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BANKING ON DEPOSITS IN A DOLLARIZED ECONOMY

Maturity Transformation and Interest Rate Risk in Armenia

Working Paper WP-2026-04

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ABSTRACT

This paper examines how Armenian banks manage interest rate risk while engaging in maturity transformation, using a quarterly bank-level dataset covering all commercial banks from 2014 to 2024. We document significant maturity mismatch in the Armenian banking sector, with an average duration gap of about 2 years. Despite this mismatch, net interest margins show little systematic sensitivity to changes in Central Bank of Armenia's (CBA) policy rate. This suggests that Armenian banks' interest income and expense move together, consistent with sensitivity matching in realized cash flows over the sample period. This matching is strongest for local-currency (AMD) positions, while for foreign-currency positions it is considerably weaker, highlighting the importance of currency composition in a highly dollarized banking system.

Keywords:	Maturity Transformation, Interest Rate Risk, Sensitivity Matching, Deposit Franchise, Monetary Transmission
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1 Introduction

Two primary functions of banks in the financial system are to take deposits from households and provide loans. It is generally recognized that banks finance long-term assets with short-term liabilities, and engage in what is commonly referred to in the literature as maturity transformation (Diamond and Dybvig, 1983, Gorton and Pennacchi, 1990, Kashyap, R. Rajan, and Stein, 2002). Diamond and Dybvig, 1983 discuss the maturity transformation, showing that banks transform illiquid long-term investments into liquid demand deposits, allowing households to smooth consumption while financing productive projects. However, in traditional banking theory, this activity makes banks vulnerable to liquidity and interest rate risks, since assets and deposits reprice at different speeds when market interest rates rise: increases in interest rates can raise funding costs more than asset returns, reducing bank profitability and equity. Most of the literature emphasizes the liquidity side of this vulnerability, namely the risk that depositors withdraw simultaneously and force the fire-sale liquidation of illiquid assets (Diamond and R. G. Rajan, 2001; Brunnermeier, Gorton, and Krishnamurthy, 2012; Segura and Suarez, 2017). Bologna (2018) shows that more maturity transformation can raise net interest margins but that excessive maturity transformation increases risk exposure.

Beyond liquidity risk, banks' maturity mismatches also expose them to interest rate risk. These two risks are conceptually distinct, as assets may be exposed to one but not the other. In addition, liquidity risk is concentrated during financial crises, while interest rate risk is continuously important (Drechsler, Savov, and Schnabl, 2021). Reflecting this importance, the Basel framework for interest rate risk in the banking book (IRRBB) identifies repricing (gap) risk as one of its principal components (Basel Committee on Banking Supervision, 2024), and understanding these exposures is important for assessing the banking sector's resilience to changes in interest rates. Drechsler, Savov, and Schnabl (2021), however, show that maturity transformation does not inherently imply interest rate risk, since banks use a natural hedging mechanism. The key idea behind this mechanism is the "deposit franchise": because deposits provide payment services, liquidity and an ongoing bank relationship, depositors accept rates below market rates that adjust slowly, so banks raise deposit rates by substantially less than market rates. This allows banks to manage their balance sheets in a way that matches the sensitivities of interest income and interest expense, and thus offset the interest rate risk, protecting net interest margins from interest rate shocks, even when balance sheets exhibit considerable duration mismatches. Most of the existing evidence on this mechanism comes from the banking systems of advanced countries. Much less is known about whether similar dynamics operate in small, open and highly dollarized economies, where banks operate with multi-currency balance sheets, rely heavily on foreign-currency funding, and are more exposed to external shocks.

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These features raise an important question: whether persistent maturity transformation in the Armenian banking system increase banks' exposure to interest rate risk. Using a supervisory bank-level panel covering all Armenian commercial banks from 2014 to 2024 at a quarterly frequency, we apply the framework of Drechsler, Savov, and Schnabl (2021). We first measure the maturity mismatch between bank assets and liabilities, using both balance-sheet maturity data and an income-based measure of effective duration. We then estimate how bank-level interest income and interest expense respond to changes in the CBA (Central Bank of Armenia) refinancing rate (hereafter, the policy rate), and test whether banks with more rate-sensitive interest expense also have more rate-sensitive interest income, both across banks and, in a two-stage panel framework, within banks over time. Finally, we separate interest income and expense into local-currency (AMD) and foreign-currency components to examine whether this alignment differs across currencies.

Armenia is a particularly informative setting for this question, for four reasons. First, it is a small, open and highly dollarized economy: the foreign-currency share of bank liabilities was about 65 percent in 2014–2015 and still about 37 percent at the end of 2024. Because domestic monetary policy directly affects only the AMD side of banks' balance sheets, the same banks hold positions that are, and positions that are not, priced off the CBA policy rate, which allows us to compare how the mechanism operates in the two currencies. Second, the banking system relies heavily on deposit funding: deposits account for about 62 percent of total liabilities and household deposits for about 40 percent, which is the precondition for a deposit franchise. Third, the sample covers large and varied movements in the policy rate, including the tightening that followed the 2014–2015 external shock, the subsequent easing cycle, and a tightening of about six percentage points in 2021–2023, which provides the variation needed to estimate interest-rate sensitivities. Fourth, supervisory data on all banks' maturity structure and currency composition allow these exposures to be measured at the bank level. Earlier CBA research also shows that in this environment depositor behaviour depends on the currency structure of bank liabilities and its interaction with exchange-rate risk (Hayruni, Pirumyan, and Shirkhanyan, 2025), which underlines the importance of accounting for currency composition when studying bank risk.

Our analysis reveals several key insights. Armenian banks exhibit a significant and persistent maturity mismatch. Depending on the aggregation method, the average contractual maturity gap is approximately 1.4 years, while the income-based duration gap is about 2 years. However, these aggregate measures differ substantially across currencies. The maturity mismatch is considerably larger for AMD-denominated positions, averaging 2.3 years, while it is smaller for foreign-currency positions. This distinction is particularly important because AMD-denominated assets and liabilities are more directly exposed to changes in domestic monetary policy. Irrespective of this, aggregate net interest margins remain within a narrow range (about 3–4.6 percent) across monetary policy cycles,

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although return on assets rose markedly after 2022. Cross-sectional and panel regressions show that the interest-rate sensitivities of income and expense are positively and significantly associated across banks and over time. The point estimates of the matching coefficients are below one, but one-for-one matching generally cannot be rejected, so the data cannot distinguish full matching from substantial but incomplete matching.

Importantly, once the analysis is performed separately for domestic and foreign currencies, the matching mechanism becomes particularly strong for local-currency positions, where the estimated coefficients are positive and statistically significant, about 0.67–0.76, and not statistically different from one. For foreign-currency positions, the coefficients are smaller and one-for-one matching is rejected. This difference may partly reflect the distinct interest rate benchmarks and repricing dynamics of foreign-currency positions, rather than necessarily indicating less effective management of foreign-currency interest rate risk. Because the currency components of income and expense are constructed proxies rather than reported figures, the currency results should be read as indicative.

Our analysis distinguishes between balance-sheet maturity exposure and the sensitivity of banks' earnings to interest rate changes. The balance-sheet measures are based on residual contractual maturities, which do not necessarily coincide with interest-rate repricing dates. The cash-flow approach captures how interest income, interest expense, net interest margins, and profitability respond to changes in monetary policy, so our findings primarily concern realized earnings sensitivity rather than changes in the economic value of bank equity, which we cannot directly assess with the available data. Because Armenian bank equity is not traded in a liquid stock market, we cannot implement the present-value (stock-return) test of Drechsler, Savov, and Schnabl (2021). Stable margins are therefore not evidence that banks are protected from all forms of interest rate risk: economic-value risk, liquidity risk, deposit migration and credit risk may still respond to policy rate changes.

These findings contribute to the literature in several ways. First, we provide evidence consistent with the deposit-franchise-based hedging mechanism documented in advanced economies operating in the Armenian banking sector, although with some limitations. Second, the paper highlights the importance of currency composition in understanding monetary policy and financial stability in highly dollarized economies. By separating interest income and interest expense into AMD and foreign-currency components, we show that the sensitivity-matching mechanism is not uniform across currencies. The evidence indicates that the matching is strongest for AMD-denominated positions, where domestic monetary policy directly affects asset and liability repricing, while it is substantially weaker for foreign-currency positions, whose pricing is linked more closely to foreign interest rates. This result provides new insights into how banks manage interest-rate risk in multi-currency balance sheets and highlights the importance of accounting for currency-specific channels when evaluating monetary policy.

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The paper is structured in the following manner: Section 2 describes the institutional background of the Armenian banking system and the supervisory bank-level dataset used in the analysis. Section 3 outlines the empirical methodology, including the repricing-maturity approach, the mimicking portfolio framework for estimating effective duration, the cash-flow sensitivity approach, and the cross-sectional and panel frameworks used to test sensitivity matching. Section 4 presents the empirical findings. We first discuss aggregate balance sheet evidence and the interest-rate sensitivities of bank earnings and profitability, followed by cross-sectional and panel evidence on sensitivity matching, including a separate analysis of AMD and foreign-currency positions, and the role of deposit market concentration. Section 5 concludes and discusses the limitations of the analysis.

2 Data and Institutional Background

2.1 Data

We use a comprehensive bank-level panel dataset that includes all commercial banks operating in Armenia from 2014 to 2024, with a quarterly frequency. Bank-level balance sheet and income statement data are provided by the CBA. The dataset includes banks' assets and liabilities by type, total interest income, total interest expense, and net profit. A key limitation of the data is that although interest income and expenses are considered at the bank level, they are not disaggregated by currency.

Monetary policy and market interest rates are taken from the official publications of the CBA. The main short-term policy instrument is the policy rate of the CBA, which serves as the main benchmark for monetary policy stance. To proxy short- and long-term market interest rates, 1-year and 10-year Armenian government bond yields are used, respectively. All monetary and financial variables are transformed into consistent quarterly series.

In our analysis, we also include key macroeconomic controls, namely we include real GDP growth, inflation[1], the nominal exchange rate (AMD/USD)[2], and a measure of sovereign risk. GDP growth captures aggregate demand conditions, while inflation reflects the price environment. The exchange rate is particularly important in the Armenian context given the high degree of financial dollarization, and it plays a central role in the disaggregated analysis, where we examine the sensitivity of interest income from foreign-currency assets and interest expenses from foreign-currency liabilities. Sovereign risk is proxied by the difference of Armenian government bond yields to U.S. Treasury yields, capturing external financing conditions and country risk. In extended specifications, these

[1]Inflation is calculated using consumer price index obtained from the Central Bank of Armenia price statistics database: Central Bank of Armenia, 2026c

[2]Exchange rate dataset, the CBA exchange rate archive: Central Bank of Armenia, 2026a

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additional macroeconomic control variables are introduced to assess the robustness of the results.

The final dataset thus combines bank-level financial statements, monetary policy rates, yield-curve information, and macroeconomic indicators. Table 1 reports summary statistics for the main variables used in the analysis.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.
Bank-level variables			
Assets (billion AMD)	748	328	291
Liabilities (billion AMD)	748	279	261
Interest Income (%)	748	8.18	1.54
Interest Expense (%)	748	4.34	1.70
Net Interest Margin (%)	748	3.84	1.28
Return on Assets (%)	748	1.35	3.69
Interest rate variables			
Policy Rate (%)	44	7.40	1.84
1Y Yield (%)	44	8.59	2.20
10Y Yield (%)	44	10.91	2.03
Macro-financial variables			
GDP Growth (%)	44	4.98	5.50
Inflation (YoY, %)	40	2.66	3.28
Exchange Rate (AMD/USD)	44	457.56	38.71
Sovereign Spread	44	3.53	0.95

Note: The table reports descriptive statistics for the main variables used in the empirical analysis. The sample is a balanced panel of 17 Armenian commercial banks observed quarterly from 2014Q1 to 2024Q4, comprising 748 bank-quarter observations. Assets and liabilities are expressed in billions of AMD. Interest income and interest expense are measured as annualized ratios to total assets.

The final sample consists of a balanced panel of 17 Armenian commercial banks observed quarterly from 2014Q1 to 2024Q4, yielding 748 bank-quarter observations. During 2015–2017, the Armenian banking sector underwent substantial consolidation, with the number of commercial banks declining from 21 to 17. To maintain a consistent panel, we exclude the four banks absorbed through these mergers,[3] without retrospectively consolidating their financial statements with those of the acquiring banks. We also exclude Fast Bank, which entered the banking sector in 2022. The resulting sample therefore covers the 17 banks continuously observed throughout the study period.

At the macro-financial level, the average CBA policy rate over the sample period is 7.4 percent, while the mean yields on 1-year and 10-year Armenian government bonds are 8.6 percent and 10.9 percent, respectively. Together, the numbers indicate that the yield curve is upward sloping on average during the sample period. At the bank level,

[3]The four excluded banks collectively accounted for approximately 8% of total banking sector assets

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the average interest income rate is 8.18 percent, while the mean interest expense rate is 4.34 percent, implying an intermediation spread of roughly four percentage points. This magnitude is broadly consistent with spreads typically observed in banking systems of emerging markets. There is also substantial heterogeneity in bank size, with a wide gap between smaller and larger institutions (Table 1).

The average net interest margin is 3.8 percent, and the mean return on assets is 1.35 percent. These figures indicate that, over the sample period, Armenian banks operate with moderate yet relatively stable profitability.

Although the baseline sample covers the period from 2014Q1–2024Q4, the empirical analysis also considers a subsample covering 2017Q1–2024Q4. The earlier period includes the 2014–2016 external shock associated with the Russian recession, a decline in remittance flows, and a significant exchange rate adjustment in Armenia. The post-2017 period is therefore considered separately to reduce the impact of these disruptions and to assess the robustness of the results in a more regular macroeconomic environment. However, the post-2017 period also experienced important changes, including shifts in banks' currency composition and deposit structures, the COVID-19 pandemic, and substantial inflows following the Russia–Ukraine war. Differences between the two samples may therefore reflect changes in balance-sheet composition as well as the exclusion of earlier disruptions.

