this methodology to a cross-country analysis, thereby encompassing diverse industrial systems and market-oriented financial structures for a more comprehensive evaluation of the relationship between human resource training and banking stability. Additionally, future investigations could delve deeper into the types of training programs implemented by banks, exploring the distinction between commercial and technical training and their orientations toward credit risk, anti-money laundering, and asset management activities. Such endeavors could provide a more nuanced understanding of the relationship between human resource training and banking stability.

4.1 Robustness tests

In this section, we explore the robustness of our previous results. Specifically, we present numerous tests conducted to account for alternative dependent and independent variables and to address potential endogeneity concerns.

Table 4 presents the outcomes of Model (1), using the volatility of the ROAA as the dependent variable, which serves as an alternative proxy for bank risk. Consistent with our earlier observations, the results align with those presented in Table 3.

< Insert Table 4 >

Table 5 presents the results of the estimations with the independent variable measured in terms of training investment as a percentage of operating income.

< Insert Table 5 >

In Column 1 of Table 5, we observe a significant effect of training investment on the overhead ratio, with the expected sign ($\beta = -0.456$, $p < 10\%$). Similarly, Column 2 indicates that training investment significantly reduces credit risk ($\beta = -0.189$, $p < 5\%$). Subsequently, the introduction of the overhead ratio in Column 5 results in a slight reduction in the impact of training investment on bank stability, which decreases from 3.390 (as observed in Column 3) to 3.213. Finally, the inclusion of credit risk in Column 6 further diminishes the influence of training investment on bank stability, yielding a coefficient of 2.658 (compared to 3.213 in Column 5). These findings suggest that credit risk and bank efficiency may be the channels through which training influences bank stability.

While our models have addressed potential biases arising from time-invariant, unobserved heterogeneity through the incorporation of cross-section fixed effects, we acknowledge the persistence of endogeneity concerns due to sample selection bias and relevant omitted variables. To comprehensively address these concerns, we have conducted four distinct tests: the Heckman 2-step method, a matched control sample with entropy balancing, 2SLS-IV, and the generalized method of moments (GMM) approach.

Our initial sample comprised 398 banks, and complete data on training and other employee-related variables is available for 97 banks in our final sample. To mitigate the potential selection bias linked to each institution's decision to disclose information, we employed Heckman's 2-step procedure (Heckman, 1979). In the first step, which is depicted in Column 1 of Table 6, we estimate a logit model regressing the training dummy variable (equal to one if institutions disclosed employee training information and zero otherwise) on all control variables from our primary specification. In the second stage, the inverse Mills ratio, as computed in the first stage, is included as a regressor in Model (1). Importantly, the coefficient of the inverse Mills ratio is not statistically significant at the 5% level, suggesting that sample selection bias is not a substantial concern. Consequently, the results of the 2-step estimation model confirm our primary findings.

< Insert Table 6 >

A second approach to addressing endogeneity involves mitigating self-selection bias through entropy balancing (McMullin & Schonberger, 2020). In this technique, weights for each observation are calculated based on entropy, ensuring that the weighted sample replicates the covariate distribution of a reference sample, thus enhancing balance and reducing selection bias.

In our analysis, we partitioned the banks into two groups, namely, a treatment group and a control group, to examine the influence of training on bank stability. The treatment and control groups were distinguished by high and low levels of employee training. Specifically, banks with an average number of training hours higher (lower) than the sample median for a given year t are classified as having higher (lower) training.

< Insert Table 7 >

Panels A and B of Table 7 display the mean and variance in the covariates before and after applying entropy balancing, respectively. The results indicate no statistically significant differences in the covariates following the balancing procedure. Panel C presents the re-estimated models using a balanced sample comprising 497 bank-year observations. The findings confirm the positive impact of the training variable on bank stability, as indicated in columns 3-5. Moreover, when the mediators are included in the models (columns 4 and 5), the training variable evidence of a reduction in both magnitude and significance reinforces the preliminary results presented in Table 3.

A third approach to potentially addressing endogeneity is the 2SLS-IV approach. Following Nguyen et al. (2021), we instrumented our variable suspected to be endogenous, i.e., employee training, using two instruments that capture the degree of citizen involvement in the social and political life of the region in which the bank is headquartered. In the literature on industrial relations and human resource management, training can be influenced by regulatory, normative, and cognitive pressures originating from political and social institutions (Hassi & Foucher, 2017; Heyes & Stuart, 1998; Scott, 2001).

We collected two variables from the Italian Bureau of Statistics (ISTAT): (1) the percentage of citizens who make donations to political parties and (2) the percentage of citizens who participate in social initiatives. These variables, while unrelated to the dependent variable, may be associated with the independent variable. Increased political

and social engagement can heighten the influence or coercive pressure exerted by entities such as political parties and unions on firm training decisions (Esteban-Lloret et al., 2018). The results are reported in Table 8 and align with those previously shown in Table 3.

< Insert Table 8 >

Finally, we employ the GMM approach with robust standard errors at the bank level. Specifically, the employee training variable is instrumented using its own second-year lag and two exogenous instruments. Table 9 shows that our main findings remain unchanged.

< Insert Table 9 >

5. Additional analysis: Bank size, market discipline, and employee type

In this section, we conduct cross-sectional tests to assess how the previously examined model performs under varying circumstances.

