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WORKING PAPER WP-2025-04

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Viktoria Alaverdyan ⁽¹⁾, Gevorg Minasyan ⁽²⁾, and Aleksandr Shirkhanyan ⁽³⁾

ABSTRACT

This paper examines whether macroprudential foreign exchange (FX) regulations unintentionally shift currency risk to sectors not directly targeted by such measures. Using a difference-in-differences framework and a highly granular dataset combining loan-level credit registry data with bank-level balance sheet information, we analyse how Armenian banks adjusted their portfolios following the introduction of a differentiated loan-to-value (LTV) regulation that imposed stricter limits on FX-denominated mortgages. The results show that the differentiated LTV, while tightening borrowing conditions for FX-denominated mortgages, also led to an increase in the dollarization of business loans and a higher share of foreign-currency bonds in banks’ portfolios. These shifts imply that FX-related macroprudential policies can reallocate rather than reduce currency risk, emphasizing the need for system-wide oversight to prevent its build-up in unregulated segments of the financial system.

Keywords:	Macroprudential policy; Foreign exchange regulation; Loan-to-value limits; Dollarization; Bank portfolio reallocation
JEL Codes:	E58, G21, G28, F31, E44
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Acknowledgments: We are grateful to Artashes Karapetyan (ESSEC Business School), Jeffrey Wooldridge (Michigan State University), Ruben Enikolopov (Pompeu Fabra University), and Vardges Levonyan (University of Zurich) for their valuable comments and suggestions. We also thank participants at the EcoMod2025 International Conference on Economic Modeling and Data Science, the AEA 15th Anniversary Conference, and the YSU 2nd International Conference for helpful discussions and feedback on earlier drafts of the paper. All remaining errors are our own.

1. INTRODUCTION

The global financial crisis reshaped the way central banks and regulators approach financial stability. In its aftermath, many countries established formal macroprudential frameworks aimed at addressing systemic risks that traditional monetary and microprudential tools could not fully contain. These frameworks rely on instruments such as countercyclical capital buffers (CCyB), capital conservation buffers, and a range of borrower-based measures, including loan-to-value (LTV), loan-to-income (LTI), and debt-service-to-income (DSTI) ratios. Complementary liquidity and funding standards, such as the liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) under Basel III, have further strengthened the resilience of financial systems (BCBS, 2013; Nier et al., 2019). Cross-country evidence shows that emerging markets tend to rely more heavily on foreign-exchange (FX)-related prudential tools, reflecting their greater exposure to currency mismatches and dollarization pressures, whereas advanced economies emphasize borrower-based measures (Cerutti et al., 2017; Biljanovska et al., 2023).

In line with global developments, Armenia has also progressively strengthened its macroprudential framework over the past decade. The Central Bank of Armenia (CBA) has introduced a set of measures to enhance financial resilience, including the CCyB, the capital conservation buffer, and stricter lending standards on real-estate-secured loans. These tools have been complemented by higher capital requirements for systemically important financial institutions (SIFIs) to limit contagion risk and by refinements in liquidity management regulations such as the introduction of the LCR and NSFR. The expansion of these policies coincided with a period of rapid credit growth and strong housing market dynamics. Between 2017 and 2024, the stock of mortgage loans in Armenia increased more than sixfold, while real estate prices in the capital city, Yerevan, rose by about 60 percent, raising concerns about overheating and excessive leverage. In response, in April 2022 the CBA introduced a differentiated LTV regulation, setting stricter limits for FX-denominated mortgages (70 percent) compared to loans in Armenian dram (90 percent). The measure aimed to reduce household currency mismatches and mitigate systemic FX risk arising from the growing share of foreign-currency lending in the mortgage market.

Despite the increasing use of FX-related prudential instruments, the empirical literature on their effectiveness remains limited. Evaluating their impact is complicated by data constraints and by the fact that financial institutions may respond to targeted regulations by reallocating risk rather than reducing it. Ahnert et al. (2021) document that tighter macroprudential FX regulations generally reduce banks' borrowing and lending in foreign currency but may lead firms to substitute toward non-bank FX borrowing, effectively transferring risk outside the regulated perimeter. Similar findings by Zhang and Zoli (2016) and Tobal (2019) suggest that prudential interventions can "shift the snowbanks" of FX vulnerability rather than eliminate them. Yet, there is little evidence on how such risk reallocation occurs within the banking system itself. This paper contributes to closing this gap by analysing how banks in Armenia adjusted their portfolios following the introduction of the differentiated LTV regulation. Using a highly granular dataset combining loan-level and bank-level data, the study examines

whether banks reduced their aggregate FX exposure or instead reallocated it toward unregulated assets such as business loans and foreign-currency bonds.