2.2 Currency Composition and Liability Structure

Understanding the currency composition and liability structure of bank balance sheets is central to our analysis, as bank funding in Armenia is predominantly deposit-based and highly dollarized. We examine changes in the currency composition and funding structure of Armenian banks using quarterly supervisory balance-sheet data. Table B.8 and Table B.9 in Appendix B report detailed summary statistics by quarter and by bank. As interest income and interest expense reported by the CBA are not disaggregated by currency, we use the variation in currency composition in the empirical analysis to construct proxies for the foreign-currency component of interest income and interest expense.

As we see in the Table B.8 foreign-currency (FX) share of total bank liabilities remains high but declines consistently over time. Quarterly averages illustrate a reduction from approximately 65 percent during 2014–2015 to about 37 percent by the end of 2024, reflecting a gradual process of de-dollarization, particularly after 2020. In spite of this decline, foreign-currency liabilities continue to represent an indispensable share of total funding over the sample period.

The structure of deposit funding has also changed over time, albeit the liability structure remains strongly deposit-based, with demand and term deposits together accounting for about 62 percent of bank funding over the period. Demand and term deposits are maturity categories rather than depositor categories and include corporate as well as

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household deposits. Household deposits, including both demand and term deposits in domestic and foreign currencies, account for approximately 40 percent of total bank liabilities, representing roughly 64 percent of total deposit funding. Demand deposits increased from roughly 17–20 percent of total liabilities in the mid-2010s to nearly 30 percent by 2024. In contrast, term deposits decrease from approximately 40–48 percent before 2017 to around 30–34 percent after 2022. Non-deposit funding is not negligible: interbank borrowing accounts for around 16 percent of total liabilities over the sample period, and liabilities to other financial organizations for a further 13 percent. Issued bank securities have a very small share before 2018 but have been gradually increasing since then, reaching about 4 percent of total liabilities in recent years.

3 Methodology

Our empirical analysis proceeds in three main steps. First, we measure the extent of maturity transformation in the Armenian banking sector using two complementary approaches: a repricing-maturity-based measure constructed from balance-sheet data, and an income-based measure that infers the effective duration of bank assets from observed interest income dynamics. Second, we estimate the sensitivity of banks' interest income and interest expense to changes in the CBA policy rate in order to quantify banks' exposure to interest rate risk. Third, we examine whether the sensitivities of income and expense are matched in a way that offsets this exposure, using both cross-sectional and panel regression frameworks.

3.1 Repricing Maturity

We start our analysis by computing repricing maturities for bank assets and liabilities, and we follow the approach of English, Van den Heuvel, and Zakrajšek, 2018, as implemented in Drechsler, Savov, and Schnabl, 2021, and we use supervisory data reported by Armenian banks.[4] Maturities are reported in nine intervals converted into days: demandable (0 days), 0–15 days, 16–30 days, 31–60 days, 61–90 days, 91–180 days, 181–365 days, 365–1825 days (1–5 years), and 1825–3650 days (over 5 years). To compute repricing maturity, we assign the midpoint of each interval and convert it into years, assigning zero repricing maturity to demandable positions. For mortgage loans only, we use an extended final interval of 1825–9125 days, corresponding to a midpoint of 15 years. We then weight each maturity category by its amount and use it to estimate the overall repricing maturity

[4]The supervisory data report residual contractual maturities rather than the time until the next interest-rate reset. While these generally coincide for fixed-rate instruments, floating-rate instruments may reprice earlier. Accordingly, our balance-sheet measures capture contractual maturity mismatches rather than precise repricing gaps. Following Drechsler, Savov, and Schnabl (2021), we keep the term "repricing maturity" for these measures; for floating-rate instruments they overstate the time to repricing, so the resulting gaps are best read as upper bounds on the repricing gap.

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of a bank's assets. The categories are consumer loans, mortgage loans, business loans, interbank loans, government-related exposures, repo agreements, and factoring and leasing. As a result, we calculate that the average repricing maturity of Armenian banks' assets equals 2.4 years. Mortgage loans exhibit the longest repricing maturity, averaging 14.3 years, reflecting their long contractual structure. This is consistent with the Armenian mortgage market, where the typical contractual maturity is around 15 years, and the upper maturity bucket (over 5 years) captures predominantly long-term housing loans. Consumer loans follow with an average repricing maturity of 3.00 years, while business loans reprice considerably earlier, at an average of 2.4 years. Interbank loans also display relatively short repricing maturities of 1.3 years, and factoring and leasing average about 1.3 years. Asset repricing maturities further vary substantially across currencies.

We apply the same methodology to compute the repricing maturity of liabilities. Bank liabilities consist mainly of deposits, repo-based funding, and leasing-related liabilities. Deposits are further classified into household, corporate, and financial-sector deposits. We assign demandable deposits and repo-based funding a zero repricing maturity. For the liabilities repricing maturity is obtained as a weighted average across all liability categories, using outstanding amounts as weights. On average, total liabilities have a repricing maturity of 1.2 years, with substantial differences across currencies, ranging from 0.9 years in RUB and 1.0 year in AMD to 1.5 years in USD.

Table A.3 and Table A.4 report summary statistics by asset and liability category. The maturity mismatch, measured as the gap between asset and liability repricing maturities, is on average strongly positive, indicating that Armenian banks engage in sizable maturity transformation.

3.2 Estimated Duration

Using repricing maturity as a proxy for duration has limitations, as it does not consider prepayments or amortization. Borrowers may repay or refinance loans before maturity, so the effective maturity of assets can differ from contractual terms. To address this, we use a complementary method following the cash-flow approach of Drechsler, Savov, and Schnabl, 2021, which constructs a Government bond mimicking portfolio that estimates the duration of bank assets based on observed interest income dynamics.

The intuition of this approach is straightforward. For banks that hold only short-term assets, their interest income will move closely with short-term interest rates. In contrast, for banks with only long-term fixed-rate assets, interest income follows the moving average of current and past long-term interest rates, because cash flows are fixed. In practice, banks hold a combination of these two, so their interest income responds to movements, both in short- and long-term rates.

For assets, we construct a Government bond mimicking portfolio that reproduces the

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dynamics of Armenian banks' aggregate interest income. This is done by regressing the interest income rate (interest income divided by total assets) on two interest-rate factors. The first income factor is the CBA policy rate, which represents short-term, floating-rate assets with near-zero duration. The second factor is the interest income constructed from a buy-and-hold portfolio of 10-year Armenian government bonds, which shows the long-term fixed-rate exposure. A moving average of the 10-year government bond yield approximates the income from this buy-and-hold portfolio. The regression is given by:

$$\text{IntInc}_t = \beta_F r_t + \beta_M \, \text{IntInc}_{10y,t} + \varepsilon_t, \tag{1}$$

where IntInc_t is the interest income rate, r_t is the CBA policy rate, and $\text{IntInc}_{10y,t}$ is the income from the 10-year buy-and-hold bond portfolio.

The coefficients β_F and β_M represent the weights of a synthetic bond portfolio that replicates the asset side of banks' balance sheets. We estimate this regression under four specifications: with and without a constant, and with and without the restriction $\beta_F + \beta_M = 1$. When this restriction is imposed, the coefficients directly represent portfolio weights.

To convert the estimated portfolio into a duration measure, we compute the Macaulay duration of the 10-year buy-and-hold government bond portfolio using the standard annuity formula. Because the portfolio continuously replaces maturing bonds with new 10-year bonds, its duration is shorter than ten years and depends on the discount rate. Using the sample-average 10-year Armenian government bond yield of 10.9 percent as the discount rate, the Macaulay duration of a 10-year level annuity is approximately 4.6 years. The implied duration of bank assets is then obtained by multiplying the estimated weight on the 10-year factor by the duration of this buy-and-hold portfolio, after rescaling the coefficients so that their sum equals one.

We estimate the duration of bank liabilities using the interest expense rate this time. The duration mismatch is the difference between asset and liability duration. A positive duration mismatch (table A.7) shows that banks fund long-term assets with short-term liabilities; they engage in maturity transformation.

This approach has two important advantages. First, it does not rely on detailed contractual maturity information, which is especially valuable if there is any data limitation. Second, it provides a transparent and economically interpretable measure of interest rate exposure.

3.3 Cash-Flow Approach: Interest-Rate Sensitivity

To measure the sensitivity of banks' interest income and expense to changes in interest rates, we follow the cash-flow approach of Drechsler, Savov, and Schnabl, 2021. This framework allows us to measure how strongly banks' cash flows respond to interest rate

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changes and whether the responses of income and expense offset each other. This approach focuses on how banks' future interest income and funding costs evolve following changes in interest rates as assets with longer maturities tend to behave like fixed-rate instruments, as their cash flows are largely determined by past interest rate conditions and adjust only gradually over time. In contrast, shorter-term or floating-rate liabilities reprice more frequently and therefore respond more quickly to changes in interest rates. Hence, the impact of interest rate changes on banks' net future cash flows is reflected gradually, over time.

For each bank i, we estimate the sensitivity of interest expense using the following time-series regression:

$$\Delta \text{IntExp}_{i,t} = \alpha_i + \sum_{\tau=0}^{3} \beta_{i,\tau}^{\text{Exp}} \Delta r_{t-\tau} + u_{i,t}, \tag{2}$$

where $\Delta \text{IntExp}_{i,t}$ is the quarterly change in the interest expense rate (interest expense divided by assets and annualized), Δr_t is the quarterly change in the CBA policy rate, and α_i is a bank-specific constant (the regression is estimated separately for each bank). The three quarterly lags capture delayed adjustment of policy rate changes. The overall expense beta is defined as the sum of the lag coefficients. Analogous regressions are estimated for the interest income rate, net interest margin (NIM), and return on assets (ROA). Consistent with the literature, ROA is seasonally adjusted by calculating a four-quarter moving average using the current and preceding three quarters before taking quarterly differences. This adjustment accounts for seasonal patterns in the reporting of loan-loss provisions and other accounting items. These regressions provide bank-level interest income, interest expense, NIM, and ROA betas that summarize each bank's exposure to interest rate shocks through cash flows. In line with this framework, the cash flow approach focuses on realized income and expenses and does not include valuation effects such as unrealized capital gains or losses, thus avoiding double counting.

Two features of these estimates are important for their interpretation. First, the betas capture the cumulative sensitivity of reported earnings to changes in the CBA policy rate over four quarters. They do not measure changes in the economic value of bank equity or risks associated with repricing beyond this horizon, deposit migration, withdrawals, or liquidity pressures. Consequently, a small NIM beta indicates limited short-run earnings sensitivity rather than complete hedging of interest rate risk. Second, the bank-level betas are estimated using relatively short time series, with at most 40 quarterly observations in the full sample and 32 in the post-2017 sample, compared with at least 60 in Drechsler, Savov, and Schnabl, 2021.

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3.4 Cross-Sectional Test of Sensitivity Matching

An important aspect of bank balance sheet management is how banks balance the sensitivity of their income and funding costs to changes in interest rates. In this context, we adopt the cash-flow framework of Drechsler, Savov, and Schnabl, 2021 to analyze whether banks with more interest-sensitive funding also exhibit greater sensitivity of interest income, based on observed cash-flow dynamics.

$$\beta_i^{\text{Inc}} = \alpha + \gamma \beta_i^{\text{Exp}} + \varepsilon_i, \tag{3}$$

where β_i^{Inc} and β_i^{Exp} denote the interest income and interest expense betas of bank i, respectively. The γ coefficient measures the extent to which the sensitivity of banks' asset-side cash flows matched with the sensitivity of their funding costs.

The economic intuition behind this regression is direct. When funding costs respond strongly to changes in interest rates, banks become more vulnerable to interest rate shocks on their liabilities side. In such cases, it is reasonable to expect that income on assets may also move in a similar direction, depending on how the balance sheet is structured. Therefore, a positive relationship between the beta coefficients of estimated income and expenses suggests that the sensitivities of assets and liabilities are broadly aligned.

This regression allows us to examine whether banks with more sensitive funding also tend to have more interest-rate-sensitive assets. The estimated slope coefficient, γ, indicates how close these sensitivities are to each other across banks. Values of γ close to one suggest that income and expenses sensitivities are broadly matched. We therefore report, for each matching coefficient, both the conventional test of $H_0 : \gamma = 0$ and a test of $H_0 : \gamma = 1$ (one-for-one matching), together with 95 percent confidence intervals. A coefficient can be significantly different from zero and still be significantly below one. The regression measures association, not the direction of adjustment: a positive γ may reflect asset–liability management, but also product mix, contract design, currency matching or the joint choice of assets and funding.

3.5 Panel Matching: Two-Stage Estimation

Complementing the cross-sectional analysis, we follow Drechsler, Savov, and Schnabl, 2021 and introduce a two-stage panel approach to examine the consistency of sensitivity within banks over time. While cross-sectional regressions focus on average relationships across banks, this specification uses the time variation of interest rates to assess whether changes in funding costs are reflected in interest income at the bank level. Thus, the panel framework allows us to assess whether changes in funding costs are associated with changes in interest income within banks over time.

In the first stage, we estimate how each bank's funding costs respond to policy rate

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changes. Specifically, we relate changes in the interest cost rate to current and past policy rate changes.

$$\Delta \text{IntExp}_{i,t} = \alpha_i + \sum_{\tau=0}^{3} \beta_{i,\tau}^{\text{Exp}} \Delta r_{t-\tau} + u_{i,t}, \tag{4}$$

where α_i reflects bank-specific factors that are constant over time. The coefficients summarize how funding costs adjust over several quarters following policy rate changes. The fitted values, $\Delta\widehat{\text{IntExp}}_{i,t}$, represent the portion of the funding cost variation that is attributable to policy rate changes. This stage is identical to equation (2).

