Non-Bank Financial Intermediation (NBFI) and Bank Stability: International evidence

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Abstract

This paper examines the effect of Non-Banking Financial Intermediation (NBFI) activity on the stability of traditional banks. Using an international sample of 16,563 banks from 27 countries during the period 2009-2022, our results show that the NBFI activity negatively impacts banks' stability. The final effect, however, is contingent upon the specific economic function performed by the NBFI entities. Our results show that NBFI activity significantly affects both the asset side of banks' balance sheets (e.g., loan growth and pricing) and the liability side (e.g., reliance on short-term funding). Additionally, we find evidence that NBFI activity reduces banks' market power, further affecting stability. We also show that the impact of NBFI on bank stability is contingent on individual bank characteristics, suggesting a heterogeneous effect across banks. Our results remain robust across various measures of bank stability and NBFI activity, as well as under different subsample analyses.

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1. INTRODUCTION

The rise of the Non-Banking Financial Intermediation sector (NBFI)[1] – defined as "*credit intermediation involving entities and activities (fully or partially) outside the regular banking system*" (FSB, 2017) – has significantly transformed the financial landscape over the past years and, in particular, after the Global Financial Crisis (GFC) of 2007/2008. NBFI entities, which could be classified according to the different types of economic functions[2] attributed to their business model, have gained popularity due to their ability to provide financial services outside the traditional banking system[3]. In this sense, the NBFI business model can be viewed as a network of specialized financial institutions facilitating the flow of funds from savers to investors through diverse securitization and secured funding mechanisms (Adrian and Ashcraftm, 2016).

As regulatory frameworks have evolved and technology has advanced, NBFI has filled gaps in the market, offering innovative solutions and greater funding access for individuals (Frost et al., 2019; Fuster et al., 2019; Gambacorta et al., 2019) and firms alike (Tian et al., 2024). To some extent, this reality represents a long-term structural shift, driven in part by the retrenchment of traditional banks. Consequently, NBFI entities not only fill underserved areas by the banking system but also foster innovation and affect economic activity in significant ways. However, the expansion of NBFI has also been associated with financial vulnerabilities. While their growth contributed to the GFC, the NBFI has been implicated in more recent episodes of market stress, such as the March 2020 market turmoil, the Archegos default in March 2021, the commodities market volatility in 2022, and the Liability-Driven Investment (LDI) crisis, which exacerbated stress in the UK gilt market in September 2022 (FSB, 2023).

In response to the contribution of NBFI to vulnerabilities in the financial sector, the regulators – primarily the FSB and G20 – have implemented reforms aimed at mitigating risks and fostering a resilient, market-based financial system. Measures included stricter accounting standards, limits on

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[1] Clear evidence of the extent to which this sector is characterized by a high level of heterogeneity is that the reports published by the FSB prior to 2018 these institutions were referred to as the *shadow banking* system. Subsequently, the FSB chose to change the name of *shadow banking* to *Non-Banking Financial Intermediation (NBFI)*, which represents, in a more faithful way, the heterogeneity of the nature of these entities.

[2] According to the FSB (2020), five different types of economic functions (EF1-EF5) could be considered: 1) management of collective investment vehicle, 2) loan provision dependent on short-term funding, 3) Intermediation of market activities dependent on short-term funding or secured funding of client assets, 4) facilitation of credit creation and 5) securitization-based credit intermediation. Table B1 summarizes these different economic functions of NBFI entities.

[3] In 2023, the size of the NBFI sector reached $238,8 trillion accumulating 49,1% of the global financial assets in the world.

off-balance-sheet activities, restrictions on securitization, and enhanced monitoring of NBFI (Adrian & Ashcraft, 2012; Adrian & Jones, 2018). While stricter bank supervision has improved bank stability (Beck et al., 2022), reduced financial distress (Chortareas et al., 2012), and benefited the economy (Pagano & Sedunov, 2016), it may inadvertently drive financial activities to the less-regulated NBFI sector. This shift can increase intermediation costs, restrict traditional banking products, and reduce lending, particularly in countries with stringent banking oversight, where NBFI activity becomes more prominent (see Buchak et al., 2018; Duca, 2016; Irani et al., 2017; among others).

Although prior studies, as well as policymakers,[4] have already raised these aspects focusing more broadly on the implications of NBFI on the stability of the overall financial system and the economy (see Aramonte et al., 2021; Bengtsson, 2013; Tian et al, 2024; among others), the question of whether and to what extent the development of the NBFI sector is impacting particularly the traditional banking industry remains largely unexplored. To the best of our knowledge, previous literature has not yet explicitly examined whether and how the development of the NBFI activity could affect bank stability and bank business models (i.e. growth of loans and deposits, as well as pricing of loans and deposits). This gap leaves unanswered the extent to which NBFI development affects banks' competitive dynamics and their resultant stability. In this paper, we aim to contribute to this discussion by examining the relationship between the development of the NBFI sector and traditional bank stability. Specifically, our goal is to study whether and to what extent the activity developed by NBFI entities, within the different economic functions specified above, may alter the scenario of the traditional banking sector, thereby affecting individual banks' stability. Hence, our premise is that those NBFI entities mostly focused on what could be closer to the traditional bank business model (i.e. lending provision and credit intermediation) would greatly affect bank competition, thereby impacting bank stability.

Previous research, therefore, has highlighted that NBFI may provide a valuable alternative to bank funding, thereby helping to support real economic activity. For instance, the recent paper by Jiang (2024) uses the Chinese market as a laboratory and, in particular, the change in a policy that restricts the issuance of wealth management products (WMP) in China.[5] The author shows that firms with high WMP exposure experience a decline in investments. The effects are pronounced for more profitable

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[4] See Adrian and Ashcraft (2016).
[5] In November 2017, the People's Bank of China (PBOC), China Stock Regulatory Commission, China Bank Regulatory Commission (CBRC), and China Insurance Regulatory Commission (CIRC) jointly released the draft "New Regulations on Asset Management" (NRAM).

firms, that have higher revenue growth and are more financially constrained. Exploration of the possible channels of these effects shows a decline in the credit supply of banks that relied more on WMPs. In the same line, the paper by Tian et al. (2024) provides firm-level evidence of the real effects of the activity of the NBFI in terms of technological innovation. They provide evidence that firm-to-firm entrusted loans, the largest part of the NFBI sector in China, enhance the borrowers' innovation output. The effects are more prominent when the borrowers are subject to more severe financial constraints, information asymmetry, and takeover exposures. A plausible underlying channel is capital reallocations from less productive but easily financed lender firms to more innovative but financially less privileged borrower firms.

At the same time, however, some papers have highlighted a less beneficial influence of the NBFI activity. Using information from the Chinese FinTech and traditional banking markets, Bao and Huang (2021) show that FinTech entities are more likely to expand credit access to new and financially constrained borrowers after the start of the pandemic. However, this increased credit provision may not be sustainable over time. Their results provide evidence that the delinquency rate of FinTech loans tripled after the COVID-19 outbreak, whereas there is no significant change in the delinquency of bank loans. Within the same line of evidence, papers such as Si and Li (2022) have focused on the effects of NBFI on corporate activity. These authors show that shadow banking business significantly increases firm risk-taking. Furthermore, the impact of firms' NBFI business on their risk-taking is particularly pronounced in the case of firms with greater financing constraints and poorer corporate governance, as well as also in times of loose monetary condition and severe financial stress. Moreover, increasing commercial credit, reducing main business performance, and eroding the quality of information disclosure are channels through which NBFI seem to affect firms' risk-taking.

When talking about the channels through which NBFI activity may affect the real economy, it is necessary to consider that, like traditional banks, these entities are based on short-term funding and leverage can be vulnerable to "runs" due to liquidity and maturity transformation, which in turn can generate contagion risk (Bellavite et al., 2022a; 2022b; Leong et al., 2020). In this sense, previous papers have shown that the GFC brought NBFI to the forefront of scholars' and policymakers' attention because of its supposed contribution to exacerbating the effects of the financial turmoil (Bengtsson, 2013). NBFI often forms part of complex financial intermediation chains, which can also involve traditional banks (Pozsar et al., 2013; Cetorelli, 2014). Within this context, Bernanke et al. (2011) document that NBFI provides funding in a similar way to traditional banks, but without the

same regulatory oversight, which can induce systemic risk. Gennaioli et al. (2013) study the relationship between NBFI and systemic risk, finding that NBFI entities may help to withstand the systemic risk but are vulnerable to crises and liquidity dry-ups when investors neglect tail risk. Aramonte et al. (2021) review structural shifts in intermediation and how NBFI has shaped the demand and supply of liquidity in financial markets. They identify key channels of systemic-risk propagation in the presence of NBFI entities, emphasizing the central role of leverage fluctuations through changes in margins. Nevertheless, the NBFI sector has been largely discussed as a diversified system (Pozsar et al., 2013), also to its different impacts on the GFC (Lysandrou and Nesvetailova, 2015), highlighting it as a welcome source of diversification of credit supply from the banking system that may provide healthy competition for banks.

Apart from liquidity-based arguments, other mechanisms have been also proposed. Xiao (2020) proposes a new transmission channel of monetary policy. The shadow monetary tightening could unintentionally increase financial fragility by driving deposits into the uninsured sector of NBFI entities, therefore enhancing the competition between the NBFI sector and commercial banks in a deposit market. Facing a more yield-sensitive clientele, NBFI entities passed through more rate hikes to depositors, thereby attracting more deposits when the Federal Reserve raised rates. Given these results, and because NBFI deposits are outside of government safety nets, such as deposit insurance and the discount window, shifts in the relative shares of deposits may have important implications for financial stability.

When it comes to banks' exposure to NBFI activity, one primary channel is the provision of explicit or implicit backstops, where banks may act as a safety net for the NBFI sector, thus increasing interdependence between their activities. Indirect exposure can arise through common asset holdings, such as bonds or structured products, creating shared risk and amplifying connections between banks and shadow banking entities. This interconnectedness, while facilitating capital flow and financing across different parts of the financial system, also introduces inherent vulnerabilities. Abad et al (2022) provides an in-depth examination of the exposure of EU banks to the NBFI system. Drawing on a dataset constructed from the EBA data in 2015, they show that 60% of the EU banks' exposures are towards non-EU entities, particularly US-domiciled NBFI entities. According to their results, bank size and efficiency present a positive relationship with EU banks' exposures to NBFI. Bank capitalization and profitability are negatively associated with the exposures to these types of entities.

Given all the previous arguments and evidence, it seems logical to think that the development of the NBFI system can influence individual banks' financial stability. When referring specifically to the FinTech entities, as a particular type of NBFI entity, several studies have documented a superior capacity of FinTech lenders to assess borrowers' creditworthiness compared to incumbent lenders (Frost et al., 2019; Fuster et al., 2019; Gambacorta et al., 2019). Di Maggio & Yao (2021) or Ghosh et al. (2021), among others, find that, compared to traditional banks, these FinTech lenders are able to screen borrowers more efficiently, because they are able to screen better borrowers' verifiable payment information. This suggests that FinTech firms, as lenders, might be better at pricing on the intensive margin. As a result, banks may find themselves providing financing to borrowers exhibiting a greater level of uncertainty, thereby increasing their overall risk exposure.