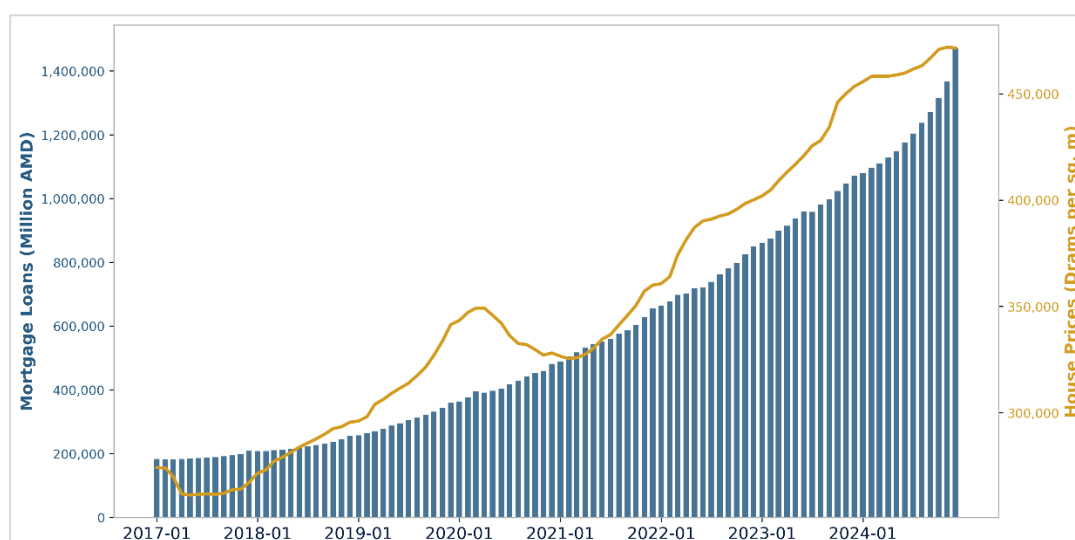
The empirical findings reveal that the differentiated LTV regulation, while imposing stricter limits on FX-denominated mortgages, also led to an increase in the dollarization of business loans and a higher share of FX-denominated bonds in banks' portfolios. Banks that were most affected by the policy – those previously active in high-LTV FX mortgages – rebalanced their balance sheets by increasing the dollarization of business loans and expanding their holdings of FX-denominated bonds. From a policy perspective, these results illustrate the dual nature of targeted macroprudential tools: while they can effectively mitigate specific vulnerabilities – in this case, household-level currency mismatches – they may also induce risk migration to less-regulated sectors, such as business lending or bond investments. The Armenian experience thus underscores the need for system-wide monitoring of aggregate FX exposures and for complementary measures that limit the reemergence of risks in other parts of the financial system.

The remainder of this paper is organized as follows. Section 2 provides background information on Armenia's housing and mortgage markets and the context for the differentiated LTV regulation. Section 3 outlines the empirical methodology based on a Difference-in-Differences (DiD) framework. Section 4 describes the dataset and key variables. Section 5 presents the main results, while Section 6 reports robustness checks. Section 7 concludes and discusses the policy implications.

2. BACKGROUND

Over the period 2017–2024, Armenia's housing and mortgage markets experienced a pronounced overheating phase. The stock of mortgage loans expanded more than sixfold, from roughly AMD 200 billion in early 2017 to over AMD 1.3 trillion by 2024, while average apartment prices in Yerevan rose from about AMD 280,000 to nearly AMD 450,000 per square meter (Figure 1). The joint acceleration of credit growth and property prices reflected a self-reinforcing cycle in which rising collateral values encouraged further mortgage lending, and the expansion of credit stimulated additional housing demand.

Analytical assessments by the CBA, based on established price-to-rent and price-to-income frameworks (Hott & Monnin, 2008; Bergman & Sørensen, 2021; Plasil & Andrieu, 2019), confirmed that beginning in 2018–2019, actual house prices exceeded their fundamental or “normal” levels, with estimated overvaluation ranging between 8 and 25 percent, depending on the underlying assumptions (CBA, 2021).

Figure 1: Dynamics of Real Estate Prices and Mortgage Loans

Source: Central Bank of Armenia and authors' calculations

Note: Mortgage Loans (left axis) show end-of-period mortgage lending by commercial banks to resident borrowers (in million AMD), while House Prices (right axis) reflect the average market price per square meter of apartments in multi-apartment residential buildings in Yerevan (AMD).

Several structural and policy-related factors contributed to the rapid expansion of Armenia's housing and mortgage markets. Chief among them was the income tax refund mechanism on mortgage interest payments, introduced in 2015, which effectively reduced borrowing costs for households and incentivized them to take on larger mortgage loans. In parallel, state-supported refinancing programs, implemented through the National Mortgage Company and other agencies, provided banks with long-term, low-cost funding, thereby expanding the supply of mortgage credit. Following the onset of the war in Ukraine, additional demand pressures emerged as foreign arrivals and net monetary transfers increased substantially, boosting household liquidity and fuelling demand for housing, particularly in urban areas. In this context, real estate became an increasingly attractive investment vehicle, prompting both resident and non-resident buyers to increase their participation in the market.

