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WARTIME INTEREST RATE PASS-THROUGH IN UKRAINE: THE ROLE OF PRUDENTIAL INDICATORS

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Wartime Interest Rate Pass-Through in Ukraine: The Role of Prudential Indicators

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Abstract:
In this paper, I study Ukraine's heterogeneous and time-variant pass-through from the money market interest rate to bank deposit and lending rates. I utilize a new panel dataset containing individual banks' characteristics and prudential indicators over 2019-2023, a period comprising the full-scale Russian invasion. First, using TVPARDL models, I reveal that during the invasion, the pass-through diminished for all examined bank products. It is also weaker to deposits in times of monetary policy tightening. Second, using panel regressions, I show how banks' characteristics and prudential indicators influence the transmission. Their impacts are asymmetric during monetary policy tightening and loosening. Overall, I track wartime interest rate pass-through for practical monetary policy purposes and contribute to the topic of interactions between monetary and prudential policies.

JEL: C54, E43, E52, G21
Keywords: monetary policy transmission mechanism, interest rate pass-through, wartime economy

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1 Introduction

Modern monetary policy in Ukraine intertwines with war. Amid the Russian invasion in 2014, the National Bank of Ukraine (NBU) abandoned its fixed exchange rate regime and transitioned to inflation targeting. The escalation in early 2022 (the Big War) forced the NBU first to fix the nominal exchange rate and later shift to a heavily managed exchange rate flexibility.[1] The NBU has committed to return to conventional inflation targeting with a floating exchange rate "after Ukraine is freed from Russian invaders" (NBU, 2022c).

In June 2022, the NBU steeply raised its policy interest rate by 15 pp to 25% per annum. Amid fixed exchange rate and tight capital controls, the move aimed to "protect households' income and savings in the hryvnia, … [and] reduce the pressure on the foreign exchange market" (NBU, 2022d). With the relatively large interest rate hike, the NBU acknowledged that "the monetary transmission mechanism has only a limited effect in wartime." Indeed, the initial interest rate pass-through (IRPT) to bank interest rates was deemed unsatisfactory as most banks only gradually increased their rates on deposits and loans. The then chairman of the NBU Council went so far as to claim that "financial markets are not able to transmit monetary policy signals during a war" (Danylyshyn, 2022).

In this paper, I track wartime IRPT in Ukraine using time-variant parameter autoregressive distributed lag (TVP-ARDL) models. My dataset contains bank-level data on deposits and loans issued to households and corporations by more than 50 banks in 2019-2023. The pass-through is asymmetric, time-variant, and heterogeneous across banks, products, and customers. The median strength of the transmission to all bank rates is low compared to peer countries. Moreover, it declined during the Big War, consistent with a broader finding that IRPT weakens during financial turmoil (Hristov et al., 2014).

I also run panel regressions to assess how transmission is affected by individual banks'

[1] In contrast to 2014, when international reserves were depleted, in 2022, the NBU held considerable reserves, which were later supplemented by international financial assistance. During this managed exchange rate flexibility period, the NBU covered the structural deficit of foreign currency and significantly limited exchange rate volatility.

characteristics, including prudential indicators. The results partially corroborate the usual finding that ample capital and liquidity buffers make banks less responsive to monetary policy actions (Kok & Werner, 2006). However, the effects differ significantly across different bank products and stages of the monetary policy cycle. Furthermore, I estimate how banks with credit risk exposures adjust IRPT to deleverage or diversify. The interactions between monetary and prudential policies must be considered, as the latter affects the former's transmission channels.

The paper is organized as follows. After the Introduction, Section 2 provides the literature review on IRPT and the role of prudential indicators. Section 3 outlines macroeconomic developments in Ukraine in 2019-2023; it may be bypassed by readers familiar with the economy's macroeconomic background. Section 4 presents data. Section 5 introduces the two-step methodology. Section 6 illustrates the time evolution and heterogeneity of IRPT and discusses how individual banks' characteristics influence it. Finally, Section 7 concludes.

2 Literature

2.1 Heterogeneous and time-varying IRPT

IRPT from the money market interest rate to banking rates is heterogeneous across countries, individual banks, and products. Kok and Werner (2006) and, more recently, Mayordomo and Roibás Millán (2023) document significant variation across euro-area countries. Brissimis and Delis (2010) identify heterogeneous behavior at the bank level for US and euro-area banks; Stanisławska (2015) does the same for individual Polish banks. Montagnoli et al. (2016) differentiate between Italian regions.

The pass-through is generally more pronounced for non-financial corporations than for households – see Kok and Werner (2006) for the euro area, NBRK (2023) for Kazakhstan, and Grui et al. (2023) for Ukraine. The transmission is typically stronger to lending rates than to deposit rates – see Grigoli and Mota (2017) for the Dominican Republic and Grezsta et al.

(2023) for Poland. However, Stanisławska (2015) finds stronger pass-through to corporate deposit rates than corporate lending rates. Furthermore, the weakest IRPT is exhibited by consumer lending rates – see Gregor et al. (2019) for a meta-analysis of 52 studies. Gregor and Melecký (2018) do not find any stable pass-through to consumer lending rates in Czechia.

Country-specific and bank-specific financial characteristics can cause heterogeneity. Deeper capital markets grant higher IRPT (Gregor et al., 2019), while fixed exchange rate regimes and money market rate volatility impede it (Gigineishvili, 2011). The pass-through increases with more vigorous competition in the banking sector (Kok & Werner, 2006; Van Leuvenstejn et al., 2013). In general, IRPT to both deposit and lending rates is often incomplete due to financial frictions and monopolistic bank behavior.

The evidence on the role of the macroeconomic characteristics is mixed. Higher consumer inflation raises uncertainty. On the one hand, it may stimulate transmission as banks adjust their lending rates more often to pass the risk to borrowers. On the other hand, banks may increase their margins and decrease the pass-through (Gigineishvili, 2011). GDP growth, credit growth, and other business-cycle indicators are associated with slower IRPT as higher demand for loans and supply of deposits allow banks to delay interest rate adjustments. Alternatively, banks may behave more actively to capture market shares (Kok & Werner, 2006). Nevertheless, GDP per capita unambiguously strengthens IRPT as it is correlated with the country's financial development.

The scale of the pass-through depends on banks' business models and individual characteristics. Generally, larger, more liquid, and better-capitalized banks display less pronounced IRPT. The pass-through is also lower in banks with more substantial relationship banking proxied by a ratio of long-term loans and deposits. However, better credit portfolio quality strengthens transmission (Stanisławska, 2015). Banks with a large pool of deposit funding are less sensitive to money market rate changes (Kok & Werner, 2006). This is also true for banks with a higher share of non-interest income. However, such banks may aim to capture market shares, thus offering more attractive interest rates and increasing transmission

speed. Higher operating expenses tend to increase the pass-through to both deposit and lending rates.

IRPT might be asymmetric in response to policy interest rate hikes and cuts. For instance, Grigoli and Mota (2017) assess that deposit rates in the Dominican Republic respond faster to decreases. While lending rates are more sensitive to increases. Montagnoli et al. (2016) detect an upward rigidity in Italian deposit rates. Greszta et al. (2023) estimate a stronger short-term reaction of deposit rates to decreases in the money market interest rate than to its increases; however, the long-term pass-through remains the same. The evidence supports the collusive market hypothesis. High bank concentration and lack of competition distort monetary policy transmission by introducing asymmetries.

Conversely, Galindo and Steiner (2022) uncover an opposite asymmetry in Colombia. Most lending rates in Colombia adjust faster to policy rate cuts than hikes, while deposit rates respond more aggressively to hikes than cuts. The authors explain their findings with high market competition.

IRPT to bank rates becomes significantly less complete during financial turmoil. The result holds for deposit and lending rates alike – see Hristov et al. (2014) for the euro area during the Global Financial Crisis (GFC). The authors attribute decreasing pass-through to markets with lower loan-to-value ratios, higher costs of bank capital adjustment, lower degree of competition, and higher costs of interest rate adjustment. Financial stress distorts banks' balance sheets and their pricing behavior. Blot and Ladonde (2013) document persistently worse transmission to corporate lending rates in the euro area after the GFC. Egan and McQuinn (2023) reveal that IRPT to mortgage rates in the euro area is impaired even 15 years after the crisis. Structural changes in banks' balance sheets and increased market concentrations significantly influence the strength of the pass-through.

Changing macro-financial environment paves the way for time-varying IRPT. Mayordomo and Roibás Millán (2023) estimate that the pass-through to deposit rates in the euro area in 2022-2023 is more sluggish than it used to be during previous hiking cycles. Gregor

and Melecký (2018) document declining pass-through to mortgage and corporate lending rates in Czechia, which they attribute to bank deleveraging. However, Hennecke (2017) finds no evidence for changes in the long-term pass-through in Germany's low interest rate environment.

It is common to estimate IRPT with single-equation error-correction models (ECMs) (Gregor et al., 2019). Many empirical papers use autoregressive distributed lag (ARDL) models with monthly data frequency (Gregor & Melecký, 2018; Hlazunov et al., 2023). Asymmetries are tested with threshold autoregressive (TAR) and nonlinear ARDL (NARDL) techniques (Grigoli & Mota, 2017; Galindo & Steiner, 2022). Time variance is estimated using rolling windows (Aziakpono & Wilson, 2013; Gregor & Melecký, 2018) or simply with different subsamples (Stanisławska, 2015). Blot and Labondance (2013) run Chow break tests to identify a structural break in transmission.