Furthermore, a channel through which NBFI may impact bank stability is by potentially intensifying competition within the banking sector. The traditional "competition-fragility" view (Hellmann et al., 2000; Repullo, 2004) suggests that more competition erodes market power, decreases profit margins, and therefore, reduces banks' charter value. This induces risk-taking by banks, who will seek additional sources of income. Several studies have obtained evidence of this after empirically examining the direct relationship between competition and bank stability (Agoraki et al., 2011; Jiménez et al., 2013; Turk Ariss, 2010; Yeyati & Micco, 2007). Therefore, it is reasonable to think that if the advent of NBFI entities truly diminishes bank market power, they may become more inclined to take risks which could, in turn, compromise their stability. In this regard, Cuadros-Solas et al. (2024), show that commercial banks suffered a reduction in their market power as a consequence of higher levels of credit provided by FinTech companies. This reduction in bank market power is one of the channels through which the level of financial stability is reduced for commercial banks.

Our paper contributes to previous literature in the following terms. Firstly, we provide additional insights into the impact of the NBFI sector on the traditional banking industry by empirically analyzing how different NBFI economic functions influence bank stability. Secondly, we also provide evidence on how NBFI activity affects the traditional banking business model, including both the assets and liabilities sides, the pricing of loans and deposits, and the extent to which bank market power is influenced by NBFI entities. Thirdly, since the specific characteristics of each bank entity seem to affect bank stability (see Beck et al., 2022; Cuadros-Solas et al., 2025; among others), this paper also contributes to the literature by exploring whether the strength of the effects associated with NBFI may be contingent on the characteristics of traditional banks -in terms of size, efficiency, liquidity and

capitalization- and on the extent to which banks present a lending-based main business model and are dependent on different deposit funding.

The empirical analysis is carried out for an international database composed of 16,563 banks from 27 countries over the period 2009-2022. Our baseline results are consistent with a negative effect of NBFI on bank stability with this effect being particularly relevant in the case of those NBFI entities more focused on the management of collective investment vehicles with features that make them susceptible to runs as well as on securitization-based credit intermediation and funding of financial entities. Our results also reveal that the NBFI sector affects the traditional bank business model via the growth and pricing of loans and the variation in short-term bank funding ratios. Likewise, our empirical findings also support the negative effect of NBFI on bank market power, considering this as one of the potential channels through which the impact of NBFI on bank stability may take place. In further analyses, we also examine the potential heterogeneous influence of NBFI on bank stability. In particular, the negative effect of NBFI on bank stability is less relevant in the case of larger, more efficient, less liquid, and less capitalized banks. Banks that are more deposit-oriented and those with lower levels of loan orientation in their business models are better positioned to counteract the impact of NBFI on financial stability.

The rest of the paper is organized as follows. Section 2 describes the sample, variables, and econometric model. Sections 4 and 5 discuss the main empirical results and additional tests. Finally, Section 6 concludes.

2. DATA AND EMPIRICAL APPROACH

2.1. Data

To carry out the empirical analyses we use a unique bank-level dataset retrieved from several sources. Bank-level information is obtained from the ORBIS Bank Focus Database (Bureau Van Dijk), focusing on commercial banks, saving banks, cooperative banks, bank holding companies, investment banks, and private banks. These institutions are central to the financial system, either as primary providers of traditional credit or as key players in financial intermediation. Data on the NBFI sector is retrieved from the FSB's Global Monitoring Report on Non-Bank Financial Intermediation. This database provides information on the NBFI total assets, offering insights into the size and structure of these entities while focusing on five economic functions (EF1 to EF5) performed by them. Information on the characteristics of the banking sector and key macroeconomic indicators are

sourced from the Global Financial Development database, accessible through the World Bank (WB), and the International Financial Statistics dataset provided by the International Monetary Fund (IMF).

After addressing missing data for key variables and ensuring the availability of bank-level information for at least three consecutive years, the final dataset consists of an unbalanced panel of 16,563 banks from 27 countries[6] that are members of either the G20 or the OECD, covering the period from 2009 to 2022. This yields a total of 56,335 bank-year observations.

2.2. Empirical Approach

2.1.1 Key variables: non-bank financial intermediation and bank stability

The NBFI sector broadly encompasses all entities engaged in financial intermediation, either fully or partially, outside the traditional banking system. However, the NBFI ecosystem comprises a diverse range of interconnected entities. According to the FSB (2020), five different types of economic functions (EF1-EF5) could be attributed to the NBFI business, namely: (i) management of collective investment vehicles with features that make them susceptible to runs (MMFs, fixed-income funds, mixed funds, credit hedge funds, real estate funds); (ii) loan provision dependent on short-term funding (finance companies, leasing/factoring companies, consumer credit companies); (iii) Intermediation of market activities that is dependent on short-term funding or secured funding of client assets (broker-dealers, securities finance companies); (iv) facilitation of credit creation (credit insurance companies, financial guarantors, monoline); and (v) securitization-based credit intermediation and funding of financial entities (securitization vehicles, structured finance vehicles, asset-backed securities). Table B1 in Appendix B summarizes the business models of the NBFI entities belonging to the five different economic functions.

We use the annual ratio of total assets of the NBFI sector to GDP (*NBFI_GDP*) as the main proxy for measuring the importance of NBFI in each country[7]. Additionally, we also use the ratio of total assets to GDP for each of the five economic functions (EF1 to EF5), encompassing the specific types of entities classified by the FSB as part of the NBFI sector.

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[6] Argentina, Australia, Belgium, Brazil, Canada, Chile, China, France, Germany, Hong Kong, India, Indonesia, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, Saudi Arabia, Singapore, South Africa, Spain, Switzerland, Turkey, UK, United States, South Korea.

[7] For robustness purposes, in Section 5.2 we also employ alternative ratios such as the NBFI assets-to-total financial system assets ratio (*NBFI_FINASSETS*) and the ratio of NBFI assets over total banking sector assets (*NBFI_BANKASSETS*).

As shown in Figures 1 and 2, the importance of NBFI activity has increased significantly between 2009 and 2022, rising from 27.06% to a peak of 57.26% in 2021 before slightly declining to 55.04% in 2022. Among the different economic functions, EF1 (collective investment vehicles) holds the largest share and has seen its importance grow over time, rising from approximately 50% in 2009 to over 70% in recent years, reflecting its central role in the intermediation activities of the NBFI. In contrast, EF5 (securitization-based intermediaries), EF2 (entities reliant on short-term funding), and EF3 (market intermediaries) account for average shares during the analyzed period of 10.8%, 9.3%, and 9.8%, respectively. Meanwhile, EF4 (credit facilitators) represents the smallest share, averaging just 0.3%.

<INSERT FIGURES 1 and 2>

Table B2 in Appendix B presents the average values for the ratio of NBFI assets to GDP (*NBFI_GDP*) as well as for the different economic functions over the period 2009-2022 across our sample countries. As can be observed, Luxembourg (5012.34%), Ireland (884.58%), and the United States (85.43%) stand out with the highest ratios, primarily driven by EF1 (4564.62%, 597.41%, and 51.98%, respectively). The high ratios of NBFI assets to GDP in Luxembourg and Ireland reveal that both countries are global hubs for NBFI, attracting significant financial intermediation business thanks to their favorable tax environments and regulatory frameworks. Countries like the Netherlands (14.30%) and South Korea (9.76%) also show significant shares in EF5, alongside Luxembourg (277.06%) and Ireland (181.67%). Similarly, EF2 has notable contributions in India (15.81%) and Canada (10.26%), with additional activity in South Africa (5.01%) and Chile (5.46%). These patterns reveal the heterogeneity in the prominence of NBFI entities and their economic functions across countries.

To measure bank stability, we use the Z-score indicator. Previous papers have traditionally used this variable (see Beck et al., 2013; Laeven & Levine, 2009; Schaeck & Cihák, 2014; among others) which is computed as the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. A three-year rolling window is applied to calculate the standard deviations for each bank annually. A higher Z-score implies greater bank stability, as it is inversely associated with bank insolvency probability. Given that the Z-score is highly skewed, we use the natural logarithm of the Z-score, which is normally distributed. Table 1 shows that the natural logarithm of the *ZSCORE (ZSCORE)* is distributed with a mean value of 4.01 and a standard deviation of 1.15 in our international sample of banks.

In line with previous literature on bank stability (e.g., Beck et al., 2013; Behr et al., 2010; Laeven et al., 2016), we incorporate both bank-level and country-level control variables in all estimations. For the bank-level control variables, we consider the natural logarithm of total assets in the bank balance sheet as the proxy for bank size (*Size*). We also include the share of interest income in total assets (*Traditional*) as a proxy for bank business activity. Moreover, we consider the cost-to-income ratio as an inverse proxy of bank efficiency (*Cost-to-Income*), the annual growth rate in total profits (*⊿Profits*), the annual growth rate in the volume of granted loans (*⊿Loans*), and the liquidity ratio (*Liquidity*).

In order to account for the potential effects of the economic cycle, we include the natural logarithm of the annual growth rate of GDP per capita (*GDPpc*) and the annual percentage change in the consumer price index (*Inflation*). We also consider the ratio of private credit by deposit money banks to GDP (*Private Credit*) to assess each country's financial development. The variable definitions and data sources are presented in Table B3 of the Appendix.[8] The main descriptive statistics are reported in Table 1.

<center><INSERT TABLE 1></center>

Our empirical approach relies on a linear regression with panel data estimators. We regress our proxy for bank stability on the main explanatory variable: the percentage of total assets from the NBFI to GDP. Apart from explicitly controlling for traditional bank- and country-level variables explaining bank stability, in all the estimates we include bank-fixed effects to capture the effects of potential unobserved heterogeneity:

$$ZSCORE_{ijt} = \beta_0 + \beta_1 NBFI\_GDP_{jt-1} + \sum_{l=1}^{7} \gamma_l \; BANK_{ijt-1} + \sum_{h=1}^{6} \delta_h \; COUNTRY_{jt} + \mu_i + \lambda_t$$

$$+ \; \varepsilon_{i,t}$$

<div align="right">[1]</div>

where *i*, *j*, and *t* refer to the bank, country, and year, respectively. We regress our proxy for bank stability, the natural logarithm of the Z-score (*ZSCORE*), on the main explanatory variable: the ratio

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[8] All the variables are winsorized at the 1st and 99th percentile levels to reduce the influence of outliers.

of total assets from the NBFI sector to GDP (*NBFI_GDP*). Alternatively, we sequentially include the volume of total assets of each type of NBFI economic function to GDP.