These trends raised concerns regarding the sustainability of housing prices and their alignment with underlying economic fundamentals, including household income dynamics, demographic trends, financial conditions, and housing supply constraints. In response, the authorities implemented a series of macroprudential and regulatory measures aimed at containing financial sector risks associated with the housing market. In April 2022, the CBA introduced LTV ratio limits of 90 percent for dram-denominated loans and 70 percent for foreign-currency loans, to limit excessive leverage and mitigate exchange rate risk. The CCyB was subsequently raised to 1.5 percent of risk-weighted assets effective August 1, 2023, and to 1.75 percent effective May 1, 2025, enhancing banking system resilience against potential shocks and curbing excessive lending growth. In parallel, the CBA strengthened its macro-financial risk monitoring framework, enhancing stress-testing methodologies, collecting more granular data from property developers, and reinforcing microprudential risk assessments. To reduce bank exposure to the construction sector, a September 2023 amendment to the Civil Code restricted the use of funds in escrow accounts by property developers. Furthermore, as

of March 2023, the Government adopted legislation prohibiting foreign-currency mortgages for residents with income denominated in the national currency, aiming to mitigate household-level currency mismatch risks.

Against this backdrop of rapid credit growth, rising property valuations, and tightening prudential policies, the introduction of the differentiated LTV regulation in April 2022 offers an important opportunity to examine how banks adjust their balance sheets in response to currency-based macroprudential constraints. Although the measure was primarily intended to limit household leverage and reduce banks' exposure to foreign exchange risk, its broader effects on portfolio composition remain less understood. The Armenian case provides a particularly informative setting, as the policy change was both targeted and clearly defined, allowing for a clear assessment of how banks reacted to the tightening of foreign currency lending conditions. Specifically, we investigate whether these foreign exchange-related regulations prompted banks to reallocate assets by shifting foreign currency exposure toward unregulated categories such as business loans and foreign currency-denominated bond holdings, thereby revealing potential channels of risk migration and policy leakage within the macroprudential framework.

3. METHODOLOGY

To identify the causal impact of the differentiated LTV regulation on banks' balance-sheet composition, we employ a DiD framework. This allows us to compare the evolution of key outcome variables between banks more exposed to the regulation (treated) and those less exposed (control) before and after the policy's implementation. The analysis covers a symmetric observation window of one year before and after the regulation came into force in April 2022, ensuring a balanced comparison of pre- and post-policy behaviour (see Figure 2).

Figure 2: Event Window Definition



Following Behncke (2023), banks are classified according to their pre-policy exposure to the new prudential constraint. We identify as treated those institutions that had issued a relatively large share of new foreign-currency mortgages with LTV ratios exceeding 70 percent before the introduction of the differentiated LTV cap, as they were expected to be most affected by the policy change. The degree of exposure is quantified as:

$$LTV_{exp_i} = \frac{1}{12} \sum_{t=Apr\ 1,2021}^{Apr\ 1,2022} \frac{\text{New mortgage volumes with LTV} > 70\% \text{ in USD}_{it}}{\text{Total new USD mortgage volumes}_{it}}$$

This measure captures the variation in how strongly banks were exposed to the upcoming regulation by computing, for each institution, the average share of high-LTV foreign-currency mortgages in total new USD mortgage lending during the year preceding the policy change (see Appendix 2).¹ A higher value of LTV_{exp_i} implies that a larger portion of a bank's pre-policy lending activity exceeded the new regulatory ceiling, meaning that the bank had to adjust its future lending behaviour more substantially once the limits were introduced. Conversely, banks that had maintained more conservative LTV ratios before April 2022 were less exposed to the tightening and therefore faced weaker adjustment pressures. After computing this exposure measure for all banks, we examine its distribution and use the median value as a cut-off point to classify institutions into treatment groups. Banks with exposure above the median are assigned to the treated group, reflecting higher sensitivity to the regulation, while those below the median constitute the control group. Later in the analysis, we also explore alternative thresholds to verify that the main results remain robust to different definitions of the exposure cut-off.

Based on the identification design described above, the analysis proceeds using a two-way fixed effects (TWFE) specification that exploits both the cross-sectional variation in banks' exposure to the regulation and the time dimension around its implementation. The baseline regression model is defined as:

$$Y_{it} = \beta_1 * Treated_i * Post_t + \beta_2 * X_{it} + \alpha_i + \gamma_t + \epsilon_{it}$$

In this equation, Y_{it} represents the outcome variable, which includes the dollarization ratio of business and consumer loans and the share of foreign currency denominated bonds in total bond purchases. $Treated_i$ captures treatment status and indicates the extent to which bank i was affected by the regulation. It takes the value of 1 for treated banks and 0 for control banks. $Post_t$ is time variable equal to 1 for periods after the regulation was introduced and 0 for the earlier period. The coefficient of the interest is β_1 , which measures the difference in outcomes between treated and control banks following the introduction of the policy. X_{it} is a vector of control variables that includes the Tier 1 capital-to-risk-weighted assets ratio (N_{1_2}), the natural logarithm of total assets, non-performing loans (NPLs) by loan type, the dollarization level of household deposits, the consumer price index (CPI) and gross domestic product (GDP). Finally, α_i and γ_t represent bank and time fixed effects that control for unobserved differences across institutions and common changes over time, while ϵ_{it} is the error term.