First, we examined the influence of bank size. The literature highlights that larger firms tend to invest more in employee training than smaller ones, primarily due to their anticipation of higher returns on this investment. Furthermore, larger firms possess specific characteristics, such as innovation, complex operations, and involvement in foreign markets, which necessitate more extensive training (Storey, 2004). These arguments are also applicable to large banks due to their substantially greater resources, heightened visibility to external stakeholders, and increased complexity from both organizational and strategic perspectives. Additionally, bank size may account for variations in bank risk levels, especially in terms of credit risk, as bank size often serves as a proxy for relationship-oriented banking activities (Berger et al., 2005; Cole et al., 2004; D'Amato & Gallo, 2019; Wheelock & Wilson, 2000). The literature suggests that small banks, which predominantly operate in localized areas, tend to foster closer relationships with their customers, thereby increasing the effectiveness of peer monitoring mechanisms. Consequently, small banks rely more heavily on soft information for decision-making (Uchida et al., 2012). Conversely, large banks typically maintain more distant customer relationships and prioritize transaction-oriented approaches. Additionally, in larger geographical areas, peer monitoring mechanisms exhibit diminished effectiveness due to less stable relationships among banks, customers, and peers. Hence, it can be inferred that small banks lean more toward relationship monitoring through soft information to manage credit risk, whereas large banks may place greater emphasis on training programs related to technologies, tools, and credit risk management procedures (Akhavain et al., 2005). Therefore, we anticipate that the mechanisms explored in the previous sections are particularly relevant for large banks.

To test the impact of bank size on the relationship between employee training and bank stability, as well as the potential mediating effects of credit risk and bank efficiency, we divided our sample into two subgroups: large and small banks. Large banks are defined as those with total assets at the end of the fiscal year greater than or equal to the median value, while small banks compose the remaining group. The results of this test are presented in Table 10.

< Insert Table 10 >

The results, shown in column 3 of Table 10, highlight that employee training has a positive and highly significant impact on the stability of large banks ($\beta = 0.0261$, $p < 1\%$). As anticipated, when we introduce bank efficiency and credit risk into the model (columns 2 and 3), the coefficient for employee training decreases from 0.284 to 0.261, confirming the mediating effect of bank efficiency and credit risk on the relationship between employee training and bank stability. For small banks, the coefficient for employee training is positive but only marginally significant ($\beta = 0.017$, $p < 10\%$). Additionally, credit risk and bank efficiency do not show statistical significance. Therefore, we conclude that these two variables do not exert a mediating effect on this group of banks.

These findings align with the literature emphasizing the central role of employee training in larger firms, suggesting that training is a likely key factor in risk management for large banks. Furthermore, the mediating effect of credit risk and bank efficiency on the relationship between employee training and bank stability implies that large banks may organize targeted training programs for their employees focused on credit risk and efficiency. In contrast, the training initiatives in small banks might address more general aspects of banking or more timely topics.

We also delved into the relationship between employee training and bank stability under different market discipline scenarios. Market discipline is a significant variable that encourages banks to adopt sound and prudent management practices, thereby curbing excessive risk-taking behaviors (Bennett et al., 2015; Caiazza et al., 2018; Nier & Baumann, 2006). Thus, it can be argued that market discipline, by urging banks to limit their risk appetite, may also motivate banks to adopt behaviors well-aligned with effective risk management practices, such as employee training programs, to enhance risk management skills. As a result, we hypothesized that the relationship between employee training and bank stability, along with their proposed mediating mechanisms, might differ in situations of higher market discipline from that in situations of lower market discipline.

Consistent with Caiazza et al. (2018), we approximated market discipline using the ratio of market funding to total assets at the end of the fiscal year. We categorized banks subject to high (low) market discipline as those with a ratio of market funding higher (lower) than the median value. The results of this analysis are presented in Table 11.

< Insert Table 11 >

As large banks are subject to greater market discipline than their smaller counterparts (Bertay et al., 2013), the results presented in Table 11 are in alignment with those presented in Table 10. Specifically, for banks operating in highly market-disciplined environments, we observed that employee training positively and significantly impacts bank stability, with credit risk and bank efficiency playing significant mediating roles in this relationship. In contrast, for banks in less market-disciplined environments, employee training significantly and positively affects bank stability, but credit risk and bank efficiency do not act as mediators in this relationship. Therefore, these results suggest that

in highly market-disciplined banks, training initiatives are tailored to address specific aspects of the banking business that are highly relevant to external stakeholders.

To further investigate the impact of employee training on bank risk, we conducted a detailed exploration of training heterogeneity by narrowing our sample to only include banks that are required to publish nonfinancial statements in compliance with the European Union (EU) Directive 2014/95/UE. This directive mandates the disclosure of social, environmental, and labor-related information for nearly all large companies (with more than 500 employees and total assets or revenues exceeding 20 or 40 million euros, respectively). In Italy, there are 39 banks that are obligated by regulators to submit such statements, 15 of which are listed banks. Although large firms have been mandated to disclose nonfinancial information since 2017, we included years before 2017 to gather data from banks that had already been disclosing nonfinancial information in accordance with the criteria of Directive 2014/95/UE. Therefore, our examination is focused on this subset of banks over the period of 2011 to 2019. To collect data on employee training for this subset, we manually reviewed nonfinancial reports available on the banks' websites.