The vector *BANK* includes the abovementioned bank-level control variables which enter the regressions lagged by one period to reduce potential endogeneity concerns. The vector *COUNTRY* includes the country-level controls. μ_i is a parameter that represents an independent term for each bank in the panel to control for characteristics that are specific to each bank. These specific controls allow us to capture any unobserved effects that are specific to each bank, persistent over time, and not directly included in the regressions. λ_t is a set of year dummy variables to capture unobserved bank-invariant time effects not included in the regression. $\varepsilon_{i,t}$ is a white-noise error term. Moreover, to address potential correlations in the dependent variable (*ZSCORE*), standard errors are clustered at the country level, as the primary explanatory variable (*NBFI_GDP*), is measured at the country level and uniformly affects all banks within a country. Furthermore, banks operating within the same regulatory, economic, and institutional framework are subject to shared influences, creating intra-country correlations that violate the assumption of independent observations. Clustering at the country level accounts for these dependencies, ensuring robust standard errors and valid statistical inferences, whereas clustering at the bank level would fail to capture such correlations.[9]

To further examine the impact of NBFI on bank stability, we decompose the Z-score indicator into its components: the capital equity ratio and ROA (*log(roa+equity/assets)*) as the numerator; and the standard deviation of ROA over a three-year rolling window (*log(sd(roa))*) as the denominator. In each case, these variables replace the Z-score as the dependent variable in Equation (1), enabling us to assess how exposure to the NBFI activity influences different dimensions of bank stability. The capital equity ratio and ROA are positively associated with the Z-score, indicating their role in enhancing financial resilience. The standard deviation of ROA is negatively associated with the global indicator of bank stability, as greater variability in returns signals higher systemic risk. This approach aligns with the methodologies of Beck et al. (2022) and Raykov and Silva-Buston (2022), offering a more detailed understanding of how each component contributes to the overall assessment of bank stability.

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[9] In further robustness tests, we check that the baseline results hold when we consider cluster at the bank level.

3. BASELINE RESULTS

In this section, we present the results of our baseline model analyzing how NBFI activity influences bank stability. The results are reported in Table 2, where the dependent variable is the logarithm of the Z-score, representing bank stability (*ZSCORE*). In column (1), the effect of the aggregate NBFI activity is examined. In columns (2) to (6) we show the results obtained when the NBFI activity is decomposed into the five distinct economic functions (EF1 to EF5) defined by the FSB to capture their specific effect on bank stability.

As shown in column (1) of Table 2, the aggregate measure of NBFI activity (*NBFI_GDP*) presents a negative and statistically significant coefficient when explaining bank stability. This result suggests that the expansion of the NBFI sector may intensify competition in the banking market and exacerbate risks related to liquidity and maturity transformation. As these entities expand their role in financial intermediation, traditional banks may respond by assuming higher levels of risk to mitigate the potential loss of market share, thereby reducing their financial resilience. These findings would be consistent with the notion that NBFI entities, due to their operational flexibility and softer regulatory frameworks, are better positioned to capture higher-quality borrowers, leaving banks to focus on riskier clients. Consequently, the activity of the NBFI sector influences the dynamics of resource allocation and increases interconnectedness, which may contribute to reducing bank stability.

The analysis of the NBFI activity decomposed by economic functions is reported in columns (2) to (6). As can be seen, notable differences emerge in terms of the impact each economic function has on bank stability. Specifically, in terms of *NBFI_F1_GDP* (collective investment vehicles) we obtain a significant negative association with bank stability (column (2)). This result highlights the risks posed by entities such as money market funds and fixed-income funds susceptible to liquidity runs. These entities may also intensify competition for savings as well as exacerbating liquidity mismatches, as highlighted by the FSB (2020). Similarly, as for the results of the *NBFI_F5_GDP* (securitization-based intermediaries), we obtain a negative and significant coefficient in column (6), which may emphasize the systemic risks associated with securitization chains, which may increase complexity and propagate financial contagion (Aramonte et al., 2021). By contrast, *NBFI_F2_GDP* (entities reliant on short-term funding), *NBFI_F3_GDP* (market intermediaries), and *NBFI_F4_GDP* (credit facilitators) do not exhibit statistically significant effects on bank stability (columns (3), (4), and (5), respectively). These functions are more focused on their operations and/or complement traditional banking activities, thereby limiting their broader systemic implications (Pozsar et al., 2013; FSB, 2020).

Regarding control variables, loans growth (*ΔLoans*) consistently shows a negative and statistically significant effect across all specifications. This indicates that rapid credit expansion undermines bank stability, as also noted by Schaeck and Cihák (2014). Conversely, private credit-to-GDP (*Private Credit*) has a positive and significant effect, suggesting that more developed credit markets contribute to greater bank stability, consistent with Cubillas and Suárez (2018). Overall, Inflation negatively and significantly affects bank stability, reflecting the increased uncertainty and financial risks associated with higher inflation, as suggested by Beck et al. (2013). Finally, bank size (*Size*) is positively associated with bank stability in column (6), indicating that larger banks are better equipped to manage risks stemming from complex financial instruments.

In conclusion, aggregate NBFI activity negatively impacts bank stability. This result may be motivated by the more intensive competition that banks face in credit markets and the increasing risks related to liquidity and maturity mismatches. Among the economic functions, EF1 (collective investment vehicles) and EF5 (securitization-based intermediaries) emerge as the main contributors to this destabilizing effect. Specifically, EF1 heightens competition for savings and creates liquidity mismatches, while EF5 adds systemic complexity through securitization chains.

<INSERT TABLE 2>

Tables 3 and 4 present the results for the decomposition of the Z-score indicator. We analyze separately, the numerator (*log(roa + equity/assets)*), which reflects profitability and capitalization, and the denominator (*log(sd(roa))*), which captures the volatility of returns as a measure of risk. In particular, the results in Table 3, show that aggregate NBFI activity (column (1)) does not show a statistically significant effect on profitability and capitalization, suggesting that broader NBFI activity may have a limited direct impact on these dimensions. However, when analyzing specific economic functions, entities reliant on short-term funding (EF2, column (3)) and those acting as market intermediaries (EF3, column (4)), present statistically significant negative coefficients, indicating potential pressures on profitability and challenges to maintaining high capitalization levels. Conversely, credit facilitators and insurers (EF4, column (5)) exhibit a significant positive and significant coefficient, highlighting their contribution to strengthening banks' financial stability through enhanced profitability and capitalization.

<INSERT TABLE 3>

In Table 4, we present the results obtained when the dependent variable is the return volatility, as a measure of risk (i.e. the denominator of the Z-score indicator). As can be seen in column (1), the aggregate measure of NBFI activity (*NBFI_GDP*) shows a significant positive effect on the standard deviation of ROA, underscoring the risk-amplifying nature of broader NBFI activity. Similarly, collective investment vehicles (reported in column (2)) and securitization-based intermediaries (column (6)) are associated with increased volatility, reflecting the systemic risks posed by liquidity mismatches and complex securitization chains. By contrast, EF2, EF3, and EF4 do not exhibit statistically significant effects on return volatility, suggesting that their operations have a more localized or negligible influence on risk.

<center><INSERT TABLE 4></center>

Taken together, these results indicate that the impact of aggregate NBFI activity varies depending on the type of economic function performed by the NBFI entity. In the case of collective investment vehicles (EF1) and securitization-based intermediaries (EF5), the impact on bank stability is primarily transmitted through increased risk, as evidenced by heightened return volatility, rather than through changes in profitability or capitalization. Conversely, for those types of NBFI entities mainly involved in short-term funding (EF2) and market intermediation (EF3) the impact on bank stability is mainly driven by changes in profitability or capitalization. Finally, NBFI entities involved in credit facilitation and insurance activities (EF4) seem to exhibit a relatively positive impact on stability of traditional banking institutions. This highlights their more focused operations or complementary roles within the financial system, which limit their broader impact on systemic risk and overall bank stability.

4. HOW DOES SHADOW BANKING AFFECT BANK STABILITY?

To examine the impact of NBFI activity on traditional banks and their stability, we focus on three critical dimensions that aim at capturing the core mechanisms through which NBFI interacts with the banking sector. First, on the asset side, we analyze the influence of NBFI on banks' lending activities, which are central to their role in financial intermediation. Understanding how NBFI impacts credit allocation and loan volumes is crucial, as changes in these areas can directly affect the banks' asset portfolios and their overall business model. Moreover, we also assess the pricing of loans and deposits, the basic products that underpin the traditional banking business model. By evaluating whether and how NBFI reshapes pricing strategies, we aim to understand the implications for banks' profitability and their capacity to withstand financial stress. Second, on the liability side, we investigate how

competition from NBFI influences the financing structure of banks. Deposits are a fundamental and stable source of funding for banks and shifts in customer preferences toward NBFI products can alter banks' liquidity profiles, potentially increasing reliance on more volatile funding sources. Finally, we explore market power, recognizing that the emergence of NBFI introduces competitive pressures that could redefine the dynamics of the financial sector. These dimensions are interconnected and collectively provide a comprehensive framework for analyzing how NBFI channels its influence on traditional banking operations and, ultimately, on bank stability. By focusing on these areas, we aim to shed light on the systemic implications of NBFI and its potential to disrupt or complement the traditional banking sector in the evolving financial landscape.

4.1 Assets-side impact: Lending

4.1.1 Loan volume

The impact of the NBFI activity on the asset side of traditional bank balance sheets is primarily reflected in changes to their lending activities. Lending represents a core function of traditional banks, serving as a critical channel for allocating financial resources across the economy. The entry and expansion of NBFI entities, some of which specialize in niche lending markets or offer competitive financing alternatives, can significantly influence banks' lending activity. In this section, we aim to understand to what extent the dynamics of banks' lending could be affected by the presence of NBFI entities.

To do so, we examine whether the dynamics of bank loans, measured by the annual growth rate of the proportion of bank loans over total bank assets ($\Delta Bank\ Loans$), change as there is a higher volume of NBFI. This measure is particularly relevant for understanding these dynamics because it captures both the scale and priority of lending activities within the broader context of a bank's balance sheet. The proportion of loans over total bank assets reflects the strategic emphasis banks place on their core lending operations relative to other asset classes, such as securities or investments. By focusing on the annual growth rate, we can identify trends and shifts over time, providing insights into whether banks are expanding, contracting, or reallocating their lending portfolios in response to the competitive pressures or opportunities introduced by NBFI. To be consistent with our main specification, we control for bank-level ($BANK$) and country-level characteristics ($COUNTRY$) while considering bank (μ_i) and time (λ_t) fixed effects.

The results are reported in Table 5. In column (1), the effect of aggregate NBFI activity is examined, while columns (2) to (6) decompose NBFI activities into the five distinct economic functions (EF1 to EF5). The results in column (1) reveal that aggregate NBFI activity (*NBFI_GDP*) is negatively and significantly associated with the growth of bank loans. This finding suggests that as the NBFI sector increases the lending activity of banks is negatively affected, as the share of loans over total assets is reduced. This result is consistent with the notion that NBFI entities, through their alternative financial products and services, increasingly compete with traditional banks for borrowers and influence the overall demand for bank credit. This negative impact on bank lending is mostly driven by NBFI entities involved in the management of collective investment vehicles susceptible to runs (*NBFI_F1_GDP*) and securitization-based credit intermediation (*NBFI_F5_GDP*). For both types of NBFI functions (columns (2) and (6)) the coefficients are negative and statistically significant, indicating that the activities of entities such as money market funds, fixed-income funds, and other investment vehicles (EF1) and securitization vehicles (EF5) significantly reduce banks' lending activity. In the case of EF1 entities, these types of entities likely divert financial resources from traditional banking channels by offering competitive returns or alternative financing options, which can undermine banks' ability to maintain or grow their loan portfolios. Similarly, in the case of EF5 entities, these entities also absorb a portion of credit market activity, which seems to challenge the traditional role of banks in credit intermediation. The securitization process involves transforming illiquid bank assets, such as loans, into marketable securities, thereby affecting banks' balance sheets and their approach to credit provision. NBFI entities engaged in securitisation-based credit intermediation offer alternative credit products that often appeal to borrowers who might otherwise rely on traditional bank loans.

