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Amplifying Transmission of Monetary Policy Through Deposit Competition

Bono Beriša, Ivan Mužić and Jurica Zrnc

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About authors

Bono Beriša
University of St Andrews Business School, UK
bb206@st-andrews.ac.uk

Ivan Mužić
Faculty of Economics and Business, University of Rijeka
ivan.muzic@efri.uniri.hr

Jurica Zrnc
Croatian National Bank
jurica.zrnc@hnb.hr

Challenges for Monetary Policy Transmission in a Changing World Network (ChaMP)

This paper contains research conducted within the network "Challenges for Monetary Policy Transmission in a Changing World Network" (ChaMP). It consists of economists from the European Central Bank (ECB) and the national central banks (NCBs) of the European System of Central Banks (ESCB).

ChaMP is coordinated by a team chaired by Philipp Hartmann (ECB), and consisting of Diana Bonfim (Banco de Portugal), Margherita Bottero (Banca d'Italia), Emmanuel Dhyne (Nationale Bank van België/Banque Nationale de Belgique) and Maria T. Valderrama (Oesterreichische Nationalbank), who are supported by Melina Papoutsi and Gonzalo Paz-Pardo (both ECB), 7 central bank advisers and 8 academic consultants.

ChaMP seeks to revisit our knowledge of monetary transmission channels in the euro area in the context of unprecedented shocks, multiple ongoing structural changes and the extension of the monetary policy toolkit over the last decade and a half as well as the recent steep inflation wave and its reversal. More information is provided on its website.

Amplifying Transmission of Monetary Policy Through Deposit Competition*

Bono Beriša[†] Ivan Mužić[‡] Jurica Zrnc[§]

Abstract

We study the effects of a government initiative aimed at increasing the pass-through of monetary tightening to deposit rates. A large state-owned bank responded first to the initiative with a sharp and unexpected deposit rate increase. Competing banks quickly followed, albeit with substantial heterogeneity. The resulting deposit-rate shock led to a sizable increase in term deposits, driven primarily by ex-ante liquidity-rich individuals. Using matched deposit and residential real-estate purchase data at the individual level, we document a strong portfolio-rebalancing effect away from real estate. At the same time, consumption remains unchanged. Despite the sizable deposit reallocation, the shock does not affect the supply of loans to firms or households, consistent with high pre-existing bank liquidity. This setting provides a unique opportunity to uncover the effects of increased deposit competition and the ensuing deposit-rate shock on household portfolios, consumption, and bank lending.

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[†]University of St Andrews Business School, UK. bb206@st-andrews.ac.uk

[‡]Faculty of Economics and Business, University of Rijeka. ivan.muzic@efri.uniri.hr

[§]Croatian National Bank. jurica.zrnc@hnb.hr, Corresponding author

1 Introduction

The optimality of a monetary union depends on the extent to which its member states experience similar economic shocks (Mundell, 1961). However, even when countries face identical economic shocks, the transmission of monetary policy can vary significantly between countries that form a monetary union due to, for example, differences in banking structures, financial market depth, and institutional frameworks. The recent monetary tightening in the euro area (EA) has highlighted these divergences, with substantial variation in how the European Central Bank (ECB) monetary policy was transmitted to loan and deposit interest rates across member states with clear potential consequences for inflation (Beyer et al., 2024; Kerola et al., 2024).

Is there a policy lever that individual countries in a monetary union can pull to amplify monetary policy transmission through banks? In this paper, we study the effects of a government policy that significantly increased deposit rates and spurred competition for deposits through an unexpected and sharp term-deposit rate increase by the largest state-owned bank in Croatia. At the time, despite being an EA member, Croatia exhibited the weakest transmission of monetary tightening to household deposit rates, while inflation remained persistently high and was the second-highest among euro area countries (Figure 1). In September 2023, the government held meetings with banking sector representatives to express concerns regarding the slow transmission of monetary policy tightening to deposit rates. The aim of the initiative was to stimulate household savings and thereby curtail consumption, in line with basic mechanisms in standard representative-agent New Keynesian models. Following the meetings, the largest state-owned bank unilaterally raised interest rates on newly issued term deposits by 2.5 p.p., thereby kicking off competition for deposits with other banks. The immediate effects of the policy on term deposit rates were sizable, although the share of the state-owned bank in the banking system's total assets was not large, approximately 7%. The result was a sharp increase in the aggregate interest rate on new term deposits by 1 percentage point from a level of 1.5%, which was less than half the euro area average of 3.3%.

This episode provides a rare opportunity to study a pure deposit rate shock and trace its impact on individuals, banks, and the economy. In most settings, deposit rates move mainly in response to policy-rate changes, which simultaneously affect banks' opportunity cost of lending and the returns on alternative assets competing for household savings. As a result, such policy changes do not provide a well-identified deposit rate shock, but also move lending rates and returns on other assets simultaneously.

Figure 1: Change in HH deposit rates, p.p.

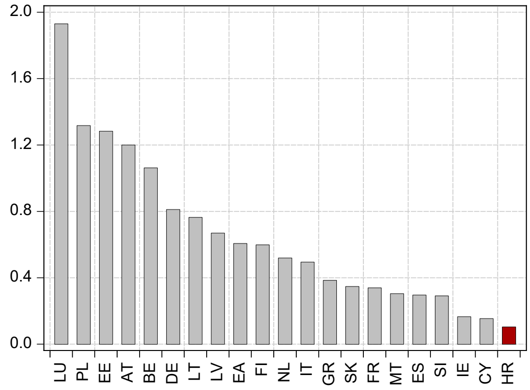
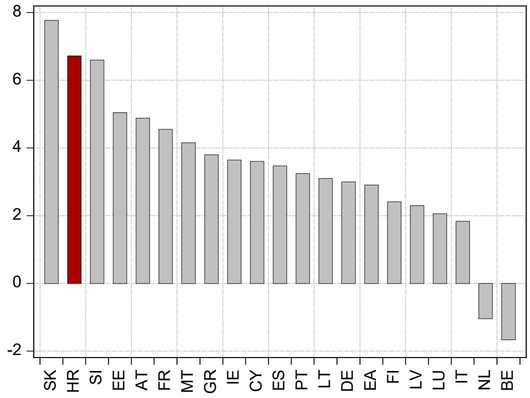


Figure 2: Inflation (YoY%)



Note: The left panel shows changes in interest rates on newly agreed household term deposits from June 2022 to October 2023. The right panel shows the year-on-year change in the Harmonised Index of Consumer Prices (HICP) in the fourth quarter of 2023. Source: ECB.

Our empirical framework exploits the unexpected and sharp increase in deposit rates by Croatia's state-owned, systemically important bank in October 2023. At the individual level, we study whether higher deposit returns induce portfolio reallocation away from residential real estate. Rather than using realized increases in term deposits, which are endogenous post-shock portfolio choices, we define exposure using individuals' pre-intervention liquid wealth. High-liquidity individuals were more exposed to the increase in deposit returns, that is, more likely to adjust their savings portfolios after the rate hike. We therefore compare changes in real estate purchase behavior across individuals with different levels of pre-intervention liquidity, controlling for local shocks using county-by-time fixed effects and time-invariant individual characteristics with individual FE. Extensions address alternative explanations by controlling for differential income trends, bank characteristics, returns on other financial assets and changes in housing price expectations.

For county-level consumption, differential pre-trends complicate identification. Since we cannot control for individual or county-time FE as in individual level analysis, we use a synthetic control approach that constructs a synthetic control group for counties with higher saving response. At the bank level, we exploit cross-bank differences in exposure to deposit-rate competition, measured primarily using banks' pre-intervention deposit betas. We also consider realized changes in household deposit funding costs as an alternative measure, while treating them with caution because they may reflect endogenous bank responses. This bank-level variation allows us to study the effect of the deposit-rate shock on loan supply to households and firms, using fixed-effect specifications designed to absorb borrower demand conditions (Degryse et al., 2019; Khwaja & Mian, 2008) and additional bank time varying characteristics to control for possible supply confounders.

To assess the effects of this unique policy experiment, we draw on several rich administrative datasets. Firstly, we use a confidential database of bank-depositor records that includes detailed information on individual depositors' outstanding balances at specific banks, associated interest rates, and term deposit initiation dates. Secondly, we incorporate the Croatian National Bank's confidential bank-firm and bank-individual loan-level datasets, which include loan amounts and interest rates for both new and outstanding loans. Additionally, we use confidential transaction data on residential real estate purchases collected by the Croatian tax authority. To measure consumption patterns, we utilize purchase data at the county level from the Croatian tax authority, which records both the daily amount and the number of purchases.

We show that competing banks responded swiftly to the unilateral deposit rate hike, adjusting their own rates within days to mitigate the risk of deposit outflows. This reaction dampened the initial surge in deposit inflows into the state-owned bank, as the increase in term deposits largely stemmed from a reallocation of funds within banks rather than customers switching across banks. The response of other banks to the deposit rate shock is largely predictable by bank deposit betas, which we use as a rough measure of deposit market power following Drechsler et al. (2017). At the individual level, we show that the dominant source of liquidity reallocation into term deposits are high-liquidity individuals. The high-liquidity individuals were getting better interest rates, even after controlling for deposit maturity, bank-time and county-time fixed effects. These facts suggest that they might be more financially sophisticated, in line with recent findings by Cirelli and Olafsson (2025).

Ex ante, one might expect the policy to have only modest effects on consumption. While standard New Keynesian models emphasize intertemporal substitution, the empirical literature argues that consumption is only weakly responsive to interest rates and much more responsive to income (Campbell & Mankiw, 1989; Havranek & Sokolova, 2020). In a HANK setting, the aggregate response to an increase in deposit rates depends on which households increase savings. If the adjustment is concentrated among high-liquidity households, the income effect of higher deposit rates partly offsets the substitution motive to cut consumption (Kaplan & Violante, 2022; Kaplan et al., 2014, 2018). Since the increase in term deposits is driven precisely by ex-ante liquid households, given that they have sufficient liquid funds to increase term deposits in the first place, the policy might not have substantial effects on consumption.

A potentially large margin of adjustment might occur in the portfolio of households. A rise in term deposit rates raises the opportunity cost of holding alternative assets and should therefore induce these households, who are less constrained by liquidity needs and more able to lock in savings, to shift wealth toward deposits. In Croatia, where real estate is the largest asset on household balance sheets (Kunovac, 2020), as in many countries including the US (Poterba et al., 2011), this mechanism could translate into lower housing demand. Linking depositor and property transaction data, we study whether high-liquidity individuals changed their saving patterns and housing purchase probability, while controlling for county-time and individual fixed effects. We find a substantial 5.9% drop in high-liquidity households' house purchases. The effect strengthens over time and persists for up to nine months after the shock, after which reliable purchase data are no longer available. We show that the effect increases with ex-ante liquid wealth and is not financed by mortgages, but by deposits/cash. This further suggests that an investment motive is at play. The effect survives a battery of robustness checks, such as controlling for differential income dynamics and controlling for the differential effect of returns on other assets across the liquid-wealth distribution.

While increases in interest rates incentivized saving, the impact on household consumption is indistinguishable from zero at the county level. We identify the consumption effects in a synthetic-control design. Counties experiencing larger increases in term deposits do not display a decline in retail purchases relative to their synthetic counterparts after October 2023. We show that this null effect is robust to a battery of checks, including leave-one-out and leave-two-out donor exclusions, resampling of the donor pool, alternative treatment thresholds and pre-treatment windows placebo tests in both space and time. The result is also robust to redefining treatment using an ex-ante measure of exposure to the deposit-rate shock, the county-level share of high-liquidity individuals. To ascertain the aggregate effects on consumption, we follow the methodology of Coglianese et al. (2025), who, similarly to us, study the aggregate effects of one unexpected monetary policy decision in Sweden. Using local projections with lagged business-cycle controls, we find that aggregate consumption remains within its usual cyclical dynamics explained by the model. A causal interpretation of this estimate requires that, conditional on these controls, consumption would also, in the absence of the intervention, have continued to follow its typical cyclical dynamics.

Do banks transmit this funding shock to loans? We investigate whether the reallocation of deposits influences loan supply. Our analysis indicates that loan supply to firms and households remains unaffected. This might be rationalized by the fact that Croatian banks maintained substantial excess liquidity, averaging approximately 17% of total assets, so moderate deposit inflows and outflows did not significantly increase the likelihood of liquidity issues at individual banks. Banks also did not pass through the increase in their funding cost to the interest rate on loans. In line with Altavilla et al. (2025), we find that excess liquidity diminishes the effects of deposit flows on the loan supply and the passthrough to loan rates. The fact that the intervention didn't change loan supply also allows us to examine the effects of a pure deposit rate shock on saving, investment, and consumption.

We are the first to study the effects of this type of policy pressure designed to amplify monetary policy transmission through deposit competition. Related literature on state-owned banks and monetary policy mainly focused on how state-owned banks increase lending during downturns (Carvalho, 2014; Deng et al., 2015). An alternative and more popular policy during the 2022-2023 monetary tightening was bank taxation. Indeed, almost half of EU countries introduced new bank taxes during this period (Maneely & Ratnovski, 2024). While tax policies are quite heterogeneous, they tend to decrease loan supply and increase loan rates, with ambiguous effects on deposit rates (see e.g. Pekanov & Schratzenstaller, 2025). We show that government pressure to raise deposit rates didn't influence consumption but led to a portfolio reallocation away from housing. It also did not change borrowing costs for firms and households, as the banking system was well-capitalized and had ample excess liquidity.

We also contribute to the literature on the impact of deposit market competition on monetary policy transmission (Drechsler et al., 2017, 2021; Kho, 2025; Wang et al., 2022), by using a natural experiment that allows us to track the effects of a change in deposit market competition. The literature relies on often-criticized market concentration measures for identification (Begenau & Stafford, 2022; d'Avernas et al., 2023) or on structural estimation approaches. Our detailed data show a that the main drivers of deposit reallocation are high-liquidity individuals who also receive higher interest rates. In a recent paper studying a single Icelandic bank, Cirelli and Olafsson (2025) also find that most of reallocation out of highly liquid checking deposits during monetary tightening is by high-liquidity individuals. Our paper provides a natural experiment in which there is an isolated deposit shock that doesn't affect loan rates, which might, in turn, affect saving patterns. In contrast to Drechsler et al. (2017), we find that deposit reshuffling across the banking system did not translate into loan supply changes, arguably due to high ex-ante reserves. Our results imply that in a banking system with sufficiently ample liquidity the bank lending channel of monetary policy doesn't work through the deposit-channel.

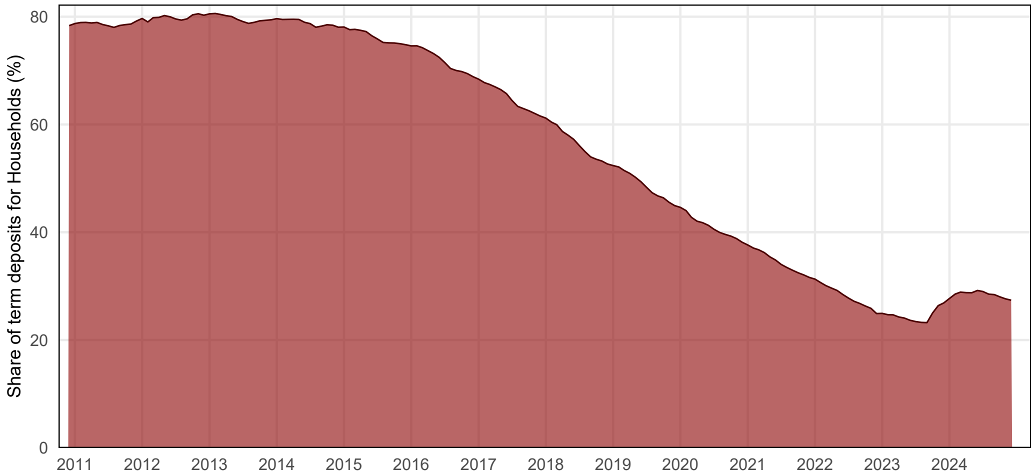
We contribute to the literature on transmission of monetary policy by showing the effects of a well-identified deposit-rate shock, thus unveiling a strong portfolio rebalancing channel and no statistically discernible effects on consumption (Agarwal et al., 2021; Auclert et al., 2025; Boddin et al., 2024; Jarociński & Karadi, 2020; Kaplan et al., 2018; Slacalek et al., 2020). The fact that the intervention didn't change loan rates allows us also to uncover the effects of a pure deposit rate shock on the saving, investment and consumption responses. We find that the standard New Keynesian intertemporal substitution channel is absent, while we are the first to empirically identify a substantial portfolio-rebalancing channel of an interest rate hike, driven by high-liquidity individuals who increase saving. This finding implies that the relevant channel through which monetary policy can have sizable effects on consumption is lending rates, not deposit rates.

The remainder of the paper is organized as follows. Section 2 provides institutional background on the Croatian banking system and the October 2023 policy initiative. Section 3 outlines the theoretical mechanisms linking deposit competition to household saving, consumption, housing investment, and bank lending. Section 4 describes the administrative datasets and the construction of our main variables. Section 5 presents our empirical results. We first study banks' deposit-rate responses in Subsection 5.1 and the ensuing deposit flows in Subsection 5.2. We then examine portfolio rebalancing using linked depositor and residential real-estate transactions in Subsection 5.3. We analyze consumption responses using county-level purchase data in Subsection 5.4. Finally, we evaluate whether changes in bank funding transmit to credit supply and loan pricing in Subsection 5.5. Section 6 concludes.

2 Institutional Background

Household deposits are the main funding source for banks in Croatia, accounting for about 53% of liabilities. Because households hold most of these deposits in overnight accounts, deposit rates provide a key channel through which monetary policy affects banks' funding costs and households' portfolio choices. In earlier high-rate periods, households allocated a substantial share of savings to time deposits, which historically dominated their deposit holdings. The subsequent prolonged low-interest-rate environment weakened incentives to lock in longer maturities, lowering the share of time deposits to 22% by the third quarter of 2023 (Figure 3).

Figure 3: Share of term deposits in total household deposits



Note: The figure shows the share of household deposits with agreed maturity (term deposits) in total household deposits. Total household deposits are the sum of overnight deposits and deposits with agreed maturity. Source: CNB.