Our analysis was limited to information that could be compared across as many banks as possible, avoiding ambiguity. We specifically examined training segmentation based on employee typology, focusing on training provided to executives, middle managers, and other personnel. Utilizing these three variables, we re-estimated Model 1. The subsequent results, derived from exclusively exploring the direct relationship between training (for executives, middle managers, and other personnel) and bank stability, are presented in Table 12.

< Insert Table 12 >

The findings indicate that the training hours allocated to executives and middle managers did not significantly impact on bank stability during the observation period. In contrast, the training provided to the remaining personnel, particularly those working in the bank's office, had a positive and significant effect on stability. This finding suggests a crucial role for bank clerks in managing banking processes. Given their involvement in daily operations in front office and/or back-office positions, bank employees are the initial point of contact with customers. Consequently, their training emerges as a strategic factor in the enhancement of risk management and overall bank performance.

6. Discussion and conclusions

Despite the critical role that human resources play in the management of banking operations, there has been a noticeable lack of scholarly attention on the understanding of how employee training influences bank stability. Given the stringent regulatory mandates concerning organizational and governance structures, loan origination and monitoring, and nonperforming loan management (ECB, 2017; EBA, 2018, 2020; ECB, 2021), banks find themselves compelled to enhance their organizational capabilities and strike a delicate balance between stimulating business expansion and ensuring prudent risk management.

This paper contributes to the financial literature by examining the impact of bank employee training on bank stability, with a specific focus placed on elucidating the mediating mechanisms involved. We delve into two pivotal dimensions that shape a

bank's stability: credit risk, which is an indicator of the effectiveness of core business-related management processes, and operational efficiency, which is characterized by reduced operational costs. Our findings provide three noteworthy insights. First, we establish a positive association between employee training and bank stability, thus seamlessly aligning with the RBV perspective. Second, our analysis underscores the substantial role played by training in the reduction of credit risk and the implementation of relatively marginal improvements in cost management. Third, we demonstrate that employee training primarily fortifies bank stability through the alleviation of credit risk, thereby exerting a comparatively minor influence on the reduction of the overhead ratio.

Consequently, we infer that credit risk and the overhead ratio function as partial mediators in the relationship between employee training and bank stability. Importantly, our results are robust across different specifications and endogeneity tests. Further analysis shows that the training provided to bank clerks, i.e., bank personnel as distinct from executives or middle managers, enhances bank stability. Although this result requires further and more robust evidence, it does suggest that bank clerks—both those on the front line and those in the back office—play pivotal roles in managing banking processes. This finding highlights the importance of effective training for customer-facing staff who are better equipped to collect soft information, which is useful for managing bank risk.

Our findings have several implications for both theory and practice. In light of the various crisis events that have occurred over the past decade, there has been renewed discourse surrounding bank risk-taking and the enhancement of bank resilience. In pursuit of this objective, banking authorities and scholars have stressed the importance of various safeguards, which range from adequate organizational and corporate governance structures to the credit origination and monitoring processes of banks. However, scant attention has been given to microlevel organizational variables (such as employee training) that could influence bank responsiveness to supervisory concerns.

Therefore, our study offers valuable insights for banks and supervisory authorities by identifying the factors that contribute to bank stability, such as employee training programs. For financial intermediaries, training should be viewed as a mechanism for enhancing human resources, enabling such resources to contribute to the long-term stability and business sustainability of the bank. The results show how spending on employee training, rather than generating an increase in operating costs, actually enhances bank efficiency. To optimize the balance between training costs and increased efficiency, developing training plans in the best possible way, namely, through ex-ante assessments, is important to the analysis of human resource potential and the exploitation of the remote technologies available today. From a supervisory perspective, this study supports the notion that human capital is integral to prudent management and, consequently, serves as a key driver of bank stability. Specifically, the supervisory authority emphasizes the importance of adequate training for bank employees. The empirical evidence obtained in this study supports this emphasis on the part of the supervisory authorities and testifies to the need for constant professional training throughout the entire organizational structure of the bank to ensure bank stability.

Furthermore, our findings are important to depositors and investors. Indeed, the Bank Recovery and Resolution Directive (BRRD) 2014/59/EU minimizes the cost of bank failure for taxpayers by shifting the risk onto investors and depositors (beyond certain thresholds). Investment in employee training, which ensures better bank stability,

indirectly enables the better protection of depositors and investors; furthermore, more stable banks are in themselves the basis of a stable financial system. From this perspective, the information regarding investments in human resources that is reported in nonfinancial reports, which is mandatory for banks pursuant to Directive 2014/95/EU, plays an important role in guiding the asset allocation decisions of investors and depositors by increasing the efficiency of capital allocation in financial markets.

Nonetheless, this study has certain limitations that warrant consideration in future research. Notably, it is based on the Italian context, which is characterized by SMEs and a bank-centric system. A cross-country analysis encompassing diverse industrial systems (including those marked by a predominance of large corporations) and market-oriented financial systems would enable a more comprehensive evaluation of the relationship between training and bank stability, as well as an assessment of the mediating effects of the suggested variables (credit risk and bank efficiency). Additionally, a more detailed analysis of the types of training programs implemented by banks, beyond the limited data that is currently available, should be undertaken. This includes distinguishing between commercial training and technical training and exploring whether these programs are oriented toward credit risk assessment, the prevention of money laundering, or asset management activities. Such an analysis can provide further evidence regarding the relationship between human resource training and banking stability.