In the second stage we regress changes in interest income on the predicted change in interest expenses, which represent funding costs. Specifically, we estimate:

$$\Delta \text{IntInc}_{i,t} = \lambda_i + \sum_{\tau=0}^{3} \gamma_\tau \Delta r_{t-\tau} + \delta\, \Delta\widehat{\text{IntExp}}_{i,t} + \varepsilon_{i,t}, \tag{5}$$

Here, $\Delta \text{IntInc}_{i,t}$ denotes the change in the interest income rate. The coefficient δ measures how closely changes in interest income move with the policy-induced component of changes in funding costs. A value of δ close to one suggests that changes in funding costs are largely matched by changes in interest income. The coefficients γ_τ capture the part of the response of interest income to changes in interest rates that is not explained by funding costs. This two-stage panel approach evaluates sensitivity matching within banks over time, rather than only across banks on average. Because the second stage uses fitted values from the first stage, conventional standard errors do not account for first-stage estimation uncertainty. All reported standard errors for the panel estimates are therefore obtained from a block bootstrap in which each block consists of the cross-section of banks in a given quarter, and both stages are re-estimated in each of 1,000 replications. This preserves the cross-sectional correlation of shocks within each quarter and accounts for first-stage estimation uncertainty.

Because the fitted expense change has bank-specific sensitivities to a common policy rate, δ is identified from cross-bank differences in these sensitivities: in a balanced panel, the fitted expense change net of its cross-bank average in each quarter is unaffected by any shock common to all banks. Consequently, adding quarter fixed effects to both stages leaves δ and its bootstrap standard error unchanged (Table C.4). Shocks whose effects differ across banks in a way correlated with their policy-rate sensitivities, such as an uneven distribution of the 2022 inflows, could still affect the estimate.

In additional specifications, we extend this framework by incorporating macroeconomic controls, namely GDP growth, inflation, the change in the AMD to USD exchange rate and Armenian sovereign risk, with bank-specific sensitivities to these controls in the first stage, and by estimating the model separately for AMD- and foreign-currency components, which allows us to examine whether sensitivity matching differs across currency exposures.

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4 Results

4.1 Aggregate Balance Sheet Evidence

Based on our methodology, we begin our analysis drawing attention to the maturity structure of banks' balance sheet in Armenia. Applying supervisory dataset of banks' balance sheet, we construct repricing maturities for assets and liabilities as described in Section 3.1. In the Figure 1 we show the dynamic of the repricing maturity over the period 2014–2024.

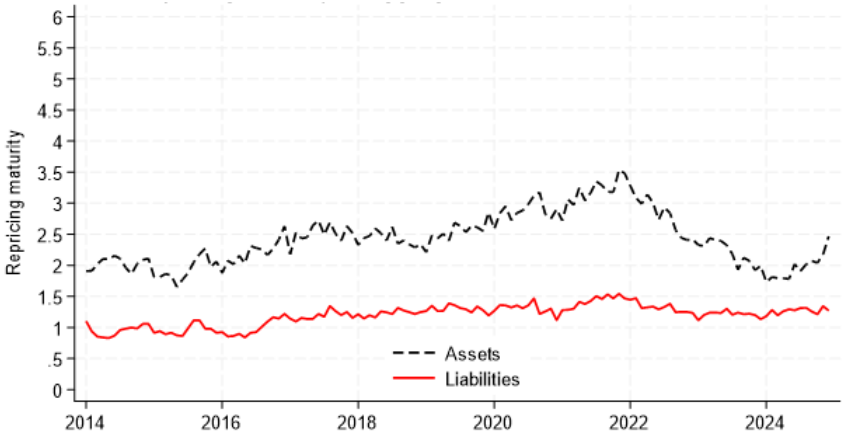


Figure 1: Evolution of Repricing Maturities of Bank Assets and Liabilities in Armenia

Notes: Quarterly weighted-average repricing maturities of bank assets and liabilities based on supervisory bank data.

Our findings show two main features. First, asset repricing maturities are consistently longer than liability repricing maturities. The gap between them is relatively stable over time, ranging from roughly one to two years and averaging about 1.4-2 years depending on the aggregation method (Tables A.5,A.7). The measurement statistics in Tables A.3 and A.4 show this pattern across different balance sheet categories. The persistent difference we documented indicates that Armenian banks systematically fund longer-term assets with shorter-term liabilities, that is, they engage in maturity transformation. Bearing in mind that Armenian banks also have multi-currency balance sheet we examine the repricing maturities across currencies. Table A.5 reports the maturity mismatch separately by currency reflecting that the maturity gap is largest for AMD-denominated positions, with an average of 2.34 years, while it is significantly smaller for foreign currency positions. Particularly, the USD and other foreign currency categories demonstrate shorter mismatch, whereas positions denominated in Russian rubles evince practically no mismatch on average. This variation shows that maturity transformation in the Armenian banking system is not uniform across currencies: it is concentrated in local-currency positions, where domestic monetary conditions are the relevant benchmark. Our data

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do not allow us to determine whether this reflects deliberate balance sheet choices or differences in the products and funding available in each currency.

Applying the income-based measure of duration, we find approximately two years (1.86–2.04 years) across the different specifications (Table A.7). As a textbook benchmark, a standard duration approximation implies that a gap of this size would reduce the present value of bank assets relative to liabilities by roughly 1.4–2 percent for each percentage point increase in rates, and, at an average leverage of about six to one, by a multiple of that relative to equity. This is an economic-value calculation, which we cannot test because we do not observe market values of Armenian bank equity. The remainder of the paper asks whether this balance sheet exposure shows up in realized cash flows.

It is necessary to examine whether this substantial balance-sheet exposure is reflected in the aggregate cash flows. Figure 2 depicts the CBA policy rate with the NIM and ROA over the sample period, and shows that the policy rate exhibits pronounced fluctuations, with an extended easing phase during the mid-2010s followed by a rapid tightening after 2021. On the contrary, aggregate NIM stays within a narrow range (about 3–4.6 percent) over the entire period, showing only small changes even when the policy rate moves strongly. NIM declined modestly during the 2014–2016 tightening and rose by about 1.5 percentage points from 2022 onwards, so its co-movement with the policy rate is weak and not of consistent sign. ROA was similarly stable until 2021 (around 1 percent), but roughly tripled in 2022–2023, which coincided with the large inflows following the Russia–Ukraine war and reflects non-interest income as well as margins. This suggests that despite the sizeable maturity gap, bank net interest margins do not respond proportionally to interest rate changes, while ROA is affected by other factors.

To better understand this stability, it is important to consider the two components of net interest margins separately. Figure 3 shows that interest expenses respond only weakly to changes in the policy rate. During the 2021–2023 tightening, when the policy rate rose by about six percentage points, the aggregate interest expense rate rose by only a few tenths of a percentage point, while interest income rose by more than one percentage point. Part of the muted expense response may reflect the 2022 inflows, which increased total assets (the denominator) and the share of low-cost demand deposits at the same time. [5] Deposit rates adjust slowly and remain significantly below the policy rate. This is consistent with a deposit franchise: market power in deposit markets, as documented by Drechsler, Savov, and Schnabl (2017), and the payment, liquidity and safety services that deposits provide allow banks to keep deposit rates low. In a dollarized system, foreign-currency deposits may also be sticky for other reasons, including depositors' demand for protection against exchange-rate risk and abundant foreign-currency liquidity. Our data contain total interest expense rather than deposit rates by deposit type, depositor and

[5] Deposits account for about 62 percent of total liabilities, and household deposits for about 40 percent, making deposits the primary source of funding.

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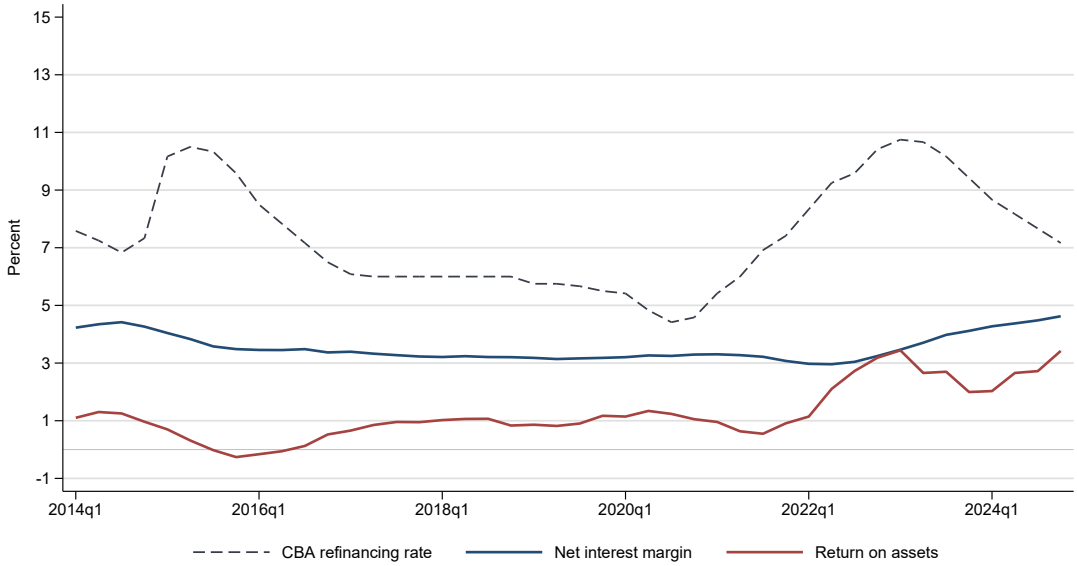


Figure 2: CBA Policy Rate, Aggregate Net Interest Margin, and ROA

Notes: The figure displays the quarterly CBA policy rate along with the aggregate net interest margin and return on assets of the Armenian banking system from 2014Q1 to 2024Q4. The vertical axis shows percentages.

currency, so the evidence is consistent with, but does not uniquely identify, the deposit franchise mechanism. Overall, these features imply that Armenian banks can engage in maturity transformation with limited exposure of their short-run cash flows to policy rate changes.

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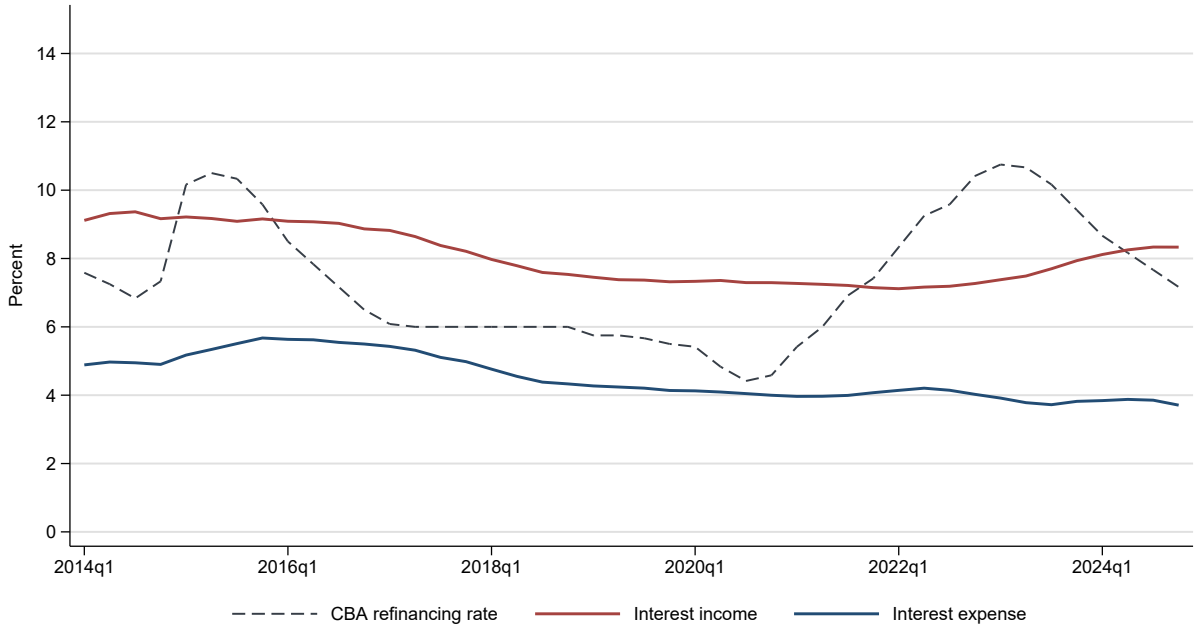


Figure 3: CBA Policy Rate, Interest Income, and Interest Expense

Notes: The figure plots the CBA policy rate together with aggregate interest income and interest expense of the Armenian banking system, calculated as ratios to total assets. The sample covers quarterly observations from 2014Q1 to 2024Q4. The vertical axis shows percentages.

Further illustrating the role of the deposit franchise, we compare the observed cash flows of banks with a hypothetical portfolio of government bonds that is designed to replicate the exposure of bank assets to the policy rate. To isolate the role of funding structure, we compare the banks' actual net interest margins with the margins of a hypothetical portfolio that matches the asset duration but assumes a full and direct sensitivity from interest rates. This portfolio shows how bank cash flows would behave if assets were fully funded at market rates, which is the case in the absence of the deposit franchise.