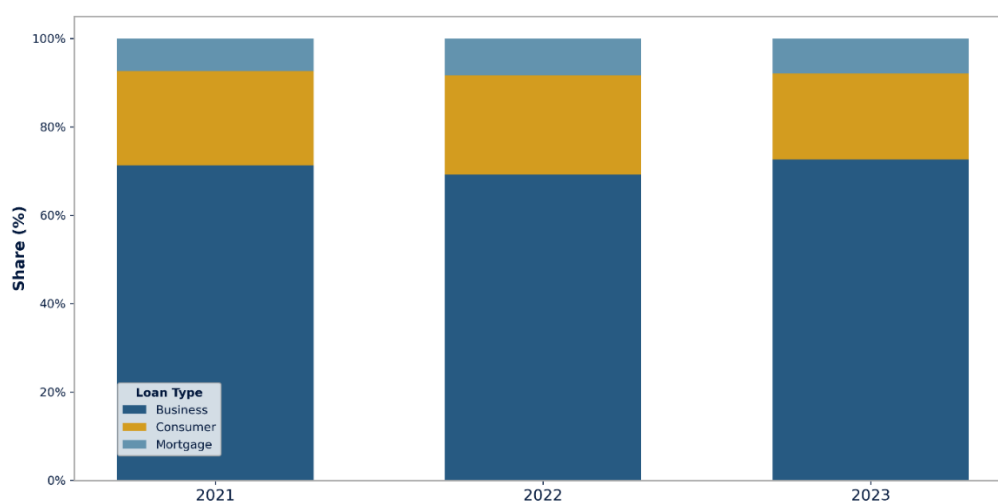
¹ To calculate these shares, we used mortgage loan amounts issued before the policy change. Repeating the exercise with mortgage counts yielded the same treatment-control classification.

4. DATA

The dataset used in the analysis combines detailed credit registry information and bond acquisition data, covering 17 commercial banks and spanning the period from April 2021 to April 2023. The credit registry dataset contains 3,776,184 loan-level records on consumer and business loans issued to resident borrowers. For each loan, the data include information on loan type, amount, currency, interest rate, and borrower category. The dataset on bond acquisitions consists of 6,339 daily bank-level observations that record the value and currency of each bank's bond purchases. These data are aggregated to a monthly frequency to calculate, for each bank, the share of FX bonds in total bond purchases.

Figure 3 presents the annual composition of loan amounts issued by type for the period 2021 – 2023 within the aggregate banking system portfolio. Business loans account for the largest share – approximately 69 to 73 percent each year – followed by consumer loans at around 19 to 23 percent, and mortgage loans comprising the smallest portion at roughly 7 to 8 percent. These proportions display only modest variation across years. In contrast, the distribution of loan counts is overwhelmingly concentrated in consumer lending, which represents about 98 percent of all loan issuances, compared to roughly 1 percent for business loans and 0.6 to 0.7 percent for mortgage loans. Hence, while business lending dominates in terms of total loan value, consumer loans account for the overwhelming majority of individual loan issuances.

Figure 3: Annual Distribution of Issued Loans Across Loan Types



Source: Central Bank of Armenia and authors' calculations.

To complement the loan-level information, the analysis includes two additional groups of variables that help control for factors potentially affecting banks' responses to the differentiated LTV regulation (Tables 1 and 2). Table 1 outlines the main elements of the credit registry data and the variables derived from it. The outcome measure is the dollarization level, which captures the proportion of foreign-currency loans within each loan category. We also account for several bank-specific indicators, most notably the non-performing loan ratios (NPL) reported separately for total, foreign-currency, and dram loans. These indicators provide a snapshot of each bank's credit risk environment and allow the empirical strategy to account for differences in underlying financial conditions.

Table 1. Descriptive Statistics: Credit Registry Data

Variable Group	Definition	Business Loans		Consumer Loans		Mortgage Loans	
		Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Outcome Variables	Dollarization Level	0.237	0.232	0.026	0.070	0.137	0.188
Bank-Specific Indicators	Non-Performing Loans						
	Total	0.021	0.025	0.019	0.024	0.004	0.003
	FX Loans	0.028	0.037	0.005	0.008	0.004	0.005
	AMD Loans	0.016	0.024	0.026	0.029	0.003	0.003

Source: Central Bank of Armenia and authors' calculations.