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Table 1
Descriptive statistics

Variable	Obs	Mean	Std. Dev.	First quartile	Median	Third quartile	Min	Max
Z score (<i>ln</i>)	614	4.8869	1.5979	3.793	4.903	5.877	0.6968	11.0175
σ (ROAA)	614	0.0018	0.0027	0.0003	0.0007	0.002	0.0000	0.019
Bank size (€/billion)	681	28.1	117	0.559	1.425	4.301	0.044	927
Business model	676	0.614	0.159	0.537	0.630	0.728	0	0.916
Debt to the interbank market	671	0.178	0.138	0.100	0.153	0.212	0	0.875
Liquidity	672	0.153	0.128	0.062	0.109	0.197	0.026	0.709
Leverage	680	0.09	0.032	0.068	0.083	0.103	0.043	0.202
Cost-to-income	680	0.664	0.165	0.578	0.656	0.725	0.291	1.864
Overhead ratio	675	0.0281	0.013	0.021	0.026	0.031	0.006	0.112
Credit risk	673	1.08	0.757	0.577	0.953	1.404	0	4.849
Training hours (per capita)	610	44.66	17.225	33.182	42.946	54.148	11.73	156
Training investments (%)	620	0.176	0.110	0.089	0.156	0.240	0.020	0.494
Graduate employees	621	0.389	0.117	0.312	0.380	0.450	0.042	0.920
Average tenure of employees (year)	700	16.986	3.601074	15.20	17.322	19.30	4.62	25.000

The table presents the main descriptive statistics for the variables used in this study, including the number of observations, mean, standard deviation, minimum and maximum.

Table 2
Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Z score (<i>ln</i>)	1													
2. σ (ROAA) (<i>ln</i>)	-0.980**	1												
3. Bank size (<i>ln</i>)	-0.213**	0.149**	1											
4. Business model	-0.083†	0.061	0.219**	1										
5. Debt to the interbank market	0.003	0.0004	-0.019	-0.153**	1									
6. Liquidity	0.063	-0.087†	0.089†	0.015	-0.119*	1								
7. Leverage	0.307**	-0.132**	-0.376**	-0.136**	-0.044	-0.094†	1							
8. Cost-to-income	-0.227**	0.182**	-0.025	0.165**	-0.203**	0.190**	-0.153**	1						
9. Overhead ratio	-0.393**	0.380**	-0.051	-0.084†	-0.134**	-0.240**	-0.038	0.128**	1					
10. Credit risk	-0.492**	0.408**	0.259**	0.134**	-0.077	-0.371**	-0.447**	0.119*	0.494**	1				
11. Training hours	0.102*	-0.145*	0.067	0.076	-0.114*	0.306**	-0.185**	0.136**	-0.100*	-0.153**	1			
12. Training investments (%)	0.109*	-0.138**	-0.270**	-0.014	-0.055	-0.099*	-0.126*	0.153**	0.033	0.012	0.210**	1		
13. Graduate employees	0.018	-0.016	0.073	-0.033	0.033	0.262**	0.014	0.019	-0.028	-0.167**	0.155**	0.141**	1	
14. Average tenure of employees	-0.147**	0.153**	0.063	0.080	-0.049	0.120*	0.036	0.344**	0.131**	0.208**	0.005	-0.168**	-0.167**	1

The table presents the Pearson coefficients between the variables used in this study. †, *, ** denote significance at the 10%, 5% and 1% levels, respectively.

Table 3
Regression results of the relationship between employee training and bank stability

	Overhead ratio	Credit risk	Z-score	Z-score	Z-score	Z-score	VIF
	1	2	3	4	5	6	7
Bank size	-0.686* (-2.24)	-0.080 (-1.33)	0.199 (0.47)	0.318 (1.07)	-0.0115 (-0.03)	-0.0159 (-0.04)	1.35
Business model	-0.022 (-0.04)	0.130 (0.70)	-1.269 (-0.92)	0.154 (0.11)	-1.116 (-0.80)	-0.863 (-0.60)	1.21
Debt to the interbank market	-0.032 (-0.06)	-0.445** (-3.58)	-0.318 (0.190)	-1.298 (0.287)	-0.356 (-0.137)	-1.005 (-0.120)	1.23
Liquidity	0.002 (0.43)	0.0001 (0.15)	0.0239* (2.16)	0.0166 (1.49)	0.0266* (2.50)	0.0263* (2.44)	1.76
Leverage	-0.010 (-0.35)	-0.059*** (-5.87)	0.398*** (4.60)	0.258*** (3.40)	0.378*** (4.54)	0.275*** (3.53)	1.63
Cost to Income ratio		-0.001*** (-6.59)					
Graduate employees (%)	1.194† (1.91)	0.428 (1.53)	1.244 (0.52)	2.604 (1.11)	2.198 (0.95)	2.258 (1.00)	1.28
Average tenure of employees	-0.047† (-1.79)	-0.014† (-1.73)	0.0601 (0.85)	-0.0236 (-0.36)	0.0570 (0.84)	0.0263 (0.36)	1.23
<i>Independent variable</i>							
Training hours (per capita)	-0.004** ^a (-1.69)	-0.001** ^a (-1.88)	0.0225*** ^a (2.99)		0.0221*** ^a (2.92)	0.0212*** ^a (2.90)	1.12
<i>Mediators</i>							
Overhead ratio				-0.291*** (-3.81)	-0.425*** (-3.69)	-0.319*** (-3.89)	1.50
Credit risk				-2.232*** (-3.62)		-1.814* (-2.44)	2.48
Constant	13.10** (2.90)	2.419* (2.59)	-5.464 (-0.70)	-1.673 (-0.31)	-0.898 (-0.12)	1.798 (0.24)	
Bank-fixed effects	yes	yes	Yes	yes	yes	yes	
Year-fixed effects	yes	yes	Yes	yes	yes	yes	
N	552	557	503	538	499	499	
R ²	0.197	0.501	0.148	0.161	0.180	0.202	
F-test	10.30***	14.882***	7.288***	7.377***	8.689***	9.278***	