Panel econometric tools help assess heterogeneity between countries and individual banks. Kok and Werner (2006) and Blot and Labondance (2013) employ panel ECMs using the dynamic seemingly unrelated regression (DSUR) method, which enables cross-sectional dependencies. Brissimis and Delis (2010) use a local generalized method of moments (LGMM) technique to make the pass-through a function of observable bank characteristics.

The role of individual macro-financial characteristics can be estimated with a two-step procedure. In the first step, Matějů (2019) uses time-varying parameter VAR (TVP-VAR) models to estimate time-varying monetary policy transmission to inflation and GDP for a cross-section of countries. In the second step, the author runs panel regressions to assess how the transmission strength is related to counties' characteristics. The transmission strength is measured with the magnitude of an impulse response of the variable some number of quarters after the monetary policy shock.

In this paper, I apply a similar two-step methodology to bank-level data in Ukraine. So do Shapovalenko and Vdovychenko (forthcoming). My approach is novel because it analyzes a larger set of bank interest rates, utilizes a unique dataset with individual banks'

characteristics, and accounts for their asymmetric effects during monetary policy tightening and loosening.

Earlier works for Ukraine did not analyze individual banks' characteristics affecting IRPT. Grui et al. (2023) estimate time-invariant prewar IRPT while differentiating between types of customers and bank ownership, i.e., state, private, and foreign. Hlazunov et al. (2023) additionally differentiate between maturities. NBU (2023) traces the relationships between macroeconomic variables and system-wide time-variant pass-through to household deposits.

2.2 The role of prudential indicators

Prudential regulations are intended to limit the risks that a commercial bank may undertake. They include minimum capital requirements, liquidity standards focused on the quality of assets and stability of liabilities, and other limitations on a bank's portfolio. Prudential requirements are an effective policy tool for enhancing banking sector stability. However, they could also have unintended consequences for monetary policy transmission.

Beyer et al. (2017) classify prudential requirements into three categories, namely capital-based, liquidity-based, and asset-based micro- and macroprudential policy instruments (MPIs). Capital-based measures include capital ratios, capital buffers, and the leverage ratio. They ensure that a bank can absorb a reasonable amount of loss. Liquidity-based instruments include the Liquidity Coverage Ratio and the Net Stable Funding Ratio. They require the bank to hold sufficient high-quality liquid assets to manage expected net cash outflows and provide an incentive to get funding from stable long-term sources. Asset-based restrictions mitigate the bank's exposure to credit risk. Among them are caps on Loan-to-Value and Loan-to-Income ratios, limits on foreign currency loans, and requirements to increase diversification, i.e., decrease dependence on a particular client or a group of connected clients.

Less capitalized banks tend to respond more to monetary policy changes (Kok & Werner, 2006; Brissimis & Delis, 2010). However, the impact is asymmetric. According to Beyer et

al. (2017), banks bound by capital-based requirements may raise margins between lending and deposit interest rates, cut lending, or shift it to safer borrowers. The bank lending channel becomes stronger once capital ratios are low. Maddaloni and Peydró (2013) reveal that during the GFC, euro-area banks with capital constraints could not soften lending conditions as much as their better-capitalized peers. Borio and Zhu (2012) reach similar conclusions in their overview of empirical studies on Italian and US data. Altavilla et al. (2020) investigate euro area banks throughout the sovereign debt crisis. The authors argue that those banks that were poorly capitalized, highly exposed to sovereign debt, and had high non-performing loan ratios were less likely to pass the monetary expansion to borrowers due to threats to their viability.

Monetary policy has a greater influence on banks with lower amounts of liquid assets (Kok & Werner, 2006; Beyer et al., 2017). Strict liquidity-based requirements induce banks to actively attract deposits, transmitting higher funding costs to lending conditions. Conversely, excess liquidity buffers against market fluctuations and slows down the pass-through.

Asset-based MPIs limit credit growth by imposing quantitative restrictions on supply. The effect is similar to tightening lending conditions. Compared with other MPIs, the impact may be less pronounced because they only affect a portion of borrowers (Beyer et al., 2017).

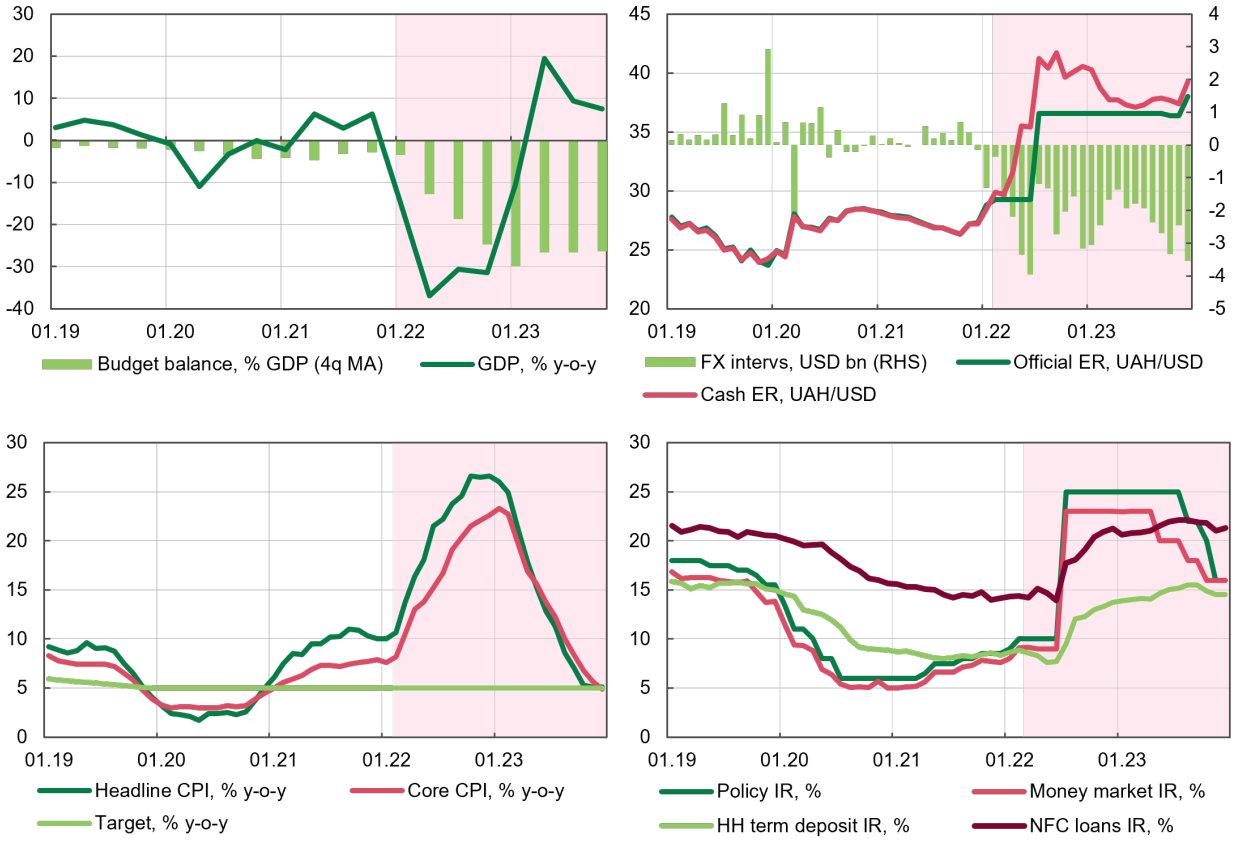
3 Macroeconomic background

Real GDP growth in Ukraine averaged 1.8% in 2016-2021, a relatively slow pace for a small, open emerging market economy (GDP PPP per capita was 14.4 thousand USD in 2021). Such growth is insufficient to catch up with more advanced European peers. Economic performance could be improved through reforms and increased investment attractiveness, both of which are achievable through closer European integration. Since 2014, many reforms have already been implemented as part of the Association Agreement signed between the EU and Ukraine (Gorodnichenko et al., 2022). In December 2023, the European Council

officially opened accession negotiations with Ukraine.

In 2022, Russia escalated its war of aggression, resulting in severe macroeconomic consequences alongside immense human suffering. Real GDP plummeted by 28.8% in 2022 – the largest decline in Ukraine's modern history. The war disrupted supply chains and led to mass emigration. The physical destruction of production facilities and a maritime blockade sharply reduced export potential, while imports remained strong due to increased defense purchases and Ukrainians spending abroad. As of 2023, 18% of Ukrainian land remained under occupation, 15% of the prewar population stayed abroad, and 10% were on occupied territories.

Figure 1: Macroeconomic background[2]



Note: HH – households, NFC – non-financial corporations.
Source: NBU, own calculations.

[2]Hereinafter, the shaded area indicates the Big War, which was still ongoing as of late 2024.