Table 2 presents the descriptive statistics for the aggregate-level dataset, which incorporates both bank-specific normatives and macroeconomic variables. The outcome variable in this table, the share of FX bonds in a bank's total bond purchases, captures the extent of foreign currency exposure on the investment side of banks' balance sheets. The bank-specific indicators reflect differences in financial strength, solvency, and liquidity, such as the total and Tier 1 capital adequacy ratios (N_1_1 and N_1_2), highly liquid assets-to-total assets and demand deposits (N_2_1 and N_2_2), as well as bank size measured by total assets. The deposit dollarization ratio captures persistent currency mismatches on the funding side. The macroeconomic variables help separate the impact of the regulation from broader economic trends. Real GDP growth accounts for overall economic activity influencing credit demand and repayment capacity; inflation, measured by the CPI growth rate, affects the real value of collateral and debt service; and the average USD/AMD exchange rate captures currency valuation movements that may influence both loan currency composition and investment allocation in FX bonds.

Table 2. Descriptive Statistics: Aggregate Data

Variable Group	Definition	Mean	Std. dev.
Outcome Variables	The Share of Total FX Bonds in Bank's Bond Purchases	0.313	0.410
Bank-Specific Normatives and Indicators	Capital adequacy ratio (N_1_1)	22.199	19.081
	Tier 1 ratio (N_1_2)	24.139	20.798
	Highly liquid assets / total assets (N_2_1)	36.522	12.566
	Highly liquid assets / demand deposits (N_2_2)	150.366	118.358
	Assets (in Millions)	464.000	330.000
Macroeconomic Variables	Real GDP growth, Y-to-Y, %	10.537	3.403
	CPI, Y-to-Y, %	7.980	1.588
	Monthly Average USD to AMD Exchange Rate	450.411	47.164
Deposit Dollarization	Dollarization Level of Individual Deposits	0.004	0.007

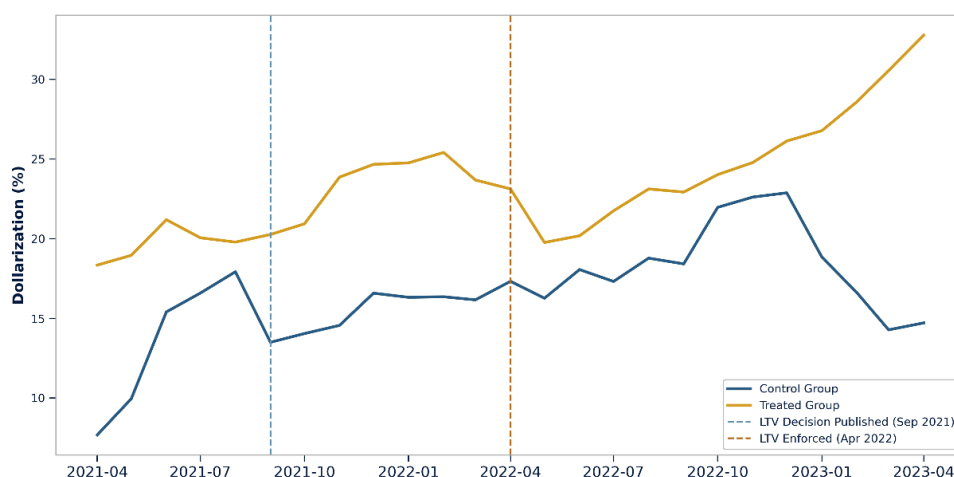
Source: Central Bank of Armenia and authors' calculations.

5. EMPIRICAL FINDINGS

5.1. Effects on Consumer and Business Loan Dollarization

We begin by examining how the differentiated LTV regulation affected the currency composition of bank lending, focusing on both business and consumer loans. Figure 4 depicts the monthly evolution of dollarization for the two groups of banks over the period from April 2021 to April 2023. As noted earlier, business loans constitute the largest component of total lending, accounting for roughly two-thirds of outstanding credit. Consumer loans, though far more numerous in count, represent a much smaller share in value and therefore exert less influence on aggregate dollarization trends. Given this composition, and because the most visible shifts occur within this category, the discussion below focuses primarily on business lending dynamics, while also briefly noting the comparatively muted and less systematic patterns observed in the consumer loan portfolio of banks.

Figure 4: Monthly Dynamics of Business Loan Dollarization



Source: Central Bank of Armenia and authors' calculations.

Note: The figure shows the three-month simple moving average of business loan dollarization.

Before the policy's introduction, both treated and control banks followed similar dollarization trajectories, supporting the parallel-trends assumption required for the DiD framework. Dollarization ratios fluctuated between 15 and 20 percent, largely reflecting market developments rather than any regulatory changes. Following the announcement of the policy in September 2021 (blue dashed line), a mild divergence started to emerge, as treated banks appeared to adjust their lending behaviour in anticipation of the forthcoming cap. The divergence became substantially more pronounced after April 2022, when the LTV limits were formally enforced (red dashed line). From mid-2022 onward, the treated group consistently increased the share of foreign-currency business loans, reaching above 30 percent by early 2023, while the control group remained broadly stable near 15 percent. This suggests that banks most constrained in the FX-mortgage market reallocated foreign-currency lending toward business clients, who were not directly affected by the new prudential rule. In contrast, consumer loan dollarization showed no comparable change over the same period, reflecting

the pre-existing regulatory framework that already restricted FX lending to card-related products and overdrafts (see Appendix 1).