The table presents the regression results of the model that tests the relationship between employee training and bank stability. Moreover, it show the test of the mediation effect of the overhead ratio and credit risk on this relationship. In column 7 are reported the VIF (Variance Inflation Factors) values. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively. ^a One tailed *p*-value.

Table 4

Regression results of the relationship between employee training and ROAA volatility

	$\sigma(\text{ROAA})$	$\sigma(\text{ROAA})$	$\sigma(\text{ROAA})$	$\sigma(\text{ROAA})$
	1	2	3	4
Bank size	-0.158 (-0.38)	-0.316 (-1.04)	0.0270 (0.06)	0.0313 (0.07)
Business model	1.276 (0.92)	-0.179 (-0.13)	1.129 (0.79)	0.882 (0.60)
Debt to the interbank market	0.424 (0.28)	1.552 (1.17)	0.336 (0.23)	0.997 (0.69)
Liquidity	-0.0252* (-2.28)	-0.0179 (-1.61)	-0.0277* (-2.61)	-0.0274* (-2.55)
Leverage	-0.262** (-3.21)	-0.131† (-1.71)	-0.244** (-3.10)	-0.144† (-1.89)
Graduate employees (%)	-1.490 (-0.61)	-2.859 (-1.19)	-2.364 (-1.01)	-2.423 (-1.06)
Average tenure of employees	-0.0574 (-0.81)	0.0257 (0.39)	-0.0558 (-0.81)	-0.0260 (-0.35)
<i>Independent variable</i>				
Training hours (per capita)	-0.0233** ^a (-3.15)		-0.0231** ^a (-3.10)	-0.0222** ^a (-3.08)
<i>Mediators</i>				
Overhead ratio		0.262*** (3.45)	0.379** (3.16)	0.275** (3.24)
Credit risk		2.173*** (3.53)		1.764* (2.40)
Constant	5.707 (0.74)	2.794 (0.49)	1.713 (0.22)	-0.909 (-0.11)
Bank-fixed effects	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes
N	503	538	499	499
R ²	0.119	0.124	0.146	0.167
F-test	4.496***	4.339***	5.370***	5.498***

The table presents the regression results of the model that tests the relationship between employee training and bank risk proxied by the natural log of the standard deviation of ROAA. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 5
Regression results of the relationship between training investment and bank stability

	Overhead ratio	Credit risk	Z-score	Z-score	Z-score	Z-score
	1	2	3	4	5	6
Bank size	-0.435 (-1.18)	-0.0905 (-1.09)	0.589 (1.19)	0.318 (1.07)	0.482 (1.06)	0.471 (1.04)
Business model	0.0785 (0.13)	0.189 (0.91)	-1.269 (-0.88)	0.154 (0.11)	-1.306 (-0.89)	-0.921 (-0.61)
Debt to the interbank market	0.0964 (0.12)	-0.420* (-2.46)	0.703 (0.42)	-1.197 (-0.97)	0.759 (0.49)	-0.142 (-0.09)
Liquidity	0.00519 (1.10)	0.000322 (0.27)	0.0112 (0.88)	0.0166 (1.49)	0.0144 (1.18)	0.0134 (1.17)
Leverage	-0.00684 (-0.22)	-0.0574*** (-5.12)	0.424*** (5.07)	0.258*** (3.40)	0.415*** (5.29)	0.305*** (3.49)
Cost to Income Ratio		-0.00138*** (-5.87)				
Graduate employees (%)	0.867 (1.36)	0.428 (1.66)	2.848 (1.22)	2.604 (1.11)	3.617 (1.65)	3.775† (1.74)
Average tenure of employees	-0.0406 (-1.39)	-0.0166* (-2.04)	0.0713 (0.95)	-0.0236 (-0.36)	0.0625 (0.87)	0.0216 (0.28)
<i>Independent variable</i>						
Training investment (%)	-0.456† ^a (-1.51)	-0.189* ^a (-1.74)	3.390*** ^a (2.92)		3.213*** ^a (2.87)	2.658* ^a (2.30)
<i>Mediators</i>						
Overhead ratio				-0.291*** (-3.81)	-0.458*** (-3.85)	-0.342*** (-3.68)
Credit risk				-2.232*** (-3.62)		-2.031** (-2.81)
Constant	9.079† (1.77)	2.488* (2.03)	-9.689 (-1.19)	-1.673 (-0.31)	-6.905 (-0.93)	-4.262 (-0.56)
Bank-fixed effects	Yes	yes	yes	yes	yes	yes
Year-fixed effects	Yes	yes	yes	yes	yes	yes
N	476	476	438	539	438	438
R ²	0.156	0.517	0.122	0.161	0.156	0.185
F-test	7.762***	17.48***	6.395***	7.377***	6.873***	7.132***