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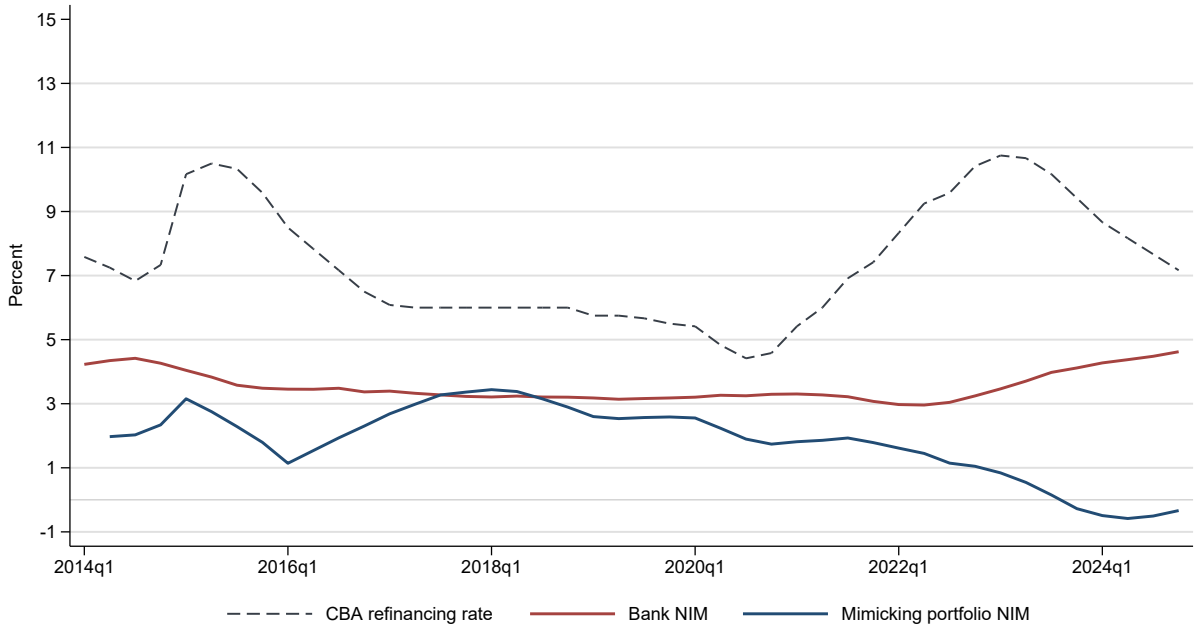


Figure 4: Observed Bank NIM and NIM of a Treasury Mimicking Portfolio

Notes: The figure compares the observed aggregate bank net interest margin (NIM) with the NIM implied by a hypothetical portfolio constructed using the estimated asset and liability durations. The dashed line represents the CBA policy rate. Quarterly data cover the period from 2014Q1 to 2024Q4. The vertical axis shows percentages.

The mimicking portfolio is constructed using the income-based duration approach described in Section 3.2. On the asset side, the portfolio consists of a combination of the 10-year Armenian government bond yield and, as a short-term instrument, the CBA policy rate, with weights selected to replicate the dynamics of aggregate bank interest income. On the funding side, the portfolio borrows at market rates, with funding costs directly tied to the CBA policy rate and the one-year government yield, which implies a full and immediate adjustment to interest rates. As a result, the net interest margin of the mimicking portfolio shows the effect of duration mismatch in the absence of a deposit franchise.

Figure 4 compares the observed aggregate bank NIM with the NIM implied by the hypothetical-mimicking portfolio. The NIM of the mimicking portfolio moves much more than actual bank NIM and in the opposite direction to the policy rate, with a lag of several quarters. It rises from about 1.2 percent in early 2016 to about 3.4 percent in 2018 during the easing cycle, and falls from about 1.9 percent in 2021 to below zero in 2024 after the tightening cycle. Over the same 2021–2024 period, actual bank NIM rose from about 3 to 4.6 percent. This comparison indicates that, if funding repriced fully and immediately at market rates, a balance sheet with a similar duration mismatch would exhibit significant margin volatility. The figure therefore illustrates the value of sticky,

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low-cost funding under this assumption; it shows why a deposit franchise could stabilize margins.

The aggregate evidence supports three main findings. First, Armenian banks systematically fund longer-term assets with shorter-term liabilities, with a maturity mismatch of roughly 1.4–2 years depending on the measure. Second, despite this mismatch, aggregate net interest margins remain within a narrow range. Third, this stability coincides with slow and incomplete adjustment of funding costs to policy rates, which limits the short-run sensitivity of interest margins.

The following section examines the sensitivities of interest income and interest expense to policy rate changes.

4.2 Interest-Rate Sensitivities of Bank Earnings and Profitability

In this subsection, we examine how banks' cash-flow components, interest income and interest expense, respond to changes in interest rates. Using the methodology introduced in Section 3.3, we construct interest-rate sensitivity coefficients, or betas, that summarize how these cash-flow components adjust to changes in the CBA policy rate. To assess the robustness and stability of the results, we estimate the betas over two sample periods: the full 2014–2024 sample and a post-2017 subsample.[6] The latter is used to isolate a more regular macro-financial environment after the adjustment period associated with the 2014–2016 external shock, when the Russian recession, the sharp decline in oil prices, ruble depreciation, falling remittances, and exchange-rate pressures in Armenia jointly affected domestic demand, financial markets, and banking-sector liquidity conditions.[7]

Table 2 summarizes the beta coefficients across banks for both sample periods. In the full sample, the average beta coefficients of interest costs and income are close to each other (0.101 and 0.099, respectively), indicating that, on average, their responses to the policy rate are closely matched. Both rise only about 10 bps when the policy rate increases by 100 bp. This magnitude is small, well below the average betas of about 0.35 reported for U.S. banks by Drechsler, Savov, and Schnabl (2021); a likely reason is that a large part of the Armenian balance sheet is denominated in foreign currency, whose pricing responds little to the CBA rate. Because these responses are both small and

[6] This distinction is important because the earlier period reflects an exceptional macro-financial adjustment rather than a normal monetary policy environment, and the subsample shows whether the full-sample results are driven by this episode.

[7] The 2014–2016 period captures an exceptional external and financial adjustment episode rather than a regular macroeconomic environment. The Russian recession, triggered by the decline in oil prices, sanctions, and ruble depreciation, affected Armenia through trade, remittances, exchange-rate pressures, and banking-sector liquidity conditions. The CBA responded with sharp policy-rate and liquidity measures, which may have influenced the estimated sensitivities of banks' interest income and expense to policy rate changes. The paper therefore uses the 2017–2024 subsample to test whether the results hold outside this adjustment period.

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closely matched, their effects largely offset each other. As a result, the average betas for net interest margins and profitability remain close to zero (−0.002 for NIM and −0.031 for ROA), indicating limited short-run exposure of bank margins to interest rate movements.

In the post-2017 subsample, the picture is similar, although the estimated sensitivities of interest expense and income are substantially smaller, indicating a weaker overall response of both funding costs and interest income to policy rate changes over the period.

Regardless of the smaller betas of interest income and expense, the effects on net interest margins remain limited, with the average NIM beta again close to zero. At the same time, the average ROA beta is higher (0.172) and more dispersed (standard deviation 0.390). This increase likely reflects factors related to the period after 2022 which was characterized by substantial inflows into the Armenian banking system associated with the Russia–Ukraine war, when the migration and capital inflows supported bank profitability and may have contributed to the higher and more volatile ROA sensitivity observed in this subsample.

Table 2: Summary of Estimated Betas Across Samples

	2017–2024		2014–2024	
Variable	Mean	SD	Mean	SD
Expense beta	0.024	0.128	0.101	0.120
Income beta	0.049	0.134	0.099	0.138
NIM beta	0.025	0.110	-0.002	0.110
ROA beta	0.172	0.390	-0.031	0.326

Notes: The table reports summary statistics of bank-level interest-rate sensitivity coefficients (betas) for interest expense, interest income, net interest margin (NIM), and return on assets (ROA). Betas are estimated using the cash-flow approach described in Section 3.3.

Overall, the net interest margins of Armenian banks have little average short-run sensitivity to policy rate changes, and the average sensitivities of income and expense remain close in both samples. This is consistent with balance sheet structures in which the rate sensitivity of interest income is aligned with that of funding costs.

4.3 Cross-Sectional Analysis

Drawing upon the estimated bank-level betas, we conduct a cross-sectional analysis to assess whether the interest-rate sensitivity of Armenian banks' interest income is matched with that of their interest expenses. The cash-flow framework predicts that banks with more interest-sensitive funding should hold assets with returns that respond similarly to monetary policy. This suggests a near one-to-one relationship between income and expense betas across banks.

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We plot the relationship between the calculated interest income and expense betas for all banks in the sample Figure 5. We observe that there is a clear positive association: banks with low expense sensitivity also have low income sensitivity, and vice versa. Moreover, the fitted line is upward sloping, supporting the idea of matching.

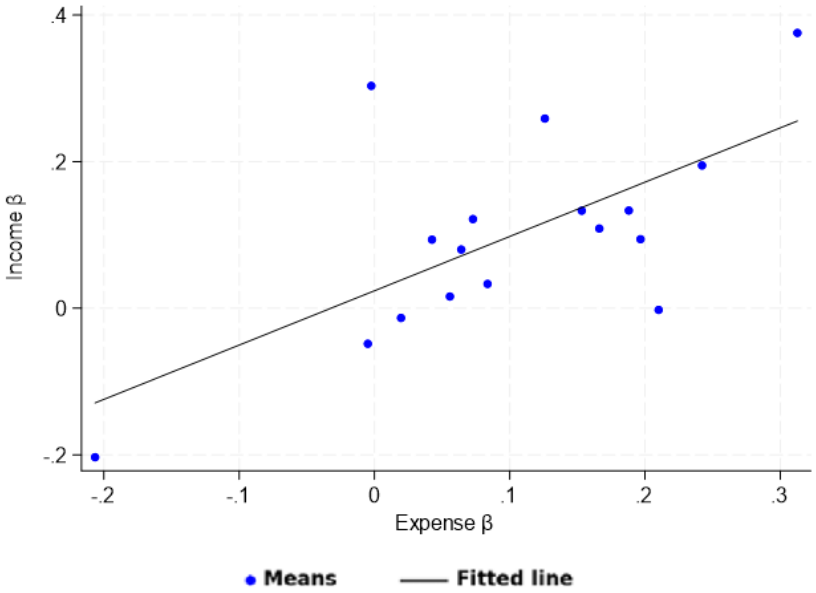


Figure 5: Interest Income Beta versus Interest Expense Beta (All Banks)

Notes: The figure plots interest income betas against interest expense betas for all 17 banks; each point is one bank. The solid line shows the linear fit.

To quantify this relationship, we estimate the cross-sectional regression given in equation (3). Table 3 reports the estimation for both the full sample and the subsample starting from 2017 of 17 Armenian banks. The estimated matching coefficients are 0.741 in the full sample and 0.682 in the post-2017 sample, both significantly different from zero. Neither is significantly different from one. The constants are small and not significantly different from zero, so a bank with insensitive interest expense tends to have insensitive interest income. These findings indicate a strong positive association between the interest-rate sensitivities of income and funding costs, consistent with sensitivity matching across banks. [8]

[8] With 17 observations, individual banks can also be influential: one bank with negative estimated income and expense betas (lower left of Figure 5) has high leverage on the fitted slope.

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Table 3: Cross-Sectional Matching Across Samples

	(1) 2017–2024	(2) 2014–2024
Expense β	0.682**	0.741**
	(0.335)	(0.301)
Constant	0.033	0.024
	(0.027)	(0.038)
95% CI, Expense β	[0.03, 1.34]	[0.15, 1.33]
p-value, $H_0: \gamma = 1$	0.342	0.390
Observations	17	17
R-squared	0.420	0.419

Notes: The table reports cross-sectional regressions of interest income betas on interest expense betas for the full sample period and the post-2017 subsample. Standard errors for the expense beta coefficients are obtained from 1,000 nonparametric bootstrap replications, resampling banks with replacement. Standard errors for the constants are heteroskedasticity-robust. Statistical significance for the bootstrapped coefficients is based on the normal approximation. The bootstrap treats bank-level interest-rate sensitivities as given. The confidence intervals and the p-values for $H_0: \gamma = 1$ use the bootstrap standard errors and the normal approximation. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

It is also informative to examine how sensitivity matching varies with bank size. We examine the relationship between income and expense betas and bank size, measured by the log of average assets (Figure A.10). Expense betas increase with bank size, whereas income betas are roughly flat across the size distribution. Unlike in Drechsler, Savov, and Schnabl (2021), where income and expense betas rise in parallel with size, larger Armenian banks therefore appear less closely matched. This is confirmed by the panel estimates for the large-bank subsample (Table C.3), whose matching coefficients (about 0.5–0.6) are below those for all banks. Because larger banks account for most system assets, system-wide exposure may be larger than the unweighted cross-bank averages suggest.

4.4 Panel Analysis

The purpose of this section is to extend the cross-sectional analysis using a two-stage panel regression framework with bank fixed effects, which uses all bank–quarter observations. This approach allows us to examine whether the interest income and expense sensitivities matching holds over time and across lags, rather than just on average.

In the first stage, we estimate how each bank's funding costs respond to policy rate changes. In the second stage we regress changes in interest income on the predicted change in interest expenses using the fitted values of interest expense from the first stage, along

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with the policy-rate lags and bank fixed effects. The coefficient on fitted interest expense, measures the degree of interest rate sensitivity matching between income and expense. Furthermore, we perform regressions with different sampling period and specification to ensure robustness. In particular, we use the post-2017 subsample, which isolates a more stable macroeconomic environment. We also include macro controls in both samples, namely GDP growth, inflation, the change in the exchange rate (AMD/USD) and Armenian sovereign risk, with bank-specific sensitivities to these controls in the first stage. As reported in Table 4, the second-stage estimates are different across sample periods and specifications.