Abundant liquidity, high capital buffers, market concentration, and the relatively small participation of households in the market for non-deposit financial instruments help explain the sluggish response of deposit rates to monetary policy tightening in 2022 and well into 2023 (Deskar-Škrbić et al., 2023). Throughout 2023, Croatian households faced the lowest deposit rates in the euro area, even as key policy rates rose sharply in response to inflationary pressures (Figure 4). Meanwhile, bank profits increased rapidly, intensifying calls for policy action.

The government met with banking sector representatives in September 2023 to express concern over the slow transmission of monetary policy to deposit rates. Following the meetings, the largest state-owned bank unilaterally raised interest rates on newly issued term deposits by 2.5 p.p., thereby kicking off competition for deposits with other banks. Importantly, this repricing was linked exclusively to term deposit rates, while the interest rates on transaction deposits remained effectively unchanged at about 0.02%. The press release of the state-owned bank explicitly references the government initiative:

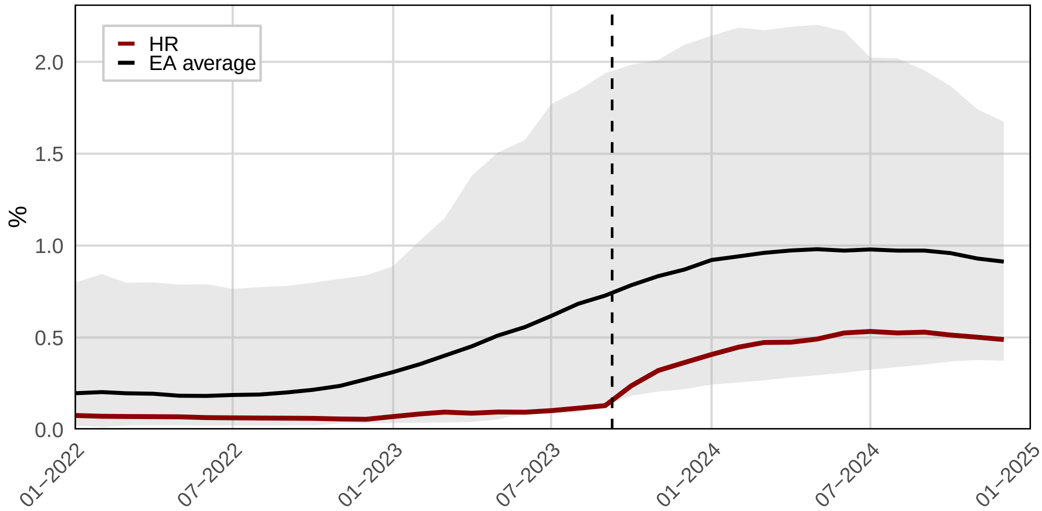
"Following constructive discussions with the Ministry of Finance and the Government of the Republic of Croatia on the effects of inflation on our citizens... The introduction of such a product will contribute to curbing inflation by immobilizing time-deposited funds while, on the other hand, allowing savers to achieve an attractive return that mitigates the negative effects of inflation on the value of money."[1]

Government pressure on banks to increase deposit rates is by no means unique to

[1] HPB (2023). "Jedinstveni proizvod na tržištu: HPB nudi štednju uz fiksnu, godišnju kamatnu stopu do 3,00%". HPB Official Press Release. Accessed on February 13, 2025.

Croatia. Similar initiatives occurred in other parts of the euro area (e.g. Italy and Spain[2]). In the US, senators have repeatedly pressured banks to increase deposit rates by sending open letters to CEOs of large US banks and in Senate hearings[3] The extent to which these pressures had any effects is unclear.

Figure 4: Interest rates on total outstanding deposits from households



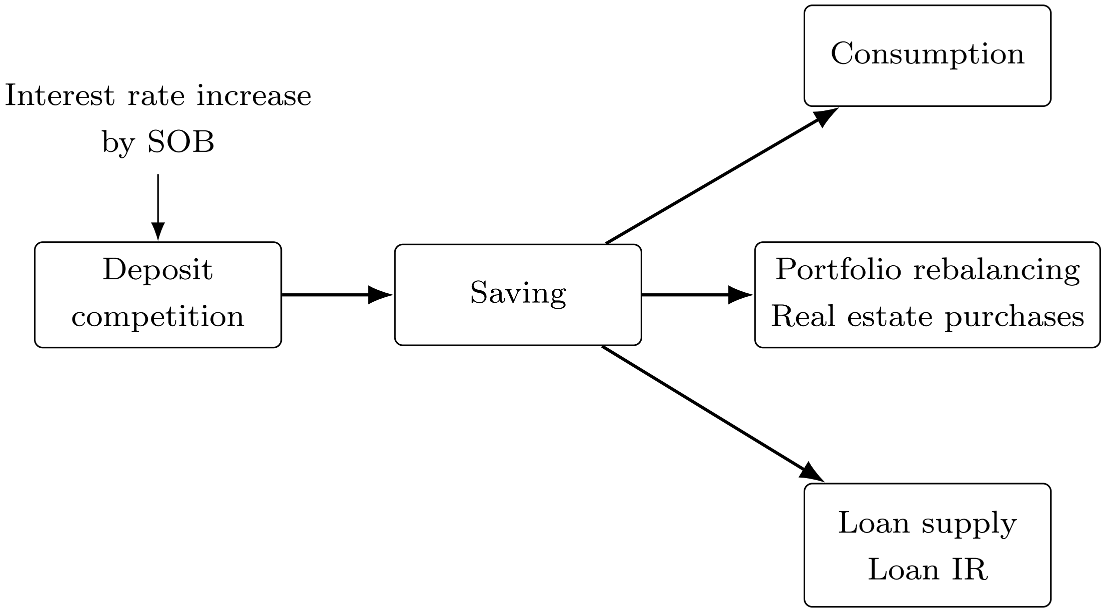
Note: The figure plots the weighted-average household deposit rate on total outstanding deposits for Croatia (HR) and the euro area (EA). The shaded band indicates the minimum–maximum range across euro-area countries at each point in time. Source: ECB; CNB calculations.

3 Theoretical Framework

This chapter presents the main potential channels through which an unexpected increase in term deposit rates by a state-owned bank can affect deposit market competition, bank loan supply, and individual decisions about saving, investment, and consumption (Figure 5).

[2]McElroy, C. and Lozano, C. (2023). "European bank stock recovery faces test as political pressure on deposits mounts". *S&P Global*. Accessed on January 5, 2026.
[3]Gibson, K. (2025). "Big banks hiked interest rates on borrowers but not for savers, senators say". *CBS News*. Accessed on January 5, 2026.

Figure 5: Transmission channels of a deposit rate shock



Deposit competition. Deposits serve as a crucial funding source for banks, valued for their stability and comparatively lower cost relative to wholesale funding alternatives. Banks typically exert a degree of market power in the deposit market, enabling them to maintain a spread over comparable financial market rates (Drechsler et al., 2017). This market power can arise from several factors, including bank size, the concentration of the local market, low financial sophistication or inertia often observed among individual depositors (Drechsler et al., 2017; Egan et al., 2025; Yankov, 2024), but also as compensation for fixed costs of providing additional services such as extensive branch and ATM networks (d'Avernas et al., 2023).

Beyond market power dynamics, other characteristics inherent to bank assets and liabilities also critically shape its deposit-rate setting behavior. For instance, banks holding large portfolios of long-term, fixed-rate loans face constraints in rapidly repricing their assets when policy rates increase. Consequently, they tend to maintain lower deposit rates to safeguard their net interest margins (Polo, 2021). In contrast, institutions with greater exposure to interest rate risk can more readily pass through changes in funding costs to their asset yields, thereby gaining more flexibility to raise deposit rates (Gomez et al., 2020).

Interest rates and the intertemporal allocation of consumption. In New Keynesian models, the core transmission channel of changes in the interest rate operates through households' intertemporal consumption. The Euler equation governing consumption dynamics implies that an increase in the real interest rate increases savings and decreases consumption. The empirical macroeconomics literature, however, finds little evidence for this channel. Consumption is not sensitive to interest rate movements (Campbell & Mankiw, 1989), while it is very sensitive to movements in income (Havranek & Sokolova, 2020). A burgeoning heterogeneous agent New Keynesian literature (HANK) explains these findings through a substantial share of hand-to-mouth households that do not have enough liquid funds, which they might save (Kaplan & Violante, 2022; Kaplan et al., 2014, 2018). This implies that high-liquidity households have larger income effects, which reduce the substitution channel. The aggregate effects on consumption in our case will crucially depend on which type of households will drive the saving aggregate. Given that ex-ante liquid households are the group that is mostly able to increase term deposits, one might expect the consumption effects of the policy to be small.

Portfolio rebalancing and housing demand. A rise in the return on one safe asset, e.g. term deposits, increases the opportunity cost of holding other assets and thus potentially shifts more of the household's portfolio towards that safe asset. In a standard HANK framework (e.g. Kaplan et al. (2018)), this would particularly affect the rebalancing of high-liquidity households. They are less constrained by possible liquidity shortages that might prevent such reallocation, allowing them to more readily lock in more of their wealth. This contrasts sharply with low-liquidity households, who likely lacked the substantial liquid funds to significantly increase such savings. Furthermore, high-liquidity households have larger incomes in general, which also correlates with financial sophistication. Financially sophisticated individuals are, in turn, more likely to shop for or negotiate better interest rates. The most important form of household wealth in Croatia is housing wealth (Kunovac, 2020). Hence, a rise in term deposit rates could have a significant impact on real estate demand. The portfolio reallocation effect might be amplified by the fact that high-liquidity individuals are more likely to invest in real estate, arguably due to the lumpiness of the investment and various fixed costs associated with investment in housing. Furthermore, high-liquidity households have higher incomes and are more creditworthy, allowing them to surpass these costs.

Deposits and loan supply. Deposit inflows and outflows are a key determinant of banks' ability to supply credit and have been empirically shown to influence lending decisions (Jiménez et al., 2012; Kashyap et al., 1993; Khwaja & Mian, 2008). Deposits are special because of their stability (Hanson et al., 2015) and the increasing marginal cost of wholesale funding (Stein, 1998). The reshuffling of deposits across banks also results in the reallocation of excess liquidity. Excess liquidity serves as insurance against future possible liquidity shocks, and increasing it can spur lending (Altavilla et al., 2023, 2025). However, in environments characterized by ample pre-existing liquidity and large capital buffers, as in Croatia, the direct impact of deposit movements on loan supply might be moderated. Excess liquidity might be above the saturation point after which marginal liquidity flows do not have meaningful effects on banks probability of default. However, there might be effects on loan pricing. Banks hedge the long-duration, relatively interest-rate-insensitive asset portfolio with market power in the deposit market (Drechsler et al., 2021). If competition in the deposit market suddenly increases, banks might raise interest rates on new loans to offset higher funding costs.

4 Data

We combine several confidential micro-level datasets from the Croatian National Bank (CNB) and the Croatian Tax Authority (CTA). Together, these sources allow us to trace deposits, loans, consumption, and real estate transactions at the individual or regional level, and to link them via anonymized identifiers.

Depositor-level data. The CNB depositor registry contains monthly account-level records for all depositors in Croatian banks, including anonymized individual identifiers. For each account, it reports the deposit type, balance, interest rate, contract date, maturity date, and whether the deposit is new or renewed. We use data from June to December 2023 to quantify the effects of the deposit rate increase (see Table A.1, Table A.2).

Loan-level credit data. We use two detailed CNB datasets on lending. The first covers all corporate loans at the firm–bank–loan level, reporting monthly amounts, interest rates, maturities and risk assessments. The second covers all new housing loans at the borrower–bank level, with anonymized identifiers, amounts, interest rates, maturities and borrower characteristics such as income. These data enable us to examine whether banks altered loan supply in response to deposit flows (see Table A.3, Table A.4).

County-level consumption data. From the CTA, we use daily county-level retail consumption data derived from the national fiscalization system,[4] which records all issued receipts for transactions subject to VAT. The dataset provides comprehensive and timely information on retail spending in each county, with full geographic coverage and daily frequency. Within our framework, we use these data to test whether counties more exposed to the deposit shock experienced subsequent declines in aggregate spending.

Real-estate transaction data. The CTA real estate registry records all registered property sales in Croatia, reporting transaction prices, locations, and dates, together

[4]Fiscalization is an electronic system that records all cash and non-cash transactions subject to value-added tax in real time, allowing the tax authority to monitor sales and ensure compliance.

with anonymized individual identifiers and various characteristics of the property (see Table A.1, Table A.2). By linking these records to depositor- and loan-level data, we can examine portfolio rebalancing effects, specifically whether high-liquidity individuals adjusted their property purchases in response to the shock.

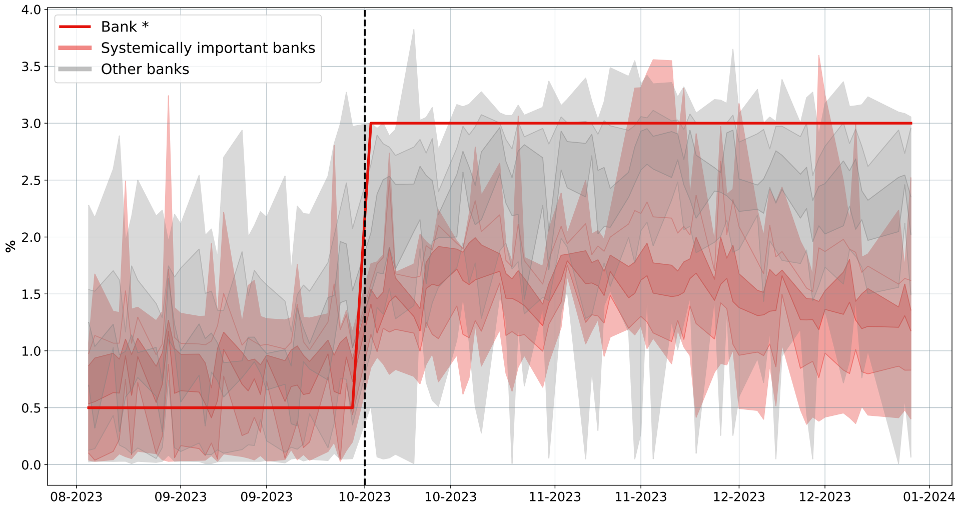
5 Results

This section presents the key empirical results showing how the deposit rate shock is transmitted through the economy. Following the structure in Figure 5, we first study the responses of other banks to the deposit rate shock. Next, we analyze individuals' responses to the increased deposit rates, particularly the flow into term deposits. We then assess the effects of increased savings on consumption and housing investment decisions. Finally, we explore how changes in bank funding influenced credit supply to firms and households.

5.1 Interest rate competition

This subsection analyzes the competitive dynamics in deposit interest rates following the policy initiative. Figure 6 documents a discrete 2.5 p.p. increase in the state-owned bank's offered term-deposit rate. Before the policy shift, the state-owned bank's deposit rate was below the median even for large banks, but after the intervention, it moved to the upper end of the distribution, matching the top of the range for smaller banks and exceeding the maximum offered by large banks. The magnitude and abruptness of this repricing indicate that the change was exceptional relative to the bank's prior rate-setting behavior. The initial sharp increase in deposit rates by the state-owned bank prompted a rapid, market-wide response, with other banks also adjusting their term deposit rates upwards. Despite this general upward trend, there was substantial variation in the magnitude of these adjustments across different banks.

Figure 6: Deposit rate changes by state-owned and private banks following the policy intervention in October 2023



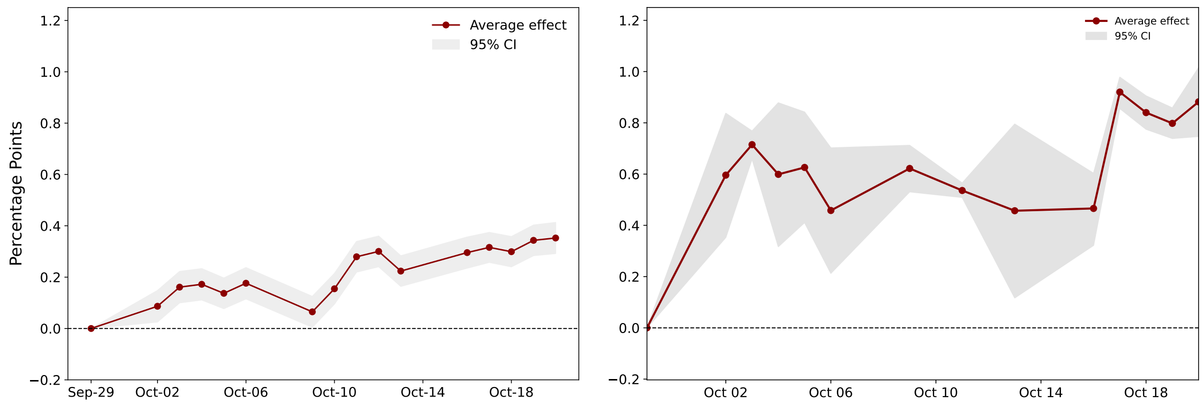
Notes: This figure shows the daily evolution of term deposit rates offered by Croatian banks before and after the policy intervention introduced in October 2023 (dashed vertical line). Banks are split into two groups: systemically important banks (red) and other banks (grey). Within each group, the fan chart displays the cross-sectional distribution of bank-level averages divided into quintile bands, with darker shading representing banks with term deposit rates closer to the median. Bank* refers to the state-owned bank whose rate is derived from publicly available Excerpts from decisions on interest rate levels (12-month time deposits in euro). As a consequence, this series does not exhibit usual daily oscillations that can be caused by different characteristics of deposits and special arrangements with individual clients. The shown group of systemically important banks excludes the Bank*. Sources: Deposit Registry; excerpts from decisions on interest rate levels for the Bank*.

Because other banks' responses can reflect many forces (Section 3), we use each bank's deposit beta as an ex-ante summary measure of deposit market power (Drechsler et al., 2017). We calculate the deposit beta as the ratio of the change in the marginal cost of household funding[5] for banks to the change in the deposit facility rate during the tightening period, prior to any intervention by the state-owned bank. The deposit beta measures the reaction of banks' deposit rates to key monetary policy rates, not to other banks' rates. In the framework of Drechsler et al. (2017), however, policy pass-through is tightly linked to deposit-market power. Figure 7 presents estimates of daily deposit rate changes between low and high deposit beta banks. The estimates reveal that the pass-through was significantly weaker among banks with arguably greater market power (lower deposit beta), which relayed a smaller portion of the initial rate increase to their depositors.