As observed in columns (3), (4), and (5), we do not find any significant impact on bank lending arising from the remaining functions (EF2–EF4). This may suggest that while entities in these functions support credit markets, their influence on traditional bank lending is neither direct nor substantial. For EF2, these entities, such as finance companies, leasing firms, and consumer credit providers, typically target specific markets with a narrower operational scope than traditional banks. They often serve borrowers who do not meet banks' credit criteria or who require specialized financing solutions. Given their niche focus, EF2 entities may not compete with banks for a broad range of borrowers. Instead, they tend to complement traditional bank lending by catering to segments that banks may not prioritize. For EF3, entities like broker-dealers and securities finance companies

primarily engage in facilitating market-based financial transactions rather than traditional credit intermediation. Their focus on activities such as securities trading, underwriting, and securities lending makes their interaction with traditional bank lending minimal. Similarly, EF4 entities, including credit insurers, financial guarantors, and monoline insurers, primarily support credit markets by offering guarantees and risk-sharing mechanisms. These entities play a complementary role in credit intermediation by enhancing the creditworthiness of borrowers or financial instruments, rather than directly originating loans. Overall, the results underline the heterogeneity in how different NBFI activities influence bank lending dynamics.

<INSERT TABLE 5>

4.1.2 Loan pricing

We now analyze how NBFI activity influences the pricing of loans, thereby trying to understand if NBFI may influence in terms of banks' ability to set loan prices. As previously argued, the influence of NBFI entities can be clearly reflected in changes in the asset side of the banks' balance sheets. However, it could be the case that NBFI provokes different reactions in terms of both the amount of assets (as previously shown) and also in terms of loan pricing. Hence, as well as we have shown an effect in terms of the growth rate of loans for different types of NBFI entities, we now aim to explore if there is a loan pricing effect that can be associated with the development of the NBFI sector.

To develop this analysis, we now examine if the trend followed by the price of loans, defined on an annual basis as the ratio of interest on loans over total loans (*Price of Loans*), could be partially explained by the NBFI activity, as well as it is in terms of loans growth. By focusing on loan pricing, we aim to provide evidence into whether and to what extent banks react to the presence of NBFI entities not only in terms of the size of the lending portfolio but also in terms of loan pricing, thereby responding via prices to the new competitive scenario created by the presence of these entities. Again, and to be consistent with our baseline results, we test the effect of the global measure of NBFI as well as for each specific economic function (EF1-EF5). We control also for the whole set of bank-level (*BANK*) and country-level characteristics (*COUNTRY*) while considering bank- and year-fixed effects.

The results are presented in Table 6. Column (1) shows the influence of the aggregate measure of NBFI activity on the *Price of Loans*. In columns (2) to (6) we present the regression results for the five different economic functions developed by the NBFI entities. As can be seen from the results

presented in columns (2) and (3), the coefficients for the *NBFI_F2_GDP* and *NBFI_F3_GDP* variables present a negative and statistically significant association with the price of bank loans. These results suggest that the activities developed by NBFI entities, such as finance companies, leasing/factoring companies or consumer credit companies, as long as they contribute to loan provision (*NBFI_F2_GDP*), are negatively associated with the price of traditional banks' loans. This result highlights that those NBFI entities mostly focused on the EF2 are more likely to compete in terms of traditional bank lending activity by offering competitive conditions to granted loans. This could justify banks' reaction towards setting lower loan prices, as these entities are assumed to affect more directly the share of the credit market that traditional banks have.

As reported in column (3), the coefficient for the NBFI entities that are mainly focused on the intermediation of market activities dependent on short-term funding (*NBFI_F3_GDP*) is also negative and statistically significant. These types of intermediation activities, although not directly related to the core of a traditional bank's business model (i.e. loans and credits to individuals and firms), may also affect the extent to which a traditional bank can provide these types of intermediation services in the capital markets. Hence, this result may suggest that banks could be forced to reduce loan prices in order to provide a competitive response to the presence of this particular type of NBFI entity.

Taken together, these results are in line with those previously shown in terms of loan growth. Indeed, our findings suggest that the extent to which NBFI affects the traditional banks' business model is not only limited to exclusive competition in terms of quantity or prices. On the contrary, our empirical findings indicate that competition from NBFI may arise both in terms of loan growth and in terms of affecting banks' ability to set loan prices. The extent to which the particular type of business model component (i.e. growth of loans and loan prices) is affected, finally depends on the type of function developed by the NBFI entity. In other words, the extent to which the NBFI sector competes with traditional banks is contingent upon the specific type of activity developed by these entities.

<INSERT TABLE 6>

4.2 Liabilities-side impact: Deposits and short-term funding

The liability-side impact of NBFI can be primarily observed through its influence on bank deposits and short-term funding. Deposits represent a core and stable funding source for banks, enabling them to finance lending activities and manage liquidity. However, the growth of the NBFI sector introduces competitive pressures that can erode the traditional dominance of banks in deposit collection and alter

the structure of short-term funding markets. In this section, we analyze how NBFI affects the ability of banks to attract and retain deposits, as well as the broader implications for their funding stability and liquidity management.

4.2.1 Deposits and short-term funding volume

NBFI entities often offer alternative investment products, such as money market funds, collective investment vehicles, and other short-term instruments that compete directly with bank deposits. These products frequently provide higher returns, greater flexibility, or more tailored investment solutions, making them attractive to both retail and institutional investors. Moreover, NBFI activities can affect the broader short-term funding landscape. Certain NBFI entities, such as finance companies, broker-dealers, and securitization vehicles, actively participate in short-term funding markets through instruments like commercial paper and repurchase agreements. By doing so, they not only introduce additional competition for funding but also alter the dynamics of these markets.

Empirically, we examine the impact of NBFI on deposits by focusing on the dynamics of time deposits, measured by the annual growth rate of the proportion of time deposits[10] over total bank liabilities (Δ*Time Deposits*). Time deposits include customer deposits with a fixed maturity date, often referred to as term deposits, which bear interest. These deposits typically require the depositor to leave the funds in the account until the maturity date, in exchange for a guaranteed interest rate. This measure captures both the scale and the strategic role of time deposits in banks' liability structures. Time deposits are a critical funding source for banks, offering relatively stable and predictable inflows compared to more volatile sources of short-term funding. By analyzing changes in the proportion of time deposits, we can assess whether NBFI activities are reshaping banks' funding profiles, particularly by attracting savers away from traditional bank deposit products.

The results can be found in Table 7. The results show that aggregate NBFI activity (*NBFI_GDP*) does not have a statistically significant impact on the growth of time deposits. This finding suggests that the overall size of the NBFI sector does not exert measurable pressure on banks' ability to attract or grow time deposits, likely because the aggregate measure encompasses a wide range of

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[10] For robustness purposes, we also examine the impact on demand deposits. However, demand deposits typically exhibit greater volatility than time deposits which could obscure the impact of NBFI on the liability structure of banks. Additionally, demand deposits are often tied to broader banking services, such as checking accounts and payment systems, which may create stickiness in this funding source and reduce the substitutability with NBFI products. In our empirical analysis, we do not find a significant effect of NBFI on the growth of demand deposits. The results are available upon request.

heterogeneous activities with varying degrees of overlap or competition with traditional banking products. In this sense, the most notable result is for EF4 (column (5)), which includes entities facilitating credit creation, such as credit insurers, financial guarantors, and monoline insurers. In this case, the coefficient is negative and statistically significant at the 1% level. This suggests that the growth of EF4 entities is associated with a decline in the annual growth rate of time deposits as a proportion of total bank liabilities. These NBFI entities typically offer saving products that could compete with time deposits, such as credit-linked investment products, guaranteed return schemes, or instruments tied to credit insurance and financial guarantees. These products often appeal to savers seeking higher returns, enhanced credit protection, or diversified investment opportunities compared to traditional time deposits offered by banks.

<INSERT TABLE 7>

Finally, we also examine the impact of NBFI entities on banks' short-term funding. In this case, our dependent variable is the annual growth rate of the proportion of short-term funding over total bank liabilities (Δ*Short-term Funding*). Short-term funding consists of instruments such as commercial paper, promissory notes, and the short-term portion of debt securities, which are vital sources of liquidity for banks. These instruments are used by banks to manage day-to-day operations and meet short-term obligations, often bridging the gap between the maturity of their liabilities and assets. NBFI entities, such as finance companies, broker-dealers, and securitization vehicles, often compete in the same short-term funding markets, issuing similar instruments to raise liquidity.

The results are shown in Table 8. As can be observed, the aggregate measure of NBFI activity (*NBFI_GDP*) in column (1) has a negative and statistically significant coefficient at the 10% level. This result suggests that, at the aggregate level, the growth of the NBFI sector is associated with a modest reduction in the annual growth rate of banks' short-term funding as a proportion of their total liabilities. Or the other way around, banks may have more difficulties accessing stable and cost-effective short-term funding as competition from NBFI entities intensifies. This finding may reflect increased competition from NBFI entities in short-term funding markets, as these entities often issue instruments such as commercial paper or repurchase agreements that attract investors who might otherwise fund banks. As these NBFI entities attract investors and institutions seeking higher returns or diversification, banks face increasing competition, leading to reduced availability of funding and potentially higher costs for securing short-term liquidity. Moreover, as could be observed (columns (3), (4), and (6)), the negative relationship is driven by EF2, EF3, and EF5 types of NBFI entities.

<INSERT TABLE 8>

4.2.2 Cost (pricing) of deposits

After examining whether and to what extent the different types of bank deposits are affected by NBFI entities, we now analyze if the cost of deposits is also a variable potentially affected by the development of these types of entities. The premise is that NBFI may also affect traditional banks' business model, not only affecting the amount of the different types of deposits that a traditional bank collects, but also the extent to which the bank pays interest for those deposits. As previously argued, NBFI entities may also compete with traditional banks' deposits through the provision of alternative investment products and other short-term instruments for investors that compete directly with bank deposits. Hence, it could be also reasonable to think that banks may also suffer from these competitive pressures and react via increased interest paid to deposits.

To do so, and following a similar procedure to that reported above, we compute a measure of the cost of deposits defined as the annual ratio between the amount of interest paid on deposits over the total amount of customer deposits (*Cost of Deposits*). As in the previous analyses, in all the regressions explaining the cost of deposits, we also include the vectors of bank-level (*BANK*) and country-level characteristics (*COUNTRY*) and consider bank- and year-fixed effects. The results are reported in Table 9. In column (1) we report the results obtained for the aggregate measure of the activity of NBFI. In columns (2) to (6) the results for the different economic functions of the NBFI entities are presented. As can be seen, we do not obtain any statistically significant coefficient at conventional levels.