Table 4: Two-Stage Panel Regression: Interest Expense and Interest Income Sensitivity

	2017Q1–2024Q4		2014Q1–2024Q4	
	(1)	(2)	(3)	(4)
Interest Expense (fitted)	0.713***	0.871***	0.352	0.604***
	(0.230)	(0.277)	(0.222)	(0.215)
Policy Rate (direct effect)	0.068	-0.001	0.048	0.001
	(0.058)	(0.079)	(0.054)	(0.070)
95% CI, fitted expense	[0.26, 1.16]	[0.33, 1.41]	[−0.08, 0.79]	[0.18, 1.03]
p-value, $H_0 : \delta = 1$	0.212	0.641	0.004	0.065
Bank Fixed Effects	Yes	Yes	Yes	Yes
Bank-specific policy-rate slopes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes
Bank-specific macro slopes	No	Yes	No	Yes
Observations	544	544	680	680
Number of Banks	17	17	17	17

Notes: The table reports second-stage panel regression estimates of changes in interest income rates on fitted changes in interest expense rates. Fitted interest expenses are obtained from first-stage regressions allowing bank-specific sensitivities to contemporaneous and three lagged changes in the CBA policy rate. All specifications include bank fixed effects. Columns (2) and (4) additionally control for GDP growth, inflation, changes in the exchange rate, and the sovereign spread, with bank-specific macro sensitivities included in the first stage. The reported direct policy-rate effect is the sum of contemporaneous and three lagged policy-rate coefficients in the second-stage regression. Standard errors in parentheses are obtained from 1,000 nonparametric bootstrap replications, resampling entire quarterly cross-sections of banks and re-estimating both stages. The 2014Q1–2024Q4 sample window has an effective estimation period of 2015Q1–2024Q4 due to first differences and lagged policy-rate changes. Significance stars are based on normal-approximation bootstrap tests against zero. The 95% confidence intervals and the p-values for $H_0 : \delta = 1$ use the bootstrap standard errors and the normal approximation. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

First, we discuss the post-2017 period (columns (1)–(2)). The estimated coefficients are relatively large and highly significant, being 0.71 without and 0.87 with macro controls; the coefficient increases when macro controls are included. These results show a strong relationship between the banks' interest expense and interest income even after

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taking into account the macroeconomic conditions. Despite the fact that the coefficients are below one in magnitude, they are not statistically different from one ($p = 0.21$ and $p = 0.64$). The confidence intervals ([0.26, 1.16] and [0.33, 1.41]) are, however, wide.

This implies that there is insufficient evidence to reject the hypothesis of one-for-one matching: the post-2017 evidence is consistent with banks broadly matching the interest-rate sensitivity of their income and funding costs, which helps to stabilize net interest margins, although the data cannot rule out substantially incomplete matching. On the other hand, the estimates for the full sample period (2014–2024; columns (3)–(4)) are noticeably smaller, being 0.35 without and 0.60 with macro controls. Without controls, the coefficient is not significantly different from zero and one-for-one matching is rejected; with controls, one-for-one matching is not rejected at the 5 percent level. The full sample includes the period of the Russian oil price shock, when the Armenian economic environment was more fragile and banks may have faced more uncertainty in funding conditions and asset demand, which could dampen this mechanism. Another important factor is that Armenian banks had a larger share of foreign-currency liabilities in the earlier period, whose pricing responds less to the CBA rate. Including macro controls increases the estimated coefficient, which suggests that macroeconomic shocks with different effects across banks weaken the measured relationship in the full sample; because the result depends on the specification, we do not treat it as evidence of one-for-one matching.

Taking everything into consideration, the results of the panel regressions show that changes in interest income are positively associated with policy-induced changes in funding costs, but the strength of this association depends on the macroeconomic environment and the specification used to isolate the relationship. In the Armenian context, the mechanism is stronger in more stable periods, while periods of increased volatility are associated with a weaker relationship. Compared with the cross-sectional estimates (0.74 and 0.68), the panel coefficients are lower in the full sample and similar or higher in the post-2017 sample, which suggests that the volatile early period weakens the relationship between interest income and expense.

Taken as a whole, the panel evidence reinforces the cross-sectional finding that interest income and expense sensitivities are positively matched, both across banks and within banks over time. The design does not identify which side of the balance sheet adjusts, or whether the alignment results from deliberate asset–liability management, so we describe it as an association that may contribute to the relative stability of net interest margins.

To assess the robustness of our panel results, we conduct several additional exercises. First, we re-estimate the two-stage regressions for a subsample of larger banks, identified using their average log assets The estimated income–expense sensitivity relationship remains positive across both sample periods, although the coefficients are generally smaller for large banks, particularly in the post-2017 period (0.59 and 0.49, compared with 0.71

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and 0.87 for all banks). The corresponding results are reported in Appendix C.3.

Second, we consider specifications including both bank and quarter fixed effects to account for unobserved bank heterogeneity and common time-specific shocks. The estimated matching coefficients and their standard errors are identical to the baseline specifications. As explained in Section 3.5, this is because the matching coefficient is identified from cross-bank differences in policy-rate sensitivities, which quarter fixed effects do not affect in a balanced panel. Shocks common to all banks therefore cannot drive the estimated matching relationship. These results are presented in Appendix C.4.

To further validate the findings, we re-estimate the model using alternative measures of the policy rate, namely the interbank money market rate and the Lombard repo rate. The money market rate, obtained from the IMF[9], reflects short-term interbank lending conditions and reflects the cost of market funding, while the Lombard repo rate[10] represents the central bank's standing lending facility. The results are similar with these alternative policy rate measures (Table C.2).

4.4.1 Panel Analysis Across Currencies

One of the main characteristics of banking systems in small economies such as Armenia is the presence of multi-currency balance sheets. We extend the framework of Drechsler, Savov, and Schnabl, 2021 by separating bank cash flow components into local (AMD) and foreign-currency components. This distinction is particularly important, and Armenia represents an especially interesting case where foreign-currency assets and liabilities remain persistently high. As it is well known, interest rates on assets and liabilities may respond differently to domestic interest rate changes. This setting allows us to provide novel evidence on how the matching of income and expense sensitivities operates in a small, open, and highly dollarized economy. The economic reason for separating AMD and foreign-currency positions is that domestic monetary policy does not affect the two sides of banks' balance sheets in the same way. AMD-denominated assets and liabilities are directly tied to domestic monetary conditions: changes in the CBA refinancing rate influence AMD deposit rates, AMD loan rates, and the opportunity cost of holding dram-denominated instruments. In contrast, foreign-currency assets and liabilities are only indirectly affected by the CBA policy rate. Their pricing depends more on foreign interest-rate benchmarks, foreign-currency liquidity, exchange-rate expectations, and the demand for dollar-denominated savings and borrowing. In a highly dollarized banking system, FX deposits may also behave differently from AMD deposits because households and firms hold them not only for yield, but also as a hedge against exchange-rate risk. As a result, foreign-currency interest income and expense are expected to exhibit weaker

[9]Data source: International Monetary Fund, 2026
[10]Data source:Central Bank of Armenia, 2026b

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and potentially less stable responses to changes in the domestic policy rate than AMD-denominated components.

This difference is also consistent with differences in balance sheet structure. Earlier maturity evidence shows that Armenian banks engage in substantially more maturity transformation in AMD than in foreign currency. The average maturity mismatch is largest for AMD-denominated positions, while the mismatch is smaller for USD and other foreign-currency positions and nearly absent for RUB positions. Banks therefore take more repricing exposure on the local-currency side, where domestic monetary policy is the relevant benchmark, and have shorter repricing maturities and smaller gaps in foreign currency.

An important implication for interpretation is that the CBA policy rate is the natural reference rate for AMD positions but not for foreign-currency positions. A weak response of USD, EUR or RUB income and expense to the CBA rate consistent with weaker sensitivity of foreign-currency positions to domestic monetary policy, but does not by itself indicate that banks manage foreign-currency interest rate risk less effectively: a dollar balance sheet can be well matched against dollar interest rates even if both its assets and liabilities barely respond to the CBA rate. Foreign-currency liquidity in Armenia may also have been affected independently of the CBA rate by remittance cycles and by the large inflows of 2022. A statistical consequence is that when foreign-currency expense responds little to the CBA rate, the fitted expense from the first stage varies little across banks, so the foreign-currency matching coefficient is weakly identified and imprecisely estimated. As a partial step in this direction, the foreign-currency specifications with macro controls also include the U.S. Federal Reserve policy rate and lagged exchange-rate changes (Table 5). Estimating foreign-currency sensitivities fully against the relevant foreign benchmark rates is beyond the scope of this paper and left for future work.

As we mentioned before, a key limitation in our dataset is that banks do not report interest income and expense separately by currency at the level of detail required for our purposes. To analyze the mechanism separately for local and foreign-currency components, we would ideally need interest income and expense generated exclusively from AMD-denominated and foreign-currency-denominated assets and liabilities, so addressing this constraint, we construct proxy measures of AMD- and foreign-currency-specific interest income and expense using information on the currency composition of assets and liabilities together with the corresponding average interest rates. In essence, total interest income and expense are allocated across currencies in proportion to their contribution to interest-generating assets and interest-bearing liabilities. This approach captures both the structure of bank balance sheets and differences in interest rates across currencies.

More specifically, we construct currency-specific interest income and expense proxies using bank-quarter currency shares adjusted by fixed relative interest-rate benchmarks. Let $s_{it}^{D,FX}$ denote the share of foreign-currency deposits in total deposits and $s_{it}^{L,FX}$ the

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share of foreign-currency loans in total loans for bank i in quarter t. The foreign-currency allocation weights are calculated as

$$w_{it}^{E,FX} = \frac{s_{it}^{D,FX}(3.98/10.60)}{s_{it}^{D,FX}(3.98/10.60) + (1 - s_{it}^{D,FX})}, \tag{6}$$

$$w_{it}^{I,FX} = \frac{s_{it}^{L,FX}(8.09/13.30)}{s_{it}^{L,FX}(8.09/13.30) + (1 - s_{it}^{L,FX})}. \tag{7}$$

Here, the ratios 3.98/10.60 and 8.09/13.30 represent fixed FX-to-AMD interest-rate adjustments for deposits and loans, respectively, constructed from average FX and AMD interest rates on deposits (3.98 and 10.60 percent) and loans (8.09 and 13.30 percent). These ratios are common across banks and quarters rather than being constructed from bank-specific, time-varying interest rates. The expense weights are based on deposit shares but are applied to total interest expense, which also includes the cost of non-deposit funding.

Using these weights, the currency-specific interest income and expense proxies are defined as

$$\widehat{II}_{it}^{FX} = II_{it} w_{it}^{I,FX}, \tag{8}$$

$$\widehat{II}_{it}^{AMD} = II_{it}(1 - w_{it}^{I,FX}), \tag{9}$$

$$\widehat{IE}_{it}^{FX} = IE_{it} w_{it}^{E,FX}, \tag{10}$$

$$\widehat{IE}_{it}^{AMD} = IE_{it}(1 - w_{it}^{E,FX}). \tag{11}$$

Here, II_{it} and IE_{it} denote total reported quarterly interest income and expense, respectively. Thus, the FX components are calculated directly using the adjusted currency weights, while the AMD components are obtained as their complements. The resulting proxy flows are divided by total assets and multiplied by four to obtain annualized interest income and expense rates.

Because the same relative interest-rate adjustments are applied to all banks, the allocation method may mechanically contribute to the observed co-movement between AMD interest income and expense proxies, particularly when banks' asset and liability currency shares are correlated. Consequently, the estimated currency-specific matching relationships should be interpreted with caution, as they may partly reflect the construction of the proxies rather than actual interest-rate risk management. More fundamentally, because each currency component is a share of total reported interest income or expense, the proxies assume that the interest rates on AMD and FX positions move in the same proportion. They therefore cannot directly identify differences in the responses of AMD

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and foreign-currency interest income and expense to changes in the policy rate.: differences between the AMD and FX estimates arise from the level and evolution of banks' currency shares, including the gradual de-dollarization of balance sheets, rather than from observed currency-specific interest rates. The currency results are therefore indicative of how the matching relationship varies with currency composition, and should not be read as direct evidence of differences in interest-rate sensitivities across currencies based on observed currency-specific cash flows.

Our main results based on currency-level analysis are reported in Table 5. Following the main setup, we implement a two-stage estimation procedure, and the table reports the second-stage results. We first consider the AMD components of interest income and interest expense. In the full sample, the coefficient on the estimated value of interest expense is 0.67, and after including macro controls, the coefficient increases to 0.76. This indicates a strong positive matching between the policy-rate sensitivities of AMD interest income and AMD interest expense. Turning now to the post-2017 subsample, the coefficients are 0.76 and 0.68, which shows that, despite changes in the macroeconomic environment, the AMD coefficient is stable across samples and specifications. It is also worth noting that the coefficients are not statistically distinguishable from unity.

Evidence suggests a different pattern for foreign-currency positions, where the relationship is more heterogeneous and less stable across specifications. In the full sample, the estimated coefficients are 0.13 and 0.32 (columns (5)–(6)), both of which are economically small; the first is not significant and the second only at the 10 percent level. These estimates are clearly below one, indicating a weak relationship between interest income and interest expense arising from foreign-currency assets and liabilities. In the post-2017 subsample (columns (7)–(8)), the estimates are 0.27 and 0.64. The specification with macro controls, which includes the Federal Reserve policy rate, gives a larger and highly significant coefficient, but one-for-one matching is rejected in all four FX specifications Ultimately, the evidence for foreign-currency positions is weaker and less stable across specifications. As discussed above, this primarily reflects the weak and unstable association between the CBA rate and foreign-currency income and expense, rather than demonstrating that banks fail to match foreign-currency sensitivities with respect to the rates that are relevant for those positions. It is also consistent with the maturity structure discussed earlier: banks engage in less maturity transformation in foreign currency than in AMD, with shorter repricing maturities and smaller maturity gaps, so the exposure that would need to be offset is smaller.