[5]The marginal cost of deposit funding for households is calculated by multiplying the interest rates on new business with the respective outstanding stocks of transaction and time deposits, and dividing the sum of these products by the total household deposit stock (see e.g. Illes et al. (2019)).

Figure 7: Daily changes in term deposit rates following the intervention

(a) Deposit beta below median, p.p. (b) Deposit beta above median, p.p.



Note: The figure plots local-projection impulse-response estimates of term-deposit rates for banks facing different degrees of deposit competition. Each dot corresponds to a business day. The sample excludes Bank*. Banks below (above) the median competition measure have an average deposit beta of 0.05 (0.24). Source: Deposit Registry.

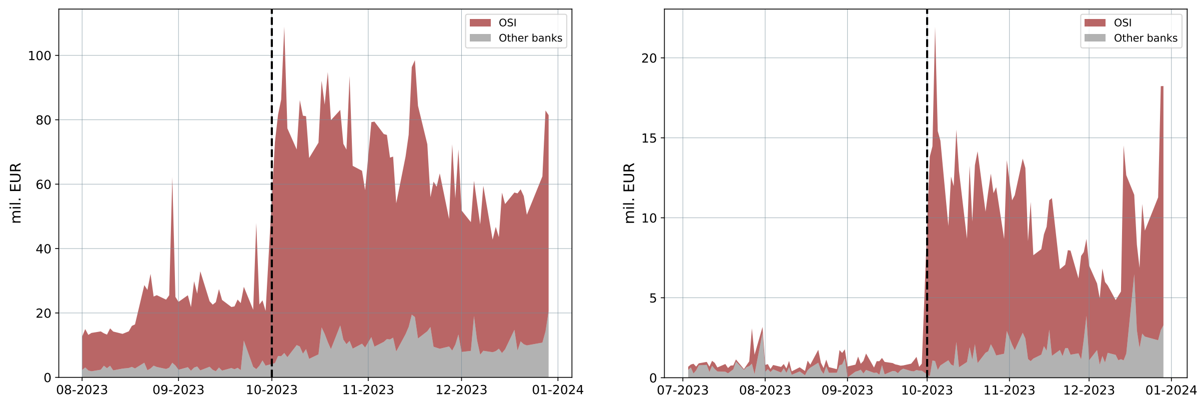
5.2 Effect on deposit flows

Following the unexpected deposit rate increase, new term-deposit originations amounted to €4.7 billion or ≈ 5.3% of GDP (Figure 8). The reallocation of deposits by individuals opening accounts at new banks increased markedly following the intervention (Panel B of Figure 8), but the predominant driver of the overall growth in term deposits was the conversion of existing overnight (sight) deposits into term accounts within the same banking institution (Panel A of Figure 8). Indeed, inflows from "new clients" - defined as deposits from individuals with no prior transactional or savings relationship with the receiving bank - were modest compared to the within-bank reallocation. Out of 4.7 billion EUR of new term deposits, only 0.6 billion EUR were from individuals who opened an account in a bank in which they didn't previously have an account. Depositors appear to have increased term deposits mainly within existing banking relationships, accepting lower rates than they could have obtained by switching banks.

Despite the strong preference for maintaining existing banking relationships, the data also reveal a clear sensitivity to interest rates. Figure 9 effectively traces an upward sloping supply of term-deposits curve, showing that higher interest rates induced a greater increase in term deposits. Furthermore, banks with higher deposit rates attracted new clients.

Figure 8: Inflows of term deposits

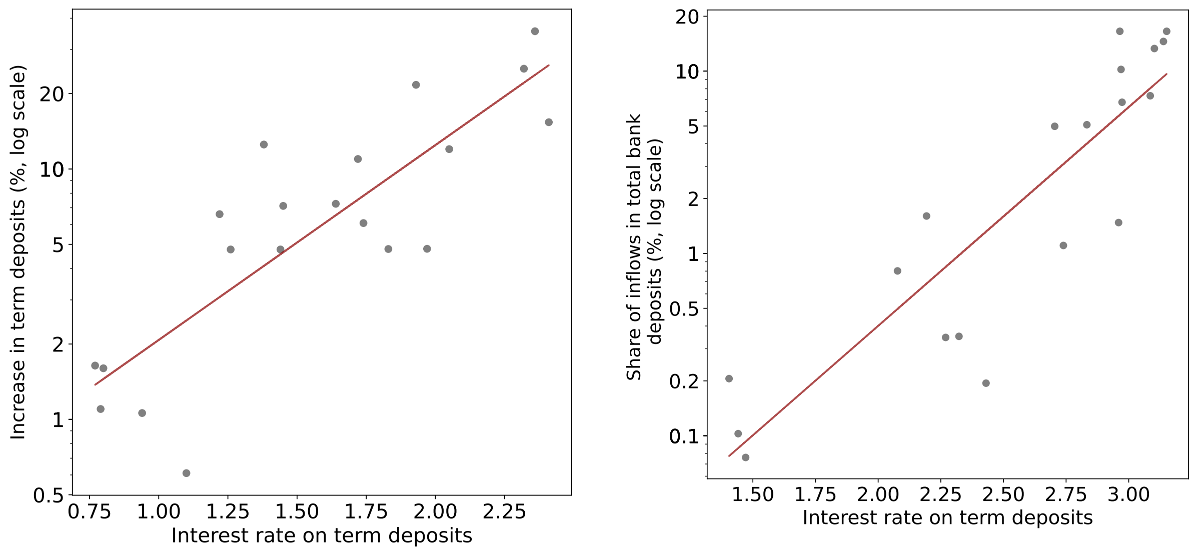
(a) Total (b) New clients



Note: The left panel shows total inflows into term deposits after the treatment, regardless of the source, including (i) within-bank reallocation from overnight to term deposits, (ii) transfers from other banks, and (iii) inflows from outside the banking system. The right panel shows inflows into term deposits from *new clients* (bank switchers), defined as individuals who held no deposits of any type in bank X before the treatment but opened a term deposit in bank X afterwards. OSI denotes systemically important banks (including the state-owned bank). Source: Deposit Registry.

Figure 9: Relationship between interest rates and deposit inflows

(a) Total allocations to term deposits (b) Inflows from “new” clients

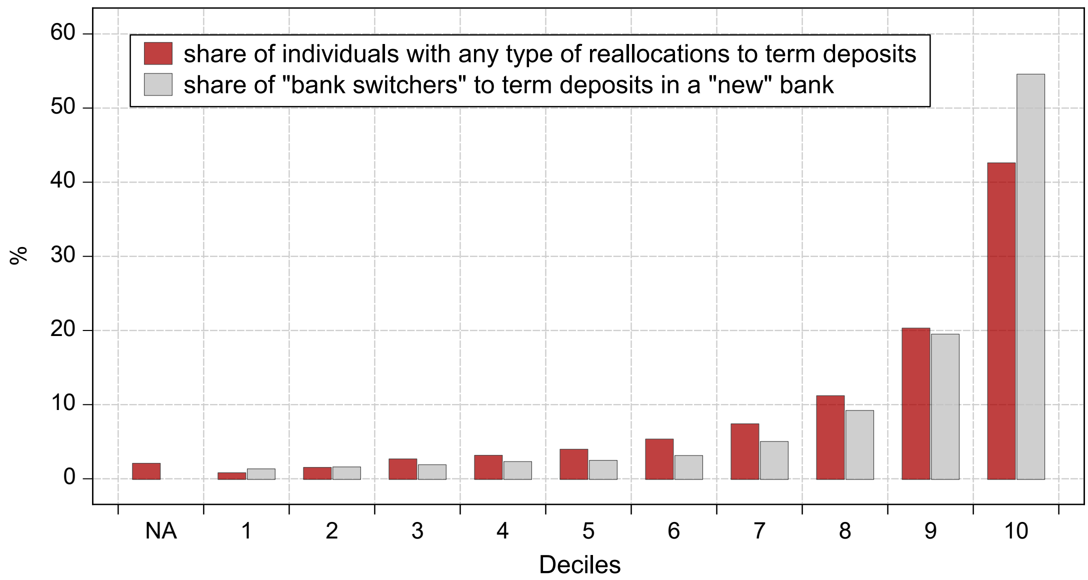


Note: The left panel shows the relationship between the interest rate a bank offers on term deposits (x-axis) and the total increase in that bank's term deposits (y-axis, log scale, in %). Total inflows include (i) internal reallocation from overnight to term deposits within the same bank, (ii) transfers of deposits from other banks, and/or (iii) inflows from outside the banking system. The right panel shows the relationship between the interest rate on term deposits (x-axis) and the share of inflows from *new clients or bank switchers* in total bank deposits (y-axis, log scale, in %). New clients denote individuals who had no deposits of any type in a given bank before the treatment, but opened a term deposit in that bank after the treatment. Each dot represents one bank. Observed period: June–December 2023. Source: Deposit Registry.

Crucially, the composition of this substantial reallocation into term deposits shows significant variation across the individuals' wealth distribution. More than 50% of all individuals who reallocated into term deposits are drawn from the tenth liquidity decile (Figure 10, Figure B.1). A similar pattern emerges for “bank switchers,” with roughly 40%

originating from the top decile. The distribution of the nominal value of new term deposits is even more skewed. The top three deciles of the pre-intervention liquidity distribution account for approximately 90% of the total new term deposits in EUR (Figure B.2). These high-liquidity individuals also have ex-ante higher saving rates, defined as the proportion of their term deposits relative to their total deposits. For instance, individuals within the top liquidity decile exhibited an average savings rate of 31%, while those in the bottom decile reported a markedly lower rate of just 1.5% (Figure B.3). Importantly, the sharp increase in interest rates induced high-liquidity individuals to strongly increase the share of term deposits in their total deposits (Figure B.4).

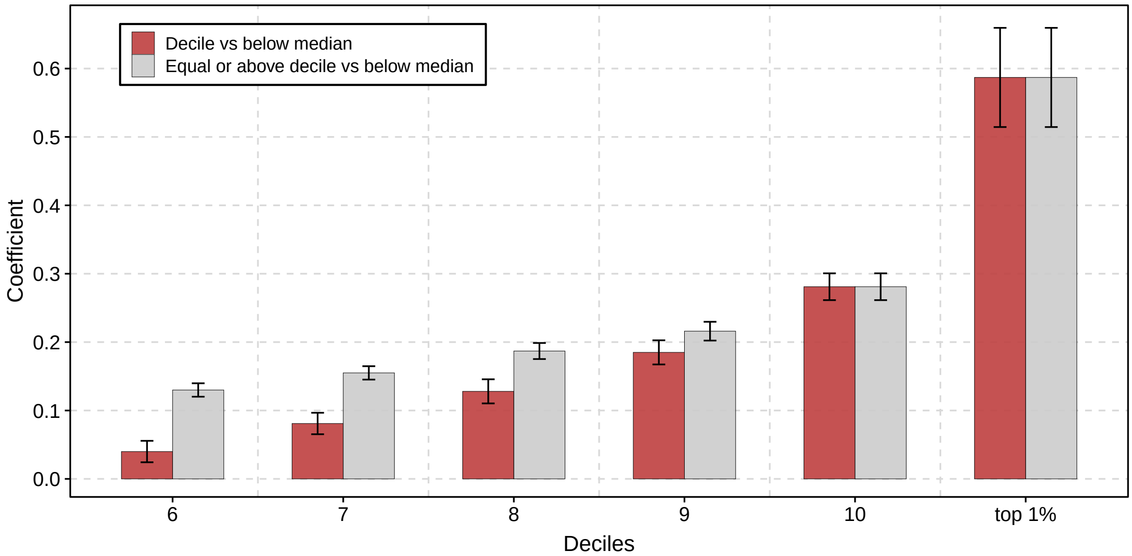
Figure 10: Reallocation to term deposits across liquidity deciles



Note: This figure shows the distribution of term-deposit reallocations across liquidity deciles, i.e., the share of all individuals who reallocated to term deposits in each decile. Red bars include individuals with *any* inflow into term deposits after the treatment, regardless of the source: (i) within-bank reallocation from overnight to term deposits, (ii) transfers from other banks, and/or (iii) inflows from outside the banking system. Grey bars show inflows from *new clients* (bank switchers), defined as individuals who held no deposits of any type in bank X before the treatment but opened a term deposit in bank X afterwards, consistent with switching in response to higher offered term rates. Individuals are assigned to deciles based on total liquidity (overnight plus term deposits across all banks) as of June 30, 2023; decile 1 comprises the least liquid and decile 10 the most liquid. Shares are computed over individuals (not amounts); corresponding amounts are reported in Figure B.2. Source: Deposit Registry.

Indeed, we show that ex-ante high-liquidity individuals were getting more favorable interest-rates, even for term deposits with the same maturity, within the same bank and in the same county (Figure 11). Interest rates on term deposits clearly increase in ex-ante liquid wealth. The substantial inequality present in saving behavior can be potentially explained by liquidity constraints, financial sophistication, bank switching costs and the fact that high-liquidity have larger benefits from searching for better interest rates (Calvet et al., 2007; Cirelli & Olafsson, 2025; Lusardi & Mitchell, 2014; McKay, 2013).

Figure 11: Interest rates on term deposit recieved by the deciles of wealth of term depositor



Note: This figure shows the interest rate received by individuals with respect to their liquid wealth. Liquid wealth is calculated as the sum of overnight and term deposits across all banks as of June 2023. Liquidity deciles are computed over individuals who began holding a term deposit at a bank between October 2023 and December 2023. We also include the top 1%, defined as the top percentile of liquid wealth across individuals. Dark red bars report estimates from a specification in which the corresponding decile receives a dummy equal to 1 and deciles 1–5 receive 0. Grey bars report estimates from a specification in which the dummy equals 1 for the corresponding decile and all higher deciles, and 0 for deciles 1–5. Error bars show 95% confidence intervals. Each estimation controls for county × time, bank × time, and term-deposit-maturity category × time fixed effects. Source: Deposit Registry.

5.3 Portfolio Rebalancing - Residential Real-Estate

Given that high-liquidity individuals are driving the increase in term deposits, an ex-ante likely margin of adjustment is the portfolio. Real estate is the largest asset on Croatian household balance sheets (Kunovac, 2020), as in many countries worldwide, including the US (Poterba et al., 2011). An identification challenge is that term-deposit increases are also an outcome. Hence, we focus on an ex-ante measure of exposure to the deposit rate increase: the level of liquid wealth. We exploit the fact that high-liquidity individuals were ex-ante much more probable to increase saving after the rate hike. Table A.2 shows some characteristics of both groups. High-liquidity individuals have higher income than low-liquidity individuals, get better interest rates, are more likely to take a mortgage and have similar levels of debt-service-to-income. To test whether higher deposit rates induce portfolio reallocation away from housing, we estimate an individual-level reduced-form specification using administrative data on real estate property transactions. We estimate the following reduced form:

$$y_{i,t} = \alpha + \beta\,\text{High-liquidity}_i \times \text{Post}_t + \lambda_i + \gamma_{c,t} + \epsilon_{i,t}, \quad (1)$$

where $y_{i,t}$ is a binary indicator equal to one if individual i purchased a residential property at time t, and zero otherwise; λ_i are individual fixed effects and $\gamma_{c,t}$ are county-by-time fixed effects (c indexes counties and t indexes months). The indicator High-liquidity$_i$ equals one for high-liquidity individuals (those whose total deposits were above the median in the pre-intervention period) and zero for low-liquidity individuals, serving as a proxy for their ex-ante sensitivity to changes in deposit returns. Post$_t$ equals one in the post-intervention period and zero otherwise. The coefficient β thus captures the differential response of ex-ante high-liquidity individuals' housing purchase decisions to the deposit rate shock. Standard errors are clustered at the individual level. In the simplest approach, we divide the time period into two periods. The pre-period is defined as three months prior to the shock and the post-period is defined as three month after the shock. We first perform this coarse period characterization because of the large number of observations and computational constraints. In a robustness check, we compute local projections and estimate the dynamic effects of the increase in deposit rates.

The identification assumption is that, in the absence of the policy, ex-ante high- and low-liquidity individuals would have followed parallel trends in their housing purchase behavior. These parallel trends would occur if, for example, both types of individuals would face similar trends in their income and there are no changes in the returns on other assets that might drive this reallocation. While this assumption is inherently untestable, we provide corroborating evidence that, prior to the policy event, high- and low-liquidity individuals indeed exhibited similar trends in house purchases. Our specification also controls for potentially differing economic trends across various counties in Croatia. We also perform various robustness checks that, for example, control for income at the individual level, the differential response across wealth categories to returns on other financial assets and different definitions of high-liquidity. Furthermore, it is important to note that no other significant housing-market policies or banking regulatory changes were enacted contemporaneously with the deposit rate intervention.

Figure 12 presents initial graphical evidence on house purchase behavior surrounding the policy shock. High-liquidity and low-liquidity individuals exhibited similar real estate purchase trends prior to the shock. After the shock, high-liquidity individuals, defined as those with above-median pre-treatment liquid wealth as of June 30, 2023, reduced their house purchases strongly relative to their pre-treatment levels and relatively to the low-liquidity individuals.

Figure 12: Number of House Purchases by Liquidity Group (log, indexed to September 2023)

Note: This figure shows log changes in house purchases by domestic buyers, indexed to September 2023, separately for high-liquidity and low-liquidity individuals. High-liquidity individuals are defined as those above the median in total liquidity (sum of all deposits across all banks) as of June 30, 2023. The figure shows log differences in house purchase values for domestic buyers relative to September 2023. Vertical line indicates the date of the deposit rate intervention. Sources: Tax Authority; Deposit Registry.

To formally estimate the effect of the deposit rate increase, we propose an instrumental variables model of the following form. The first stage is:

$$T_{i,t} = \alpha + \beta\,(\text{High-liquidity}_i \times \text{Post}_t) + \lambda_i + \gamma_{c,t} + \epsilon_{i,t}, \tag{2}$$

where i indexes individuals, t indexes months and c indexes counties (the county of individual i). $T_{i,t}$ denotes the average interest rate individual i obtains on their total deposits at time t, or the logarithm of their total deposit holdings at time t. This equation models how these realized deposit market outcomes $T_{i,t}$ are influenced by our instrument (the interaction term $\text{High-liquidity}_i \times \text{Post}_t$). The model includes individual fixed effects (λ_i) to control for time-invariant unobserved individual attributes and county-by-time fixed effects ($\gamma_{c,t}$) to capture common macroeconomic trends and shocks across counties. Standard errors are clustered at the individual level.