In 2023, the economy was adapting to wartime conditions. Real GDP returned to growth thanks to expansionary fiscal policy and the development of alternative export routes. Fiscal policy lost a large amount of revenue but maintained an unprecedented accommodative stance, which sustained economic activity. However, persistent logistical issues and wartime risks continue to constrain investments and hinder recovery.

The high **budget deficit** in 2022 was covered by the NBU's monetary financing and foreign financial aid. In 2023, foreign aid became the primary source of covering significant budgetary needs and enabled Ukraine to refrain from monetary funding. It also allowed the NBU to maintain adequate international reserves while doing what it could to stabilize the economy. Cooperation with international partners remains critical.

Significant budgetary spending financed by international financial aid and the NBU's monetary financing effort significantly deepened the liquidity surplus in the banking system, which had already been present since 2021.

In 2015-2021, the **nominal exchange rate** followed a managed floating regime. Foreign exchange (FX) interventions were used as an additional policy instrument to smooth exchange rate volatility and accumulate reserves.

On the first day of the full-scale Russian invasion, the NBU pegged the official exchange rate to the US dollar. The interbank exchange rate was allowed to float within a tight $\pm 1\%$ corridor around the official rate. FX interventions became the primary tool for attaining macroeconomic stability, compensating for a structural trade deficit.

In the fifth month of the Big War, the fixed exchange rate was devalued by 25%. The NBU maintained this new peg until October 2023, when it transitioned to "managed flexibility." The cash market exchange rate spread decreased due to some relaxing of currency restrictions. The NBU was generally successful in preventing the multiple exchange rate practice. The exchange rate remains heavily managed with FX interventions as the wartime trade deficit persists.

In the earliest days of the invasion, the NBU deployed a wide range of measures to

safeguard **financial stability** (NBU, 2022b). First, it imposed tight capital controls and administrative restrictions to support the exchange rate peg. Second, it supplied banks with unsecured refinancing loans and improved the valuation of government debt securities as collateral against secured refinancing loans. Third, the NBU promised not to sanction banks for violating prudential standards and deadlines for statistical data submission if such violations have been due to the invasion. It postponed the planned activation of capital buffers and rescheduled the increase in the Net Stable Funding Ratio (NFSR) requirement. Dividend payoffs were also prohibited, except for state-owned banks. Finally, the state granted household depositors a full guarantee of their deposits for the duration of martial law. Most borrowers received loan repayment holidays as the NBU eased credit risk assessment requirements. By 2023, the banking sector had adjusted to the challenging conditions, maintaining operational efficiency and accumulating capital and liquidity buffers (NBU, 2023).

The NBU adopted **inflation targeting** in 2015, successfully stabilizing inflation around its 5% target in 2019-2021. Price stability remained a priority even as the NBU temporarily departed from the conventional inflation targeting regime during the war.

Consumer inflation surged to 26.6% in December 2022 due to wartime supply shocks like destroyed infrastructure and disrupted supply chains, which outweighed reduced consumer demand. High global energy prices had minimal direct effect on inflation, thanks to a moratorium on household utility price hikes. The fixed exchange rate also helped to restrain inflation, despite the mid-year devaluation.

Inflation decreased to 5.1% in December 2023, aided by the recovery of disrupted supply chains and favorable weather conditions, which led to high agricultural yields. Restrictive monetary policy also played a role, as the exchange rate remained heavily managed after the fixed peg was lifted in October. The NBU continues to prioritize inflation stabilization.

The short-term **interest rate** was the primary monetary policy instrument under the inflation targeting regime in 2015-2021. Before the Big War, the NBU used its policy interest

rate to price two-week liquidity absorption and provision instruments, i.e., two-week certificates of deposits (CDs) and refinance loans. The policy rate was flanked by the corridor of overnight CD and refinancing loan rates, anchoring the overnight interbank rate to the policy rate. Given the liquidity surplus in the banking system, the interbank rate gravitated towards the lower bound of the corridor.

With the onset of the war, the short-term interest rate became a secondary instrument to keep domestic financial assets attractive to the population, thus relieving some pressure from the FX market. The NBU has suspended its two-week liquidity management operations, leaving only the corridor of overnight CDs and refinance loans. The interbank interest rate in 2022-2023 was stuck at the lower bound of the corridor as the banks rarely traded with each other amid considerable liquidity surplus. In October 2023, the NBU adopted the lower-bound operational design, when the policy rate determines the interest rate on overnight CDs.

In June 2022, the NBU hiked the policy rate to 25%, expecting the government and the banking system to raise interest rates on domestic government debt securities and retail deposits. Initial IRPT to deposit rates was generally considered insufficient, prompting the NBU to introduce several measures to improve it. First, it engaged in talks with the government to increase yields on government debt securities. Second, in January-September 2023, the NBU, in several stages, raised minimum reserve requirements for current accounts, as well as demand and short-term deposits. Third, in April 2023, it introduced three-month CDs with lucrative interest rates and maximum volumes linked to the volumes of banks' retail term deposits.

IRPT to bank rates in Ukraine is sluggish and incomplete. Moreover, it weakened with the onset of the Big War. Compared to other countries, the pass-through in Ukraine is muted by the relatively shallow financial market with a low degree of competition (Grui et al., 2023). It further decreased amid the heavily managed exchange rate, financial stress, and macroeconomic uncertainty during the Big War. IRPT is also held back by excessive

banking sector liquidity. However, the NBU's measures started to improve it. Section 6 provides details regarding the strength of the pass-through and its determinants.

4 Data

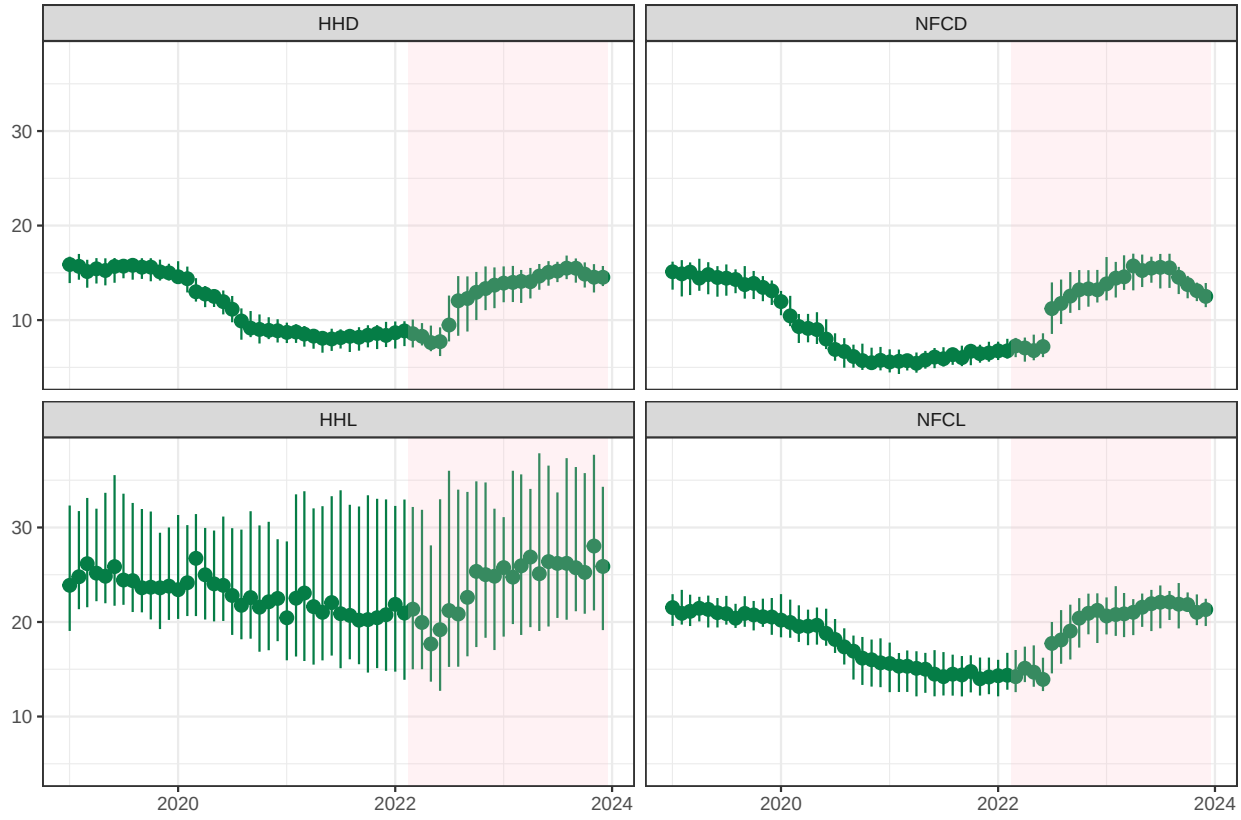
My data sample comes from statistics collected by the NBU. It covers the period from 2019 (when observations of some prudential indicators become available) to 2023. It encompasses the start of the Russian full-scale invasion in February 2022, which allows drawing conclusions about wartime distortions in IRPT. I take into account only interest rates in Ukrainian hryvnia and differentiate between four retail and wholesale banking products –- household deposits (HHD), non-financial corporation deposits (NFCD), household loans (HHL), and non-financial corporation loans (NFCL) (Figure 2).