Overall, these results suggest that the impact of NBFI activities on time deposits is limited, except for EF4 (insurance) entities, where we find a negative relationship. This could be driven by these entities offering saving products that directly compete with time deposits, such as credit-linked investment products or guaranteed return schemes, which attract savers away from traditional bank deposits. The impact on short-term funding, however, is more pronounced. At the aggregate level, NBFI activity is associated with a modest reduction in banks' short-term funding. This suggests that the growth of NBFI entities increases competition in short-term funding markets, making it more challenging for banks to secure cost-effective liquidity. Finally, the competition derived from the activity of the NBFI entities is not reflected in terms of the cost of deposits.

<INSERT TABLE 9>

4.3 Market power impact: Lerner index

The results presented in previous sections highlight that the development of the NBFI sector poses new competitive pressures to traditional banks both on the asset side of the bank balance sheet (via growth in loans and loan pricing), as well as on the liabilities-side (via changes in short-term funding, mainly). As previously shown, the degree to which NBFI entities compete with banks is different depending on the type of business developed by the specific economic function that they develop. Competition from the NBFI sector can be reflected in the amount of loans and credits that the traditional bank may grant, as well as in terms of its ability to set prices for the loans granted, which may finally suggest a clear impact on banks' performance ratios. Hence, we now further explore the extent to which NBFI activity may affect the degree of bank market power of our international sample of banks.

To carry out the empirical analysis, we first compute the Lerner index (*LERNER*) as a measure of the level of bank market power (i.e., it is an inverse proxy for bank competition). The Lerner index has been widely used in the banking sector as an indicator of the degree of market power (see, for instance, Beck et al., 2013; Cuadros-Solas et al., 2024; Cruz-García et al., 2021; Cubillas & González, 2014; Maudos & Fernández de Guevara, 2004). This index defines the difference between the price (interest rate) and marginal cost expressed as a percentage of the price, considering that divergence between product price and marginal cost of production is the essence of monopoly power.[11] It takes the value 0 in the case of perfect competition, and 1 under perfect monopoly.

The econometric specification follows a similar pattern to those previously defined. Apart from the specific variable proxying for the NBFI activity and the different economic functions developed by these entities (EF1-EF5), we also introduce bank- and country-level variables (*BANK* and *COUNTRY*, respectively), as well as bank- and year-fixed effects. The results are reported in Table 10. In column (1) we show the results for the aggregate measure of NBFI. In columns (2)-(6) we sequentially present the results for the regressions using each of the variables proxying for the different economic functions that the NBFI entities can develop (EF1-EF5). As can be seen in column (1), we find that the *NBFI_GDP* variable has a negative and significant effect on market power (*LERNER*). In line with the arguments discussed above, this finding suggests that, on average, as the volume of NBFI activity increases, bank market power decreases. This result suggests that the rise of NBFI

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[11] Appendix A describes in detail the construction of the Lerner index.

entities implies an increased level of competition in the traditional banking market. Hence, the arrival of these kinds of competitors seems to be increasing the level of contestability in the financial services market, thereby reducing bank market power.

The results reported in columns (2), (4), and (6) reveal that the effect of NBFI on bank market power is ultimately heterogeneous depending on the specific type of economic function. Hence, this negative impact on bank market power is partially driven by those NBFI entities mainly involved in the management of collective investment vehicles susceptible to runs (*NBFI_F1_GDP*); broker-dealers and securities finance companies, primarily engaging in facilitating market-based financial transactions rather than traditional credit intermediation (*NBFI_F3_GDP*); and entities focused on the securitization-based credit intermediation (*NBFI_F5_GDP*). Consistent with the results observed in section 4.1, these types of entities (EF1 and EF5) are precisely the ones that mostly affect traditional banking business and can undermine banks' ability to maintain or grow their loan portfolios and/or affect their ability to set prices. Similarly, in the case of EF3 entities, these entities may also affect the extent to which a traditional bank can provide intermediation activities in the capital markets. Hence, the competitive pressure is also increased in the presence of these entities. Results reported in columns (3) and (5) do not show any statistically significant coefficient at conventional levels for either EF2 or EF4.

<center><INSERT TABLE 10></center>

5. ADDITIONAL ANALYSES

5.1 The role of bank-level characteristics

We now analyze whether certain bank-level characteristics might shape the influence of NBFI on bank stability. The results obtained are presented in Table 11. In columns (1)-(6), we sequentially introduce the interactions between the measure of NBFI (*NBFI_GDP*) and each one of the variables capturing the different bank-level characteristics: *Size, Cost-to-Income, Liquidity, CET1, Deposit Orientation* and *Lending Orientation*. Results indicate that the negative and significant coefficient at conventional levels of the *NBFI_GDP* remains invariant to explain bank stability. Regarding interaction terms, we obtain negative and statistically significant coefficients in columns (2), (3), (4), and (6). These negative coefficients suggest that the negative effect of NBFI activity on bank stability is more relevant in the case of more inefficient, more liquid and better-capitalized banks, as well as in the case of banks more oriented to the loans business. These results are in line with the notion that inefficiencies in the

banking business are mainly due to poor lending decisions that arise from resource-intensive monitoring of delinquent borrowers, analyzing workout arrangements, and seizing and disposing of collateral (Berger and DeYoung, 1997). This would be even enhanced in the presence of NBFI entities. As for the interaction term with the level of bank liquidity, the results may be consistent with the fact that NBFI entities may pose an additional threat to traditional banks. Although higher levels of liquidity may increase financial stability by encouraging banks to reduce the risks and by facilitating the liquidation of assets during a crisis episode (Bernanke, 1983; Peek and Rosengren, 2000), it also makes crises less costly for banks (Wagner, 2007). According to this argument, banks may have an extra incentive to take on an amount of risk that more than offsets the positive direct impact on stability as a way to contest the presence of NBFI entities. We also obtain a negative and statistically significant coefficient for the interaction term with the CET1 ratio. This result would indicate that banks with higher levels of retained capital are better protected against credit risks but, at the same time, this fact is denotative of the more stringent regulation that affects traditional banks when compared to entities from the NBFI sector. Berger and Mester (1997) find that beyond certain thresholds, banks may become inefficient and reduce their financial stability. Hence, this effect could be particularly relevant when the NBFI sector is more developed. The extent to which banks are affected by additional capital regulatory requirements may make them more prone towards higher risk assumptions to react to the presence of NBFI entities. The results presented in column (6) are also consistent with the competition-based arguments. As can be seen, the coefficient for the interaction term *NBFI_ GDP * Lending Orientation*. This result indicates that more loan-oriented banks in their business would be the ones that suffer from the presence of NBFI entities in a more relevant way. As previously argued, those NBFI entities mostly focused on the credit generation are the ones that more heavily compete with traditional banks, thereby fostering the former to take more risks in an attempt to not lose market share in the loans market.

Interaction terms between the *NBFI_GDP* variable with *Size* and *Deposits Orientation* are positive and statistically significant at conventional levels. This implies that the negative effect of the activity of the NBFI sector on bank stability is counteracted by banks' size and by the extent to which the bank is reliant on deposits as a source of funding. In particular, the positive coefficient obtained for the interaction term of *NBFI_GDP* with *Size* indicates that in the case of large banks, the effect of NBFI on the *ZSCORE* is less negative. Larger banks are able to diversify and manage risks than smaller ones (Cubillas et al., 2021). Hence, although the overall negative impact of NBFI on bank

stability remains, the effect is counteracted by the higher ability that large banks may have to manage risks derived from the additional competitive pressures posed by these entities. A similar result is found when the interaction term between *NBFI_GDP* and *Deposit Orientation* is analyzed. As previously shown, the main source of competition for traditional banks comes from the asset-side (i.e. loans and credits), whereas the effect is less relevant when it comes to the volume of deposits.

Taken together, these results suggest that the final impact of NBFI on bank stability will ultimately depend on the type of examined bank. Typical bank-level characteristics, identified by previous literature as determinants of bank stability, will condition the extent to which banks can react to the presence of these competitors in the credit market, thereby affecting their ability to manage risks.

<INSERT TABLE 11>

5.2. Robustness tests

To ensure that our results are robust, we analyze the impact of NBFI activity using alternative variables proxying to bank stability and the activity of NBFI entities. The results are presented in Table 12. In Panel A we present the robustness tests based on alternative measures for bank stability. In column (1), we use the Z-score using a four-year moving window. In column (2) we compute an alternative Z-score variable that replaces the total capital ratio with the Common Equity Tier 1 capital (CET1). In column (3), following Berger et al. (2020) and Demirgüç-Kunt and Huizinga (2010), we use the accounting Sharpe ratio, which is defined as the return on equity divided by the standard deviation of the return on equity using a 3-year rolling time window. In column (4), we use the ratio of total impairments on loans and advances to total assets to total equity. As can be seen from these results, we continue to observe a negative relationship between the NBFI activity and bank stability.

In Panel B of Table 12 we report the results when alternative measures for the NBFI activity are used. In column (5) we use the NBFI assets-to-total financial system assets ratio (*NBFI_FINASSETS*). Results presented in column (6) are obtained using the ratio of NBFI assets over total banking sector assets *(NBFI_BANKASSETS)*. Both measures are aimed at capturing the weight of the NBFI activity in a more specific manner and using the financial system and the banking sector, respectively, as references. As can be observed, the results are consistent with those reported in the baseline regressions when the *NBFI_GDP* variable is used.

<INSERT TABLE 12>

To ensure that our results are not driven by a set of countries and banks in our sample, we conduct additional subsample analyses. We first conduct a subsample analysis excluding those non-high-income countries according to the World Bank's income level classification[12]. Since the NBFI could have a special relevance in emerging economies, we also aim to ensure that our results are not driven by these countries. Results are shown in column (1) of Table 13. The results reported are consistent when considering only high-income economies. In columns (2) and (3) we present the results obtained when only commercial banks and the largest banks (i.e. those banks with total assets larger than $30,000,000) are considered in the regression, respectively. We thus ensure that our results are not just driven by the impact of NBFI on non-commercial banks and medium-sized banks. As can be seen, even after these subsamples analyses, the results are consistent with the baseline findings.

<INSERT TABLE 13>

6. CONCLUSIONS

The NBFI sector has gained remarkable prominence in recent years, reflecting its critical role in the evolving financial landscape. NBFI entities have expanded their footprint by offering innovative financial solutions and filling gaps left by traditional banks, particularly in the wake of the GFC. Their activities now represent a significant portion of global financial assets, with steady growth driven by advancements in technology, regulatory arbitrage opportunities, and the increasing demand for diversified investment and funding options. According to recent data, the NBFI sector's share of financial intermediation has risen substantially, with specific segments, such as collective investment vehicles and securitization-based entities, leading this growth. This expansion highlights the sector's importance in facilitating credit provision, supporting economic activity, and fostering competition within the financial system. However, it also highlights the need for robust regulatory frameworks to manage the potential risks associated with its rapid development and interconnectedness with traditional banking.