The second stage is:

$$y_{i,t} = \alpha + \beta\,\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \epsilon_{i,t}, \tag{3}$$

where $y_{i,t}$ is the binary indicator for a residential property purchase by individual i at time t, $\widehat{T}_{i,t}$ are the predicted values of the average interest rate on deposits from the first stage, and λ_i and $\gamma_{c,t}$ are individual and county-by-time fixed effects, as in the first stage.

Standard errors are clustered at the individual level.

Table 1: Effect of Deposit Rate Shock on House Purchase Probability (IV Regression)

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x High-liquidity	0.08882***	0.39672***	-0.00024***		
	(0.00044)	(0.00251)	(0.00008)		
Interest rate				-0.00272***	
				(0.00093)	
ln(T. DEPOSIT)					-0.00061***
					(0.00021)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.528	0.565	0.505	-	-
Obs.	6,367,562	6,367,562	6,367,562	6,367,562	6,367,562

Note: This table reports first-stage, reduced-form, and IV estimates of the effect of the deposit rate shock on the probability of residential real-estate purchase. The first-stage specifications in columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$. The reduced-form specification in column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, while the IV specifications in columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $\widehat{T}_{i,t}$ is the predicted value from the corresponding first stage. House purchase, $y_{i,t}$, is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. The instrument is $\text{Post}_t \times \text{High} - \text{liquidity}_i$, where "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Authority and Deposit Registry.

The results from this IV estimation are presented in Table 1. They show that high-liquidity individuals got, on average, 9 basis points higher interest rates on their total deposits (including both sight and term deposits) after the policy change, compared to the pre-treatment period. Furthermore, high-liquidity individuals seem to be more sensitive to interest rate changes, increasing their term deposits by 40% more than low-liquidity individuals. The second-stage estimates imply that a 1 percentage point increase in the average interest rates received on deposits decreases the probability of purchasing residential real estate by 0.27 percentage points. Correspondingly, a 100% increase in term deposit holdings results in a 0.06 percentage point decrease in the probability of a house purchase. The estimated 0.024 percentage point reduction in the probability of house purchase is economically significant, given the baseline probability of house purchase for high-liquidity individuals of 0.4%, representing approximately a 5.9% decline in their likelihood of buying a house.

How long-lived are these effects? We change the definition of the post period to the first quarter of 2024 and the effects are even more pronounced (Table C.1). We also estimate the dynamic effects of the deposit rate increase using a local-projection framework. Figure C.1 shows that the house purchase probability remains lower for 9 months after the shock, after which we do not have reliable house purchase data available.

We provide additional evidence that a portfolio rebalancing channel is at play. Individuals with greater ex-ante liquid wealth are more likely to finance the down payment for a loan, or even to purchase real-estate entirely with their own funds. High-liquidity individuals also increased term deposits the most and were getting better interest rates than the rest of the depositors (see Subsection 5.2). We check whether the effect is increasing in an individual's ex-ante liquid wealth and find that the effect on house purchases is increasing in liquid wealth. It is particularly strong in the top decile of the liquid-wealth distribution (Table C.2). This exercise also demonstrates the robustness of our results to a different definition of liquid wealth. For completeness, we show that both deposit rates and the associated saving response increase monotonically with an individual's liquid wealth also in the full depositor sample used for the housing-purchases analysis (Table C.3).

We further dissect the portfolio-rebalancing mechanism. We show that the majority of the portfolio rebalancing effect operates through reduced cash or deposit financed real estate purchases rather than through mortgages. We exclude all mortgage-financed purchases and show that portfolio rebalancing is driven by buyers who, in the counterfactual, would finance purchases without a bank loan (Table C.4). These are high-liquidity individuals who probably self-finance real estate purchases. In Croatia, the majority of real estate purchases are not financed by mortgages (Hrvatska narodna banka, 2025), but rather with deposits/cash. Mortgage demand barely changed due to the interest rate increase (Table C.5).

The validity of this IV approach hinges on the exogeneity and exclusion restriction assumptions regarding our instrument $\text{High-liquidity}_i \times \text{Post}_t$, once the comprehensive set of controls and fixed effects are accounted for. Parallel pre-treatment trends in housing purchases between high- and low-liquidity groups provide supportive evidence for the exogeneity assumption (Figure 12). We also dynamically estimate the effects of the policy on the probability of house purchase for high-liquidity individuals using local projections (see Figure C.1) and show that, in the months prior to the initiative, the trends in the probability of house purchase between high- and low-liquidity individuals were similar. We also performe the same exercise one year prior when there was no change in deposit rates as a placebo and find a zero effect on house purchases (Figure C.2).

Furthermore, including a detailed set of individual controls doesn't change the results. A threat to identification is that another factor influences real estate purchases at the same time as the deposit rate change. A potential confounder is the differential evolution of income between high-liquidity and low-liquidity individuals after the policy initiative. Our county-time fixed effects arguably account for a substantial portion of differential income trends, as there is significant variation across counties in the share of high-liquidity individuals. For a sizable subgroup of depositors that also took a loan in the past, we have information on their income, so we can verify for this subgroup that the results are not due to differential income trends. In Table C.6, we control for income quartile-time fixed effects for these individuals, and the results do not qualitatively change. In Table C.9 we add additional controls such as debt service to income ratio, whether the individual ever had a mortgate, ever bought a house, recieved government subsidies for mortgatges and the results still hold. The estimated parameter is different, but this is mainly due to the different sample composition. When we estimate the baseline model in Panel B of Table C.9 on the same subsample, we get a similar coefficient. This suggests that our estimated effect cannot be explained by these additional demand controls nor with unobservables correlated with these controls (Altonji et al., 2008).

Similarly, the portfolio reallocation effect could be driven by the differential response of high-liquidity individuals to changes in returns on other assets, such as bonds or stocks, rather than by an increase in deposit rates. We test for this scenario by interacting high-liquidity individuals dummy with changes in Croatian 10-year government bond yields and the S&P 500. The estimate stays similar and statistically significant (Columns (1) and (2) in Table C.7). Furthermore, the estimate might be driven by the changes in housing prices expectations at the end of the monetary policy tightening cycle. We interact the high-liquidity dummy with housing price expectations and find the that the our estimate remains highly statistically significant (Column (3) in Table C.7).

Another possibility is that the results might be driven by bank characteristics. For example, an increase in deposit rates might reduce housing demand by raising mortgage rates, not deposit rates. This is highly unlikely given that we find that the demand for mortgages barely changed. Results in Subsection 5.5 show that banks did not translate funding cost increases into loan interest rates and that loan supply did not change. To corroborate this finding further, we also leverage the fact that consumers are more likely to take a loan from a bank at which they have a deposit (Basten & Juelsrud, 2023). We control for all time-varying bank characteristics by including bank×time fixed effects for single-bank individuals, while excluding those with deposits at multiple banks. This absorbs variation in mortgage rates and other bank conditions that could affect real estate purchase decisions within the bank. Even under this specification, the estimated portfolio rebalancing effect remains strong and statistically significant (Table C.8).

5.4 Effect on Consumption

Following the observed increase in individual savings, we further investigate whether this shift, induced by the deposit rate shock, exerted a discernible dampening effect on local consumption. Specifically, we assess if geographic areas experiencing stronger reallocations into interest-bearing term deposits also exhibited weaker consumption growth in the subsequent period.

To isolate the potential effect, our empirical strategy leverages cross-county variation in the share of ex-ante high-liquidity individuals in the county. The heterogeneity of the increase in term deposits across counties is strongly related to the ex-ante proportion of high-liquidity individuals (Table D.1, Figure D.1). The identification relies on the fact that some counties across the country have common trends in consumption growth, while at the same time exhibiting different saving responses to the policy shock. Similar consumption trends across different counties would occur if, for example, high-liquidity and low-liquidity individuals exhibited similar income growth but differentially responded to the deposit rate increase.

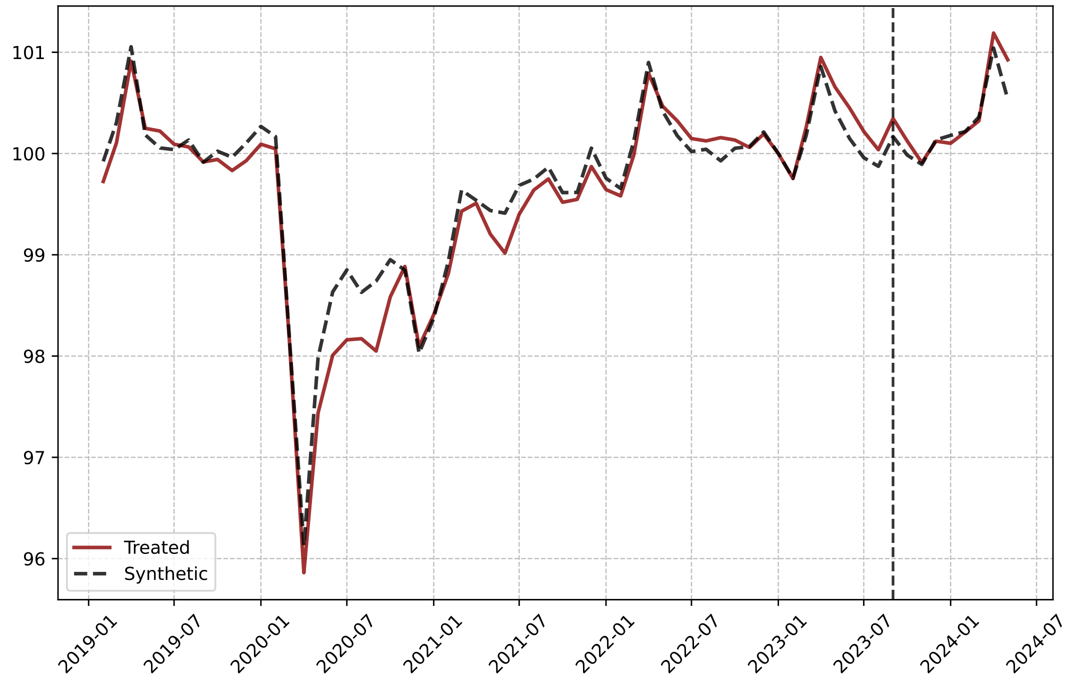
A simple difference-in-differences design using the share of high-liquidity individuals as an exposure measure is not suitable as pre-trends in consumption are not parallel (see Figure D.2a and Figure D.2b). Furthermore, using the increase in term deposits as a measure of treatment, also yields similar pre-trends (see Figure D.2c and Figure D.2d). In particular, counties with higher ex-ante liquidity and increases in term deposits are dominantly located on the country's coast, which are exposed to seasonal variation in tourism. We use seasonally adjusted series, so it is not obvious why these different trends occur. Our analysis of house purchases on individual-level data doesn't suffer from pre-trend violations, given that we can control for county-time FE. To find a more comparable control group, we employ a synthetic control methodology (Abadie, 2021; Abadie et al., 2010).

We classify counties as treated if they are in the upper quartile of the change in the share of term deposits relative to total household deposits between the end of September and the end of December 2023. This threshold captures counties characterized by a relatively pronounced household saving response. Counties in the upper quartile increased share of term deposits by 4.79 p.p. on average, while those in the potential donor pool increased by 2.2 p.p. on average. For each treated county, we construct a synthetic control group of counties. This synthetic counterpart is a weighted combination of counties with bottom-quartile increases in savings, with weights optimized to minimize the average difference in pre-treatment consumption growth between the treated and control counties.

The identification assumption underpinning this approach is that any post-treatment divergence in consumption dynamics between the treated counties and their synthetic analogues can be attributed solely to the differential impact of the deposit rate shock.

The synthetic control estimates are displayed in Figure 13. A key observation is that, after the intervention, consumption in the treated counties remained remarkably aligned with that of their synthetic counterparts. The monthly differences in consumption levels between the two groups were consistently negligible, remaining effectively flat throughout the analysis window. This finding strongly suggests that the significant increase in aggregate household term deposits did not translate into a corresponding reduction in overall household spending. In other words, despite a notable shift in household portfolios towards term deposits, there is no empirical evidence of a broad-based contraction in local consumption.

Figure 13: Synthetic Control for Consumption



Note: This figure shows synthetic-control estimates of county-level consumption. Weights: PG=0.732, BP=0.268. Treated counties are those in the top quartile of the change in the term-deposit share (term deposits over total household deposits) between end-September and end-December 2023 (see Table D.1). Over this window, the term-deposit share rises by 4.79 p.p. in treated counties and by 2.32 p.p. in the synthetic control. The synthetic control is constructed to match the pre-treatment consumption path, following Abadie, 2021; Abadie et al., 2010. Source: Tax authority (VAT data) and Deposit Registry.

We conduct numerous robustness checks. Specifically, in Figure D.3 we re-estimate the model while excluding each control county one at a time, and all unordered pairs ("leave-one-out" and "leave-two-out"), following Abadie et al. (2015), to verify that no single donor (or pair) drives the results. Next, we perform Monte Carlo resampling of the donor counties and re-estimate the model to gauge how the estimated effect varies under alternative donor pools (as in Cattaneo et al., 2021; Chernozhukov et al., 2021). The results, shown in Figure D.4, show that the effect does not differ from our main findings. Our third robustness check, following Cavallo et al. (2013), re-estimates separate synthetic control models for each treated county to verify that results are not driven by pooling the treated group, noting that the synthetic control method is designed for a single treated unit. Therefore, in Figure D.5, we show that pooling the treatment group does not alter the results at the county level. Furthermore, we shift the start of the sample to 2021, confirming that conclusions do not hinge on the chosen pre-treatment period (Figure D.6a). Instead of selecting the top and bottom quartiles of the county-level change in the term-deposit share, we split at the median to enlarge the donor pool (see Figure D.6b). This tests whether results are sensitive to the quartile threshold (as in Abadie, 2021; Ferman et al., 2020). We find no sizable differences compared to our main specification. Next, we run in-space placebo tests following Abadie et al. (2010). We apply the identical synthetic control procedure to each untreated (control) county as if it had been treated, thereby generating a reference distribution of placebo effects against which the true treatment effect can be benchmarked. The estimated effect for the treated counties falls well within this placebo distribution, indicating that it is not distinguishable from what would be obtained by chance (Figure D.7a). In Figure D.7b we show the results of placebo-in-time tests, where false treatment dates are assigned and the absolute effect at the true treatment date is compared to the placebo distribution, as in Abadie et al. (2015), finding no evidence of timing effects. Lastly, in Figure D.8 we present an alternative treatment based on the ex-ante county-level share of high-liquidity households (see Table D.1). The results are nearly identical as expected, given the close association between the increase in the term-deposit share and the prevalence of high-liquidity households across counties.

The fact that we do not identify changes in consumption across counties exhibiting different saving responses does not necessarily show that consumption did not change in the aggregate. The intertemporal substitution effect might be present in the control group, in which the share of term deposits has also increased, albeit by much less. To ascertain the aggregate effects on consumption, we follow the methodology of Coglianese et al. (2025), who, similarly to us, study the aggregate effects of one unexpected monetary policy decision in Sweden.

We implement an event study approach using local projections of the form:

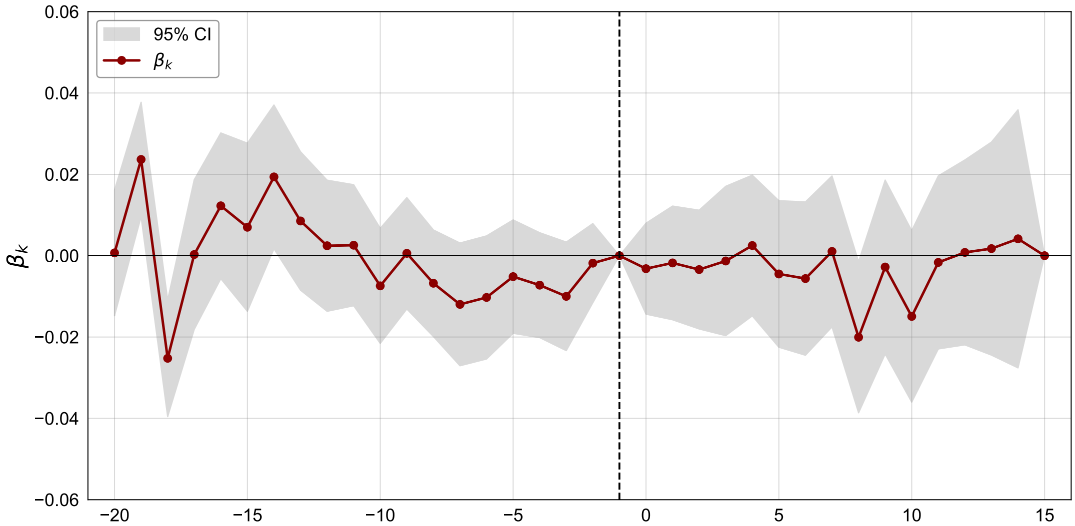
$$\log(retail)_{t+k} - \log(retail)_{t-1} = \alpha + \beta_k \times \mathbf{1}(t = 2023M10) + X'_{t-1}\gamma + \epsilon_{t,k} \qquad (4)$$

where t indexes months and k indexes horizons (in months). $\log(retail)_{t+k} - \log(retail)_{t-1}$ is the cumulative change in log real retail sales over the next k months, $\mathbf{1}(t = 2023M10)$

is an indicator variable for October 2023 (the month following the deposit rate shock), and X_{t-1} is a vector of lagged time-varying controls for macroeconomic variables that may also affect the evolution of consumption. Standard errors are robust (HC1).

The control variables X_{t-1} include lags of inflation (at horizons 1, 13, and 25 months), year-over-year changes in real wages, year-over-year changes in the Economic Sentiment Indicator (ESI), and year-over-year changes in the unemployment rate, each measured at the same lag structure. The ESI is included as a monthly proxy for GDP, which is only available at a quarterly frequency. Given the high correlation between the two series, the ESI provides a reliable higher-frequency measure of aggregate demand conditions and business cycle fluctuations. These controls are intended to capture delayed responses of consumption to broader macroeconomic conditions. By controlling for time-varying business-cycle measures in X_{t-1}, our estimates capture the deviation of aggregate consumption from its counterfactual path under typical economic dynamics. The key identification assumption is that consumption would have followed its usual cyclical pattern in the absence of the deposit rate shock.