The regression estimates presented in Table 3 reinforce these visual trends. The interaction term (Treated $\times$ Post) is positive and statistically significant for business loans, indicating an average increase of about 13.3 percentage points in the share of FX-denominated business loans among treated banks relative to controls after the policy's enforcement. For consumer loans, by contrast, the coefficient on the interaction term is small and statistically insignificant, confirming that the regulation had no measurable effect in that segment. However, this finding is expected, as consumer lending had already been subject to restrictive currency rules prior to the LTV reform. Since March 2007, banks in Armenia have been permitted to issue consumer loans in foreign currency only for credit-card products and overdrafts, effectively limiting new FX exposures in that segment.

Table 3. DiD Estimates: Business, Consumer Loans, and FX Bond Share

	Business Loans	Consumer Loans	FX Bond Share
Treated x Post	0.1330*** (0.0415)	0.0012 (0.0129)	0.1910*** (0.0708)
Bank FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	373	350	306

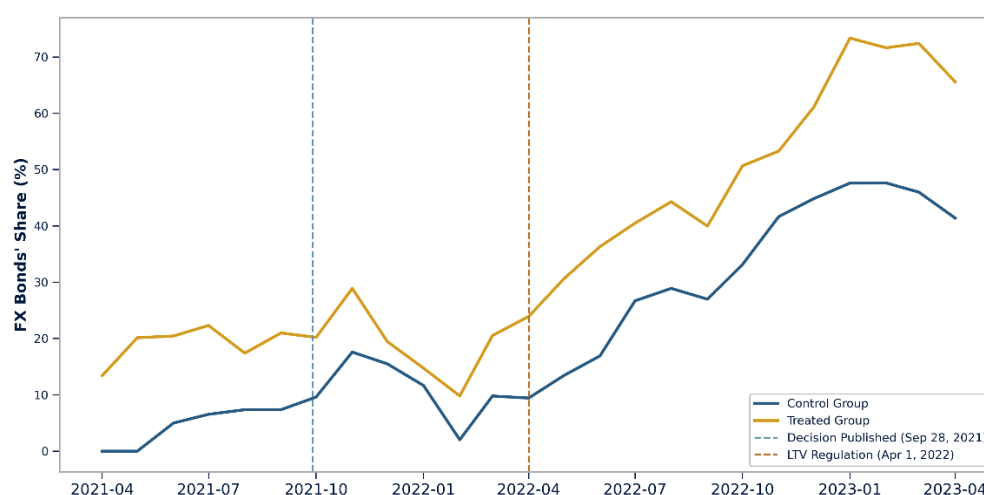
Source: Authors' calculations.

Note: Standard errors are reported in parentheses. Significance levels: *p < .10; **p < .05; ***p < .01. Controls include N_{1_2}, ln of assets, NPLs, dollarization of individual deposits, CPI, and GDP. All controls enter the regression with one period lag.

5.2. Effects on FX Bond Investments

To complement this analysis, we next examine how banks adjusted their investment portfolios, focusing on the share of FX-denominated bonds in total bond purchases. Figure 5 shows that before the LTV regulation, both groups maintained similar and relatively low levels of FX bond holdings showing no pre-existing divergence. Following the policy announcement in late 2021, treated banks began to gradually increase their FX bond share, possibly in anticipation of reduced FX lending opportunities. After the enforcement of the regulation in April 2022, this trend accelerated sharply: by early 2023, treated banks' FX bond share exceeded 65 percent, while control banks remained around 35–40 percent.

Figure 5. Monthly Dynamics of the FX Bonds' Share in Bond Purchases



Source: Central Bank of Armenia and authors' calculations.

Note: The figure shows the three-month simple moving average of the FX bonds' share in bond purchases.

The corresponding regression estimates in Table 3 confirm this interpretation. The interaction coefficient on the FX bond share variable is positive and statistically significant, with a magnitude of approximately 19.1 percentage points. This effect represents a meaningful reallocation of bank portfolios toward FX-denominated securities. Importantly, when controlling for differences in deposit dollarization, liquidity ratios, and capital adequacy, the estimate remains robust, suggesting that the behaviour was not driven by funding pressures but rather by deliberate strategic adjustment.

6. ROBUSTNESS CHECKS

To verify the reliability of the empirical results, we conduct a series of robustness tests that address potential concerns related to timing, model specification, and data structure. First, we perform a placebo test by artificially shifting the treatment date to a period prior to the actual policy implementation (2021 October). Specifically, we assign a fictitious treatment date several months before the publication of the LTV decision and re-estimate the baseline DiD model. The results, presented in Table 4, show no statistically significant treatment effect for this placebo intervention, confirming that the estimated effects in the baseline specification do not arise by chance or from unrelated time-specific shocks. This supports the interpretation that the observed post-2022 changes in commercial banks' dollarization behaviour are indeed attributable to the differentiated LTV regulation.