Across all specifications, the cumulative direct effect of policy rate changes on interest income remains small and statistically insignificant. As in Drechsler, Savov, and Schnabl (2021), this means that a bank whose interest expense does not respond to the policy rate is predicted to have interest income that does not respond either; it does not imply a causal channel running from funding costs to income.

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Table 5: Panel Estimates by Currency: AMD vs Foreign Currency

	Armenian Dram (AMD)				Foreign Currency (FX)			
	2017–2024		2014–2024		2017–2024		2014–2024	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\widehat{\text{IntExp}}$	0.756***	0.684***	0.665**	0.755***	0.271	0.636***	0.126	0.324*
	(0.210)	(0.233)	(0.328)	(0.287)	(0.241)	(0.173)	(0.153)	(0.173)
$\sum_{\tau=0}^{3}\gamma_\tau$	0.092	0.052	0.009	-0.028	-0.008	0.007	0.040	0.069
	(0.074)	(0.080)	(0.063)	(0.072)	(0.050)	(0.081)	(0.048)	(0.058)
95% CI	[0.34, 1.17]	[0.23, 1.14]	[0.02, 1.31]	[0.19, 1.32]	[−0.20, 0.74]	[0.30, 0.98]	[−0.17, 0.43]	[−0.02, 0.66]
p, H_0: $\delta = 1$	0.245	0.175	0.307	0.393	0.002	0.035	<0.001	<0.001
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	544	544	680	680	544	544	680	680

Notes: The table reports second-stage panel regression estimates separately for AMD- and foreign-currency positions. Fitted changes in interest expenses are obtained from first-stage regressions allowing bank-specific interest-rate sensitivities. All specifications include bank fixed effects and contemporaneous and three lagged changes in the CBA policy rate. Macro specifications additionally control for macroeconomic conditions, including GDP growth, inflation, exchange-rate movements, and the sovereign spread. The FX macro specifications also include the Federal Reserve policy rate and lagged exchange-rate changes. Standard errors in parentheses are obtained from 1,000 nonparametric bootstrap replications, resampling the cross-section of banks by quarter and re-estimating both stages in each replication. This procedure preserves contemporaneous cross-bank dependence within quarters and accounts for first-stage estimation uncertainty. Significance stars are calculated using the normal approximation based on bootstrap standard errors and refer to tests against zero. The confidence intervals (for the coefficient on fitted expense) and the p-values for $H_0 : \delta = 1$ use the bootstrap standard errors and the normal approximation. AMD and FX income and expense are constructed proxies (Section 4.4.1). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

These results, as a whole, reveal a clear asymmetry between local and foreign-currency positions. The estimated coefficients for AMD positions are consistently large (0.67–0.76), statistically significant, and not statistically different from one, consistent with a strong alignment of AMD income and expense sensitivities. The coefficients for foreign-currency positions are smaller, less stable, and significantly below one, which implies a weaker relationship between policy-induced changes in funding costs and income in foreign currency.

4.5 Deposit Market Concentration and Interest Income–Expense Matching

An important implication of the deposit franchise mechanism is that banks with greater market power in deposit markets may be less exposed to changes in market interest rates through their funding costs. Drechsler, Savov, and Schnabl (2021) show that banks operating in more concentrated deposit markets have lower interest expense sensitivities and that these differences are matched by corresponding differences in interest income sensitivities. We examine whether deposit market concentration is similarly related to the adjustment of interest income and expenses in the Armenian banking sector.

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To measure deposit market concentration, we construct a bank-level Herfindahl–Hirschman index (HHI), following the geographical aggregation approach of Drechsler, Savov, and Schnabl (2021). We first calculate an HHI for each region and quarter as the sum of squared deposit market shares. We calculate regional deposit-market HHIs at a quarterly frequency, using end-of-quarter deposit balances across Armenia's 11 administrative regions (10 marzes and Yerevan).

$$HHI_{rt} = \sum_{b=1}^{N_{rt}} \left(\frac{D_{brt}}{\sum_{k=1}^{N_{rt}} D_{krt}} \right)^2, \tag{12}$$

where D_{brt} denotes deposits held by bank b in region r at time t, and N_{rt} is the number of banks operating in that region. We then construct a bank-level HHI by taking the weighted average of regional concentration, using each bank's geographical distribution of deposits as weights:

$$HHI_{it}^{Bank} = \sum_{r} \left(\frac{D_{irt}}{\sum_{s} D_{ist}} \right) HHI_{rt}. \tag{13}$$

This measure captures the extent to which a bank operates in concentrated regional deposit markets. Higher values indicate greater exposure to concentrated deposit markets and are used as a proxy for differences in local deposit market power. Unlike the branch-based measure in Drechsler, Savov, and Schnabl (2021), our index uses regional deposit shares for both the calculation of local concentration and the bank-level weights. Deposit shares are themselves influenced by deposit pricing (a bank that pays higher rates gains market share), so this measure is more likely than a branch-based measure to be correlated with banks' funding-cost behaviour for reasons other than market power. In addition, because deposits are heavily concentrated in Yerevan, banks' regional weights, and hence their HHI values, may differ relatively little. The bank-level HHI has a mean of 0.1060, with a cross-bank standard deviation of 0.0251 and a within-bank standard deviation of 0.0138; the variation over time within banks, which identifies the specification below, is thus about half as large as the variation across banks. These statistics are calculated over a balanced panel of 17 banks covering 2017Q1–2024Q4 (544 bank-quarter observations).

We next examine whether market concentration helps explain differences in banks' interest expense adjustments and whether these differences are matched on the income side. To do so, we estimate a two-stage instrumental variables regression, using bank-level HHI as an instrument for changes in interest expenses. The first stage is specified as

$$\Delta IntExp_{it} = \alpha_i + \pi HHI_{it}^{Bank} + \sum_{\ell=0}^{3} \beta_\ell \Delta r_{t-\ell} + \boldsymbol{\theta}' X_t + u_{it}, \tag{14}$$

where Δr_t is the change in the CBA policy rate, α_i denotes bank fixed effects, and X_t includes macroeconomic controls in the extended specification. The second stage relates

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changes in interest income to the instrumented changes in interest expenses:

$$\Delta IntInc_{it} = \mu_i + \delta \Delta \widehat{IntExp}_{it} + \sum_{\ell=0}^{3} \gamma_\ell \Delta r_{t-\ell} + \boldsymbol{\lambda}' X_t + \varepsilon_{it}. \tag{15}$$

The regressions include bank fixed effects and contemporaneous and three lagged changes in the policy rate. The extended specification additionally controls for GDP growth, inflation and exchange rate changes. Standard errors are clustered at the bank level.

This specification differs from that of Drechsler, Savov, and Schnabl (2021) in one important respect. They use market concentration to instrument banks' expense *betas* in the cross-section, because the deposit franchise predicts that market power reduces the sensitivity of deposit costs to market rates. Here, the level of the bank-level HHI instruments the quarterly *change* in interest expense. With bank fixed effects, the instrument is therefore identified from changes in banks' HHI over time, which can arise from shifts in regional deposit shares, branch network changes and mergers, rather than from cross-bank differences in market power. The exclusion restriction, that concentration affects interest income only through interest expense, is also strong, because regional market power may affect loan pricing directly. We therefore treat these estimates as supplementary evidence rather than as a clean test of the market power mechanism.

The first-stage results indicate a negative relationship between deposit market concentration and changes in interest expenses. The estimated coefficient on bank-level HHI is -2.596, with a standard error of 0.554, and is statistically significant at the 1% level. Thus, conditional on policy rate changes and bank fixed effects, banks operating in more concentrated deposit markets exhibit smaller changes in interest expenses.

The second-stage results indicate substantial matching between changes in interest income and interest expenses. The estimated coefficient on instrumented interest expenses is 1.170 in the baseline specification. After including the macroeconomic controls, the coefficient is 1.018. Both estimates are statistically significant and neither is statistically distinguishable from one at conventional significance levels. The confidence intervals are, however, wide ([0.27, 2.07] and [0.36, 1.68]), so these estimates do not pin down the degree of matching precisely.

These results are consistent with the broader evidence of interest income–expense matching presented in the previous sections. They suggest that differences in the deposit market environments in which Armenian banks operate may be relevant for understanding how changes in funding costs are reflected in interest income. This provides additional evidence consistent with the deposit franchise mechanism, although the estimates should not be interpreted as establishing a causal relationship between market concentration and interest rate risk.

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Table 6: Deposit Market Concentration and Interest Income–Expense Matching

	First Stage		Second Stage	
	(1)	(2)	(3)	(4)
HHI score	-2.596^{***}	-2.974^{***}		
	(0.554)	(0.648)		
Instrumented Δ Interest Expense			1.170^{**}	1.018^{***}
			(0.459)	(0.337)
Constant	0.315^{***}	0.548^{***}	0.014	-0.221^{***}
	(0.074)	(0.134)	(0.014)	(0.085)
Bank fixed effects	Yes	Yes	Yes	Yes
Policy-rate changes (0–3 lags)	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes
Observations	544	544	544	544
No. of banks	17	17	17	17
First-stage R^2	0.038	0.051		
Excluded-instrument F-statistic	21.94	21.06		
95% CI, instrumented expense			[0.27, 2.07]	[0.36, 1.68]
p-value, $H_0: \delta = 1$			0.711	0.957

Notes: This table reports two-stage least squares (2SLS) estimates of interest income–expense matching. Columns (1)–(2) report the first-stage regressions, where changes in interest expenses are regressed on the bank-level Herfindahl–Hirschman Index (HHI), constructed from regional deposit market concentration. Columns (3)–(4) report the second-stage regressions, where changes in interest income are regressed on instrumented changes in interest expenses. All specifications include bank fixed effects and contemporaneous and three lagged changes in the CBA policy rate. Columns (2) and (4) additionally control for GDP growth, inflation, changes in the exchange rate, and the sovereign spread. Sample: 2017Q1–2024Q4. Stars refer to tests of $H_0: \delta = 0$. With 17 clusters, cluster-robust standard errors and F-statistics should be interpreted with caution. The excluded-instrument first-stage F-statistics are calculated from the squared cluster-robust t-statistics on HHI. Standard errors clustered at the bank level are reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

5 Conclusion

The primary aim of this paper is to examine how Armenian banks manage interest rate risk in the presence of maturity transformation, deposit-based funding, and multi-currency balance sheets. Using quarterly bank-level data from 2014 to 2024, we study how changes in the CBA policy rate are associated with changes in banks' interest income, interest expense, and profitability, and whether the sensitivities of income and expense are aligned so as to offset this exposure.

The first key finding is that Armenian banks engage in substantial maturity transformation. Using the two complementary approaches, we estimate an average maturity mismatch of roughly 1.4 to 2 years, depending on the measure, which indicates that banks systematically fund longer-term assets with shorter-term liabilities. It deserves attention that this gap is not uniform across currencies, as maturity transformation is stronger in

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AMD-denominated positions and weaker in foreign-currency positions.

Second, this balance-sheet exposure is not associated with large and proportional fluctuations in realized short-run cash flows: aggregate net interest margins remain within a narrow range despite large movements in the CBA policy rate, while return on assets rose after 2022 for reasons that include non-interest income. This stability is consistent with a deposit franchise: deposits account for most bank funding, and funding costs adjust slowly and remain well below the policy rate, so policy rate changes is associated with only partially into funding costs.

Third, the average interest income and expense betas are very similar in the full sample, and the average NIM beta is close to zero, so policy rate changes have limited average short-run effects on bank margins; the dispersion across banks is, however, considerable. Cross-sectionally, banks with more rate-sensitive funding have more rate-sensitive income: the matching coefficients are about 0.7, significantly positive and not significantly different from one, but with wide confidence intervals given 17 banks. Panel estimates are similar in the post-2017 sample and lower in the full sample, where one-for-one matching is rejected without macroeconomic controls. The relationship is stronger in more stable periods and weaker for large banks. Because the matching coefficient is identified from cross-bank differences in policy-rate sensitivity, it is unaffected by shocks common to all banks. Overall, the evidence shows a positive and substantial matching of income and expense sensitivities, which limits the average short-run sensitivity of margins.

We further examine the role of deposit market concentration, finding a negative relationship between local market concentration and changes in banks' interest expenses, which is consistent with the deposit franchise mechanism. The corresponding instrumental-variable estimates of the matching coefficient are positive and close to one, although the relatively wide confidence intervals do not allow us to determine the precise degree of matching. Moreover, the interpretation of these estimates depends on the identifying assumptions of the instrumental-variable approach.

A further contribution is the currency-level analysis, which indicates a clear asymmetry between AMD and foreign-currency positions. For AMD-denominated components, the estimated coefficients are large (0.67–0.76), stable across samples and specifications, statistically significant, and not statistically different from one, consistent with a strong matching of AMD interest income and expense sensitivities. In contrast, foreign-currency coefficients are smaller, less stable, and significantly below one. This difference may reflect the distinct interest rate benchmarks and repricing dynamics of foreign-currency positions, rather than necessarily indicating less effective management of foreign-currency interest rate risk. Since the currency components of interest income and expense are constructed using currency shares rather than directly observed, the results should be interpreted as indicative evidence of differences in sensitivity matching across currencies.

Our analysis has several policy implications. First, Armenian banks' interest income

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and expense sensitivities are substantially matched, particularly in local currency, so the average short-run response of net interest margins to policy rate changes is small despite a sizeable maturity gap. Second, because the estimated sensitivities and maturity exposures differ across currencies, monetary policy and supervisory analysis should distinguish between AMD and foreign-currency positions.