The table presents the regression results of the model that tests the relationship between training investment (%) and bank stability. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 6
Results of the Heckman selection model

	Prob.(Training)	Z-score
	1	2
Bank size	2.195*** (3.90)	-0.0160 (-0.04)
Business model	-2.824* (-2.04)	-0.863 (-0.60)
Debt to the interbank market	-3.129* (-2.25)	-0.669 (-0.48)
Liquidity	-0.0171 (-1.08)	0.0263* (2.32)
Leverage	0.112 (1.44)	0.275*** (3.54)
Overhead ratio	-0.243 (-1.47)	-0.319*** (-3.82)
Credit risk	1.978* (2.52)	-1.814* (-2.44)
Graduate employees (%)		2.258 (1.03)
Average tenure of employees		0.0263 (0.35)
Training hours (per capita)		0.0212** ^a (2.89)
Inverse Mills Ratio		-0.0000989 (-0.00)
Constant		1.799 (0.25)
Bank-fixed effects	Yes	Yes
Year-fixed effects	Yes	Yes
N	1169	499
$LR(\chi^2)$	254.7***	
R^2		0.202
$F-test$		8.819***

The table presents the regression results of the Heckman selection model. In column 1 is shown the logit model with dependent a dummy variable that takes value 1 if the amount of training hours per capita is present in our database for bank i in year t and 0 otherwise. *, ** and *** denote significance at the 5%, 1% and 0.1% levels, respectively.

^a One tailed p -value.

Table 7
Results of the entropy balancing approach

Panel A – Pre-balancing	Treatment sample		Control sample		Std. diff.
	Mean	Variance	Mean	Variance	
Bank size	14.62	3.558	14.88	4.272	-0.142
Loan	0.6322	0.01159	0.614	0.026	0.124
Debt to interbank market	0.169	0.02203	0.184	0.026	-0.144
Liquidity	13.5	102.4	15.36	170.84	-0.184
Leverage	8.624	6.98	8.550	6.465	0.028
Overhead ratio	2.623	0.4871	2.678	0.667	-0.079
Credit risk	0.698	0.102	0.675	0.121	0.072
Graduate employees	0.3789	0.007711	0.377	0.011	0.023
Average tenure of employees	17.18	8.423	17.72	10.15	-0.186

Panel B – Post-balancing	Treatment sample		Control sample		Std. diff.
	Mean	Variance	Mean	Variance	
Bank size	14.62	3.558	14.62	3.558	-0.0001
Loan	0.6322	0.02203	0.6322	0.02205	0.0001
Debt to interbank market	0.169	0.01159	0.1691	0.01165	-0.0009
Liquidity	13.5	102.4	13.5	102.7	-0.0007
Leverage	8.624	6.98	8.624	6.98	0.0000
Overhead ratio	2.623	0.4871	2.622	0.4873	0.0004
Credit risk	0.698	0.102	0.6978	0.102	0.0005
Graduate employees	0.3789	0.007711	0.3789	0.007715	-0.0003
Average tenure of employees	17.18	8.423	17.18	8.429	0.0002

Panel C	1	2	3	4	5
Bank size	-0.445*	-0.084	0.506	0.352	0.280
	(-1.99)	(-1.55)	(1.01)	(0.74)	(0.60)
Loan	-0.350	0.058	-2.006	-2.145†	-1.985
	(-0.81)	(0.46)	(-1.62)	(-1.73)	(-1.56)
Debt to interbank market	-0.240	-0.498***	-0.186	-0.250	-0.758
	(-0.54)	(-4.44)	(-0.13)	(-0.18)	(-0.57)
Liquidity	0.002	-0.001	0.0267*	0.0280*	0.0263*
	(0.45)	(-0.71)	(2.40)	(2.53)	(2.32)
Leverage	0.004	-0.061***	0.464***	0.455***	0.364***
	(0.14)	(-8.19)	(5.55)	(5.58)	(4.49)
Cost-to-Income ratio		-0.0007			
		(-1.18)			
Graduate employees (%)	1.341	0.476†	2.148	2.776	3.125
	(1.54)	(1.93)	(0.85)	(1.12)	(1.29)
Average tenure of employees	-0.042*	-0.010†	0.0369	0.0200	0.0000497
	(-2.02)	(-1.83)	(0.64)	(0.35)	(0.00)
High(training)	-0.084† ^a	-0.023 ^a	0.313 ^a	0.298 ^a	0.282 ^a
	(-1.49)	(-1.80)	(2.01)	(1.95)	(1.89)
Overhead ratio				-0.478***	-0.380***
				(-4.84)	(-4.06)
Credit risk					-1.603**
					(-2.59)
Constant	11.94*	2.939*	-13.06	-8.007	-4.416
	(2.55)	(2.58)	(-1.17)	(-0.75)	(-0.43)
Bank-fixed effects	Yes	Yes	Yes	Yes	Yes

Year-fixed effects	Yes	Yes	Yes	Yes	Yes
N.	550	555	497	497	497
R ²	0.628	0.906	0.541	0.557	0.566
F-test	6.52***	18.25***	4.20***	4.35***	4.96***