The data with interest rates and bank features are organized into four panels comprising 54-60 banks, depending on the product. The panels are different and unbalanced as some banks do not necessarily offer all of the products all the time or at all. Additionally, some data are missing for three months in 2022, when banks were temporarily exempt from submitting information on their prudential ratios. Over the period from 2019 to 2023, the total number of commercial banks in Ukraine decreased from 77 to 63. Defaulted banks are excluded from the analysis. Throughout the study period, the analyzed banks accounted for at least 84% of all banking system assets, with their share rising to over 97% towards the end of the period.

I estimate the pass-through to bank interest rates from the overnight money market rate, specifically the Ukrainian Overnight Index Average (UONIA) (Figure 1). The sample contains one period of monetary policy tightening – April 2021 to April 2023 – and two periods of loosening.

Household loan (HHL) rates are the highest among the interest rates analyzed and exhibit the greatest heterogeneity across banks. The household lending market is relatively shallow and predominantly consists of risky short-term consumer loans. The medians of all interest

Figure 2: Medians and interquartile ranges of bank interest rates



Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: NBU, own calculations.

rates increased amid tightening in 2022.

Heterogeneity in the pass-through may stem from individual bank characteristics and their prudential indicators (Figure 3),

- size (share of assets),
- balance sheet items (shares of government bonds and loans to non-financial customers in assets, share of deposits in liabilities),
- non-interest income and operational expenses normalized to assets,
- capital (leverage ratio, capital adequacy ratio),
- liquidity (share of certificates of deposits in assets, liquidity coverage ratio),
- portfolio quality (shares of FX loans and loan loss provisions),

- risk exposures (one borrower, related party).

A median-sized bank in Ukraine commands less than 0.25% of system-wide assets, with this ratio trending upwards during the estimation period as the number of operating banks declined.

The share of government bonds in assets increased in 2020 as the government financed its deficit amid the COVID-19 crisis. However, during the Big War, the share declined due to quickly growing investments in NBU's certificates of deposits. Similarly, the share of loans in assets also declined. In 2021, the median share of deposits in liabilities temporarily decreased as smaller banks increasingly attracted refinancing loans from the NBU to finance the purchase of government bonds.

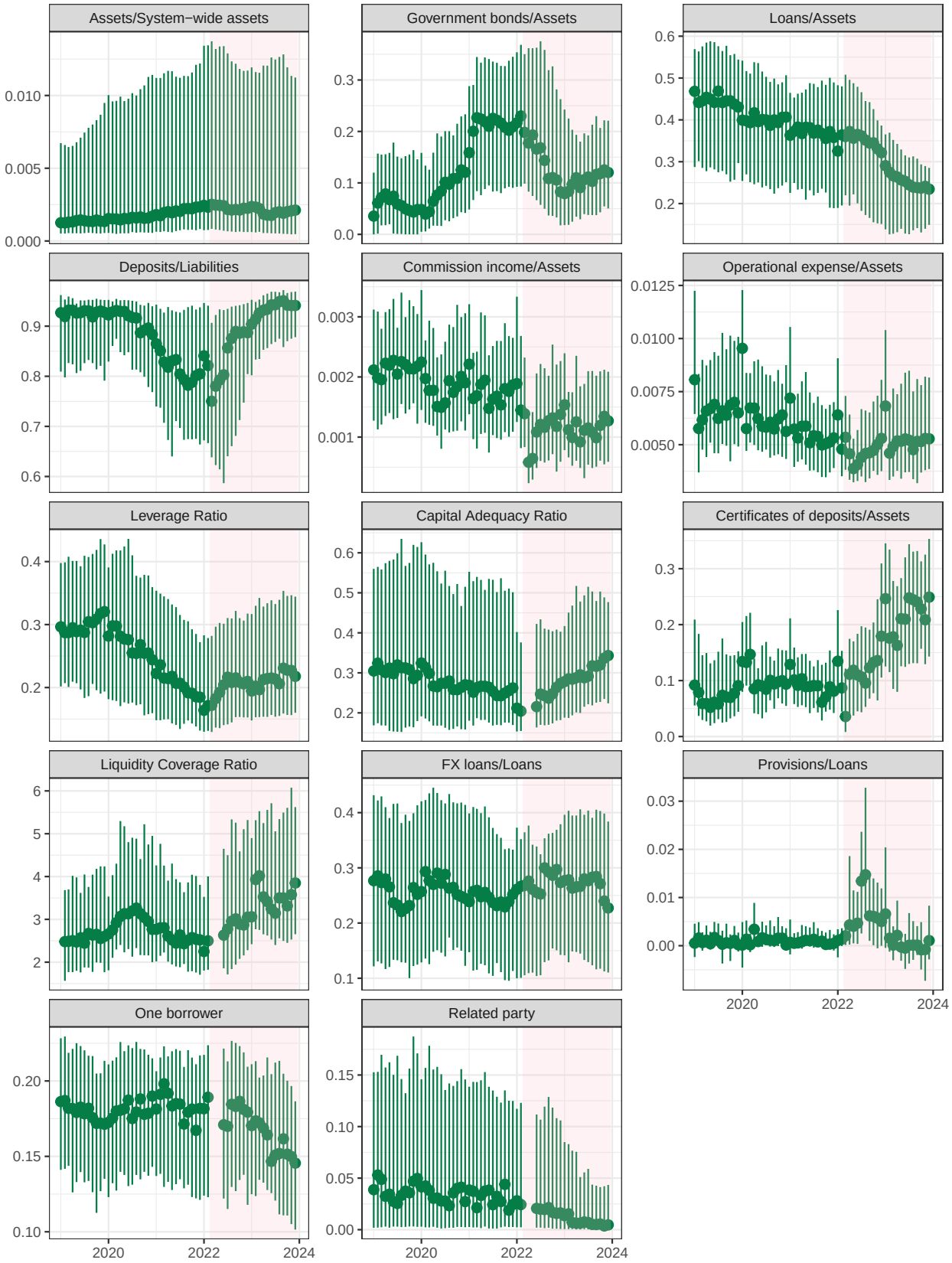
Commission income fell during the Big War because of a general drop in economic activity. Operational costs diminished in 2019-2021 as banks improved their operational efficiency. Recurring spikes mark end-of-year bonuses and are seasonally adjusted before further use.

High capital sufficiency indicators, i.e., leverage and capital adequacy ratios, indicate a well-capitalized banking system. The ratios declined in 2019-2021 as banks expanded lending activity but rebounded during the Big War due to deleveraging and high profitability.

Liquidity sufficiency indicators, i.e., the share of certificates of deposits in assets and liquidity coverage ratio, were elevated in 2021 and grew further in 2022-2023.[3] The large budget deficit, initially financed by the NBU and later by international aid, deepened the liquidity surplus in the banking sector. Rising portfolios of high-yield government bonds and NBU's certificates of deposits contributed to the banking system's profitability.

[3]The share of certificates of deposits is not among prudential instruments in Ukraine but is often cited as a measure of excessive liquidity. This paper does not investigate the role of the NFSR due to a short data sample after its introduction and the changing size of the requirement.

Figure 3: Medians and interquartile ranges of bank characteristics and prudential indicators



Source: NBU, own calculations.

The share of FX loans remained relatively stable throughout the estimation period. Over 99% of FX loans are corporate because banks have not been allowed to issue them to households since the Global Financial Crisis. The remaining less than 1% are mostly legacy non-performing mortgages. Loan loss provisions spiked in 2022 as banks prepared to recognize wartime defaults.

Following the onset of the full-scale invasion, new lending was largely subsidized by state programs focused on small enterprises.[4] Consequently, bank portfolios became more diversified, and exposure concentrations to large borrowers and related parties decreased.

Table 1: Medians of bank characteristics and prudential indicators across ownership in December 2023

	State	Private	Foreign
Assets/Systemwide assets	0.10	0.001	0.02
Loans/Assets	0.27	0.25	0.23
Deposits/Liabilities	0.94	0.94	0.96
Government bonds/Assets	0.26	0.14	0.08
Commission income/Assets	0.001	0.001	0.001
Operational expense/Assets	0.002	0.006	0.004
Leverage ratio	0.16	0.23	0.18
Capital adequacy ratio	0.18	0.34	0.32
Certificates of deposit/Assets	0.14	0.25	0.28
Liquidity coverage ratio	2.66	3.87	2.85
FX loans/Loans	0.34	0.22	0.31
Provisions/Loans	-0.001	0.004	0.000
One borrower	0.10	0.17	0.12
Related party	0.001	0.01	0.002

Source: NBU, own calculations.

Bank business models in Ukraine are closely related to their ownership – state, private, or foreign (Hlazunov et al., 2023). Table 1 displays the medians of banks' characteristics and prudential indicators across their ownership groups at the end of the sample in December 2023.[5] State-owned banks are large and hold many government bonds and FX loans but have low capital and liquidity buffers and low exposures to related parties. Private banks are small and keep relatively few FX loans but maintain high capital and liquidity buffers

[4]Box 1 of the NBU's Financial Stability Report, December 2022 (NBU, 2022a) provides more information.