Table 4. Robustness Check: Placebo Test Results

	Business Loans	FX Bond Share
Treated x Post (2021m10)	0.0153 (0.0495)	0.0943 (0.0800)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
Observations	373	306

Source: Authors' calculations.

Note: Standard errors are reported in parentheses. Significance levels: *p < .10; **p < .05; ***p < .01. Controls include N_1_2, ln of assets, NPLs, dollarization of individual deposits, CPI, and GDP. All controls enter the regression with one period lag.

Second, we test for serial correlation in the panel data, which, if present, could bias the standard errors and affect inference. The Wooldridge test for first-order autocorrelation was applied to both specifications – one with business loan dollarization and another with the FX bond share as dependent variables. The null hypothesis of no autocorrelation was rejected for the business-loan model, indicating the presence of serial correlation, while it was not rejected for the FX-bond model.

Table 5. Wooldridge Test for Autocorrelation in Panel Data

	Business Loans	FX Bond Share
Prob > F	0.0316	0.2325

Source: Authors' calculations.

Note: This table reports the results of the Wooldridge (2002) test for serial autocorrelation in the idiosyncratic errors of a linear panel model. The null hypothesis is the absence of first-order autocorrelation.

To address this concern, we re-estimated the business-loan specification using a panel-corrected AR(1) model that explicitly accounts for within-panel autocorrelation. The key interaction term remained positive, statistically significant, and of comparable magnitude (approximately 0.16 versus 0.13 in the baseline), confirming that the main results are robust to adjustments for serial correlation (Tables 6).

Table 6. Panel-Corrected AR(1) Model for Business Loans

	Baseline	Controlling for Autocorrelation
Treated x Post	0.1330*** (0.0415)	0.1614*** (0.0553)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
Observations	373	357

Source: Authors' calculations.

Note: Standard errors are reported in parentheses. Significance levels: *p < .10; **p < .05; ***p < .01. Controls include N_1_2, logarithm of assets, NPLs, deposit dollarization, CPI, and GDP. All controls enter the regression with one period lag.

Third, we examine potential anticipatory effects. Although treated banks were issuing high-LTV foreign-currency mortgages prior to the policy, they were unaware of the forthcoming regulation until September 28, 2021, when the LTV decision was officially announced. Consequently, any behavioural adjustment before that date cannot be attributed to policy expectations. To capture possible anticipatory responses after the announcement but before legal enforcement in April 2022, we re-estimate the model using September 2021 as the treatment date (Table 7). The results show no significant effects during this pre-implementation phase, indicating that banks did not meaningfully adjust their behaviour until the regulation became binding and operational. This finding is consistent with the observed stability of dollarization patterns prior to April 2022 in Figures 4 and 5.

Table 7. Check for Anticipatory Effects

	Business Loans	FX Bond Share
Treated x Post (Sep 2021)	0.0153 (0.0495)	0.0943 (0.0800)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
Observations	373	306

Source: Authors' calculations.

Note: Standard errors are reported in parentheses. Significance levels: *p < .10; **p < .05; ***p < .01. Controls include N_1_2, logarithm of assets, NPLs, deposit dollarization, CPI, and GDP. All controls enter the regression with one period lag.

Fourth, we assess the validity of the treatment definition. In the main specification, banks are classified into treatment and control groups using the median value of the exposure measure as the cut-off. To examine whether the baseline results are influenced by institutions close to this threshold, we estimate a “donut” specification that excludes banks between the 40th and 60th percentiles. In this setup, banks below the 40th percentile form the control group, while those above the 60th percentile are treated. By removing borderline observations whose classification may be sensitive to small changes in dollarization, this approach provides a cleaner comparison between the two groups. The results in Table 8 confirm the robustness of the findings to this alternative definition. The coefficient on the Treated × Post interaction remains positive and statistically significant for both business-loan dollarization and FX bond share outcomes, implying that alternatively defined treated banks increased the dollarization of business loans by roughly 25 percentage points and raised the share of FX bond purchases by about 15 percentage points following the policy. The consistency of these effects, even after excluding banks near the median cut-off, supports the validity of the treatment definition and indicates that the results are not driven by borderline classifications.

Table 8. Alternative Treatment Definition

	Business Loans	FX Bond Share
Treated x Post	0.2505*** (0.0524)	0.1548** (0.0748)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
Observations	253	231

Source: Authors' calculations.

Note: Standard errors are reported in parentheses. Significance levels: *p < .10; **p < .05; ***p < .01. Controls include N_1_2, logarithm of assets, NPLs, deposit dollarization, CPI, and GDP. All controls enter the regression with one period lag.