This paper examines the impact of NBFI entities on the stability of traditional banks, utilizing an extensive international sample covering 16,563 banks across 27 countries from 2009 to 2022. Our findings reveal that aggregate NBFI activity negatively influences bank stability, with the effect

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[12] A description of the World Bank's methodology for classifying countries based on income level can be found at https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2021-2022. According to the definition from the World Bank, banks from the following (8) countries are removed from the regression: Argentina, Brazil, China, India, Indonesia, Mexico, South Africa and Turkey.

particularly pronounced in the context of entities focused on collective investment vehicles and securitization-based intermediation. These entities may intensify competition for financial resources, increase systemic risk through liquidity mismatches, and propagate complexity within financial intermediation chains.

The results suggest that the NBFI, by competing in both credit and deposit markets, alters traditional banks' business models. On the asset side, NBFI activity leads to slower loan growth and influences loan pricing strategies, indicating increased competition. On the liability side, certain NBFI functions exert pressure on bank funding structures, notably reducing the growth of time deposits and increasing challenges in short-term funding markets. Additionally, we demonstrate that NBFI activity diminishes bank market power, which may compel banks to adopt riskier strategies, thereby undermining stability.

From a policy perspective, these findings underline the need for a balanced approach to NBFI regulation. While NBFI entities play a critical role in diversifying financial intermediation and enhancing access to funding, their activities can amplify risks to the traditional banking sector and the broader financial system. Policymakers should consider frameworks that ensure a level playing field between the traditional banking sector and the NBFI, particularly in terms of regulatory oversight and systemic risk mitigation. Enhanced monitoring of the NBFI interconnections with banks and their contributions to market fragility is essential to address potential vulnerabilities. Furthermore, banks must adapt to the competitive pressures posed by NBFI activity. Strategies such as leveraging technological innovations, optimizing risk management frameworks, and focusing on customer-centric business models may help banks maintain resilience. Simultaneously, regulators should facilitate an environment where both sectors can coexist and complement each other, contributing to a more stable and efficient financial ecosystem.

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APPENDIX A: Estimating Lerner index

The Lerner index measures the capacity of a bank to set a price above its marginal cost. Specifically, it defines the difference between price and marginal cost expressed as a percentage of price. It assumes that the divergence between product price and the marginal cost of production is the essence of monopoly power, such that the higher the margin, the greater its market power. The Lerner index ranges between 0 and 1, with 0 being the case of perfect competition, and 1 of perfect monopoly.

Algebraically the Lerner index for each bank i and year t is calculated as follows:

$$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$$

[A1]

where P_{it} is the average price of the output of bank i in year t. It is estimated as the ratio between total income and total assets. The underlying assumption is that the flow of goods and services that banks produce is proportional to their total assets, generating financial and non-financial income. MC_{it} is the marginal cost of bank i in year t. The traditional approximation of the Lerner index does not consider the credit risk faced by banks. If a bank sets a higher interest rate as a result of the risk it assumes, a greater difference between price and marginal cost does not necessarily imply greater market power but may simply reflect the higher cost of risk. Following Maudos and Fernández De Guevara (2004), marginal cost is calculated based on a translog cost function, that we correct for credit risk as in Cruz et al. (2021)[13]:

$$lnC_{it} = \alpha_0 + \alpha_1 lnTA_{it} + \frac{1}{2}\alpha_k(lnTA_{it})^2$$

$$+ \sum_{j=1}^{4}\beta_j lnw_{jit} + \frac{1}{2}\sum_{j=1}^{4}\sum_{k=1}^{4}\beta_{jk} lnw_{jit} lnw_{kit} + \frac{1}{2}\sum_{j=1}^{4}\gamma_j lnTA_{it} lnw_{jit} + \mu_1 Trend$$

$$+ \frac{1}{2}\mu_2 Trend^2 + \mu_3 Trend\, lnTA_{it} + \sum_{j=1}^{4}\delta_j Trend\, lnw_{jit} + v_i + u_{it}$$

[A2]

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[13] Jiménez et al., (2013) construct a risk-corrected Lerner index, using information on the probability of default (PD) from the Central Credit Registry (CCR) of Bank of Spain, to which we do not have access.

where C is the total costs (financial costs, operating costs, and provisions) of bank i at time t. The cost function differs from the traditional one in that as well as the financial and operational costs, it includes the provisions that a bank makes each year, with this variable being an ex-post proxy of the cost of risk. TA is total assets and w the price of the different production factors of bank i at time t. We consider the price of four inputs:

w_1: Price of labor = staff costs / total assets[14]

w_2: Price of lendable funds = financial costs / lendable funds

w_3: Price of capital = operating costs (except staff costs) / fixed assets

w_4: Price of credit risk = provisions / volume of lending[15]

We estimate the costs' function (and hence marginal costs) separately for each country over the sample period. We allow the parameters of the cost function to vary from one country to another to reflect different technologies. To capture the influence of variables specific to each bank, we estimate the function by introducing fixed individual effects (v_i). We capture the influence of technical change in the cost function over time by including Trend. u_{it} is a random disturbance.

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[14] The price of this input (labor) could be calculated as staff costs over number of employees (instead of staff costs over total assets). However, the "number of employees" variable is not available in ORBIS Bank Focus for many of the banks in our sample (implying fewer observations). For this reason, we decided to use total assets as the denominator to calculate the price of labor.

[15] Given that risk is included in the dependent variable, it is necessary to include the unit cost of this production input, which we can call "credit risk", as a determinant, approximating it as a ratio between provisions and the volume of lending.

APPENDIX B:

Table B1. Description of NBFI by Economic Functions

Economic Function (EF)	Definition	Examples	Business Model
EF1: Collective Investment Vehicles with Features that Make Them Susceptible to Runs	Entities that pool funds from multiple investors to invest in financial assets, offering redemption rights that can lead to liquidity mismatches.	Money Market Funds (MMFs), Open-ended Fixed Income Funds, Hedge Funds, Exchange-Traded Funds (ETFs), Real Estate Investment Trusts (REITs).	Pooling investor funds to invest in diversified portfolios, offering daily liquidity, which can create liquidity mismatches during market stress.
EF2: Loan Provision That Is Dependent on Short-Term Funding	Entities providing loans or credit facilities financed predominantly through short-term funding sources.	Finance Companies, Leasing Companies, Consumer Credit Providers, Peer-to-Peer Lending Platforms, Factoring Companies.	Extending credit to consumers or businesses, funded by issuing short-term commercial paper, borrowing from wholesale markets, or relying on retail deposits.
EF3: Intermediation of Market Activities Dependent on Short-Term Funding or on Secured Funding of Client Assets	Entities facilitating market intermediation activities reliant on short-term funding, including the use of client assets as collateral.	Broker-Dealers, Securities Lending Agents, Market Makers, High-Frequency Trading Firms, Repo Markets Participants.	Engaging in securities trading and lending, funded through repurchase agreements, securities borrowing, or other short-term mechanisms.
EF4: Provision of Financial Guarantees or Insurance	Entities offering credit enhancements or insurance products that support credit intermediation by mitigating credit risk.	Monoline Insurers, Credit Derivative Product Companies, Financial Guaranty Insurers, Credit Enhancement Providers, Swap Dealers (in credit default swaps).	Providing guarantees, insurance, or credit default swaps to protect investors against losses from credit events, thereby supporting credit market activities.
EF5: Facilitation of Credit Intermediation Through Securitization and Funding Structures	Entities involved in the process of transforming illiquid assets into tradable securities, facilitating credit intermediation.	Structured Investment Vehicles (SIVs), Asset-Backed Commercial Paper (ABCP) Conduits, Collateralized Loan Obligations (CLOs), Mortgage-Backed Securities (MBS) Issuers, Special Purpose Entities (SPEs).	Purchasing pools of loans or receivables (e.g., mortgages, auto loans) and financing these through the issuance of asset-backed securities to investors.

Table B2. NBFI by country (2009 – 2022)

	NBFI_GDP (%)	NBFI_F1_GDP (%)	NBFI_F2_GDP (%)	NBFI_F3_GDP (%)	NBFI_F4_GDP (%)	NBFI_F5_GDP (%)
Argentina	6.74	3.79	1.20	0.21	0.30	1.34
Australia	59.48	46.88	4.67	-	0.36	7.57
Belgium	29.31	24.64	1.88	-	-	2.79
Brazil	38.84	36.68	0.06	0.18	0.33	1.60
Canada	79.21	59.84	10.26	2.72	0.35	6.04
Chile	22.77	15.62	5.46	1.20	0.10	0.39
China	42.82	37.09	1.28	2.50	-	7.62
France	59.82	50.90	0.50	2.20	0.78	5.61
Germany	49.20	45.63	1.89	0.10	-	1.86
Hong Kong	24.12	9.06	4.87	10.97	0.06	0.21
India	21.09	5.17	15.81	0.06	0.00	0.07
Indonesia	4.45	1.18	3.24	-	-	0.03
Ireland	884.58	597.41	-	3.50	6.07	181.67
Italy	25.52	11.89	4.21	0.08	1.11	9.70
Japan	53.84	16.95	10.20	22.41	-	4.28
Luxembourg	5012.34	4564.62	-	0.57	1.77	277.06
Mexico	17.69	8.06	4.98	2.73	0.02	1.89
Netherlands	63.85	45.48	2.83	1.44	-	14.30
Saudi Arabia	6.90	4.16	1.28	-	-	-
Singapore	10.27	5.75	0.10	2.82	-	1.61
South Africa	42.18	35.90	5.01	0.51	0.19	0.90
Spain	24.84	19.59	0.82	0.42	0.10	3.91
Switzerland	80.78	66.51	2.24	1.44	0.07	-
Turkey	7.56	2.26	3.28	0.63	-	-
UK	45.07	24.80	9.52	4.41	0.16	6.19
United States	85.43	51.98	10.18	11.40	0.29	9.39
South Korea	47.43	14.69	7.88	13.90	1.20	9.76

Table B3. Variables definitions and sources

This table describes the variables used in the paper and indicates the sources from which the data were retrieved.