[5]Tables 1, 5, and 6 consider Sense Bank, the eighth largest by assets, to be foreign-owned, which it had been on most of the sample until its nationalization in July 2023.

and high single-party and related-party credit exposures.

5 Methodology

The methodology proceeds in two steps. In the first step, I estimate time-varying parameter autoregressive distributed lag (TVP-ARDL) models for interest rates on different banking products. Every model contains the interbank overnight interest rate as an exogenous variable. The estimated parameters are then used to construct impulse response functions (IRF) to a money market shock for each product in each bank at each point in time. The obtained IRFs allow for comparing the relative strength of IRPT to different products and evaluating its time variance and cross-bank heterogeneity.

In the second step, I estimate fixed-effects regressions using panel data with IRFs and individual banks' balance sheet ratios, including their prudential indicators. The regressions account for asymmetries between monetary policy tightenings and loosenings and associate banks' characteristics with IRPT strength. The data frequency is monthly in both steps.

The TVP-ARDL model in this paper is a simplified version of the TVP-VAR model proposed by Primicieri (2005) and more recently employed for estimating monetary policy transmission by Matějů (2019). It includes one endogenous variable (bank interest rate) and one exogenous variable (money market interest rate). Parameters are estimated using the Bayesian Markov chain Monte Carlo technique (Gibbs sampler) based on the procedure developed by Primicieri (2005).[6]

An ARDL model can be described with the following equation:

$$rr_t = \beta_t z_t + u_t$$

where $z_t = [rr_{t-1}, \dots, rr_{t-l}, ir_t, \dots, ir_{t-m}, 1]^T$ is a vector of lags of the endogenous variable rr_t, an exogenous variable ir_t and its lags, and the intercept. The model has stochastic

[6]Calculations are performed in the ECB's BEAR toolbox (Dieppe et al., 2016).

volatility, meaning that both the coefficients and the variance of residuals change over time. The coefficients β_t are time-varying and follow random walk processes

$$\beta_t = \beta_{t-1} + v_t$$

where v_t is i.i.d. $\mathcal{N}(0, V)$. In turn, u_t has a time-varying distribution $\mathcal{N}(0, \sigma_t)$ and σ_t follows a geometric random walk process

$$\ln \sigma_t = \ln \sigma_{t-1} + \gamma_t$$

where γ_t is i.i.d. $\mathcal{N}(0, w)$.

The number of lags is consistent for every estimated model. I use $l = m = 3$, which is appropriate for the monthly frequency of data.

The fixed-effects model in the second step features individual and time effects, as suggested by the Hausman test. Individual effects address omitted variable bias as they allow controlling for unobserved time-invariant factors that vary across the banks. Time effects allow controlling for time-specific effects common to all banks in the panel. They account for all macroeconomic developments and administrative policy measures implemented by the NBU and capture any potential seasonality.[7]

The model subtracts averages of the variables across time and across individual banks:

$$IRF(h)_{i,t} - \overline{IRF(h)_i} - \overline{IRF(h)_t} = \beta^{two-way}\left(X_{i,t} - \overline{X_i} - \overline{X_t}\right) + (\gamma_i - \overline{\gamma_i}) + \left(\delta_t - \overline{\delta_t}\right) + \left(u_{i,t} - \overline{u_i} - \overline{u_t}\right)$$

where γ_i are unobserved individual effects and δ_t are unobserved time effects, which are constant across time and individuals respectively and thus cancel out. $X_{i,t}$ comprises explanatory variables. I pick $h = 6$ (six months after the shock) to capture a mix between

[7]Calculations rely on the R-based plm package (Croissant & Millo, 2008).

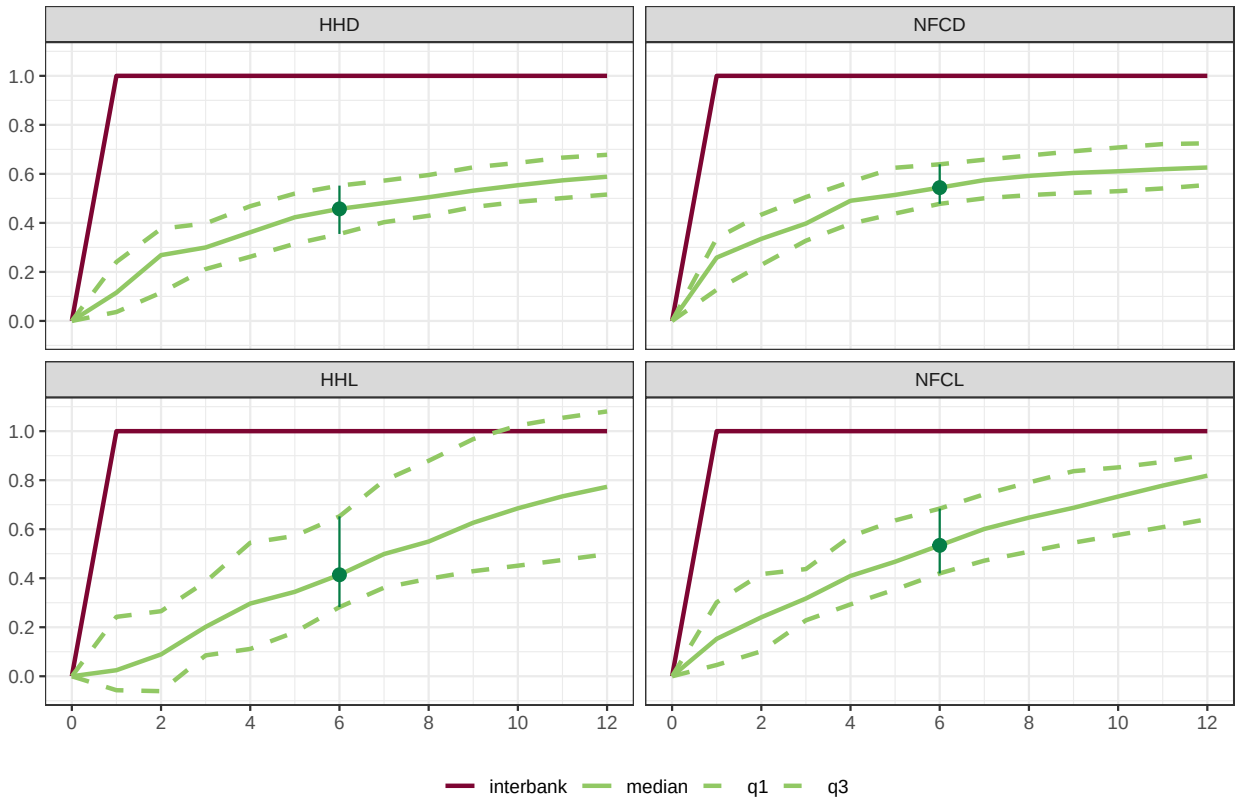
IRPT speed and strength.

6 Results

6.1 Panel of impulse responses

The first estimation step yields a panel of impulse responses (IRFs) of bank interest rates to a (permanent) monetary policy shock. Each bank has a unique IRF for each product in each period. Figure 4 depicts a cross-bank variation of IRFs for each product estimated at the end of the sample.

Figure 4: Median, first, and third quartiles of IRFs to a permanent monetary policy shock in December 2023



Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

The estimated pass-through is sluggish and, in most cases, incomplete, even 12 months after the shock. The median 12-month IRPT is highest for loans to non-financial corporations (NFCs). Household (HH) loans come second but are more sluggish and dispersed. Deposit interest rates for both HHs and NFCs have more clustered IRFs than loan interest rates. Furthermore, their pass-through is faster, judging by the hump shape of their IRFs in the first several months of the simulations. NFC deposits' median 12-month IRPT is also slightly higher than HH deposits'.

The results are consistent with banks engaging in monopolistic competition. When interest rates increase, banks lose some of their monopoly power over borrowers as they become less eager to borrow. This causes banks to decrease their loan interest spread and charge lower lending rates. In contrast, higher interest rates make deposits more attractive, allowing banks to gain monopoly power, keep deposit rates lower, and increase their deposit interest spread (Ulate, 2021).

The value of IRFs six months after the shock serves as a measure of IRPT for further analysis. It is a pragmatic choice that captures a mix of IRPT's strength and swiftness. Figure 5 presents a cross-time variation of 6-month IRFs for each product.

The estimated median IRPT is higher for NFCs than HHs, a common finding in the literature. However, higher pass-through to deposits than loans is rare. A relatively underdeveloped lending market and a low loan demand might subdue the transmission to lending interest rates. Cross-bank variation is also tighter for deposits and NFCs than for loans and HHs.

IRPT is time-variant. Estimated median values for all products decreased during the Big War, even though in 2023, they started to recover for all except HH loans. The banking system reacts to a changing macro-financial environment, including the NBU's policies (see Section 3).