Figure 14: Estimated effect on consumption using local projections



Note: The figure plots the estimated β_k coefficients from the local projection $\log(retail)_{t+k} - \log(retail)_{t-1} = \alpha + \beta_k \times \mathbf{1}(t = 2023M10) + X'_{t-1}\gamma + \epsilon_{t,k}$, where t indexes months and k horizons (in months), following the methodology of Coglianese et al. (2025). Real retail trade is seasonally adjusted. The control variables X_{t-1} include lags of inflation, year-over-year changes in real wage and the unemployment rate (at horizons 1, 13, and 25 months). X-axis denotes months before/after the shock. Shaded areas represent 95% confidence intervals based on robust (HC1) standard errors. The estimates show no effect of the deposit rate shock on aggregate consumption. Source: Eurostat.

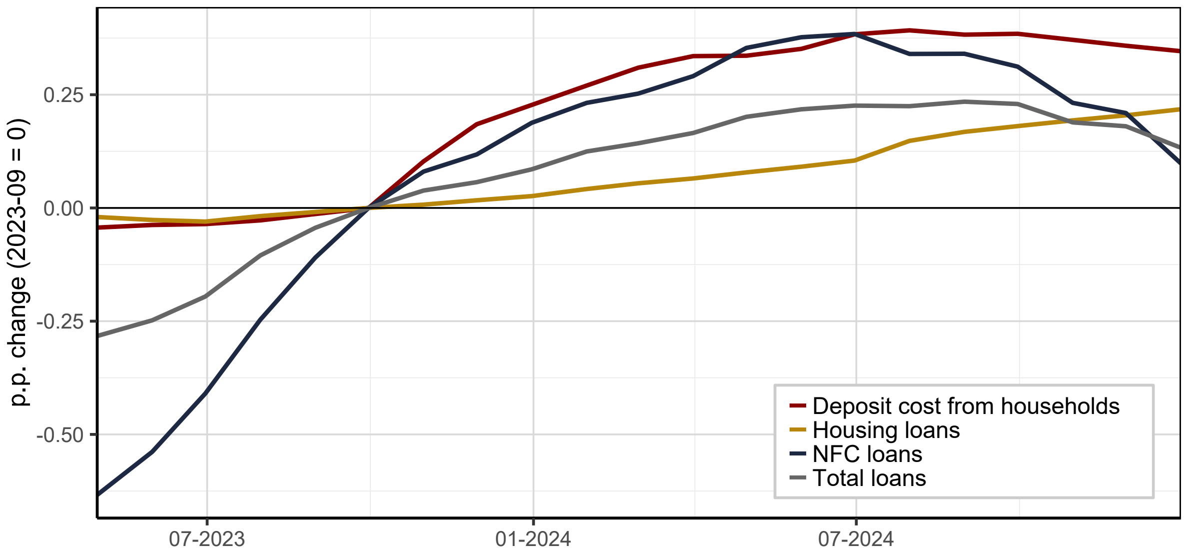
The event study estimates confirm our county-level findings. Figure 14 shows no statistically significant deviation of aggregate retail consumption from its counterfactual path following the October 2023 intervention. The coefficients β_k remain close to zero across all horizons, providing no evidence that the sharp increase in term deposits translated into reduced aggregate spending. An advantage of this approach relative to the county level analysis is that we have a much longer time series starting from 2000, while for county level analysis it start from 2019, which allows us to better capture the time series properties of consumption.

These results are in line with the composition of the saving response detailed in Subsection 5.2. As we documented, over 90% of the reallocation into term deposits was driven by individuals situated in the top three liquidity deciles. The muted response of aggregate consumption, despite this sharp rise in savings, can be rationalized through the lens of household heterogeneity and the distribution of marginal propensities to consume (Kaplan et al., 2018). Individuals driving the deposit flows, identifiable as non-hand-to-mouth possess sufficient liquid buffers to reallocate wealth into term deposits. A substantial increase in interest rates for this group also induces much stronger income effects for high-liquidity individuals, which might completely offset the substitution effect. Hand-to-mouth households, who exhibit a high MPC and would theoretically be most sensitive to cash-flow shocks, lack the liquidity to participate in this savings reallocation and are not directly affected by the deposit rate shock.

5.5 Effect on Loan Supply

Following the deposit rate increase, there was a substantial increase in the aggregate deposit rate and an increase in the cost of funding for banks (Figure 15). It is difficult to ascertain the effects of these changes on aggregate loan rates, as other factors occurring at the same time also affected loan demand and supply. In particular, the policy initiative occurred at the peak of the ECB tightening cycle, with a part of the transmission still in the pipeline across the EA. A suggestive fact is that the increase in deposit rates is much larger than the increase in lending rates. Notably, interest rates on housing loans have adjusted the least, as these are long-term and issued exclusively at fixed rates in the period after the policy shock. On the other hand, interest rates for firms are more short-term and more often linked to Euribor, which was under the influence of monetary policy.

Figure 15: Difference in Interest rates (Outstanding) for key sectors and financial products.



Note: This figure displays monthly changes in interest rates on outstanding amounts (in percentage points), indexed to September 2023. "Deposit cost from households" is the weighted-average rate paid on household deposits. "Total loans" is the weighted-average rate on outstanding loans to households and non-financial corporations (NFCs). "NFC loans" is the outstanding interest rate on loans to non-financial corporations, while "Housing loans" is the outstanding interest rate charged on loans for house purchase to households. Source: CNB.

To estimate the causal effect of the deposit rate shock on credit supply to firms and individuals, we adopt a standard identification strategy that controls for demand and supply-side confounders (Degryse et al., 2019; Khwaja & Mian, 2008). For household credit, we estimate the following difference-in-differences specification:

$$y_{h,b,t} = \alpha + \beta \, \text{Treatment}_b \times \text{Post}_t + \gamma X_{b,t-1} + \delta_{c,q,t} + \mu_{b,c} + \epsilon_{h,b,t}, \tag{5}$$

where h indexes household borrowers, b indexes banks and t indexes months. The county and income quartile of borrower h are denoted by c and q, respectively. $y_{h,b,t} \in \{\ln(\text{Loan}), \text{Interest Rate}\}$ denotes either the logarithm of the new loan amount or the interest rate charged on housing loan contracts originated by bank b for borrower h, at time t. The key explanatory variable, $\text{Treatment}_b \times \text{Post}_t$, captures the differential impact of the policy on banks with greater exposure to the deposit rate shock. Specifically, we operationalize Treatment_b using two alternative measures: (i) a binary indicator for banks with an above-median *ex ante* deposit beta, constructed analogously to Subsection 5.1, and (ii) a continuous *ex post* measure capturing the change in household deposit funding costs between September and December 2023.

We control for time-varying bank-level characteristics through $X_{b,t-1}$, which includes deposits to total assets, non-performing loan ratio, return on assets, ratio of excess liquidity to total assets [6], core capital to risk-weighted assets (CET1), and the ratio of total loans to total assets. County-by-income-quartile-by-time fixed effects $\delta_{c,q,t}$ control for regional variation in loan demand by income group, and bank-by-county fixed effects $\mu_{b,c}$ account for stable local bank-market relationships and absorb persistent bank-specific factors.

For firm credit, we estimate an analogous specification:

$$y_{f,b,t} = \alpha + \beta \, \text{Treatment}_b \times \text{Post}_t + \gamma X_{b,t-1} + \delta_{I,c,S,t} + \mu_{b,f} + \epsilon_{f,b,t}, \tag{6}$$

where f indexes firms, b indexes banks and t indexes months. The industry, location and size class of firm f are denoted by I, c and S, respectively. $y_{f,b,t} \in \{\ln(\text{Loan}), \text{Interest Rate}\}$ refers to the natural logarithm of the outstanding loan amount or the nominal interest rate charged to firm f by bank b at time t. The specification includes industry-by-location-by-size-by-time fixed effects $\delta_{I,c,S,t}$, which not only control for unobserved firm-specific credit demand shocks but also allow for the inclusion of single-bank firms in the model, and bank-by-firm fixed effects $\mu_{b,f}$, which absorb time-invariant heterogeneity in bilateral bank-firm relationships and persistent bank-specific factors (Degryse et al., 2019; Khwaja & Mian, 2008). Similarly to Bonfim et al. (2025), we cluster standard errors at the bank level in both regressions. Since we have a small number of clusters, we implement the "LZ2" correction to our standard errors, and we use a t-distribution with the cluster degrees of freedom to compute confidence intervals (Bell & McCaffrey, 2002; Imbens & Kolesár, 2016).

The main treatment variable we consider is changes in the household deposit cost of bank funding. As shown before, there is a clear relationship between increases in interest rates and inflow of term deposits across banks (Figure 8 Panel A). Hence, banks that raised interest rates also experienced higher funding costs. Also, these banks experienced an inflow of new deposits, which corresponds to inflows of reserves (Figure 8 Panel B). We cannot directly observe which banks experienced reserve outflows around the event, but term deposits associated with bank switchers amount to 0.7% of total banking-system assets. This suggests that the reallocation of excess liquidity was relatively low compared to the aggregate level of excess liquidity, which was 17% of total assets.

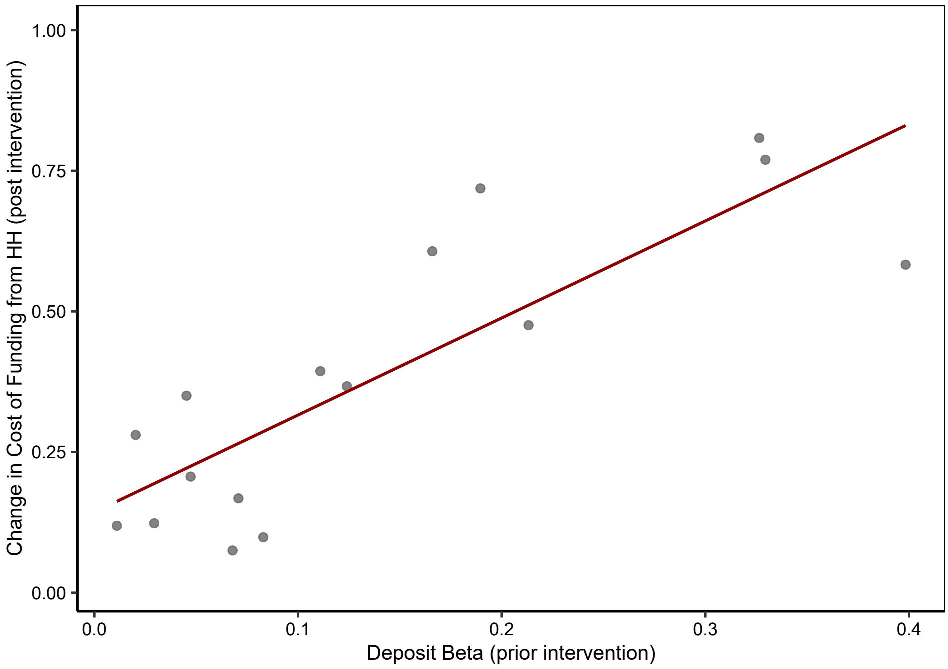
The identification assumption is that after controlling for loan demand and time-invariant bank heterogeneity, increased deposit competition is the only bank-level shock affecting loan supply in the analyzed period. The fact that we analyze a roughly one-year period and that there were no other major changes in the Croatian banking system at the

[6] Excess liquidity is defined as the sum of current-account balances and deposit-facility holdings, net of reserve requirements and marginal lending facility.

time strengthens our identification. Event study estimates show that treated and control banks had similar trends prior to the policy intervention (Figure E.1).

Given that our treatment is contemporaneous with the outcomes we observe, as an additional exercise, we use a second treatment: an ex-ante measure of banks' responsiveness to interest rate shocks. Many factors affect banks' responsiveness to interest rate shocks (Section 3), so we use the deposit beta as a summary measure, as proposed by Drechsler et al. (2017) and recently used in the context of the euro area by Cappelletti et al. (2024). Figure 16 shows that there is a very strong relationship between changes in the cost of funding from households after the policy intervention and deposit beta prior to the policy intervention. The trend line excludes the state-owned bank, which increased deposit rates much more than predicted by its deposit beta. Unfortunately, we cannot plot it due to confidentiality issues. However, Figure 6 clearly shows that the state-owned bank moved from the lower end of the deposit rate range to the top.

Figure 16: Relationship between ex-ante deposit beta and ex-post cost of funding



Note: This figure shows the relationship between banks' ex-ante deposit beta and the change in their cost of household deposit funding following the policy intervention. .Deposit beta is defined as the ratio of the change in the marginal cost of household funding to the change in the deposit facility rate over the tightening period (Jun-2022–Sep-2023), measured *prior* to state-owned bank intervention: $\beta^{\text{dep}} = \Delta \text{MC}^{HH} / \Delta \text{DFR}$. Source: HNB, ECB and authors' calculations.

The results for loan supply to firms and households, reported in Table 2, indicate no significant impact on either loan volumes or interest rates. Banks that experienced larger deposit inflows and rising funding costs continued lending to businesses and households at similar terms. The effects are also economically small. For example, above-median deposit beta banks increased mortgage loan supply by 0.3% and reduced loan supply to firms by 3%, but these rather small effects are not statistically significant. Additionally, for the firm-level dataset, we control for loan demand conditions at the firm-level using firm-time FE. We find that the impact on loan supply to firms is indistinguishable from zero even under this more stringent FE constellation (Table E.1).

The effects on loan supply are consistent with large ex-ante excess liquidity, averaging around 17% of total assets, and strong capital buffers in the banking system with 8% of capital being above the regulatory requirement (Hrvatska narodna banka, 2025). In such a context, moderate deposit flows and changes in excess liquidity did not constrain banks' ability or willingness to lend. We also test these hypotheses in the cross-section of banks. We interact the deposit-rate shock with banks' ex-ante excess liquidity and with their reliance on household-deposit funding. Banks with large ex-ante liquidity might be less affected by deposit-funding shocks and associated deposit flows. We find that high-excess liquidity insulates banks from transmitting the shock to loan supply and lending rates, but the effects for the reliance on deposits are statistically insignificant (Table E.2). Our results suggest that sufficiently ample liquidity in the banking system changes weakens the deposit channel of monetary policy.

We find that banks with larger increases in the cost of funds did not raise loan interest rates following those increases. Similarly to us, Cappelletti et al. (2024) and Coulier et al. (2024) find no effects of deposit outflows on loan interest rates in the 2022-2023 EA tightening episode, but find that banks adjust loan supply. Another factor dampening interest rate adjustment might be that the shock was financially small relative to the cyclically large profits of banks at the time. Interest rate expenses for the household sector increased by 0.8% of banks' equity and 0.1% of assets at the end of 2023, while bank profits were very large, 15.5% of equity and 2% of assets (see Figure E.2). We explore these ideas in the cross-section of banks by scaling increases in banks' costs from household financing with bank equity and profits. We find no statistically significant effects of increases in interest rate costs relative to equity and profits, consistent with the overall large capital buffers and profitability in the Croatian bank system (Table E.2).

Table 2: Effect of Deposit Competition on Lending

	Firms				Households			
Treatments:	Deposit beta		Δ Cost of funding		Deposit beta		Δ Cost of funding	
Dep. var.:	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate
POST × Treatment	-0.032	0.115	-0.037	0.137	0.002	0.067	0.096	0.075
	(0.028)	(0.108)	(0.039)	(0.108)	(0.039)	(0.082)	(0.111)	(0.090)
Bank controls	YES	YES	YES	YES	YES	YES	YES	YES
IcSt / cIt	YES	YES	YES	YES	YES	YES	YES	YES
Bank × Firm|Loc.	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R^2	0.936	0.912	0.936	0.913	0.236	0.489	0.237	0.491
Obs.	373,770	379,192	373,770	379,192	35,853	35,853	35,923	35,923

Note: For firms, columns (1)–(4) estimate $y_{f,b,t} = \alpha + \beta(\text{Post}_t \times \text{Treatment}_b) + \gamma X_{b,t-1} + \delta_{I,c,S,t} + \mu_{b,f} + \varepsilon_{f,b,t}$, where $y_{f,b,t}$ is either ln(Loan Amount) or the interest rate on firm outstanding loans. For households, columns (5)–(8) estimate $y_{h,b,t} = \alpha + \beta(\text{Post}_t \times \text{Treatment}_b) + \gamma X_{b,t-1} + \delta_{c,q,t} + \mu_{b,c} + \varepsilon_{h,b,t}$, where $y_{h,b,t}$ is either ln(Loan Amount) or the interest rate on newly originated housing loans. Treatment$_b$ is defined in two ways: Deposit beta is an indicator equal to 1 if bank b's ex-ante deposit beta, measured from June 2022 to September 2023, is above the sample median, and 0 otherwise; Δ Cost of funding is the change in bank b's household deposit funding cost between September and December 2023. $X_{b,t-1}$ denotes one-month-lagged bank controls: deposits-to-assets, non-performing-loan ratio, return on assets, excess-liquidity-to-assets, CET1 ratio, and loans-to-assets. $\delta_{I,c,S,t}$ denotes industry-by-location-by-size-by-time fixed effects for firms, $\delta_{c,q,t}$ denotes location-by-income-quartile-by-time fixed effects for households, $\mu_{b,f}$ denotes bank-by-firm fixed effects, and $\mu_{b,c}$ denotes bank-by-location fixed effects. Standard errors in parentheses are clustered at the bank level. Given the small number of clusters, we apply the LZ2 correction and compute confidence intervals using a t-distribution with cluster degrees of freedom. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Credit Registries for firms and households and bank financials.

6 Conclusion

This paper evaluates the effects of a government initiative that increased competition for deposits and thereby strengthened the pass-through of monetary policy to deposit rates. The initiative created a clear deposit-rate shock. We show that the main drivers of deposit flows are high-liquidity individuals, who responded strongly to higher deposit rates. We find that the key adjustment to a deposit rate shock is portfolio rebalancing. Households shift resources away from housing investment toward term deposits, with substantial declines in real estate purchases. Increased saving does not reduce aggregate consumption visibly, consistent with the lower marginal propensity to consume of high-liquidity individuals, low intertemporal elasticity of substitution and offsetting income effects. We also study the effects on the bank loan supply and find that the moderate deposit flows across banks do not affect loan supply in a banking system with ample reserves. More broadly, our findings show how monetary policy affects economic outcomes through the deposit rate, leaving the loan rate constant.