Variable	Definition	Source
PANEL A: Main variables		
NBFI_GDP	Ratio of total assets of NBFI to GDP	FSB
NBFI_F1_GDP	Ratio of total assets of NBFI F1 to GDP, where F1 refers to total assets of collective investment vehicles susceptible to runs (money market funds, fixed income funds, mixed funds, credit hedge funds, real estate funds)	FSB
NBFI_F2_GDP	Ratio of total assets of NBFI to GDP where F2 refers to total assets of entities reliant on short-term funding for lending (finance companies, leasing and factoring companies, consumer credit companies)	FSB
NBFI_F3_GDP	Ratio of total assets of NBFI to GDP where F3 refers to total assets of market intermediaries engaging in short-term funding activities (broker-dealers, custodial accounts, securities finance companies)	FSB
NBFI_F4_GDP	Ratio of total assets of NBFI to GDP where F4 refers to total assets of credit facilitators offering guarantees and insurance (credit insurance companies, financial guarantors, monoline insurers)	FSB
NBFI_F5_GDP	Ratio of total assets of NBFI to GDP where F5 refers to total assets of securitization-based credit intermediaries (securitization vehicles, structured finance vehicles, asset-backed securities)	FSB
ZSCORE	The natural logarithm of (ROA + CAP)/sd(ROA), where ROA is the return on assets, CAP is the capital to asset ratio, and sd(ROA) is an estimate of the standard deviation of the rate of return on assets. To calculate the standard deviation of ROA, we use a three-year moving window. A higher Z-score indicates that the bank is more stable because it is inversely related with the bank's default probability.	BankFocus
PANEL B: Bank-level control variables		
Size	The natural logarithm of total bank assets	BankFocus
Cost-to-Income	Total operating expenses by total operating income. It represents the efficiency of a bank's operations. A lower ratio means the bank is more efficient.	BankFocus
∆Profits	Annual growth rate in total profits of the bank.	BankFocus
∆Loans	Annual growth rate in the volume of bank loans.	BankFocus
Liquidity	High liquid assets (Cash & balances with central banks + Net loans and advances to banks) to total bank assets.	BankFocus

Traditional	Total interest income to total bank assets. A higher ratio means that the bank is less diversified.	BankFocus

PANEL C: Macroeconomic control variables

GDPpc	Natural logarithm of the annual growth rate of GDP per capita	IMF
Inflation	Annual percentage change of end-of-period consumer price index.	IMF
Private Credit	Private credit by deposit money banks and other financial institutions to GDP.	Global Financial Development Database (World Bank)

PANEL D: Other variables

Δ*Bank Loans*	Annual growth rate of the proportion of bank loans over total bank assets	BankFocus
Price of Loans	Ratio of interest on loans over total loans	BankFocus
Δ*Time Deposits*	Annual growth rate of the proportion of time deposits over total bank liabilities	BankFocus
Δ*Short-term Funding*	Annual growth rate of the proportion of short-term funding over total bank liabilities	BankFocus
Cost of Deposits	Annual ratio between the amount of interest paid on deposits over the total amount of customer deposits	BankFocus
LERNER	The difference between the interest rate and marginal cost expressed as a percentage of price. This index moves between 0 (pure perfect competition) and 1 (perfect monopoly). $$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$$	Own calculations using data from BankFocus
CET1	Ratio of Common Equity Tier 1 (CET1) capital under Basel III to total bank assets.	BankFocus
ZSCORE4	The natural logarithm of (ROA + CAP)/sd(ROA), where ROA is the return on assets, CAP is the capital to asset ratio, and sd(ROA) is an estimate of the standard deviation of the rate of return on assets. To calculate the standard deviation of ROA, we use a four-year moving window.	BankFocus
NBFI_FINASSETS	Ratio of total assets of NBFI to-total financial system assets	FSB
NBFI_BANKASSETS	Ratio of total assets of NBFI to-total banking system assets	FSB
Sharpe ratio	Ratio of the return on equity divided by the standard deviation of the return on equity using a 3-year rolling time window	BankFocus
IMPAIRMENT	Ratio of Impairment on loans and advances to total bank assets	BankFocus

Figure 1. Evolution of NBFI activity (%GDP) (2009-2022)
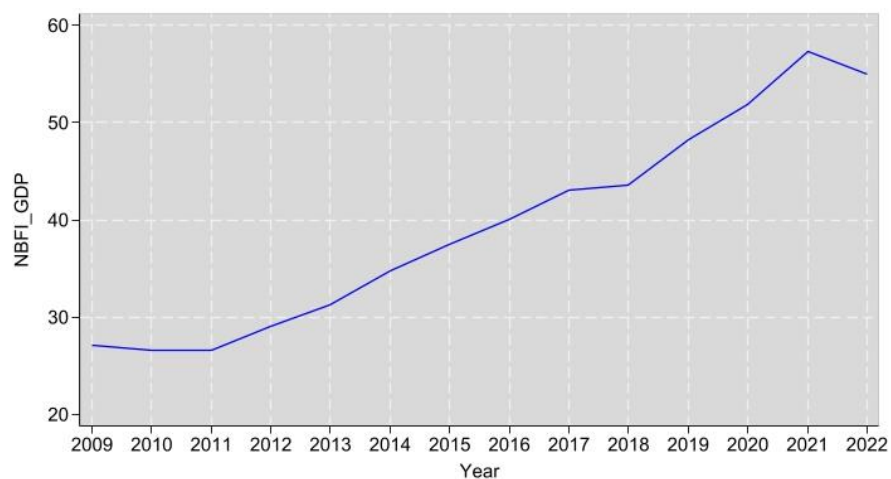
Source: Own elaboration with data retrieved from the *FSB's Global Monitoring Report on Non-Bank Financial Intermediation*.

Figure 2. Distribution of NBFI activity by economic functions (2009-2022)
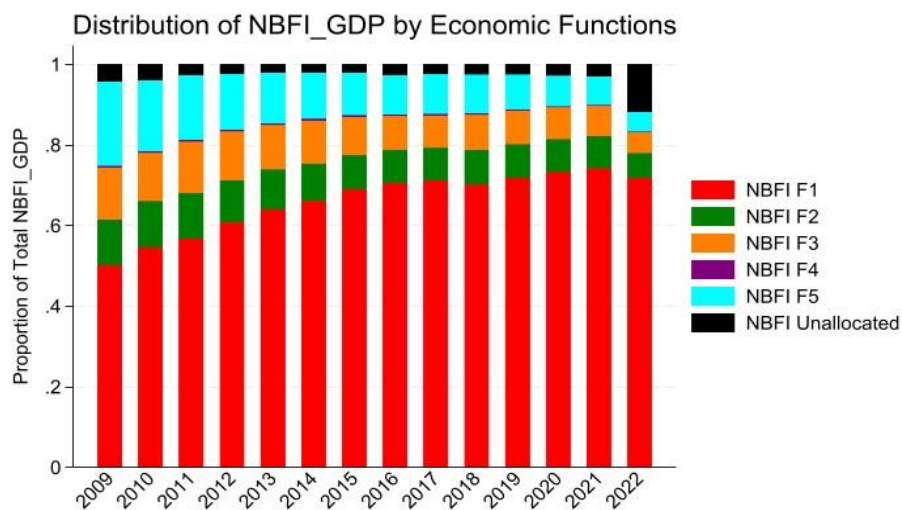
Source: Own elaboration with data retrieved from the *FSB's Global Monitoring Report on Non-Bank Financial Intermediation*.

Table 1. Descriptive statistics

This table shows the main descriptive statistics (mean, standard deviation, median, 25th, 50th, 75th, 1st, and 99th percentiles) of the main variables of interest. All the variables are defined in Table B3 of the Appendix.

	Obs.	Mean	St. Dev.	25%	Median	75%	1%	99%
NBFI_GDP	56335	121.76	545.68	49.79	62.49	75.40	4.59	4356.30
NBFI_F1_GDP	56232	97.27	490.80	19.50	48.48	60.58	1.26	3774.46
NBFI_F2_GDP	54734	6.01	4.15	1.65	7.58	8.71	0.05	15.16
NBFI_F3_GDP	54013	6.70	7.58	0.11	7.04	8.77	0.01	28.10
NBFI_F4_GDP	36273	0.43	0.55	0.23	0.24	0.42	0.00	2.23
NBFI_F5_GDP	52815	9.03	28.85	1.77	5.65	6.18	0.03	206.40
ZSCORE	56335	4.01	1.15	3.29	4.06	4.79	1.09	6.64
Size	56335	14.17	2.30	12.84	14.19	15.49	7.89	20.14
Cost-to-Income	56335	0.69	3.97	0.58	0.69	0.80	0.21	1.58
ΔProfits	56335	-0.62	111.82	-0.25	0.03	0.29	-10.63	7.76
ΔLoans	56335	7.81	1335.59	0.00	0.07	0.16	-0.39	1.35
Liquidity	56335	0.16	0.16	0.06	0.11	0.21	0.01	0.79
Traditional	56335	0.03	0.03	0.02	0.03	0.04	0.00	0.16
GDPpc	56335	81.62	37.90	50.40	77.30	100.80	25.91	213.50
Inflation	56335	3.27	4.62	0.53	1.73	6.36	-1.14	11.14
Private Credit	56335	10.73	0.49	10.63	10.88	11.04	8.80	11.64
log(roa+equity/assets)	56255	-2.34	0.59	-2.60	-2.31	-2.06	-3.91	-0.38
log(sd(roa))	56335	0.004	0.012	0.001	0.002	0.004	0.000	0.043
ΔBank Loans	56297	0.35	69.04	-0.03	0.01	0.06	-0.40	0.68
Price of Loans	48366	0.64	71.38	0.03	0.04	0.05	0.01	0.30
ΔTime Deposits	40578	0.74	44.08	-0.17	-0.05	0.03	-0.79	3.74
ΔShort-Term Funding	21494	50.62	1871.68	-0.34	-0.04	0.28	-1.00	127.38
Cost of Deposits	31205	0.77	81.35	0.00	0.00	0.01	0.00	0.19
Lerner	45997	0.48	0.15	0.41	0.51	0.58	0.05	0.78
CET1	54642	0.06	0.47	0.01	0.03	0.08	0.00	0.50
Deposits orientation	56059	0.86	0.19	0.82	0.93	0.98	0.05	1.00
Loans orientation	56324	0.59	0.22	0.47	0.62	0.74	0.01	0.92

Table 2. NBFI and Bank Stability

This table shows the results for the relationship between NBFI activity and bank stability. The dependent variable is the bank Z-score. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and bank stability. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	ZSCORE					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.000**					
	(-2.464)					
NBFI_F1_GDP		-0.000**				
		(-2.373)				
NBFI_F2_GDP			-0.006			
			(-0.539)			
NBFI_F3_GDP				0.006		
				(0.681)		
NBFI_F4_GDP					0.035	
					(0.620)	
NBFI_F5_GDP						-0.002*
						(-1.920)
Size	0.003	0.007	-0.000	0.044	0.103***	0.001
	(0.074)	(0.156)	(-0.004)	(1.708)	(3.345)	(0.027)
Cost-to-Income	0.000	0.000	0.000	0.000	0.001	0.001
	(0.376)	(0.373)	(0.298)	(0.090)	(0.401)	(0.565)
⊿Profits	0.000	0.000	0.000***	0.000	0.000	0.000
	(1.073)	(1.075)	(3.083)	(1.051)	(1.035)	(1.113)
⊿Loans	-0.000*	-0.000*	-0.000***	-0.000*	-0.000***	-0.000*
	(-1.934)	(-1.935)	(-7.378)	(-2.000)	(-19.320)	(-1.983)
Liquidity	-0.328	-0.314	-0.430**	-0.356*	-0.370*	-0.362
	(-1.557)	(-1.492)	(-2.065)	(-1.783)	(-1.855)	(-1.686)
Traditional	-0.384	-0.291	-0.376	0.428	-0.121	-0.271
	(-0.614)	(-0.454)	(-0.579)	(0.680)	(-0.326)	(-0.459)
Private Credit	0.007*	0.008*	0.009*	0.007	0.003	0.008*
	(1.889)	(1.950)	(2.016)	(1.614)	(1.106)	(1.948)
Inflation	-0.012***	-0.012***	-0.012***	-0.010***	-0.014	-0.015***
	(-4.174)	(-4.225)	(-3.945)	(-2.875)	(-1.687)	(-2.922)
GDPpc	-0.733	-0.504	-0.982	-0.518	0.285	-0.661
	(-1.224)	(-0.704)	(-1.482)	(-0.663)	(0.595)	(-1.148)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	56,335	56232	54,734	54,013	36,276	52,815
Number of banks	16,563	16,561	16,328	16,215	13,362	15,968
R2 (WITHIN)	0.131	0.131	0.132	0.135	0.155	0.140