The table presents the estimation based on the entropy balancing approach. Panel A and B reports the difference in covariates before and after entropy balancing, respectively. Panel C reports regression results based on the entropy balancing approach. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 8
2SLS-IV results of the relationship between employee training and bank stability

	Overhead ratio	Credit risk	Z-score	Z-score	Z-score	Z-score
	1	2	3	4	5	6
Bank size	-0.663** (-3.06)	-0.067 (-1.30)	0.0657 (0.16)	0.308 (1.05)	-0.129 (-0.32)	-0.12 (-0.29)
Loan	-0.0898 (-0.18)	0.14 (1.00)	-0.938 (-0.77)	0.139 (0.10)	-0.861 (-0.71)	-0.644 (-0.53)
Debt to interbank market	-0.117 (-0.23)	-0.472*** (-3.69)	0.547 (0.34)	-1.235 (-1.00)	0.576 (0.37)	-0.162 (-0.11)
Liquidity	0.00133 (0.32)	-0.0001 (-0.09)	0.0257* (2.27)	0.016 (1.46)	0.0284* (2.56)	0.0281* (2.56)
Leverage	-0.00518 (-0.16)	-0.0571*** (-7.38)	0.361*** (4.32)	0.252** (3.37)	0.344*** (4.21)	0.249** (3.20)
Cost-to-Income ratio		-0.00170† (-1.94)				
Graduate employees (%)	1.227† (1.95)	0.439† (1.82)	0.858 (0.35)	2.604 (1.11)	1.734 (0.72)	1.839 (0.79)
Average tenure of employees	-0.0546* (-2.16)	-0.0174** (-2.68)	0.109 (1.60)	-0.022 (-0.34)	0.103 (1.54)	0.0667 (0.97)
<i>Independent variable</i>						
Training hours (per capita)	-0.01† ^a (-1.47)	-0.0032 ^a (-1.84)	0.0485** (2.72)		0.0467** (2.70)	0.0425* (2.52)
<i>Mediators</i>						
Overhead ratio				-0.285*** (-3.84)	-0.386*** (-3.70)	-0.288** (-2.99)
Credit risk				-2.267*** (-3.70)		-1.734** (-2.97)
Constant	13.124*** (4.84)	2.349*** (3.80)	-3.674 (-0.47)	-0.408 (-0.08)	-0.055 (-0.01)	2.145 (0.28)
Bank-fixed effects	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes

N	545	550	499	540	495	495
<i>F</i> -test	9.365***	22.950***	4.355***	7.53***	5.544***	5.757***
First-stage F-test (<i>p</i> value)	0.0000	0.0000	0.0000		0.0000	0.0000
Kleibergen-Paap test (<i>p</i> value)	0.0000	0.0000	0.0000		0.0000	0.0000
Weak identification test	35.556	36.238	32.829		32.211	31.482
Hansen <i>J</i> test (χ^2)	1.414	0.016	0.682		0.232	0.283
Endogeneity test	0.421	1.475	2.191		2.322	1.867

The table presents the results of the 2SLS-IV approach that tests the relationship between employee training and bank stability. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 9
GMM results of the relationship between employee training and bank stability

	Z-score	Z-score	Z-score	Z-score
	1	2	3	4
Bank stability _(t-1)	0.390** (3.20)	0.216* (2.01)	0.304** (3.02)	0.270** (2.73)
Bank size	0.159† (1.74)	0.0747 (0.94)	0.0340 (0.46)	0.0579 (0.94)
Loan	-3.081† (-1.81)	-0.297 (-0.23)	-1.810 (-1.24)	-1.113 (-0.85)
Debt to interbank market	1.671 (0.92)	-1.670 (-1.19)	1.140 (0.77)	0.804 (0.58)
Liquidity	-0.00109 (-0.05)	-0.00877 (-0.54)	0.00481 (0.26)	-0.00621 (-0.32)
Leverage	0.391** (2.84)	0.172* (2.01)	0.251* (2.36)	0.191 (1.60)
Graduate employees (%)	-3.390* (-2.41)	-1.178 (-0.75)	-1.940 (-1.60)	-1.932† (-1.75)
Average tenure of employees	-0.0853 (-0.88)	-0.0346 (-0.50)	-0.0308 (-0.40)	-0.00589 (-0.08)
<i>Independent variable</i>				
Training hours (per capita)	0.0383** ^a (3.01)		0.0280** ^a (2.95)	0.0228** ^a (2.64)
<i>Mediators</i>				
Overhead ratio		-0.520* (-2.30)	-0.449* (-2.06)	-0.424† (-1.71)
Credit risk		-2.133** (-3.00)		-1.437† (-1.82)
Constant	0.0936	5.347* (2.36)	2.517 (1.02)	3.188 (1.28)

	(0.03)	(2.53)	(0.96)	(1.26)
Bank-fixed effects	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes
N	445	478	442	442
<i>F-test</i>	5.076***	6.079***	6.068***	8.801***
π_1	-4.136***	-4.164***	-4.079***	-4.134***
π_2	1.121	0.863	0.993	0.884
Sargan test (χ^2)	37.53	54.74	46.60	55.21
Hansen <i>J</i> test (χ^2)	53.40	67.60	67.30	72.88
No of instruments	76	86	86	96