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Appendix

Table A1: Definition of Main Variables

Variable	Definition
Interest Income Rate	Total quarterly interest income divided by total assets, annualized (multiplied by four).
Interest Expense Rate	Total quarterly interest expense divided by total assets, annualized (same denominator as interest income)
Net Interest Margin (NIM)	Interest income minus interest expense, divided by total assets, annualized
Return on Assets (ROA)	Net profit divided by total assets, annualized
Policy Rate	Central Bank of Armenia refinancing (policy) rate (quarterly average)
1Y Yield	Yield on 1-year Armenian government bond
10Y Yield	Yield on 10-year Armenian government bond
Asset Repricing Maturity	Weighted average residual contractual maturity of assets (midpoints of supervisory maturity buckets; an upper bound on the time to the next rate reset)
Liability Repricing Maturity	Weighted average residual contractual maturity of liabilities (as above)
Repricing gap	Asset repricing maturity minus liability repricing maturity
Duration Gap	Asset duration minus liability duration

Appendix A: Maturity transformation with different measures

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Dataset	Source	Access Date
Monetary and Financial Statistics	International Monetary Fund (IMF), Monetary and Financial Statistics (MFS) Database https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:MFS_IR(8.0.1)	May 14, 2026
Interest Rates of CBA Operations	Central Bank of Armenia, Interest Rates of the CBA Operations in Financial Markets https://www.cba.am/en/statistics/interest-rates-of-the-cba-operations-in-financial-markets/219	May 14, 2026
Price Statistics	Central Bank of Armenia, Price Statistics Database https://www.cba.am/en/statistics/price-statistics/27	May 14, 2026
Exchange Rates	Central Bank of Armenia, Exchange Rates Archive https://www.cba.am/en/exchange-rates-archive/	May 14, 2026

Table A2: Open Data Sources Used in the Analysis

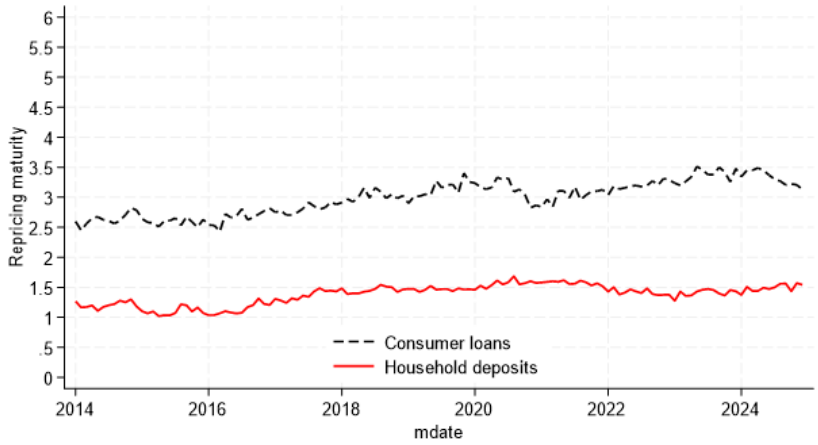


Figure A.6: Repricing Maturities of Consumer Loans and Household Deposits

Notes: The figure plots the average repricing maturities of aggregate bank consumer loans and household deposits in the Armenian banking system. Consumer loans consistently exhibit longer repricing maturities than household deposits, illustrating the presence of maturity transformation. Quarterly data cover the period from 2014 to 2024.

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Table A.3: Repricing Maturity of Bank Assets by Currency and Asset Category

Asset Category	Mean	Std. Dev.
Panel A. Total Sample		
(Total)	2.430	2.509
Business loans	2.398	1.836
Consumer loans	3.000	1.836
Mortgage loans	14.318	2.246
Interbank assets	1.288	1.868
Factoring and leasing	1.287	1.667
Panel B. By Currency		
AMD		
(Total)	3.356	2.174
Business loans	2.262	1.483
Consumer loans	3.300	1.608
Mortgage loans	14.477	1.877
Interbank assets	2.128	1.968
USD		
(Total)	2.539	2.826
Business loans	2.650	2.009
Consumer loans	3.083	1.949
Mortgage loans	14.054	2.649
Interbank assets	1.094	1.605
Factoring and leasing	1.307	1.749
EUR		
(Total)	2.653	2.501
Business loans	2.642	1.971
Consumer loans	2.877	1.967
Mortgage loans	14.379	2.554
Interbank assets	1.467	2.314
RUB		
(Total)	0.616	1.342
Business loans	1.668	1.890
Consumer loans	1.741	1.253
Mortgage loans	6.776	6.430
Interbank assets	0.155	0.857
Other FX		
(Total)	0.903	1.510
Business loans	1.242	1.503
Consumer loans	1.932	1.228
Mortgage loans	15.000	0.000
Interbank assets	0.020	0.009
Factoring and leasing	1.250	1.505

Notes: The table reports average repricing maturities of bank assets by asset category and currency denomination. Repricing maturities are expressed in years and are constructed using supervisory balance-sheet data. Asset categories include business loans, consumer loans, mortgage loans, interbank assets, and factoring and leasing exposures. Panel A reports aggregate repricing maturities for the full sample, while Panel B presents the corresponding measures separately by currency.

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Table A.4: Repricing Maturity of Bank Liabilities by Currency and Counterparty

Liability Category	**Mean**	**Std. Dev.**
Panel A. Total Sample		
(Total)	1.183	0.970
Households	1.386	0.844
Corporates	1.215	1.229
Financial Sector	1.571	2.244
Leasing	3.000	0.000
Panel B. By Currency		
AMD		
(Total)	1.022	0.994
Households	1.358	0.838
Corporates	1.173	1.213
Financial Sector	1.777	2.415
USD		
(Total)	1.508	0.907
Households	1.625	0.789
Corporates	1.422	1.263
Financial Sector	1.024	1.452
EUR		
(Total)	1.215	0.987
Households	1.288	0.902
Corporates	0.941	1.149
Financial Sector	0.843	1.676
RUB		
(Total)	0.942	0.745
Households	0.982	0.730
Corporates	0.518	0.951
Financial Sector	0.229	1.030
Other FX		
(Total)	0.492	0.971
Households	1.741	1.201
Corporates	0.321	0.807
Financial Sector	0.046	0.103
Leasing	3.000	0.000

Notes: The table reports average repricing maturities of bank liabilities by currency denomination. Repricing maturities are expressed in years and are constructed using supervisory balance-sheet data. Panel A presents aggregate repricing maturities for the full sample, and Panel B reports the corresponding measures separately for AMD and foreign-currency liabilities.

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Table A.5: Maturity Mismatch by Currency

Currency	Mean	SD
AMD	2.34	2.45
EUR	1.35	2.72
Other FX	1.23	1.66
RUB	-0.16	1.58
USD	1.03	3.11
Total	1.40	2.77

Notes: The table reports the estimated maturity mismatch by currency, calculated as the difference between asset and liability repricing maturities. Positive values indicate that assets reprice more slowly than liabilities, implying the presence of maturity transformation. All values are expressed in years.

Table A.6: Maturity Mismatch by Currency: Consumer Loans vs Household Deposits

Currency	Mean	SD
AMD	1.92	2.05
EUR	1.43	2.13
Other FX	.	.
RUB	0.89	1.22
USD	1.37	1.99
Total	1.56	2.03

Notes: The table reports the maturity mismatch between consumer loans and household deposits by currency denomination. The mismatch is calculated as the difference between the repricing maturity of consumer loans and household deposits. All values are expressed in years. Missing values indicate insufficient observations for a particular currency category.

Table A.7: Aggregate Duration Mismatch – Armenia

Specification	Asset Duration – Liability Duration
Spec (1): Unrestricted + C	2.043
Spec (2): Unrestricted, No C	2.039
Spec (3): Restricted + C	2.032
Spec (4): Restricted, No C	1.864

Notes: The table reports aggregate duration mismatch estimates obtained from the income-based mimicking portfolio approach. Duration mismatch is calculated as the difference between estimated asset and liability durations. "Restricted" specifications impose the constraint that portfolio weights sum to one, while "Unrestricted" specifications allow the coefficients to vary freely. Specifications with "+ C" include a constant term, whereas "No C" specifications exclude the constant. All values are expressed in years.

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Appendix B: Balance sheet structure

Table B.8: Quarterly Liability Shares in Total Bank Liabilities

Quarter	FX	Repo	Interbank	Financial	Securities	DD	TD	Other
2014Q1	0.640	0.000	0.184	0.138	0.000	0.177	0.424	0.045
2014Q2	0.629	0.000	0.188	0.139	0.000	0.178	0.420	0.043
2014Q3	0.637	0.000	0.182	0.137	0.000	0.187	0.412	0.049
2014Q4	0.651	0.000	0.215	0.148	0.000	0.173	0.386	0.051
2015Q1	0.627	0.000	0.213	0.151	0.000	0.167	0.396	0.046
2015Q2	0.651	0.000	0.183	0.148	0.000	0.196	0.399	0.046
2015Q3	0.662	0.000	0.171	0.147	0.000	0.202	0.407	0.045
2015Q4	0.669	0.000	0.190	0.146	0.000	0.184	0.411	0.042
2016Q1	0.670	0.000	0.179	0.146	0.000	0.178	0.430	0.042
2016Q2	0.611	0.000	0.165	0.141	0.000	0.185	0.439	0.042
2016Q3	0.623	0.000	0.159	0.148	0.000	0.178	0.445	0.044
2016Q4	0.637	0.000	0.141	0.132	0.000	0.198	0.461	0.043
2017Q1	0.633	0.000	0.126	0.141	0.000	0.205	0.463	0.041
2017Q2	0.615	0.000	0.140	0.133	0.000	0.197	0.457	0.048
2017Q3	0.614	0.000	0.140	0.133	0.000	0.218	0.435	0.051
2017Q4	0.606	0.001	0.115	0.133	0.000	0.223	0.450	0.058
2018Q1	0.604	0.000	0.129	0.133	0.034	0.217	0.440	0.026
2018Q2	0.597	0.001	0.135	0.138	0.038	0.207	0.432	0.028
2018Q3	0.591	0.000	0.140	0.134	0.038	0.225	0.416	0.027
2018Q4	0.584	0.001	0.127	0.134	0.039	0.237	0.414	0.029
2019Q1	0.570	0.000	0.141	0.133	0.039	0.227	0.404	0.036
2019Q2	0.570	0.000	0.139	0.137	0.037	0.236	0.392	0.038
2019Q3	0.570	0.000	0.133	0.136	0.038	0.245	0.397	0.032
2019Q4	0.562	0.000	0.140	0.136	0.035	0.245	0.387	0.035
2020Q1	0.570	0.001	0.123	0.156	0.037	0.227	0.405	0.032
2020Q2	0.543	0.001	0.141	0.152	0.038	0.223	0.387	0.036
2020Q3	0.544	0.000	0.152	0.145	0.042	0.226	0.368	0.044
2020Q4	0.539	0.001	0.170	0.153	0.041	0.234	0.345	0.040
2021Q1	0.520	0.001	0.170	0.150	0.045	0.229	0.349	0.038
2021Q2	0.484	0.001	0.169	0.148	0.041	0.242	0.341	0.039
2021Q3	0.465	0.000	0.179	0.142	0.040	0.240	0.344	0.040
2021Q4	0.456	0.000	0.167	0.142	0.039	0.251	0.351	0.035
2022Q1	0.456	0.000	0.169	0.139	0.039	0.247	0.353	0.039
2022Q2	0.441	0.000	0.168	0.131	0.035	0.273	0.339	0.039
2022Q3	0.458	0.000	0.159	0.123	0.032	0.305	0.323	0.043
2022Q4	0.458	0.000	0.142	0.116	0.030	0.329	0.323	0.049
2023Q1	0.442	0.000	0.142	0.117	0.033	0.325	0.323	0.046
2023Q2	0.437	0.000	0.140	0.115	0.032	0.323	0.331	0.044
2023Q3	0.433	0.000	0.138	0.107	0.034	0.329	0.333	0.043
2023Q4	0.423	0.000	0.149	0.108	0.033	0.325	0.329	0.044
2024Q1	0.404	0.000	0.166	0.106	0.034	0.309	0.329	0.043
2024Q2	0.395	0.000	0.180	0.102	0.036	0.305	0.326	0.039
2024Q3	0.380	0.000	0.189	0.097	0.040	0.294	0.324	0.045
2024Q4	0.372	0.000	0.178	0.108	0.040	0.293	0.321	0.049
Total	0.546	0.000	0.158	0.134	0.024	0.237	0.385	0.041

Note: This table reports quarterly liability shares by funding category. Shares are expressed as fractions of total liabilities.

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Table B.9: Bank-Level Average Liability Shares

Bank	FX	Repo	Interbank	Financial	Securities	DD	TD	Other
1	0.433	0.000	0.169	0.064	0.010	0.200	0.486	0.056
2	0.562	0.001	0.160	0.086	0.052	0.233	0.423	0.033
3	0.645	0.000	0.050	0.346	0.031	0.261	0.247	0.050
4	0.705	0.000	0.070	0.188	0.059	0.282	0.310	0.079
5	0.374	0.000	0.095	0.068	0.000	0.305	0.470	0.043
6	0.435	0.001	0.197	0.226	0.013	0.219	0.295	0.040
7	0.616	0.000	0.138	0.096	0.029	0.216	0.435	0.070
8	0.602	0.000	0.064	0.115	0.036	0.301	0.434	0.034
9	0.531	0.000	0.123	0.260	0.015	0.246	0.304	0.035
10	0.586	0.000	0.731	0.009	0.000	0.224	0.008	0.027
11	0.685	0.000	0.127	0.145	0.000	0.165	0.526	0.020
12	0.685	0.000	0.073	0.042	0.000	0.434	0.392	0.054
13	0.468	0.000	0.111	0.200	0.011	0.189	0.395	0.027
14	0.362	0.000	0.167	0.043	0.000	0.204	0.489	0.022
15	0.588	0.000	0.053	0.031	0.028	0.243	0.591	0.028
16	0.575	0.000	0.153	0.248	0.014	0.212	0.318	0.031
17	0.438	0.001	0.209	0.111	0.104	0.088	0.427	0.054
Total	0.546	0.000	0.158	0.134	0.024	0.237	0.385	0.041

Note: This table reports average liability shares by bank. Banks are indexed from 1 to 17. Shares represent the fraction of total liabilities accounted for by each funding category.