Table 3. NBFI and Bank Stability: Z-Score decomposition (the numerator)

This table shows the results for the relationship between NBFI activity and bank stability. The dependent variable is the bank Z-score. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and bank stability. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	log(roa+equity/assets)					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	0.000					
	(0.203)					
NBFI_F1_GDP		0.000				
		(0.719)				
NBFI_F2_GDP			-0.013**			
			(-2.168)			
NBFI_F3_GDP				-0.009***		
				(-4.873)		
NBFI_F4_GDP					0.084*	
					(2.025)	
NBFI_F5_GDP						-0.000
						(-0.419)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	56,335	56,232	54,734	54,013	36,276	52,815
Number of banks	16,563	16,561	16,328	16,215	13,362	15,968
R2 (WITHIN)	0.07	0.07	0.05	0.078	0.076	0.081

Table 4. NBFI and Bank Stability: Z-Score decomposition (the denominator)

This table shows the results for the relationship between NBFI activity and bank stability. The dependent variable is the bank Z-score. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and bank stability. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	log(sd(roa))					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	0.000***					
	(3.164)					
NBFI_F1_GDP		0.000**				
		(2.561)				
NBFI_F2_GDP			0.000			
			(0.443)			
NBFI_F3_GDP				-0.000		
				(-0.105)		
NBFI_F4_GDP					0.000	
					(0.061)	
NBFI_F5_GDP						0.000***
						(4.098)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	56,335	56,232	54,734	54,013	36,276	52,815
Number of banks	16,563	16,561	16,328	16,215	13,362	15,968
R2 (WITHIN)	0.049	0.050	0.050	0.051	0.061	0.052

Table 5. NBFI and Bank Loans: Volume

This table shows the results for the relationship between NBFI activity and growth in bank loans. The dependent variable is the annual growth rate of bank loans over total assets. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and the growth in bank loans. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *** indicate significance at the 1% level.

Dependent variable:	Δ**Bank Loans**					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.048*** (-100.189)					
NBFI_F1_GDP		-0.055*** (-65.060)				
NBFI_F2_GDP			-0.001 (-0.111)			
NBFI_F3_GDP				-0.198 (-0.952)		
NBFI_F4_GDP					7.458 (1.122)	
NBFI_F5_GDP						-0.204*** (-6.931)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	56,868	56,765	55,261	54,525	36,687	53,327
Number of banks	16,638	16,636	16,401	16,284	13,429	16,042
R2 (WITHIN)	0.003	0.003	0.001	0.001	0.002	0.002

Table 6. NBFI and Bank Loans: Pricing

This table shows the results for the relationship between NBFI activity and the price of bank loans. The dependent variable is the annual ratio of interest on loans over total loans. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and the price of loans. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *** indicates significance at the 1% level.

Dependent variable:	Price of Loans					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.003					
	(-0.89)					
NBFI_F1_GDP		-0.001				
		(-0.73)				
NBFI_F2_GDP			-0.776***			
			(-3.32)			
NBFI_F3_GDP				-0.392***		
				(-3.65)		
NBFI_F4_GDP					-0.521	
					(-0.79)	
NBFI_F5_GDP						-0.031
						(-0.88)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	48,723	48,651	47,652	46,961	29,577	47,805
Number of banks	15,597	15,595	15,435	15,308	12,514	15,422
R2 (WITHIN)	0.057	0.057	0.059	0.060	0.061	0.057

Table 7. NBFI and Bank Time Deposits: Volume

This table shows the results for the relationship between NBFI activity and growth of time deposits. The dependent variable is the annual growth rate of time deposits over total liabilities. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and the growth of time deposits. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *** indicates significance at the 1% level.

Dependent variable:	ΔTime Deposits					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	0.000					
	(0.120)					
NBFI_F1_GDP		-0.000				
		(-0.489)				
NBFI_F2_GDP			0.400			
			(1.620)			
NBFI_F3_GDP				0.136		
				(0.830)		
NBFI_F4_GDP					-1.146***	
					(-3.494)	
NBFI_F5_GDP						0.012
						(0.908)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	40,834	40,765	39,614	38,839	22,337	39,870
Number of banks	10,296	10,294	10,123	9,992	7,326	10,081
R2 (WITHIN)	0.003	0.003	0.003	0.004	0.005	0.003

Table 8. NBFI and Bank Short-Term Funding: Volume

This table shows the results for the relationship between NBFI activity and the growth of short-term bank funding. The dependent variable is the annual growth rate of short-term funding over total liabilities. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and the growth of short-term bank funding. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	ΔShort-Term Funding					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.078*					
	(-1.940)					
NBFI_F1_GDP		-0.045				
		(-1.081)				
NBFI_F2_GDP			-23.344***			
			(-3.930)			
NBFI_F3_GDP				-8.685***		
				(-4.529)		
NBFI_F4_GDP					87.618*	
					(1.755)	
NBFI_F5_GDP						-1.106**
						(-2.409)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	21,568	21,554	21,218	21,188	16,874	20,797
Number of banks	8,581	8,580	8,489	8,458	7,235	8,410
R2 (WITHIN)	0.004	0.004	0.004	0.004	0.005	0.004

Table 9. NBFI and the Cost of Bank Deposits

This table shows the results for the relationship between NBFI activity and the cost of bank deposits. The dependent variable is the annual ratio between the amount of interest paid on deposits over the total amount of customer deposits. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and the cost of deposits. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses.

Dependent variable:	Cost of Deposits					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.001					
	(-1.03)					
NBFI_F1_GDP		-0.001				
		(-0.80)				
NBFI_F2_GDP			-0.017			
			(-0.15)			
NBFI_F3_GDP				-0.043		
				(-0.76)		
NBFI_F4_GDP					1.293	
					(1.17)	
NBFI_F5_GDP						-0.020
						(-1.19)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	31,364	31,292	30,489	29,795	22,243	30,588
Number of banks	8,772	8,770	8,627	8,488	7,312	8,621
R2 (WITHIN)	0.003	0.003	0.003	0.003	0.004	0.003

Table 10. NBFI and Bank Market Power

This table shows the results for the relationship between NBFI activity and bank market power. The dependent variable is the Lerner index. Columns (2) to (6) show the results for the relationship of each NBFI economic function (EF1-EF5) and bank market power. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. ** and *** indicate significance at the 5% and 1% levels, respectively.

Dependent variable:	Lerner					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.000***					
	(-4.48)					
NBFI_F1_GDP		-0.000***				
		(-6.89)				
NBFI_F2_GDP			0.000			
			(0.036)			
NBFI_F3_GDP				-0.001**		
				(-2.03)		
NBFI_F4_GDP					0.001	
					(0.211)	
NBFI_F5_GDP						-0.000***
						(-3.15)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	46,187	46,116	45,304	44,558	31,037	43,312
Number of banks	14,867	14,865	14,711	14,592	12,026	14,355
R2 (WITHIN)	0.094	0.093	0.096	0.100	0.094	0.098

Table 11. NBFI and Bank Stability: Heterogeneities

This table shows the results for the role of the bank-level characteristics on the relationship between NBFI activity and bank stability. The dependent variable is the bank Z-score. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	ZSCORE					
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.001***	-0.000**	-0.000**	-0.000**	-0.000**	-0.000*
	(-7.99)	(-2.05)	(-2.49)	(-2.46)	(-2.77)	(-1.87)
NBFI_GDP * Size	0.000***					
	(6.45)					
NBFI_GDP * Cost-to-Income		-0.000**				
		(-2.39)				
NBFI_GDP * Liquidity			-0.000**			
			(-2.20)			
NBFI_GDP * CET1				-0.000***		
				(-3.51)		
NBFI_GDP * Deposits Orientation					0.000*	
					(1.72)	
NBFI_GDP * Lending Orientation						-0.000***
						(-3.78)
Size	-0.007					
	(-0.169)					
Cost-to-Income		0.002**				
		(2.72)				
Liquidity			-0.368			
			(-1.66)			
CET1				-0.004		
				(-0.72)		
Deposits orientation					-0.413	
					(-1.57)	
Loans orientation						0.194
						(1.38)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	56,335	56,335	56,335	51,513	56,054	56,335
Number of banks	16,563	16,563	16,563	13,593	16,491	16,563
R2 (WITHIN)	0.131	0.131	0.131	0.133	0.133	0.132

Table 12. NBFI and Bank Stability: Robustness (I)

This table shows the results for the robustness checks. The dependent variable is the bank Z-score. Panel A show the results obtained when different measures of bank stability are used. In column (1), we use the Z-score using a four-year moving window. In column (2) we compute an alternative Z-score variable that replaces the total capital ratio with the Common Equity Tier 1 capital (CET1). In column (3), we use the accounting Sharpe ratio, which is defined as the return on equity divided by the standard deviation of the return on equity using a 3-year rolling time window. In column (4), we use the ratio of total impairments on loans and advances to total assets to total equity. In Panel B we replace the *NBFI_GDP* variable for the ratio of NBFI assets-to-total financial system assets (column (5)) and the NBFI assets-to-total banking sector assets (column (6)). The remaining variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	PANEL A: Alternative Dependent Variable				PANEL B: Alternative NBFI Variable	
	ZSCORE4	ZSCORE_CET1	SHARPE	IMPAIRMENT	ZSCORE	ZSCORE
	(1)	(2)	(3)	(4)	(5)	(6)
NBFI_GDP	-0.000**	-0.003**	-0.000***	0.000*		
	(-2.62)	(-2.43)	(-3.40)	(1.76)		
NBFI_FINASSETS					-0.022**	
					(-2.13)	
NBFI_BANKASSETS						-0.002*
						(-1.87)
Bank and macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level	Country-level	Country-level	Country-level
Observations	43,821	54,282	51,785	53,318	56,335	56,335
Number of banks	10,082	16,386	14,752	16,458	16,563	16,563
R2 (WITHIN)	0.149	0.114	0.099	0.012	0.132	0.131

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Table 13. NBFI and Bank Stability: Robustness (II)

This table shows the results for the robustness checks. The dependent variable is the bank Z-score. Panel A shows the results obtained when non-high income countries are excluded. Panel B reports the results for the subsample of commercial banks. In Panel C we restrict the sample to the largest banks only. All the variables are defined in Table B3 of the Appendix. In all the estimates, bank and year fixed effects are included (not reported). T-statistics for the clustered standard errors are in parentheses. ** and *** indicate significance at the 5% and 1% levels, respectively.

	Panel A: Excluding Non-High Income Countries	Panel B: Subsample of Commercial Banks	Panel C: Subsample of Largest Banks
Dependent variable:	ZSCORE	ZSCORE	ZSCORE
	(1)	(2)	(3)
NBFI_GDP	-0.000**	-0.000**	-0.000***
	(-2.29)	(-2.65)	(-3.43)
Bank and macroeconomic controls	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Clustered Standard Errors	Country-level	Country-level	Country-level
Observations	50,019	21,278	5,081
Number of banks	14,821	6,212	896
R2 (WITHIN)	0.150	0.158	0.233