References

Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, *59*(2), 391–425.

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. *Journal of the American Statistical Association*, *105*(490), 493–505.

Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative politics and the synthetic control method. *American Journal of Political Science*, *59*(2), 495–510. https://doi.org/10.1111/ajps.12116

Agarwal, S., Chomsisengphet, S., Yildirim, Y., & Zhang, J. (2021). Interest rate pass-through and consumption response: The deposit channel. *The Review of Economics and Statistics*, *103*(5), 922–938.

Altavilla, C., Boucinha, M., Burlon, L., Giannetti, M., & Schumacher, J. (2025). Central bank liquidity reallocation and bank lending: Evidence from the tiering system. *Journal of Financial Economics*, *168*, 104058.

Altavilla, C., Rostagno, M., & Schumacher, J. (2023). *Anchoring QT: Liquidity, credit and monetary policy implementation* (CEPR Discussion Paper No. 18581). CEPR. Paris & London. https://cepr.org/publications/dp18581

Altonji, J. G., Elder, T. E., & Taber, C. R. (2008). Using selection on observed variables to assess bias from unobservables when evaluating swan-ganz catheterization. *American Economic Review*, *98*(2), 345–50.

Auclert, A., Rognlie, M., & Straub, L. (2025). Fiscal and monetary policy with heterogeneous agents. *Annual Review of Economics*, *17*.

Basten, C., & Juelsrud, R. (2023). Cross-selling in bank-household relationships: Mechanisms and implications for pricing. *The Review of Financial Studies*, hhad062.

Begenau, J., & Stafford, E. (2022). Unstable inference from banks' stable net interest margins. *Available at SSRN 4136866*.

Bell, R., & McCaffrey, D. (2002). Bias reduction in standard errors for linear regression with multi-stage samples. *Survey Methodology*, *28*(2), 169–181.

Beyer, R. C. M., Chen, R., Misch, F., Li, C., Ozturk, E. O., & Ratnovski, L. (2024). Monetary policy pass-through to interest rates: Stylized facts from 30 european countries. *IMF Working Paper No. 2024/009*.

Boddin, D., te Kaat, D. M., Ma, C., & Rebucci, A. (2024). *A housing portfolio channel of qe transmission* (NBER Working Paper No. 32211). National Bureau of Economic Research. http://www.nber.org/papers/w32211

Bonfim, D., Ferreira, M. A., Queiró, F., & Zhao, S. (2025). Fiscal policy and credit supply in a crisis. *American Economic Review*, *115*(6), 1896–1935.

Calvet, L. E., Campbell, J. Y., & Sodini, P. (2007). Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy*, *115*(5), 707–747. https://doi.org/10.1086/524204

Campbell, J. Y., & Mankiw, N. G. (1989). Consumption, income, and interest rates: Reinterpreting the time series evidence. *NBER Macroeconomics Annual 1989, 4*, 185–246.

Cappelletti, G., Marques-Ibanez, D., Reghezza, A., & Salleo, C. (2024). As interest rates surge: Flighty deposits and lending. *ECB Working Paper Series*, (2923).

Carvalho, D. (2014). The real effects of government-owned banks: Evidence from an emerging market. *The Journal of Finance*, *69*(2), 577–609.

Cattaneo, M. D., Feng, Y., & Titiunik, R. (2021). Prediction intervals for synthetic control methods. *Journal of the American Statistical Association*, *116*(536), 1865–1880. https://doi.org/10.1080/01621459.2021.1979561

Cavallo, E., Galiani, S., Noy, I., & Pantano, J. (2013). Catastrophic natural disasters and economic growth. *The Review of Economics and Statistics*, *95*(5), 1549–1561. https://doi.org/10.1162/REST_a_00413

Chernozhukov, V., Wüthrich, K., & Zhu, Y. (2021). An exact and robust conformal inference method for counterfactual and synthetic controls. *Journal of the American Statistical Association*, *116*(536), 1849–1864. https://doi.org/10.1080/01621459.2021.1920957

Cirelli, F., & Olafsson, A. (2025). What makes depositors tick?: Bank data insights into households' liquid asset allocation. *The 52nd European Finance Association Annual Meeting. EFA 2025.*

Coglianese, J., Olsson, M., & Patterson, C. (2025). Monetary policy and the labor market: A quasi-experiment in sweden. *American Economic Review*, *115*(10), 3451–3486.

Coulier, L., Pancaro, C., & Reghezza, A. (2024). Are low interest rates firing back? interest rate risk in the banking book and bank lending in a rising interest rate environment. *ECB Working Paper Series - 2950.*

d'Avernas, A., Eisfeldt, A. L., Huang, C., Stanton, R., & Wallace, N. (2023). The deposit business at large vs. small banks. *National Bureau of Economic Research Working Paper*, (31865).

Degryse, H., Jonghe, O. D., Jakovljević, S., Mulier, K., & Schepens, G. (2019). Identifying credit supply shocks with bank-firm data: Methods and applications. *Journal of Financial Intermediation*, *40*, 100813. https://doi.org/10.1016/j.jfi.2019.01.004

Deng, Y., Morck, R., Wu, J., & Yeung, B. (2015). China's pseudo-monetary policy. *Review of Finance*, *19*(1), 55–93.

Deskar-Škrbić, M., Jukić, S., Lesničar, K., & Zrnc, J. (2023). How strong is the pass-through of ecb policy rates to bank interest rates in croatia? *HNBlog*. https://

www.hnb.hr/en/-/how-strong-is-a-pass-through-of-ecb-policy-rates-to-bank-interest-rates-in-croatia-

Drechsler, I., Savov, A., & Schnabl, P. (2017). The deposits channel of monetary policy. *The Quarterly Journal of Economics*, *132*(4), 1819–1876. https://doi.org/10.1093/qje/qjx019

Drechsler, I., Savov, A., & Schnabl, P. (2021). Banking on deposits: Maturity transformation without interest rate risk. *The Journal of Finance*, *76*(3), 1091–1143.

Egan, M. L., Hortaçsu, A., Kaplan, N. A., Sunderam, A., & Yao, V. (2025). *Dynamic competition for sleepy deposits* (tech. rep.). National Bureau of Economic Research.

Ferman, B., & Pinto, C. (2021). Synthetic controls with imperfect pre-treatment fit. *Quantitative Economics*, *12*(4), 1197–1221. https://doi.org/10.3982/QE1596

Ferman, B., Pinto, C., & Possebom, V. (2020). Cherry picking with synthetic controls. *Journal of Policy Analysis and Management*, *39*(2), 510–532. https://doi.org/10.1002/pam.22206

Gomez, M., Landier, A., Sraer, D., & Thesmar, D. (2020). Banks' exposure to interest rate risk and the transmission of monetary policy. *Journal of Monetary Economics*, *117*, 543–570. https://doi.org/10.1016/j.jmoneco.2020.03.011

Hanson, S. G., Shleifer, A., Stein, J. C., & Vishny, R. W. (2015). Banks as patient fixed-income investors. *Journal of Financial Economics*, *117*(3), 449–469.

Havranek, T., & Sokolova, A. (2020). Do consumers really follow a rule of thumb? three thousand estimates from 144 studies say "probably not". *Review of Economic Dynamics*, *35*, 97–122.

Hrvatska narodna banka. (2025). *Financijska stabilnost 26*. Hrvatska narodna banka. Zagreb.

Illes, A., Lombardi, M. J., & Mizen, P. (2019). The divergence of bank lending rates from policy rates after the financial crisis: The role of bank funding costs. *Journal of International Money and Finance*, *93*, 117–141.

Imbens, G., & Kolesár, M. (2016). Robust standard errors in small samples: Some practical advice. *Review of Economics and Statistics*, *98*(4), 701–712.

Jarociński, M., & Karadi, P. (2020). Deconstructing monetary policy surprises—the role of information shocks. *American Economic Journal: Macroeconomics*, *12*(2), 1–43.

Jiménez, G., Ongena, S., Peydró, J.-L., & Saurina, J. (2012). Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications. *American Economic Review*, *102*(5), 2301–2326.

Kaplan, G., Moll, B., & Violante, G. L. (2018). Monetary policy according to hank. *American Economic Review*, *108*(3), 697–743.

Kaplan, G., & Violante, G. L. (2022). The marginal propensity to consume in heterogeneous agent models. *Annual Review of Economics*, *14*(1), 747–775.

Kaplan, G., Violante, G. L., & Weidner, J. (2014). The wealthy hand-to-mouth. *Brookings Papers on Economic Activity*, *2014*(1), 77–153.

Kashyap, A. K., Stein, J. C., & Wilcox, D. W. (1993). Monetary policy and credit conditions: Evidence from the composition of external finance. *American Economic Review*, *83*(1), 78–98.

Kerola, E., Laine, O.-M., & Paavola, A. (2024). Impact of ecb's policy rate changes on corporate loan rates varies strongly across countries. *Bank of Finland Bulletin*.

Kho, S. (2025). Deposit market concentration and monetary transmission: Evidence from the euro area. *European Economic Review*, *173*, 104933.

Khwaja, A. I., & Mian, A. (2008). Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *The American Economic Review*, *98*(4), 1413–1442. https://www.jstor.org/stable/29730128

Kunovac, M. (2020). *Distribucija imovine kućanstava u hrvatskoj* (Istraživanja No. I-57). Hrvatska narodna banka. Zagreb. Retrieved August 25, 2025, from https://www.hnb.hr/documents/20182/3063386/i-057.pdf/e310a99b-3db5-ab2a-4952-50c8d28b6217

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, *52*(1), 5–44. https://doi.org/10.1257/jel.52.1.5

Maneely, M., & Ratnovski, M. L. (2024). *Bank profits and bank taxes in the eu*. International Monetary Fund.

McKay, A. (2013). Search for financial returns and social security privatization. *Review of Economic Dynamics*, *16*(2), 253–270.

Mundell, R. A. (1961). A theory of optimum currency areas. *The American Economic Review*, *51*(4), 657–665.

Pekanov, A., & Schratzenstaller, M. (2025). *The taxation of the EU's financial sector: Options and experiences* (PE 772.638). European Parliament. Policy Department for Economy & Growth.

Polo, A. (2021). Imperfect pass-through to deposit rates and monetary policy transmission. *Bank of England Staff Working Paper*, (933).

Poterba, J. M., Venti, S. F., & Wise, D. A. (2011). *The drawdown of personal retirement assets* (tech. rep.). National Bureau of Economic Research.

Slacalek, J., Tristani, O., & Violante, G. L. (2020). Household balance sheet channels of monetary policy: A back of the envelope calculation for the euro area. *Journal of Economic Dynamics and Control*, *115*, 103879.

Stein, J. C. (1998). An adverse-selection model of bank asset and liability management with implications for the transmission of monetary policy. *The Rand Journal of Economics*, *29*(3), 466.

Wang, Y., Whited, T. M., Wu, Y., & Xiao, K. (2022). Bank market power and monetary policy transmission: Evidence from a structural estimation. *The Journal of Finance*, *77*(4), 2093–2141.

Yankov, V. (2024). In search of a risk-free asset: Search costs and sticky deposit rates. *Journal of Money, Credit and Banking*, *56*(5), 1053–1098.

A Appendix - Data

Table A.1: Summary Statistics of Dataset

	post = 0				post = 1			
Variable	N	Mean	Median	p99	N	Mean	Median	p99
Curr. Deposit	3,183,781	8,343.96	701.27	110,623.01	3,183,781	8,215.52	758.82	107,151.52
Term. Deposit	3,183,781	483.61	0.000	10,039.21	3,183,781	1,460.90	0.000	39,000.00
IR Curr.	3,183,781	0.0349	0.0100	0.2000	3,183,781	0.0330	0.0100	0.1200
IR Term	3,183,781	0.0153	0.0000	0.8000	3,183,781	0.0646	0.0000	2.5000
Liquidity decile	3,182,093	5.5128	6.0000	10.0000	3,182,093	5.5128	6.0000	10.0000
House purchase	3,183,781	0.0028	0.0000	0.0000	3,183,781	0.0027	0.0000	0.0000
High-liquidity dummy	3,183,781	0.5011	1.0000	1.0000	3,183,781	0.5011	1.0000	1.0000

Note: This table reports summary statistics from the depositor registry and the real estate transaction dataset. Post is a dummy variable equal to 1 after 2023-09-30 and 0 otherwise. Curr. Deposit is an individual's total transaction deposit balance across all banks. Term. Deposit is an individual's total term deposit balance across all banks. IR Curr. is the individual's deposit-balance-weighted interest rate on transaction deposits across all banks. IR Term is the individual's deposit-balance-weighted average interest rate on term deposits across all banks. Liquidity decile indicates the decile of an individual's liquid wealth based on total deposit holdings as of 2023-06-30. House purchase is a dummy equal to 1 if an individual purchased real estate. High-liquidity dummy equals 1 if the liquidity decile of an individual is greater than 5 (0 otherwise). Source: Tax Authority and Deposit Registry.

Table A.2: Summary Statistics by Wealth Status (High-liquidity Dummy)

	post = 0				post = 1			
	High-liquidity dummy = 0		High-liquidity dummy = 1		High-liquidity dummy = 0		High-liquidity dummy = 1	
Variable	N	Mean	N	Mean	N	Mean	N	Mean
Curr. Deposits	1,588,543	168.18	1,595,238	16,485.43	1,588,543	664.80	1,595,238	15,734.55
Term Deposits	1,588,543	12.36	1,595,238	952.89	1,588,543	45.44	1,595,238	2,870.41
IR Curr.	1,588,543	0.0329	1,595,238	0.0368	1,588,543	0.0308	1,595,238	0.0351
IR Term	1,588,543	0.0051	1,595,238	0.0254	1,588,543	0.0096	1,595,238	0.1193
House purchase	1,588,543	0.0015	1,595,238	0.0041	1,588,543	0.0015	1,595,238	0.0039
Debt	228,497	29,794.65	196,723	49,342.58	228,497	29,794.65	196,723	49,342.58
Income	226,307	11,821.84	192,664	18,011.36	226,307	11,821.84	192,664	18,011.36
DSTI (%)	214,034	32.70	183,409	32.08	214,034	32.70	183,409	32.08
Ever mortgage	228,812	0.0941	197,015	0.2214	228,812	0.0941	197,015	0.2214
First-time buyer	228,812	0.0583	197,015	0.1267	228,812	0.0583	197,015	0.1267
Subsidy recipient	228,812	0.0140	197,015	0.0321	228,812	0.0140	197,015	0.0321

Note: This table reports summary statistics split by the High-liquidity dummy. Post is a dummy variable equal to 1 after 2023-09-30 and 0 otherwise. The High-liquidity dummy equals 1 if an individual's liquidity decile, based on total deposit holdings as of 2023-06-30, is greater than 5, and 0 otherwise. The first group of variables is drawn from the Deposit Registry and is reported for the full population of depositors. Curr. Deposits is an individual's total transaction deposit balance across all banks. Term Deposits is an individual's total term deposit balance across all banks. IR Curr. is the individual's deposit-balance-weighted average interest rate on transaction deposits across all banks. IR Term is the individual's deposit-balance-weighted average interest rate on term deposits across all banks. House purchase is a dummy equal to 1 if an individual purchased real estate. The second group of variables, from Debt onward, is drawn from the Household Credit Registry and describes the characteristics of individuals that obtained a loan. These variables are reported only for individuals holding a credit in the sample, and all reported means are therefore computed over this subsample rather than over the full population of depositors. Debt is the individual's total outstanding debt balance, Income is the individual's income in EUR, and DSTI is the debt-service-to-income ratio expressed as a percentage. The remaining variables are dummies equal to 1 if the individual has the relevant characteristic and 0 otherwise. Ever mortgage is a dummy equal to 1 if the individual ever held a mortgage. First-time buyer is a dummy equal to 1 if the individual that obtained a loan was a first-time homebuyer. Subsidy recipient is a dummy equal to 1 if the individual ever received a housing purchase loan subsidy. Sources: Deposit Registry, Tax authotizy and Household Credit Registry.

Table A.3: Descriptive Statistics of the Credit Registry Dataset for firms

	post = 0					post = 1				
Variable	N	p10	Mean	Median	p90	N	p10	Mean	Median	p90
Interest rate	307,018	1.36	5.41	5.12	10.50	311,880	1.71	5.87	5.71	10.89
ln(Loan)	307,018	6.89	10.08	10.26	13.12	311,880	7.01	10.15	10.31	13.11
Δ Cost of HH Deposits	279,012	0.08	0.18	0.17	0.21	286,726	0.08	0.18	0.17	0.21
Deposit beta	279,012	0.03	0.07	0.07	0.08	286,726	0.03	0.07	0.07	0.08
CET1 Ratio	304,663	16.30	22.81	22.76	28.02	310,036	16.39	22.25	22.51	28.24
NPLR	304,663	2.45	4.30	3.26	8.53	310,036	1.78	3.72	2.85	8.33
RoA	304,663	1.17	2.86	2.84	4.88	310,036	1.59	3.89	2.81	8.00
Deposits to asset	304,663	74.92	79.08	79.45	82.19	310,036	73.94	78.59	78.52	82.55
Liquidity	304,663	13.07	25.98	28.23	34.82	310,036	14.49	23.18	23.24	30.36
Loans to asset	304,663	49.06	54.94	52.26	61.11	310,036	50.19	57.50	56.80	65.22

Note: This table reports summary statistics for the firm credit registry dataset. Post is a dummy variable equal to 1 after 2023-09-30 and 0 otherwise. Interest rate is the interest rate on the firm's outstanding loan with a given bank. ln(Loan) is the natural logarithm of the firm's outstanding loan balance with a given bank. Δ cost of HH deposits is the change in the household deposit weighted average interest rate between 2023-12 and 2023-09. The deposit beta is the ratio of the change in the marginal cost of household funding for banks to the change in the deposit facility rate during the tightening period, prior to any intervention by the state-owned bank. CET1 ratio is bank's Common Equity Tier 1 capital divided by risk-weighted assets (RWA). NPLR is bank's non-performing loan ratio. RoA is bank's return on assets. Deposits-to-assets is bank's total deposits divided by total assets. Liquidity is bank's excess liquidity divided by total assets. Loans to assets is bank's total loans divided by total assets. Source: Corporate Credit Registry and Bank's Balance Sheet Statistics.