7. CONCLUSION

This paper examined how banks in Armenia adjusted their portfolios in response to a differentiated LTV regulation that imposed stricter limits on FX-denominated mortgages. Introduced in April 2022 amid a period of fast credit expansion and soaring real estate prices, the measure aimed to address both the potential overheating of the housing market and the rising foreign-currency exposure of households. Using a DiD framework and highly granular loan- and bank-level data, the analysis provides evidence that the differentiated LTV, while tightening borrowing conditions for FX-denominated mortgages, led to an increase in the dollarization of business loans and a higher share of foreign-currency bonds in banks' portfolios. Affected banks reallocated their foreign-currency positions toward business loans and FX-denominated bonds, indicating that the policy altered the composition rather than the level of currency risk. This rebalancing did not undermine the core objective of the policy, which was targeted at the mortgage segment, but it highlights how sector-specific macroprudential measures can reshape the composition of financial intermediaries' balance sheets. These findings highlight the adaptive behavior of financial institutions and the potential for risk migration within the banking system following targeted prudential tightening. While borrower-based FX regulations can effectively contain vulnerabilities in specific market segments, they may also lead to portfolio reallocations that weaken the aggregate effectiveness of macroprudential policy.

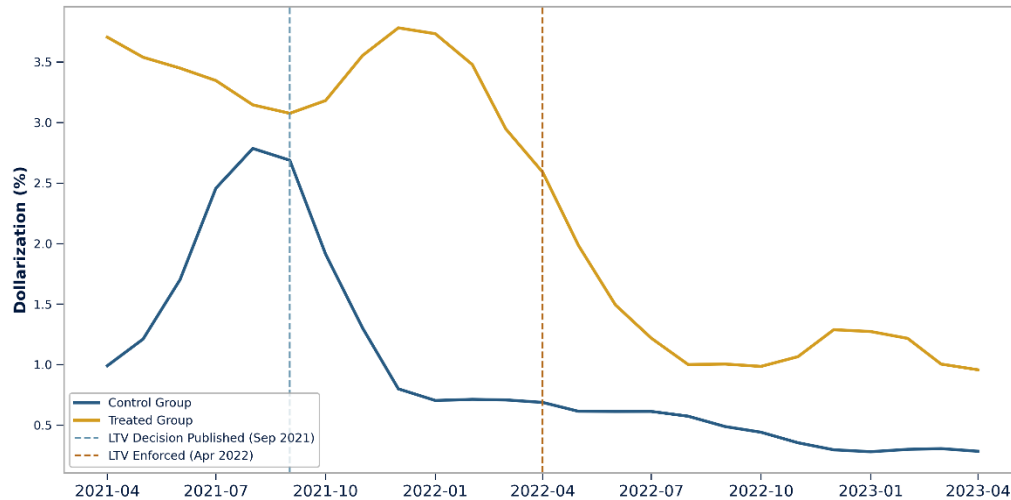
In this context, the Armenian experience underscores the importance of designing macroprudential frameworks that combine borrower-based tools with system-wide risk migration monitoring, ensuring that risk does not migrate to less-regulated parts of the financial system. In small open economies with persistent dollarization, such integrated approaches are essential to maintain the balance between financial stability, credit growth, and market depth.

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APPENDIX

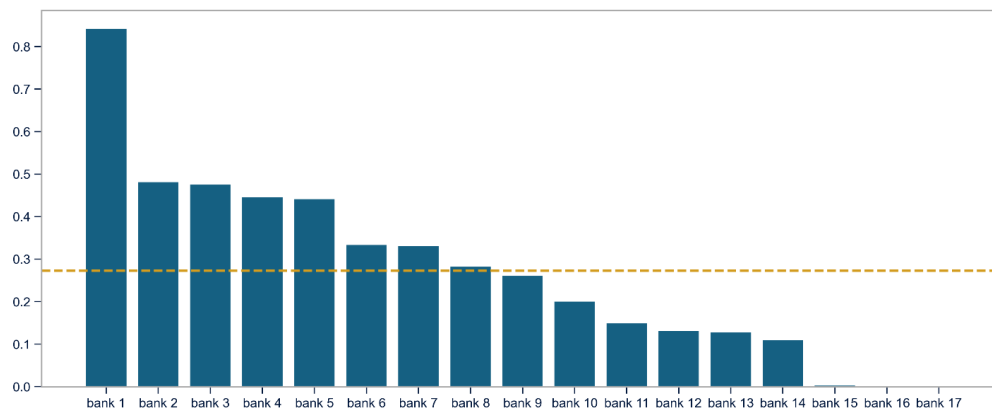
Figure 6. Monthly Dynamics of Consumer Loan Dollarization



Source: Central Bank of Armenia and authors' calculations.

Note: The figure shows the three-month simple moving average of consumer loan dollarization.

Figure 7. Distribution of LTV_{exp_i} Across Banks



Source: Central Bank of Armenia and authors' calculations.