Decreasing IRPT during a crisis is in line with the literature. Shapovalenko and Vdovychenko (forthcoming) detect financial stress and economic uncertainty as significant macro

Figure 5: Medians and interquartile ranges of 6-month IRFs

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

Table 2: Effects of the Big War and tightening (OLS)

	HHD	NFCD	HHL	NFCL
Big War	−0.056***	−0.053***	−0.039***	−0.032***
	(0.008)	(0.013)	(0.010)	(0.009)
Tightening	−0.031***	−0.024***	−0.004	−0.007
	(0.005)	(0.005)	(0.004)	(0.006)
Constant	0.511***	0.600***	0.506***	0.575***
	(0.020)	(0.020)	(0.052)	(0.035)
Observations	3,014	3,081	3,003	3,145
Adjusted R^2	0.051	0.037	0.002	0.003

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

factors that could drive down IRPT to HH deposits and NFC loans in Ukraine. The war made banks more cautious as they counted losses and reassessed their business models.

The pass-through to deposits also decreases in times of tightening monetary policy (Table 2), an argument favoring low market competition. However, the effects for loans are insignificant.

IRPT correlates across products. Banks in Ukraine do not actively trade with each other on the interbank money market. Deposits comprise a large part of their funding, the price of which transmits to lending conditions.

6.2 Factors associated with IRPT strength

The second estimation step evaluates how individual bank characteristics influence the pass-through's strength. Particular attention is paid to prudential indicators and asymmetries in their impacts during periods of monetary policy tightening and loosening.

Table 3 presents the results of two-way fixed-effects (TWFE) estimations. F-tests confirm the presence of both individual and time-fixed effects for all products. While two-way regressions account for these effects, they do not allow for measuring factors common to all banks, such as macroeconomic developments or dummies for the Big War and monetary policy tightening. Nevertheless, dummy variables can be interacted with individual banks' characteristics to detect asymmetries. I include such interactions to differentiate between banks' reactions to money market interest rate decreases and increases.

Standard errors are clustered at the bank level to account for the potential correlation of the error terms within bank clusters. Specifically, I calculate Huber-White robust standard errors.

Bigger banks exhibit weaker transmission of interest rates compared to smaller ones. This effect is evident in both periods of monetary policy loosening and tightening but is significant for corporate clients only. Specifically, a one percentage point increase in a bank's share of total sector assets during loosening is associated with a 1.362 percentage point decrease

Table 3: Effects of bank characteristics (TWFE)

	HHD	NFCD	HHL	NFCL
Assets/Systemwide assets * Loosening	−0.428	−1.362**	0.154	−1.231**
	(0.656)	(0.692)	(0.419)	(0.569)
Assets/Systemwide assets * Tightening	−0.694	−1.804**	0.129	−1.284**
	(0.696)	(0.774)	(0.453)	(0.617)
Government bonds/Assets * Loosening	0.032	0.081**	−0.016	−0.049**
	(0.034)	(0.035)	(0.063)	(0.020)
Government bonds/Assets * Tightening	0.028	0.073**	−0.012	−0.016
	(0.027)	(0.032)	(0.057)	(0.019)
Commission income/Assets * Loosening	2.223	1.497	3.469	−0.388
	(2.416)	(2.259)	(2.706)	(1.511)
Commission income/Assets * Tightening	−0.170	−0.424	1.412*	0.031
	(0.880)	(0.843)	(0.819)	(0.783)
Operational expense/Assets * Loosening	0.567	0.992	−3.249*	2.067*
	(1.460)	(2.357)	(1.868)	(1.237)
Operational expense/Assets * Tightening	2.118	4.770***	−3.224	2.320
	(1.682)	(1.696)	(2.684)	(1.604)
Leverage ratio * Loosening	−0.112*	−0.042	0.056	−0.003
	(0.060)	(0.083)	(0.066)	(0.035)
Leverage ratio * Tightening	−0.064	−0.030	0.012	−0.015
	(0.052)	(0.059)	(0.068)	(0.033)
Capital adequacy ratio * Loosening	−0.044*	0.003	0.022	0.003
	(0.023)	(0.020)	(0.014)	(0.009)
Capital adequacy ratio * Tightening	−0.036**	−0.005	0.009	−0.004
	(0.015)	(0.015)	(0.006)	(0.006)
Certificates of deposit/Assets * Loosening	−0.051	−0.034	−0.024	−0.066***
	(0.036)	(0.043)	(0.051)	(0.023)
Certificates of deposit/Assets * Tightening	−0.041	−0.027	−0.008	−0.022
	(0.033)	(0.037)	(0.034)	(0.027)
Liquidity coverage ratio * Loosening	0.002***	−0.001	−0.001*	0.00000
	(0.001)	(0.001)	(0.0004)	(0.00000)
Liquidity coverage ratio * Tightening	−0.0004	−0.0003	−0.0001	0.00004
	(0.001)	(0.0003)	(0.0003)	(0.00003)
One borrower * Loosening	0.020	0.024	0.172***	−0.032
	(0.070)	(0.063)	(0.059)	(0.036)
One borrower * Tightening	0.007	−0.029	0.050	0.014
	(0.085)	(0.076)	(0.064)	(0.050)
Related party * Loosening	0.022	−0.052**	−0.057**	−0.032***
	(0.020)	(0.022)	(0.026)	(0.012)
Related party * Tightening	0.034	0.049	0.034	−0.010
	(0.036)	(0.040)	(0.054)	(0.028)
Observations	3,014	3,081	3,003	3,145
Adjusted R^2	0.125	0.131	0.035	0.082

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.

Source: Own calculations.

in pass-through to non-financial corporation (NFC) deposits and a 1.231 percentage point decrease in pass-through to NFC loans.[8] Larger banks often have lasting relationships with corporate clients and issue loans with longer maturities, making them less responsive to short-term rate changes.

The share of government bonds in a bank's portfolio strengthens the transmission to NFC deposit interest rates. Active bond purchases necessitate more active management of deposits, a stable funding source compared to money market credit and NBU refinance loans. However, pass-through to NFC loans decreases during periods of monetary policy loosening, as banks that hold more government bonds are less active in the corporate lending market.

Higher commission revenues increase pass-through to HH loans, with significant effects observed during tightening. Banks with higher reliance on commission revenues actively compete for borrowers since non-interest income benefits from attracting many small clients. The coefficients for NFCs are not significant.

Greater operational expenses make banks less active in the HH lending market but increase their willingness to compete in the NFC market. A smaller number of larger corporate clients may decrease expenses. Banks with high operational costs are also more willing to seek funding and increase deposit interest rates for NFCs during tightening.

Better-capitalized banks have lower IRPT to HH deposits, as indicated by coefficients for leverage and capital adequacy ratios. Ample capital buffers allow banks to limit the pass-through from the money market interest rate to depositors. The effects of higher capitalization on other bank products are insignificant.

Excessive liquidity, a high share of certificates of deposits in assets, decreases the pass-through to NFC loans during loosening. Liquidity coverage ratio coefficients are sometimes significant but not economically meaningful. The effects on other products or during tightening are insignificant.

Higher credit risk exposure per single counterparty makes banks more willing to de-

[8]Note that 1 pp corresponds to 0.01 on figures 4 and 5

crease HH lending rates during loosening. In contrast, banks with demanding related party constraints are less likely to reduce retail and corporate lending rates. Moreover, they decrease the pass-through to NFC deposits. During tightening, the effects of the asset-based requirements are neutral. The one-borrower constraint makes banks willing to diversify into HH loans. The related party constraint makes them willing to attract more NFC segment funding while reducing their loan portfolio.

Effects from shares of loans, deposits, FX loans, and loan loss provisions on IRPT are insignificant for all bank products. The regressions retain only those explanatory variables that were significant for at least one of them. Table 7 in Appendix 1 presents regressions with all available explanatory variables included.

Table 8 in Appendix 2 displays correlations between the explanatory variables. The highest correlation stands at 0.65 between the leverage and capital adequacy ratios, indicating no collinearity issues. Dropping one of the two variables does not profoundly alter the results.

Banks display asymmetric responses to monetary policy expansions and contractions. Table 4 highlights them. Bigger banks are less inclined to increase their deposit rates than to lower them. A more extensive government bonds portfolio makes IRPT to corporate loans higher during tightening than loosening. High commission income does not entail significant differences, while banks with high operational expenses are likelier to increase corporate deposit rates than to decrease them.

High capital buffers do not bestow significant differences in the pass-through during tightening compared to loosening. Liquidity buffers decrease the pass-through to HH deposit rates but increase for NFC depositors and both types of borrowers. Foreign currency loans decrease IRPT to HH deposits but increase it to NFC loans. The one-borrower constraint decreases the pass-through to HH loans, while the related party constraint increases IRPT to NFC deposits.