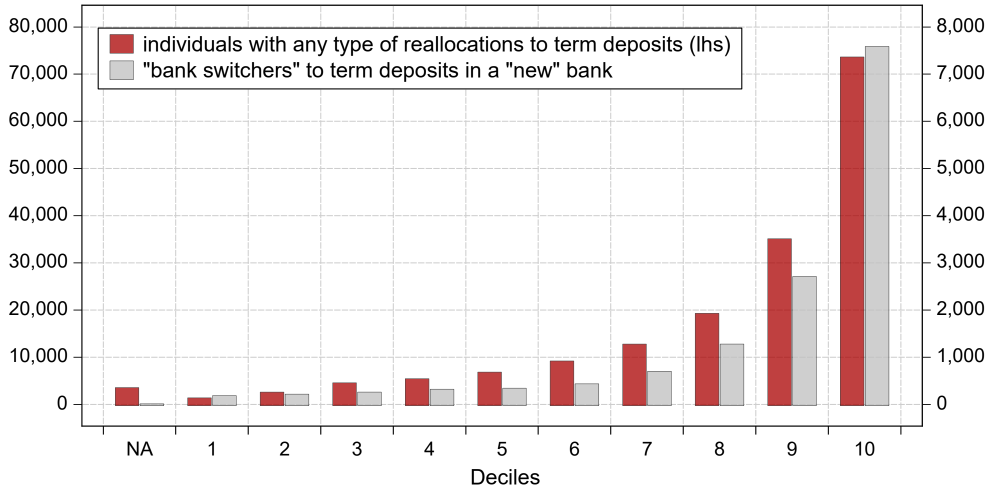
Table A.4: Descriptive Statistics of the Credit Registry Dataset for Households

	post = 0					post = 1				
Variable	N	p10	Mean	Median	p90	N	p10	Mean	Median	p90
Interest rate	18,766	2.400	3.010	2.990	3.680	18,310	3.000	3.691	3.750	4.300
ln(Loan)	18,766	10.203	11.182	11.314	12.078	18,310	10.309	11.276	11.419	12.190
Δ Cost of HH Deposits	17,531	0.075	0.137	0.120	0.209	17,128	0.075	0.136	0.120	0.170
Deposit beta	17,531	0.011	0.062	0.068	0.083	17,128	0.011	0.061	0.071	0.083
CET1 Ratio	18,743	18.038	22.920	23.568	27.372	18,297	18.349	23.015	24.026	27.313
NPLR	18,406	2.451	3.609	2.984	4.696	17,952	1.801	3.181	2.559	4.637
RoA	18,743	1.533	3.250	3.398	4.882	18,297	1.874	4.425	4.265	8.015
Deposits to asset	18,766	76.936	79.682	79.879	82.190	18,310	74.569	79.484	79.832	82.545
Liquidity	18,766	5.736	25.589	31.179	35.594	18,310	5.955	22.226	23.611	31.023
Loans to asset	18,766	50.991	58.053	53.173	79.361	18,310	53.651	61.634	59.187	83.714

Note: This table reports summary statistics for the households credit registry dataset. Post is a dummy variable equal to 1 after 2023-09-30 and 0 otherwise. Interest rate is the interest rate on the household's new loan with a given bank. ln(Loan) is the natural logarithm of the household's new loan amount with a given bank. Δ cost of HH deposits is the change in the household deposit weighted average interest rate between 2023-12 and 2023-09. The deposit beta is the ratio of the change in the marginal cost of household funding for banks to the change in the deposit facility rate during the tightening period, prior to any intervention by the state-owned bank. CET1 ratio is bank's Common Equity Tier 1 capital divided by risk-weighted assets (RWA). NPLR is bank's non-performing loan ratio. RoA is bank's return on assets. Deposits-to-assets is bank's total deposits divided by total assets. Liquidity is bank's excess liquidity divided by total assets. Loans to assets is bank's total loans divided by total assets. Source: Household Credit Registry and Bank's Balance Sheet Statistics.

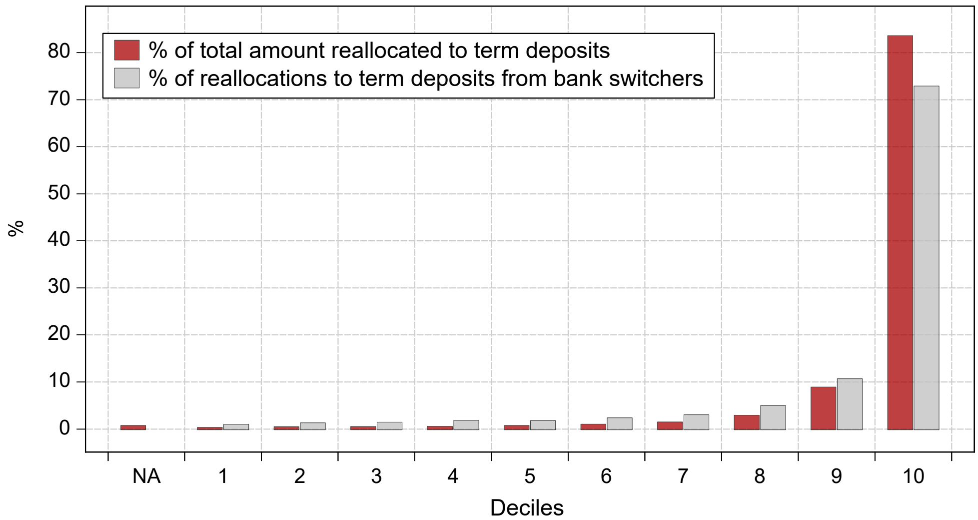
B Appendix - Effect on deposit flows

Figure B.1: Reallocation to term deposits across liquidity deciles (number of individuals)



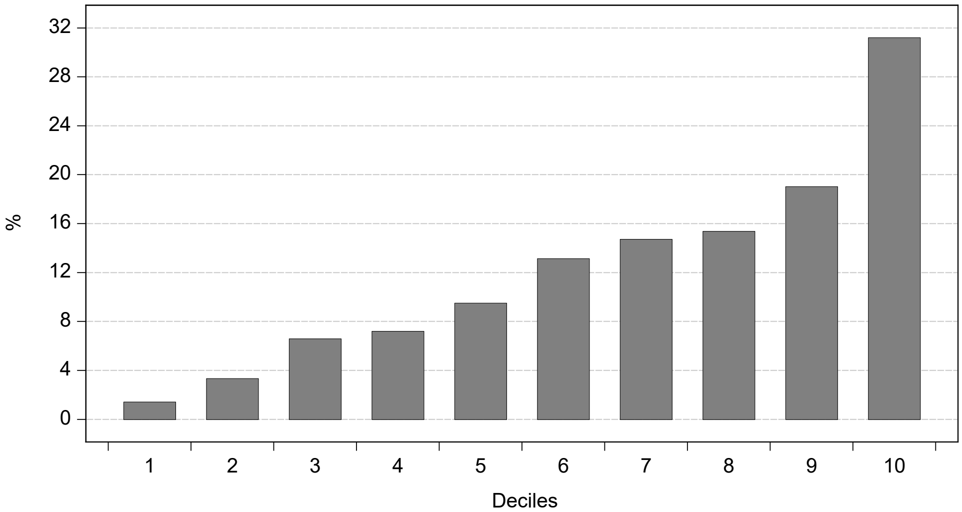
Note: Red bars show the number of individuals (in specific decile) who record *any* inflow into term deposits after the treatment, regardless of the source. This includes (i) internal reallocation from overnight to term deposits within the same bank, (ii) transfers of deposits from other banks, and/or (iii) inflows from outside the banking system. Grey bars show the number of individuals *new clients* or *bank switchers* (in specific decile): individuals who had no deposits of any type in bank X before the treatment, but opened a term deposit in bank X after the treatment, consistent with switching driven by higher offered term rates. Individuals are allocated into deciles based on their total liquidity (sum of overnight and term deposits across all banks) as of June 30, 2023. The first decile includes the least liquid individuals, while the tenth decile captures the most liquid. Source: Deposit Registry.

Figure B.2: Reallocation to term deposits across liquidity deciles (nominal amounts)



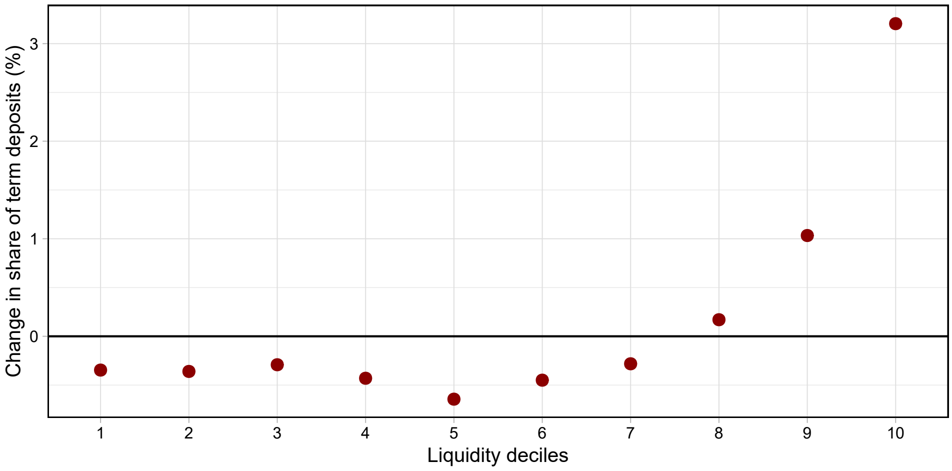
Note: Bars show the distribution of reallocated amounts across liquidity deciles, i.e., what share of the total amount reallocated to term deposits originates from each decile. Red bars capture the total amount of *any* inflows into term deposits after the treatment, regardless of the source. This includes (i) internal reallocation from overnight to term deposits within the same bank, (ii) transfers of deposits from other banks, and/or (iii) inflows from outside the banking system. Grey bars capture amounts reallocated by *bank switchers*: individuals who had no deposits of any type in bank X before the treatment, but opened a term deposit in bank X after the treatment, consistent with switching driven by higher offered term rates. Individuals are allocated into deciles based on their total liquidity (sum of overnight and term deposits across all banks) as of June 30, 2023. The first decile includes the least liquid individuals, while the tenth decile captures the most liquid. Source: Deposit Registry.

Figure B.3: Savings rates across liquidity deciles



Note: Bars show the average savings rate for individuals in each liquidity decile as of June 30, 2023. The savings rate is defined as the ratio of term deposits to total liquidity (sum of overnight and term deposits across all banks) for each individual, averaged within each decile. Individuals are allocated into deciles based on their total liquidity as of the same date. The first decile includes the least liquid individuals, while the tenth decile captures the most liquid. Source: Deposit Registry.

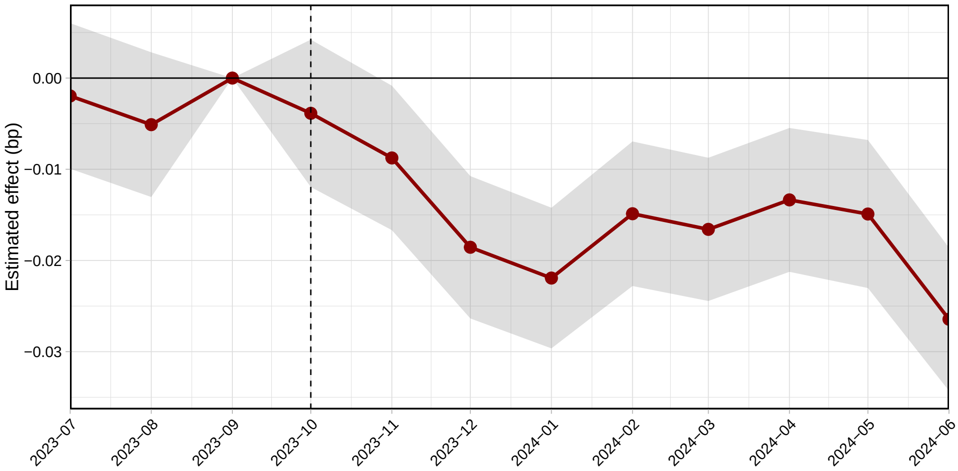
Figure B.4: Change in share of term deposits by liquidity deciles



Note: Each dot shows the average change in the savings rate for individuals in a given liquidity decile. The change is defined at the individual level as the difference between the ratio of term deposits to total liquidity (sum of overnight and term deposits across all banks) in December 2023 and the same ratio in June 2023. This difference is then averaged within each decile. Individuals are allocated into deciles based on their total liquidity as of June 30, 2023. The first decile includes the least liquid individuals, while the tenth decile captures the most liquid. Source: Deposit Registry.

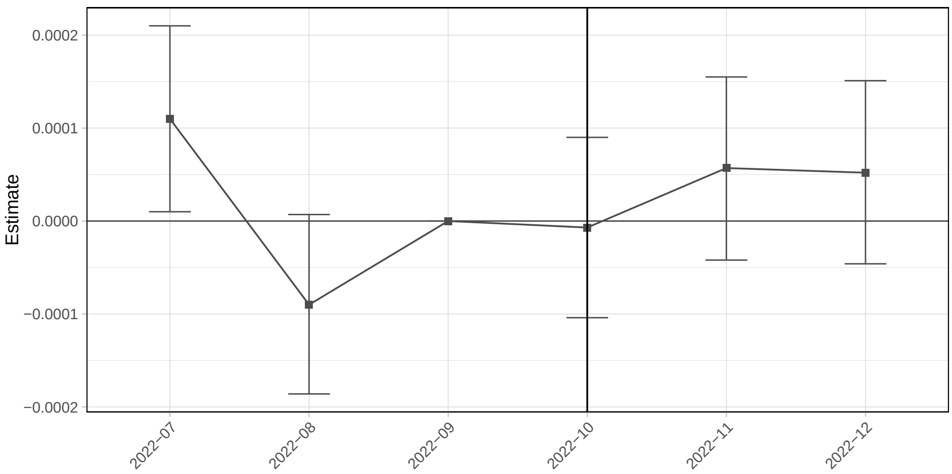
C Appendix - Portfolio Rebalancing - Housing

Figure C.1: The effect of increased deposit rates on house purchases with local projections



Note: This figure reports robustness checks based on a local projections specification of the form $y_{i,t+k} - y_{i,t-1} = \alpha + \beta_k$ *High-liquidity*$_i + \gamma_c + \varepsilon_{i,t,k}$, where i indexes individuals, t indexes months, c indexes the county of individual i, and k indexes the horizon (months). γ_c denotes county fixed effects. The dependent variable is the change in the outcome at horizon k relative to the reference month, September 2023. The model is estimated on monthly data from July 2023 to June 2024. *High-liquidity*$_i$ is an indicator equal to 1 for individuals whose total liquidity was above the median in June 2023, and 0 otherwise. Total liquidity is defined as the sum of overnight and term deposits held by an individual across all banks as of June 30, 2023. Standard errors are clustered at the individual level. Shaded areas represent 95% confidence intervals. Source: Tax Authority and Deposit Registry.

Figure C.2: The dynamic effect of placebo estimates



Note: This figure presents the dynamic effects of placebo estimates based on the following specification: $y_{i,t} = \alpha + \sum_{m \neq \text{Sep 2022}} \beta_m(\textit{High-liquidity}_i \times \mathbf{1}\{t = m\}) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where i indexes individuals, t indexes months and c indexes the county of individual i. λ_i denotes individual fixed effects and $\gamma_{c,t}$ denotes county-by-time fixed effects. The coefficients β_m capture the dynamic effects of being *High-liquidity* at each month m relative to the placebo reference month, September 2022. The model is estimated on monthly data from July 2022 to December 2022. *High-liquidity*$_i$ is an indicator equal to 1 for individuals whose total liquidity was above the median in June 2022, and 0 otherwise. Total liquidity is defined as the sum of overnight and term deposits held by an individual across all banks as of June 30, 2022. Standard errors are clustered at the individual level. Shaded areas represent 95% confidence intervals. Source: Tax Authority and Deposit Registry.