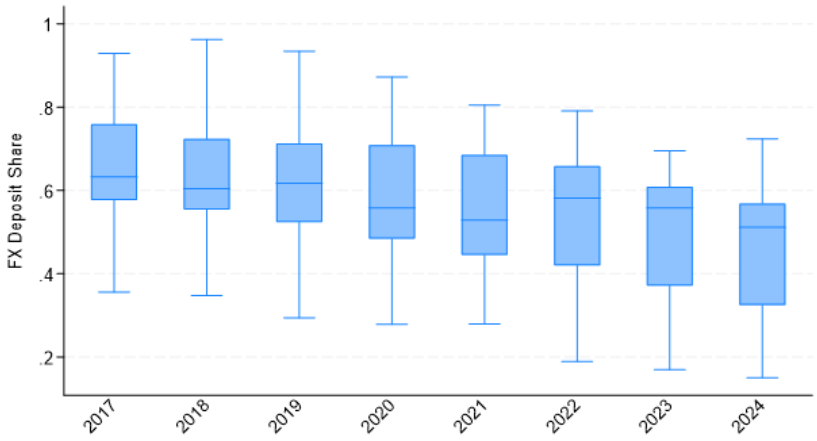


Figure A.7: Distribution of Foreign-Currency Deposit Shares Across Banks

Notes: The figure presents the distribution of foreign-currency deposit shares across Armenian commercial banks by year. Although the share of foreign-currency deposits gradually declines over time, the figure indicates that dollarization remains persistently high throughout the sample period.

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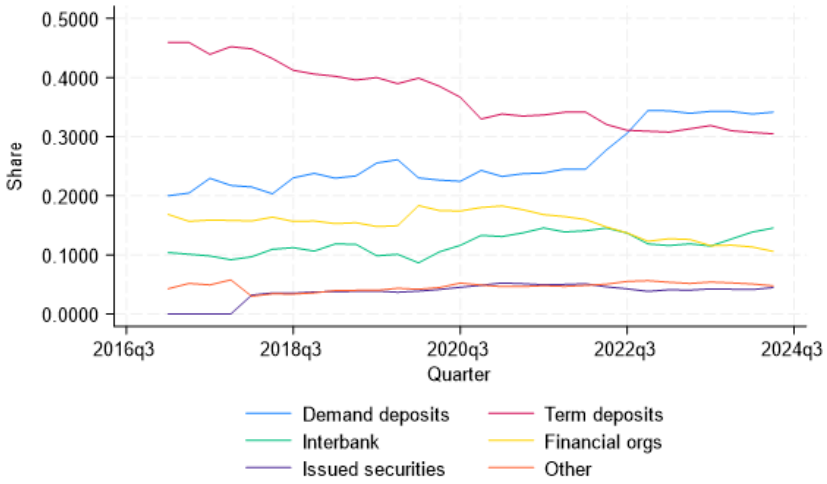


Figure A.8: Weighted Liability Structure of the Armenian Banking System

Notes: The figure shows the weighted composition of bank liabilities over time in the Armenian banking system. The blue line represents demand deposits, while the pink line corresponds to term deposits. The green line shows interbank liabilities, the yellow line represents liabilities to financial organizations, the purple line indicates issued securities, and the orange line captures other liabilities. The figure illustrates that deposits remain the dominant source of bank funding throughout the sample period. Quarterly data cover the period from 2016Q3 to 2024Q3.

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Appendix C: Results

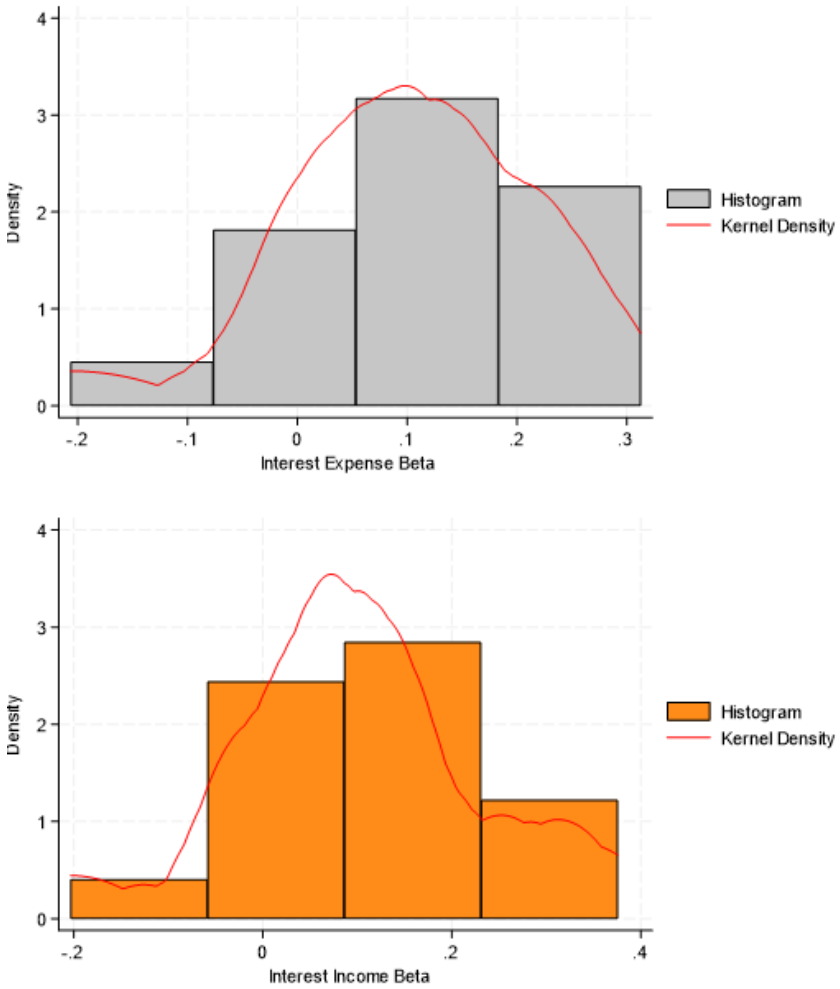


Figure A.9: Distribution of Interest Expense and Interest Income Betas

Notes: The figure presents the distribution of estimated interest expense betas (top panel) and interest income betas (bottom panel) across Armenian commercial banks. Histograms are combined with kernel density estimates. Most estimated betas are concentrated around positive values, indicating that both funding costs and interest income generally move in the same direction following interest rate changes.

In addition, the raw correlation between interest income and interest expense betas in the full sample is 0.65, indicating a strong positive relationship between the sensitivities of bank assets and liabilities to policy rate changes.

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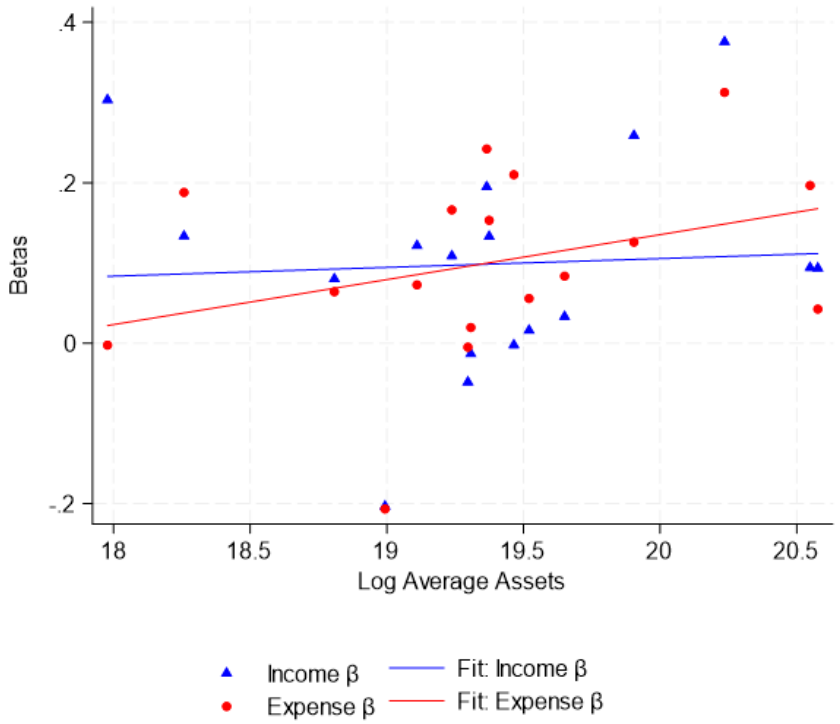


Figure A.10: Interest Income and Expense Betas by Bank Size.

Notes: The figure plots bank-level income and expense betas against the log of average assets, with linear fits. Expense betas rise with bank size, while income betas are roughly flat.

Table C.1: Average Betas Across Low- and High-Sensitivity Banks

	2014–2024				2017–2024			
	Expense	Income	ROA	NIM	Expense	Income	ROA	NIM
Low-beta banks	0.005	0.044	0.046	0.039	-0.069	-0.017	0.277	0.051
High-beta banks	0.187	0.148	-0.099	-0.039	0.106	0.108	0.079	0.002

Notes: The table reports average estimated betas for banks grouped according to the sensitivity of interest expense to policy rate changes. Low-beta banks correspond to banks with relatively weak interest expense sensitivity, while high-beta banks represent banks with stronger funding-cost sensitivity. The table reports average betas for interest expense, interest income, return on assets (ROA), and net interest margin (NIM) for both the full sample and the post-2017 subsample.

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Table C.2: Two-Stage Panel Estimates Across Alternative Policy Rates

Dependent variable: Δ *Interest Income Rate*						
	Policy Rate		Money Market		Lombard Repo	
	No Macro	Macro	No Macro	Macro	No Macro	Macro
$\Delta\widehat{\text{IntExp}}$	0.713***	0.871***	0.669**	0.872***	0.713***	0.919***
	(0.230)	(0.277)	(0.268)	(0.279)	(0.229)	(0.292)
$\sum_{\tau=0}^{3}\gamma_\tau$	0.068	-0.001	0.035	0.011	0.068	0.041
	(0.058)	(0.079)	(0.059)	(0.067)	(0.059)	(0.075)
Macro controls	No	Yes	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank-specific slopes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	544	544	544	544	544	544
Banks	17	17	17	17	17	17
Sample	2017Q1–2024Q4					

Notes: The table reports second-stage panel regressions of changes in interest income on fitted changes in interest expenses, using alternative monetary policy rate measures. All specifications include bank fixed effects and bank-specific sensitivities to contemporaneous and three lagged interest-rate changes in the first stage. Macro specifications additionally control for GDP growth, inflation, and exchange-rate changes. The policy-rate macro specification also includes the Armenian sovereign spread, so the macro columns are not fully comparable across rate measures. Standard errors in parentheses are obtained from 1,000 nonparametric bootstrap replications, resampling quarterly cross-sections of banks and re-estimating both stages. The cumulative direct interest-rate effect is $\sum_{\tau=0}^{3}\gamma_\tau$. Significance stars are based on normal-approximation bootstrap tests: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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Table C.3: Two-Stage Panel Regression: Large-Bank Subsample

	2017Q1–2024Q4		2014Q1–2024Q4	
	(1)	(2)	(3)	(4)
Interest Expense (fitted)	0.588**	0.494**	0.485*	0.543**
	(0.230)	(0.199)	(0.293)	(0.261)
Policy Rate (direct effect)	0.050	0.003	0.039	0.014
	(0.067)	(0.089)	(0.089)	(0.105)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Bank-specific policy-rate slopes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes
Bank-specific macro slopes	No	Yes	No	Yes
Observations	288	288	360	360
Number of Banks	9	9	9	9

Notes: The table replicates the baseline and macro-controlled two-stage panel specifications for large banks. Large banks are defined as institutions with average log assets at or above the bank-level median within the corresponding sample period. The classification is held fixed within each sample.
The first stage allows bank-specific sensitivities to contemporaneous and three lagged changes in the CBA policy rate. Macro specifications additionally include GDP growth, inflation, exchange-rate changes, and the sovereign spread, with bank-specific macro sensitivities in the first stage.
Standard errors in parentheses are based on 1,000 nonparametric bootstrap replications, re-sampling quarterly cross-sections and re-estimating both stages.
Significance stars use normal-approximation bootstrap inference. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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Table C.4: Two-Stage Panel Regression: Bank and Quarter Fixed Effects

	2017Q1–2024Q4		2014Q1–2024Q4	
	(1) All Banks	(2) Large Banks	(3) All Banks	(4) Large Banks
Interest Expense (fitted)	0.713***	0.588**	0.352	0.485*
	(0.230)	(0.230)	(0.222)	(0.293)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Bank-specific policy-rate slopes	Yes	Yes	Yes	Yes
Macro Controls	No	No	No	No
Observations	544	288	680	360
Number of Banks	17	9	17	9

Notes: The table reports two-stage panel estimates including bank and quarter fixed effects in both stages. First-stage fitted interest expenses are obtained using bank-specific sensitivities to contemporaneous and three lagged changes in the CBA policy rate. The direct effects of common policy-rate changes cannot be identified separately from quarter fixed effects and are therefore omitted. Large banks are defined according to their average log assets within each sample period. Standard errors in parentheses are obtained from 1,000 quarter-cluster bootstrap replications, with both stages re-estimated in each replication. Significance stars are based on normal-approximation bootstrap tests against zero. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

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