Hlazunov et al. (2023) suggest that bank ownership structure determines its business model and influences IRPT. Table 5 shows the estimated effects. State-owned banks have

Table 4: Asymmetries between tightening and loosening for bank characteristics (TWFE)

	HHD	NFCD	HHL	NFCL
Assets/Systemwide assets	−0.266***	−0.442***	−0.026	−0.053
	(0.074)	(0.116)	(0.100)	(0.078)
Government bonds/Assets	−0.004	−0.008	0.004	0.033*
	(0.028)	(0.031)	(0.031)	(0.019)
Commission income/Assets	−2.393	−1.921	−2.057	0.420
	(2.219)	(2.202)	(3.028)	(1.513)
Operational expense/Assets	1.551	3.778**	0.025	0.254
	(1.266)	(1.722)	(2.303)	(1.358)
Leverage ratio	0.048	0.012	−0.044	−0.013
	(0.033)	(0.057)	(0.036)	(0.029)
Capital adequacy ratio	0.009	−0.008	−0.013	−0.007
	(0.016)	(0.018)	(0.014)	(0.008)
Certificates of deposits/Assets	0.010	0.007	0.016	0.044*
	(0.031)	(0.036)	(0.050)	(0.026)
Liquidity coverage ratio	−0.002***	0.001	0.001	0.00004
	(0.001)	(0.001)	(0.0005)	(0.00003)
One borrower	−0.013	−0.053	−0.122***	0.046
	(0.036)	(0.046)	(0.039)	(0.036)
Related party	0.012	0.101**	0.090	0.022
	(0.035)	(0.039)	(0.061)	(0.031)

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

the lowest transmission to HHD, NFCD, and NFCL but the highest to HHL. Foreign banks have the opposite situation, which at least partially can be attributed to differences in sizes (see Table 1 in Section 4). Detailed analysis of interactions between bank business models and IRPT is left for future research.

All groups of banks for both types of deposits display statistically significant asymmetries between tightening and loosening (Table 6). Deposit interest rates are less predisposed to rise than to fall. Lending rates are also less inclined to rise, but not all coefficients are significant.

Table 5: Effects of bank ownership (OLS)

	HHD	NFCD	HHL	NFCL
State * Loosening	0.437***	0.526***	0.639***	0.441***
	(0.058)	(0.060)	(0.170)	(0.050)
State * Tightening	0.369***	0.440***	0.616***	0.437***
	(0.061)	(0.079)	(0.169)	(0.051)
Private * Loosening	0.496***	0.592***	0.538***	0.512***
	(0.020)	(0.024)	(0.058)	(0.040)
Private * Tightening	0.459***	0.567***	0.525***	0.501***
	(0.020)	(0.022)	(0.058)	(0.040)
Foreign * Loosening	0.530***	0.598***	0.275**	0.780***
	(0.054)	(0.030)	(0.117)	(0.058)
Foreign * Tightening	0.456***	0.533***	0.263**	0.745***
	(0.060)	(0.040)	(0.118)	(0.055)
Observations	3,014	3,081	3,003	3,145
Adjusted R^2	0.044	0.039	0.079	0.181

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

Table 6: Asymmetries between tightening and loosening for bank ownership (OLS)

	HHD	NFCD	HHL	NFCL
State	−0.068***	−0.086***	−0.024***	−0.003
	(0.011)	(0.020)	(0.005)	(0.005)
Private	−0.036***	−0.024**	−0.013*	−0.012
	(0.004)	(0.010)	(0.007)	(0.009)
Foreign	−0.074***	−0.066***	−0.012	−0.035***
	(0.015)	(0.013)	(0.013)	(0.007)

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.
Source: Own calculations.

7 Conclusions

This study contributes to the literature documenting sluggish and often incomplete pass-through to bank interest rates. Given that the Ukrainian financial system is bank-centric (with the banking sector holding three-quarters of all financial assets), it is critical to account for the incomplete pass-through to adhere to the Taylor principle and maintain monetary policy credibility.

IRPT in Ukraine is heterogeneous across products and customers. Monetary policy has a more significant impact on the pricing of corporate deposits than on household loans. Additionally, the response is asymmetric: deposit rates react less to tightening than to loosening, while loans show no such asymmetry. When monetary policy tightens, the bank interest rate spread widens, leading to rising net interest income. IRPT is also time-variant, having worsened across the board in 2022 amid the full-scale Russian invasion.

Prudential policies may have unintended consequences for monetary policy transmission. Smaller, illiquid, and poorly capitalized banks are more likely to transmit monetary policy signals to depositors and borrowers. Acute counterparty risk exposures incentivize banks to diversify into retail lending when facing single-party constraints or deleverage under related-party constraints. Banks with high government bond portfolios show strong pass-through for corporate deposits but weak pass-through for corporate loans. Further research could examine how IRPT depends on banks' business models and propose a coordination framework between monetary and prudential policies.

Understanding what drives bank behavior in response to central bank decisions would enhance the efficiency of monetary policy. In Ukraine, banking sector liquidity is widely cited as a reason for sluggish IRPT in 2022, as it rose due to foreign financial aid and the monetary financing of the government budget deficit. The NBU sought to combat this excess liquidity by raising minimum reserve requirements and introducing three-month liquidity-absorbing operations. Future research could also employ event studies to quantify the effects of banking liquidity on IRPT.

References

Altavilla, C., Canova, F., & Ciccarelli, M. (2020). Mending the broken link: Heterogeneous bank lending rates and monetary policy pass-through. *Journal of Monetary Economics*, 110, 81-98.

Aziakpono, M. J., & Wilson, M. K. (2013). Interest rate pass-through and monetary policy regimes in South Africa. *AERC Research Paper*, 259, African Economic Research Consortium (AERC).

Beyer, A., Nicoletti, G., Papadopoulou, N., Papsdorf, P., Rünstler, G., Schwarz, C., Sousa, J., & Vergote, O. (2017). The transmission channels of monetary, macro-and micro-prudential policies and their interrelations. *ECB Occasional Paper*, 191, European Central Bank (ECB).

Blot, C., & Labondance, F. (2013). Business lending rate pass-through in the Eurozone: monetary policy transmission before and after the financial crash. *Economics Bulletin*, 33(2), 973-985.

Borio, C., & Zhu, H. (2012). Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?. *Journal of Financial stability*, 8(4), 236-251.

Brissimis, S. N., & Delis, M. D. (2010). Bank heterogeneity and monetary policy transmission. *ECB Working Paper*, 1233, European Central Bank (ECB).

Croissant, Y., & Millo, G. (2008). Panel data econometrics in R: The plm package. *Journal of statistical software*, 27(2), 1-43.

Danylyshyn, B. (2022). Raising the accounting rate to 25%: Did this decision meet expectations. Available in Ukrainian at https://www.epravda.com.ua/columns/2022/10/20/692834/

Dieppe, A., Legrand, R., & Van Roye, B. (2016). The BEAR toolbox. *ECB Working Paper*, 1934, European Central Bank (ECB).

Egan, P., & McQuinn, K. (2023). Interest rate pass-through in Euro Area mortgage markets: The long shadow of the great financial crisis. *CESifo Economic Studies*, 69(4), 234-248.

Galindo, A. J., & Steiner, R. (2022). Asymmetric interest rate transmission in an inflation-targeting framework: The case of Colombia. *Latin American Journal of Central Banking*, 3(3), 100069.

Gigineishvili, N. (2011): Determinants of Interest Rate Pass-Through: Do Macroeconomic Conditions and Financial Market Structure Matter?. *IMF Working Paper*, 11/176, International Monetary Fund (IMF).

Gorodnichenko, Y., Sologoub, I., & Weder, B. (Eds.) (2022). Rebuilding Ukraine: Principles and Policies. *CEPR Press*, Centre for Economic Policy Research (CEPR).

Gregor, J., & Melecký, M. (2018). The pass-through of monetary policy rate to lending rates: The role of macro-financial factors. *Economic Modelling*, 73, 71-88.

Gregor, J., Melecký, A., & Melecký, M. (2019). Interest rate pass-through: A meta-analysis of the literature. *World Bank Policy Research Working Paper*, 8713.

Greszta, M., Humanicki, M., Kapuściński, M., Kleszcz. T., Kocięcki. A., Kotłowski, J., Ledóchowski, M., Łesyk, M., Łyziak, T., Pipień, M., Popowski, P., Stanisławska, E., Szafranek, K., Szafrański G., Ścibisz, D., Wesołowski G., & Wróbel, E. (2023). Monetary policy transmission mechanism in Poland. What do we know in 2023?. *NBP Working Papers*, 365, Narodowy Bank Polski (NBP).

Grigoli, F., & Mota, J. M. (2017). Interest rate pass-through in the Dominican Republic. *Latin American Economic Review*, 26(1), 4.

Grui, A., Aragon, N., Faryna, O., Krukovets, D., Savolchuk, K., Sulimenko, O., Vdovychenko, A., & Zholud, O. (2023). Between russian Invasions: The Monetary Policy Transmission Mechanism in Ukraine in 2015-2021. *NBU Working Paper*, 02/2023, National Bank of Ukraine (NBU).

Hennecke, Peter (2017). The interest rate pass-through in the low interest rate environment: Evidence from Germany. *Thünen-Series of Applied Economic Theory – Working Paper*, 151, Universität Rostock, Institut für Volkswirtschaftslehre, Rostock.

Hlazunov, A., Dadashova, P., & Lukianenko, I. (2023). Interest rate pass-through in

Ukraine: evidence from the bank ownership. *Financial and credit activity: Problems of theory and practice*, 5(52), 8-24.

Hristov, N., Hülsewig, O., & Wollmershäuser, T. (2014). The interest rate pass-through in the Euro area during the global financial crisis. *Journal of Banking & Finance*, 48, 104-119.

Kok, C., & Werner, T. (2006). Bank interest rate pass-through in the euro area: a cross country comparison. *ECB Working Paper*, 580, European Central Bank (ECB).

NBRK (2023). Monetary Policy Report, May 2023. National Bank of Kazakhstan.