The table presents the results of the GMM model that tests the relationship between employee training and bank stability. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 10
Regression results testing the relationship between employee training and bank stability for large and small banks

	Large banks			Small banks		
	Z-score	Z-score	Z-score	Z-score	Z-score	Z-score
	1	2	3	4	5	6
<i>Independent variable</i>						
Training hours (per capita)	0.0284*** (3.17)	0.0274*** (2.97)	0.0261*** (2.96)	0.0180* (1.80)	0.0174* (1.71)	0.017† (1.69)
<i>Mediators</i>						
Overhead ratio		-0.412*** (-3.44)	-0.317*** (-3.67)		-0.382 (-0.91)	-0.281 (-0.63)
Credit risk			-1.838* (-2.17)			-1.082 (-0.50)
Controls	yes	yes	yes	yes	yes	yes
Bank-fixed effects	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes
N	382	378	378	123	123	123
<i>R</i> ²	0.199	0.235	0.259	0.136	0.144	0.149
<i>F-test</i>	7.698***	8.393***	7.875***	9.096***	20.89***	18.53***

The table presents the regression results of the model that tests the relationship between employee training and bank stability for the sub-samples of large (columns 1-3) and small (columns 4-6) banks. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 11
Regression results testing the relationship between employee training and bank stability for banks subject to high and low market discipline

	High market discipline			Low market discipline		
	Z-score	Z-score	Z-score	Z-score	Z-score	Z-score
	1	2	3	4	5	6
<i>Independent variable</i>						
Training hours (per capita)	0.0266*** ^a	0.0245*** ^a	0.0225*** ^a	0.0278*** ^a	0.0301*** ^a	0.0300*** ^a
	-3.57	-3.32	-3.16	-2.77	-2.84	-2.82
<i>Mediators</i>						
Overhead ratio		-0.292*	-0.205†		-0.382	-0.273
		(-2.54)	(-1.92)		(-1.63)	(-1.12)
Credit risk			-1.869*			-2.768†
			(-2.58)			(-1.86)
Controls	yes	yes	yes	yes	yes	yes
Bank-fixed effects	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes
N	328	328	328	177	173	173
R ²	0.192	0.209	0.235	0.189	0.207	0.237
F-test	5.694***	5.794***	6.845***	3.852***	3.904***	6.121***

The table presents the regression results of the model that tests the relationship between employee training and bank stability for the sub-samples of high (columns 1-3) and low (columns 4-6) market discipline. Moreover, it shows the test of the mediation effect of the overhead ratio and credit risk on this relationship. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed *p*-value.

Table 12
Regression results of the relationship between employe training (by type of employee) and bank stability

	Z-score	Z-score	Z-score	Z-score	Z-score	Z-score
	1	2	3	4	5	6
<i>Independent variable</i>						
Exec. training (hours per capita)		-0.006 (-1.13)			-0.011 (-1.41)	-0.012 (-1.61)
MMs training (hours per capita)			0.005 (0.64)		-0.009 (-0.75)	-0.004 (-0.37)
RP training (hours per capita)				0.024*** (2.90)	0.036*** (3.30)	0.031*** (3.42)
<i>Mediators</i>						
Overhead ratio	-0.280*** (-4.25)					-0.209* (-2.20)
Credit risk	-1.133** (-2.90)					-0.988* (-2.13)
Controls	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes
N	287	179	179	179	179	179
Wald χ^2	115.6***	67.20***	65.61***	62.74***	92.90***	180.6***
Hausman FE vs RE	6.24	3.40	2.68	1.99	1.75	7.25

The table presents the model that tests the relationship between training provided to specific employee categories and bank stability. Exec. Training, MMs training and RP training denote the average amount per capita of training hours provided to the executives, middle managers and remaining personnel of bank i in the year t , respectively. The control variables are included and not reported for brevity. †, *, ** and *** denote significance at the 10%, 5%, 1% and 0.1% levels, respectively.

^a One tailed p -value.

Appendix A – Definition of variables used in the estimation

Variable	Definition	Data source
Z score (\ln)	Natural log of the Z-score of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
$\sigma(\text{ROAA})$ (\ln)	Natural log of the ROAA standard deviation of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Bank size	Natural log of the total assets of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Business model	Ratio between loans and total assets of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Debt to the interbank market	Ratio between debt to the interbank market to total debts of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Liquidity	Ratio between liquid assets and total deposits and borrowings of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Leverage	Ratio between equity and total assets of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Cost-to-income	Ratio between operating cost and operating income of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Overhead ratio	Ratio between non-interest expense and total assets of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Credit risk	Natural log of the ratio between NPLs and capital equity of bank i in year t .	Our elaboration on bank balance sheet data retrieved from Bank Focus
Training hours	Average training hours per employee of bank i in the year t .	Our elaboration on data retrieved from financial statements and non-financial documents available on banks website
Training investment (%)	Training investments as a percentage of operating income of bank i in year t .	Our elaboration on data retrieved from financial statements and non-financial documents available on banks website
Graduate employees	Proportion of employees with a college degree on total employees of bank i in year t .	Our elaboration on data retrieved from financial statements and non-financial documents available on banks website
Average tenure of employees	Average numbers of years that employees have served in a given bank i in year t .	Our elaboration on data retrieved from financial statements and non-financial documents available on banks website