NBU (2022a). Financial stability report, December 2022. National Bank of Ukraine.

NBU (2022b). Financial stability report, June 2022. National Bank of Ukraine.

NBU (2022c). NBU Postpones Key Policy Rate Decision (press release, 3 March 2022). National Bank of Ukraine.

NBU (2022d). NBU Raises Key Policy Rate to 25% (press release, 3 June 2022). National Bank of Ukraine.

NBU (2023). Financial stability report, June 2023. National Bank of Ukraine.

Maddaloni, A., & Peydró, J. L. (2013). Monetary policy, macroprudential policy and banking stability: evidence from the euro area. *International Journal of Central Banking*, 9, 121-169.

Matějů, J. (2019). What Drives the Strength of Monetary Policy Transmission?. *International Journal of Central Banking*, 15(3), 59-87.

Mayordomo, S., & Roibás, I. (2023). The pass-through of market interest rates to bank interest rates. *Documentos Ocasionales*, 2312, Banco de España.

Montagnoli, A., Napolitano, O., & Siliverstovs, B. (2016). Regional interest rate pass-through in Italy. *Regional Studies*, 50(8), 1404-1419.

Primiceri, G. E. (2005). Time varying structural vector autoregressions and monetary policy. *The Review of Economic Studies*, 72(3), 821-852.

Shapovalenko, N., & Vdovychenko, A. (forthcoming) Interest Rate Pass-Through in

Ukraine: Estimates and Determinants

Stanisławska, E. (2015). Interest rate pass-through in Poland: Evidence from individual bank data. *NBP Working Paper*, 179, National Bank of Poland (NBP).

Ulate, M. (2021). Alternative Models of Interest Rate Pass-Through in Normal and Negative Territory. *International Journal of Central Banking*, 17(1), 3-34.

Van Leuvensteijn, M., Sørensen, C. K., Bikker, J. A., & Van Rixtel, A. A. (2013). Impact of bank competition on the interest rate pass-through in the euro area. *Applied Economics*, 45(11), 1359-1380.

Appendix 1

Table 7: Effects of bank characteristics (TWFE, all variables)

	HHD	NFCD	HHL	NFCL
Assets/Systemwide assets * Loosening	−0.433	−1.143*	0.182	−1.155**
	(0.682)	(0.659)	(0.417)	(0.561)
Assets/Systemwide assets * Tightening	−0.707	−1.571**	0.175	−1.214**
	(0.719)	(0.727)	(0.444)	(0.608)
Loans/Assets * Loosening	0.022	0.030		
	(0.041)	(0.055)		
Loans/Assets * Tightening	0.007	0.066		
	(0.036)	(0.057)		
Deposits/Liabilities * Loosening			0.060	−0.003
			(0.077)	(0.018)
Deposits/Liabilities * Tightening			0.012	0.005
			(0.055)	(0.016)
Government bonds/Assets * Loosening	0.040	0.087**	0.001	−0.047**
	(0.037)	(0.036)	(0.055)	(0.022)
Government bonds/Assets * Tightening	0.019	0.118**	−0.004	−0.006
	(0.030)	(0.048)	(0.048)	(0.024)
Commission income/Assets * Loosening	2.306	1.433	3.130	−0.252
	(2.442)	(2.161)	(2.481)	(1.508)
Commission income/Assets * Tightening	0.005	−0.352	1.631**	−0.109
	(0.944)	(0.778)	(0.740)	(0.740)
Operational expense/Assets * Loosening	0.478	0.428	−3.340*	2.086*
	(1.403)	(2.233)	(1.842)	(1.237)
Operational expense/Assets * Tightening	1.680	4.410***	−3.455	2.793*
	(1.571)	(1.499)	(2.259)	(1.569)
Leverage ratio * Loosening	−0.100*	−0.045	0.065	−0.011
	(0.057)	(0.077)	(0.061)	(0.037)
Leverage ratio * Tightening	−0.069	−0.011	0.022	−0.004
	(0.051)	(0.058)	(0.062)	(0.037)
Capital adequacy ratio * Loosening	−0.044*	0.003	0.022*	0.006
	(0.023)	(0.019)	(0.013)	(0.010)
Capital adequacy ratio * Tightening	−0.032**	−0.008	0.008	−0.009*
	(0.015)	(0.015)	(0.007)	(0.005)
Certificates of deposit/Assets * Loosening	−0.037	−0.030	−0.031	−0.075***
	(0.038)	(0.049)	(0.053)	(0.023)
Certificates of deposit/Assets * Tightening	−0.042	0.011	−0.004	−0.015
	(0.036)	(0.047)	(0.033)	(0.027)
Liquidity coverage ratio * Loosening	0.002***	−0.001	−0.001*	0.00003*
	(0.001)	(0.001)	(0.0004)	(0.00002)
Liquidity coverage ratio * Tightening	−0.0002	−0.0001	−0.0001	0.0001**
	(0.001)	(0.0003)	(0.0004)	(0.00002)
FX loans/Loans * Loosening	0.027	−0.038	0.006	−0.018
	(0.032)	(0.036)	(0.046)	(0.020)
FX loans/Loans * Tightening	0.002	−0.005	0.016	−0.001
	(0.034)	(0.038)	(0.062)	(0.025)
Provisions/Loans * Loosening	−0.031	−0.039	−0.006	0.057
	(0.036)	(0.028)	(0.005)	(0.042)
Provisions/Loans * Tightening	0.027	0.024	0.010	0.003
	(0.022)	(0.056)	(0.041)	(0.030)
One borrower * Loosening	0.010	0.029	0.175***	−0.026
	(0.071)	(0.064)	(0.057)	(0.035)
One borrower * Tightening	0.016	−0.051	0.054	0.012
	(0.084)	(0.073)	(0.065)	(0.050)
Related party * Loosening	0.019	−0.054**	−0.060**	−0.031**
	(0.018)	(0.024)	(0.029)	(0.014)
Related party * Tightening	0.028	0.055	0.047	−0.018
	(0.036)	(0.036)	(0.058)	(0.028)
Observations	3,014	3,081	3,003	3,145
Adjusted R^2	0.131	0.140	0.040	0.091

*p<0.1; **p<0.05; ***p<0.01

Note: HHD – household deposits, NFCD – non-financial corporation deposits, HHL – household loans, NFCL – non-financial corporation loans.

Source: Own calculations.

Appendix 2

Table 8: Correlation matrix of explanatory variables

	Assets/Systemwide assets	Loans/Assets	Deposits/Liabilities	Government bonds/Assets	Commission income/Assets	Operational expense/Assets	Leverage ratio	Capital adequacy ratio	Certificates of deposit/Assets	Liquidity coverage ratio	FX loans/Loans	Provisions/Loans	One borrower	Related party
Assets/Systemwide assets	1	-0.193	0.081	0.154	-0.046	-0.348	0.010	-0.196	-0.135	-0.091	0.008	-0.003	-0.143	-0.146
Loans/Assets	-0.193	1	0.085	-0.533	0.098	-0.207	-0.205	-0.430	-0.427	-0.367	0.057	-0.004	0.096	0.117
Deposits/Liabilities	0.081	0.085	1	-0.562	0.109	-0.066	0.093	-0.207	0.234	-0.045	-0.064	-0.031	-0.015	0.255
Government bonds/Assets	0.154	-0.533	-0.562	1	0.001	0.123	-0.129	0.229	-0.196	0.130	0.003	0.046	0.026	-0.202
Commission income/Assets	-0.046	0.098	0.109	0.001	1	0.235	-0.150	-0.186	-0.137	-0.170	-0.067	-0.005	0.032	0.191
Operational expense/Assets	-0.348	-0.207	-0.066	0.123	0.235	1	0.422	0.516	0.115	0.462	-0.166	-0.033	-0.136	0.066
Leverage ratio	0.010	-0.205	0.093	-0.129	-0.150	0.422	1	0.653	0.129	0.550	-0.180	-0.022	-0.152	0.085
Capital adequacy ratio	-0.196	-0.430	-0.207	0.229	-0.186	0.516	0.653	1	0.364	0.596	-0.110	-0.070	-0.224	-0.014
Certificates of deposit/Assets	-0.135	-0.427	0.234	-0.196	-0.137	0.115	0.129	0.364	1	0.299	0.063	-0.087	-0.112	0.039
Liquidity coverage ratio	-0.091	-0.367	-0.045	0.130	-0.170	0.462	0.550	0.596	0.299	1	0.063	-0.081	-0.244	-0.085
FX loans/Loans	0.008	0.057	-0.064	0.003	-0.067	-0.166	-0.180	-0.110	-0.053	0.063	1	-0.015	0.220	-0.046
Provisions/Loans	-0.003	-0.004	-0.031	0.046	-0.005	-0.033	-0.022	-0.070	-0.087	-0.081	-0.015	1	-0.021	-0.016
One borrower	-0.143	0.096	-0.015	0.026	0.032	-0.136	-0.152	-0.224	-0.112	-0.244	0.220	-0.021	1	0.111
Related party	-0.146	0.117	0.255	-0.202	0.191	0.066	0.085	-0.014	0.039	-0.085	-0.046	-0.016	0.111	1

Source: Own calculations.

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