Table C.1: Effect on House purchases when shifting the post period

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x High-liquidity	0.08882***	0.39672***	-0.00047***		
	(0.00044)	(0.00251)	(0.00000)		
Interest rate				-0.00525***	
				(0.00092)	
ln(T. DEPOSIT)					-0.0011749***
					(0.00021)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.528	0.565	0.504	-	-
Obs.	6,367,562	6,367,562	6,367,562	6,367,562	6,367,562

Note: This table reports a robustness check in which the post period is shifted from October–December 2023 to January–March 2024. The first-stage specifications in columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$. The reduced-form specification in column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, while the IV specifications in columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $\widehat{T}_{i,t}$ is the predicted value from the corresponding first stage. House purchase, $y_{i,t}$, is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. The instrument is $\text{Post}_t \times \text{High} - \text{liquidity}_i$, where Post_t equals one for January–March 2024 and $\text{High} - \text{liquidity}_i$ identifies individuals with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). The sample is restricted to individuals who held deposits at a single bank as of June 30, 2023, excluding those with deposits at multiple banks. Standard errors in parentheses are clustered at the ID level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.2: House purchases and different wealth deciles

	(1)	(2)	(3)	(4)	(5)
	DEPENDENT VARIABLE: HOUSE PURCHASE				
	Baseline	Decile >6	Decile >7	Decile >8	Decile >9
Post × High-liquidity	-0.00024***	-0.00009	-0.00006	-0.00010	-0.00011
	(0.00008)	(0.00013)	(0.00010)	(0.00009)	(0.00008)
Post × Wealth		-0.00019	-0.00031**	-0.00036**	-0.00065***
		(0.00015)	(0.00013)	(0.00016)	(0.00024)
ID FE	x	x	x	x	x
County × Time FE	x	x	x	x	x
R^2	0.505	0.505	0.505	0.505	0.505
Obs.	6,367,562	6,367,562	6,367,562	6,367,562	6,367,562

Note: This table reports reduced-form estimates of the relationship between the deposit rate shock and the probability of residential real-estate purchase across different wealth thresholds. The baseline specification in column (1) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, while columns (2)–(5) estimate $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \beta(\text{Post}_t \times \text{Wealth}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. House purchase, $y_{i,t}$, is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. Wealth_i is a dummy variable equal to 1 if the individual belongs to a wealth decile above the threshold indicated in the column heading, and 0 otherwise. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.3: First stage of the IV regression with regard to wealth deciles

Dep. var.	Wealth decile	Post × High-liquidity	Post × Wealth decile	R^2	ID FE	County × Time FE	S.E.	Obs.
INTEREST RATE	>6	0.008***	0.101***	0.530	x	x	ID	6,367,562
		(0.000)	(0.001)					
INTEREST RATE	>7	0.013***	0.126***	0.534	x	x	ID	6,367,562
		(0.000)	(0.001)					
INTEREST RATE	>8	0.022***	0.166***	0.538	x	x	ID	6,367,562
		(0.000)	(0.001)					
INTEREST RATE	>9	0.042***	0.234***	0.541	x	x	ID	6,367,562
		(0.000)	(0.002)					
ln(T. DEPOSIT)	>6	0.031***	0.455***	0.567	x	x	ID	6,367,562
		(0.002)	(0.004)					
ln(T. DEPOSIT)	>7	0.056***	0.563***	0.568	x	x	ID	6,367,562
		(0.002)	(0.004)					
ln(T. DEPOSIT)	>8	0.099***	0.737***	0.571	x	x	ID	6,367,562
		(0.002)	(0.006)					
ln(T. DEPOSIT)	>9	0.189***	1.032***	0.573	x	x	ID	6,367,562
		(0.002)	(0.009)					

Note: This table shows the estimates of the first-stage specification $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \beta(\text{Post}_t \times \text{WealthDecile}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$, as indicated in the dependent-variable column. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. Wealth Decile$_i$ is a dummy variable equal to 1 if the individual's wealth decile is above the threshold shown in the row, and 0 otherwise. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.4: The effect on House purchases when excluding housing loans

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x High-liquidity	0.08895***	0.39745***	-0.00020***		
	(0.00044)	(0.00251)	(0.00007)		
Interest rate				-0.00228***	
				(0.00079)	
ln(T. DEPOSIT)					-0.00051***
					(0.00018)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.528	0.565	0.507	-	-
Obs.	6,357,666	6,357,666	6,357,666	6,357,666	6,357,666

Note: The sample excludes house purchases financed with housing loans. Columns (1) and (2) estimate the first-stage specification $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$. Column (3) estimates the reduced-form specification $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. Columns (4) and (5) estimate the IV specification $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $\widehat{T}_{i,t}$ is the predicted value from the corresponding first stage. House purchase, $y_{i,t}$, is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.5: The effect on housing loans

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSING LOAN	(4) HOUSING LOAN	(5) HOUSING LOAN
Post x High-liquidity	0.08882***	0.39672***	0.000072*		
	(0.00044)	(0.00251)	(0.000040)		
Interest rate				0.00081*	
				(0.00045)	
ln(T. DEPOSIT)					0.00018*
					(0.00010)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.528	0.565	0.500	–	–
Obs.	6,367,562	6,367,562	6,367,562	6,367,562	6,367,562

Note: Columns (1) and (2) estimate the first-stage specification $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$. Column (3) estimates the reduced-form specification $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. Columns (4) and (5) estimate the IV specification $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, where $\widehat{T}_{i,t}$ is the predicted value from the corresponding first stage. The outcome variable, $y_{i,t}$, is a dummy equal to 1 if individual i purchased a house using a housing loan in period t, and 0 otherwise. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit and Credit Registry.

Table C.6: The effect on house purchases with additional demand controls

	FIRST STAGE		REDUCED FORM	IV	
	(1)	(2)	(3)	(4)	(5)
	INTEREST RATE	ln(T. DEPOSIT)	HOUSE PURCHASE	HOUSE PURCHASE	HOUSE PURCHASE
Post x High-liquidity	0.03447***	0.15395***	-0.00128***		
	(0.00098)	(0.00535)	(0.00030)		
Interest rate				-0.03714***	
				(0.00876)	
ln(T. DEPOSIT)					-0.00831***
					(0.00197)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
Income x Time FE	x	x	x	x	x
R^2	0.513	0.534	0.503	-	-
Obs.	837,942	837,942	837,942	837,942	837,942

Note: Panel A augments the baseline specification with additional demand-side fixed effects to test whether the estimated effect is driven by demand-side heterogeneity in housing purchases. Panel B reports the baseline specification estimated on the same sample for comparison. In Panel B, columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, and columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. In Panel A, columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$, column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$, and columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$. Here, $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$, and $y_{i,t}$ is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. λ_i denotes individual fixed effects, $\gamma_{c,t}$ denotes county-by-time fixed effects, $\mu_{b,t}$ denotes bank-by-time fixed effects, and $\Omega_{d,t}$ denotes the additional demand-side fixed effects: ever-mortgage-by-time, DSTI-quartile-by-time, subsidy-recipient-by-time, first-time-buyer-by-time, and income-quartile-by-time fixed effects. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. The sample is restricted to individuals who held deposits at a single bank as of June 30, 2023, excluding those with deposits at multiple banks. Demand-side fixed effects are constructed from loan-level credit registry data available from 2020 onward. Standard errors in parentheses are clustered at the ID level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.7: The effect on house purchases when controlling for bond yields, stock market returns, and market expectations

	(1) HOUSE PURCHASE	(2) HOUSE PURCHASE	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post × High-liquidity	-0.000262***	-0.000149***	-0.000218***	-0.000167***	-0.000119***
	(0.000020)	(0.000026)	(0.000024)	(0.000021)	(0.000026)
High-liquidity × SPX Index		-0.000049***			0.000000
		(0.000000)			(0.000000)
High-liquidity × HR 10Y Yield			0.000140***		0.000186***
			(0.000041)		(0.000069)
High-liquidity × RRE Market Exp.				30.984345***	32.624628***
				(3.220364)	(3.995577)
ID FE	x	x	x	x	x
County × Time FE	x	x	x	x	x
R^2	0.087	0.087	0.087	0.087	0.087
Obs.	38,716,272	38,716,272	38,716,272	38,716,272	38,716,272

Note: The dependent variable, $y_{i,t}$, is a dummy equal to 1 if individual i purchases a house in month t, and 0 otherwise. The sample period covers April 2023 to March 2024. Column (1) estimates the baseline specification $y_{i,t} = \alpha + \beta(\text{Post} \times \text{High} - \text{liquidity}) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. Column (2) adds the interaction High − liquidity × SPX Index. Column (3) adds the interaction High − liquidity × HR 10Y Yield. Column (4) adds the interaction High − liquidity × RRE Market Expectations. Column (5) includes all three interactions jointly. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. The data are at the monthly level to capture time variation in stock market returns, bond yields, and market expectations. SPX Index denotes the S&P 500 index, HR 10Y Yield denotes the yield on the 10-year Croatian government bond, and RRE Market Expectations denotes residential real-estate market expectations based on the consumer confidence survey question on expected changes in residential real-estate values over the next 12 months. The variable RRE Market Expectations is divided by 1 million for interpretation purposes. All specifications include individual fixed effects (λ_i) and county-by-time fixed effects ($\gamma_{c,t}$). Standard errors in parentheses are clustered at the ID level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.8: The effect on house purchases with additional supply controls

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x High-liquidity	0.04215***	0.21743***	-0.00030***		
	(0.00037)	(0.00240)	(0.00009)		
Interest rate				-0.00702***	
				(0.00207)	
ln(T. DEPOSIT)					-0.00136***
					(0.00040)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
Bank x Time FE	x	x	x	x	x
R^2	0.515	0.537	0.505	-	-
Obs.	4,903,274	4,903,274	4,903,274	4,903,274	4,903,274

Note: Columns (1) and (2) estimate the first-stage specification $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \varepsilon_{i,t}$, where $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$. Column (3) estimates the reduced-form specification $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \varepsilon_{i,t}$. Columns (4) and (5) estimate the IV specification $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \varepsilon_{i,t}$, where $\widehat{T}_{i,t}$ is the predicted value from the corresponding first stage. House purchase, $y_{i,t}$, is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. All specifications include individual fixed effects (λ_i), county-by-time fixed effects ($\gamma_{c,t}$), and bank-by-time fixed effects ($\mu_{b,t}$). The sample is restricted to individuals who held deposits at a single bank as of June 30, 2023, excluding those with deposits at multiple banks. Standard errors in parentheses are clustered at the ID level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.9: The effect on house purchases with additional demand fixed effects

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Panel A: effect with additional demand FE					
Post x High-liquidity	0.03364***	0.15003***	-0.00122***		
	(0.00098)	(0.00537)	(0.00030)		
Interest rate				-0.03628***	
				(0.00906)	
ln(T. DEPOSIT)					-0.00814***
					(0.00204)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
Bank x Time FE	x	x	x	x	x
Ever mortgage x Time FE	x	x	x	x	x
DSTI quartile x Time FE	x	x	x	x	x
Subsidy recipient x Time FE	x	x	x	x	x
First-time buyer x Time FE	x	x	x	x	x
Income quartile x Time FE	x	x	x	x	x
R^2	0.513	0.534	0.503	-	-
Obs.	837,942	837,942	837,942	837,942	837,942
Panel B: Baseline					
Post x High-liquidity	0.03616***	0.15856***	-0.00145***		
	(0.00096)	(0.00525)	(0.00030)		
Interest rate				-0.03997***	
				(0.00825)	
ln(T. DEPOSIT)					-0.00912***
					(0.00189)
ID FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.513	0.533	0.503	-	-
Obs.	837,942	837,942	837,942	837,942	837,942

Note: Panel A augments the baseline specification with additional demand-side fixed effects to test whether the estimated effect is driven by demand-side heterogeneity in housing purchases. Panel B reports the baseline specification estimated on the same sample for comparison. In Panel B, columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$, and columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \varepsilon_{i,t}$. In Panel A, columns (1) and (2) estimate $T_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$, column (3) estimates $y_{i,t} = \alpha + \beta(\text{Post}_t \times \text{High} - \text{liquidity}_i) + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$, and columns (4) and (5) estimate $y_{i,t} = \alpha + \beta\widehat{T}_{i,t} + \lambda_i + \gamma_{c,t} + \mu_{b,t} + \Omega_{d,t} + \varepsilon_{i,t}$. Here, $T_{i,t}$ is either the weighted average interest rate on term deposits or $\ln(\text{T.Deposit}_{i,t} + 1)$, and $y_{i,t}$ is a dummy variable equal to 1 if individual i purchased a house in period t, and 0 otherwise. λ_i denotes individual fixed effects, $\gamma_{c,t}$ denotes county-by-time fixed effects, $\mu_{b,t}$ denotes bank-by-time fixed effects, and $\Omega_{d,t}$ denotes the additional demand-side fixed effects: ever-mortgage-by-time, DSTI-quartile-by-time, subsidy-recipient-by-time, first-time-buyer-by-time, and income-quartile-by-time fixed effects. "High-liquidity" individuals are those with total liquidity in bank accounts, defined as overnight plus term deposits, above the median in June 2023. T.Deposit denotes an individual's term deposit balance in the given period and is set to zero if the individual does not hold a term deposit; the interest rate is also set to zero for individuals without term deposits. The sample is restricted to individuals who obtained a loan from a bank at any time from 2020-09. Demand-side fixed effects are constructed from loan-level credit registry data available from 2020 onward. Standard errors in parentheses are clustered at the ID level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Tax Administration and Deposit Registry.

Table C.10: Share of high-liquidity depositors by county

County	HHI	Share rich - top deciles	Share more than 5k
Zagrebačka	0.32	40	33
Krapinsko - zagorska	0.50	38	30
Sisačko - moslovačka	0.27	33	25
Karlovačka	0.22	38	31
Varaždinska	0.33	38	30
Koprivničko - križevačka	0.22	34	26
Bjelovarsko - bilogorska	0.30	33	26
Primorsko - goranska	0.28	44	40
Ličko - senjska	0.34	36	30
Virovitičko - podravska	0.20	31	23
Požeško - slavonska	0.16	33	26
Brodsko posavska	0.32	32	24
Zadarska	0.27	42	35
Osječko baranjska	0.20	34	26
Šibensko - kninska	0.19	40	33
Vukovarsko - srijemska	0.23	30	22
Splitsko dalmatinska	0.19	43	37
Istarska	0.15	50	46
Dubrovačko - neretvanska	0.28	46	41
Međimurska	0.38	41	34
Grad Zagreb	0.27	49	45

Note: HHI = Herfindahl-Hirschman Index. Values are percentages unless otherwise stated. HHI measures the concentration of deposits across banks within each county, calculated by summing the squared market shares of each bank in terms of total household liquidity held in that county. Share rich - top deciles shows the percentage of individuals in each county who belong to the top three national liquidity deciles. Share more than 5k shows the percentage of individuals in each county whose total liquidity exceeds 5,000 euros. Individuals are allocated into deciles based on their total liquidity (sum of overnight and term deposits across all banks) as of June 30, 2023. The first decile includes the least liquid individuals, while the tenth decile captures the most liquid. Source: Deposit Registry.

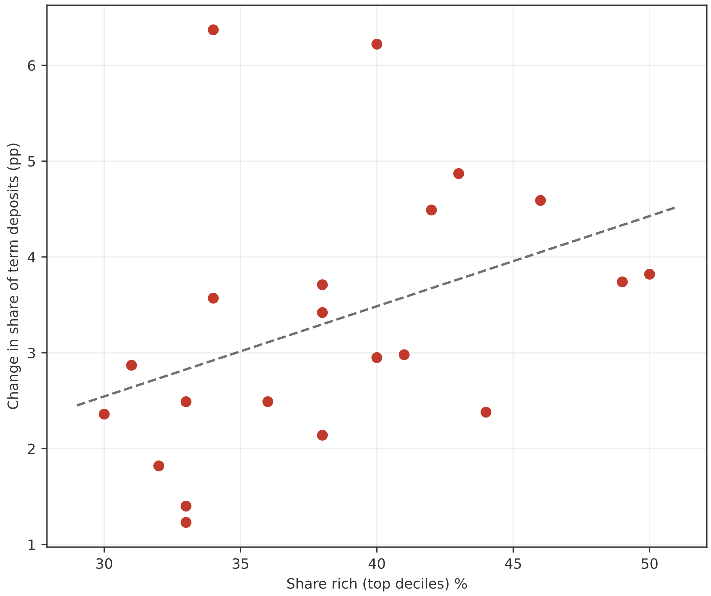
D Appendix - Effect on Consumption

Table D.1: Change in share of term deposits per county (in total deposits, %)

County	Change	Treated median	Treated Q1–Q4	Share high-liquidity
Koprivničko-križevačka	6.37	1	1	34
Šibensko-kninska	6.22	1	1	40
Splitsko-dalmatinska	4.87	1	1	43
Dubrovačko-neretvanska	4.59	1	1	46
Zadarska	4.49	1	1	42
Istarska	3.82	1	1	50
Grad Zagreb	3.74	1	–	49
Karlovačka	3.71	1	–	38
Osječko-baranjska	3.57	1	–	34
Varaždinska	3.42	1	–	38
Međimurska	2.98	1	–	41
Zagrebačka	2.95	0	–	40
Virovitičko-podravska	2.87	0	–	31
Ličko-senjska	2.49	0	–	36
Požeško-slavonska	2.49	0	–	33
Primorsko-goranska	2.38	0	0	44
Vukovarsko-srijemska	2.36	0	0	30
Krapinsko-zagorska	2.14	0	0	38
Brodsko-posavska	1.82	0	0	32
Bjelovarsko-bilogorska	1.40	0	0	33
Sisačko-moslavačka	1.23	0	0	33

Note: The table lists treated and control counties used to construct the synthetic control. Column (1) reports the change in the share of term deposits in total deposits (percentage points) in a period from 30.09.2023. to 31.12.2023. Columns (2)–(3) indicate each county's position relative to the median and quartile cutoffs. Column (4) reports the share of liqudity-rich depositors in specific county in total number of depositors per county. Liquidity-high are defined as the top three liquidity deciles of the transaction deposit distribution. Source: Deposit Registry.

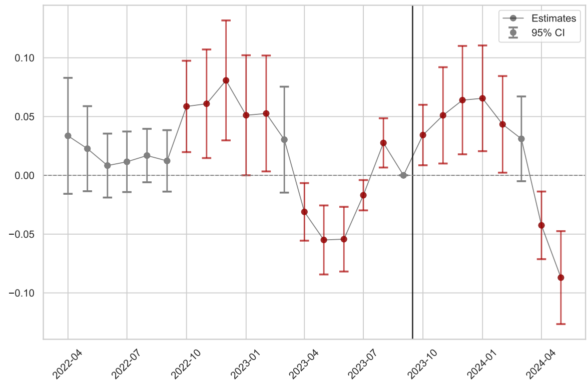
Figure D.1: Change in share of term deposits vs share of high-liquidity individuals



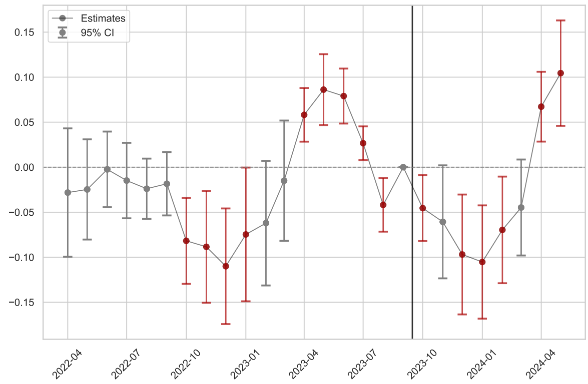
Note: The change in the share of term deposits is defined as the individual-level difference between the ratio of term deposits to total deposits in December 2023 and the same ratio in June 2023. This difference is then averaged within liquidity deciles. Liquidity deciles are defined based on individuals' total deposit holdings in June 2023. Source: Deposit Registry.

Figure D.2: Difference-in-Differences estimation of effects on consumption

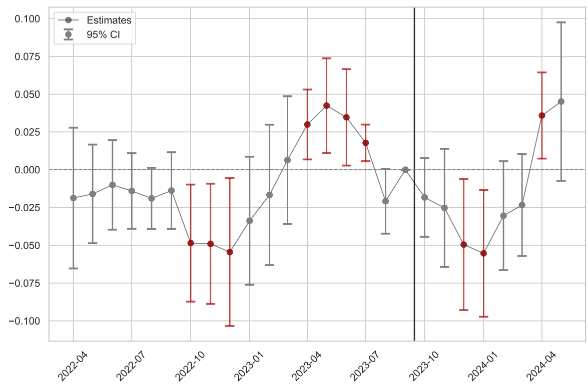
(a) Above/Below Median



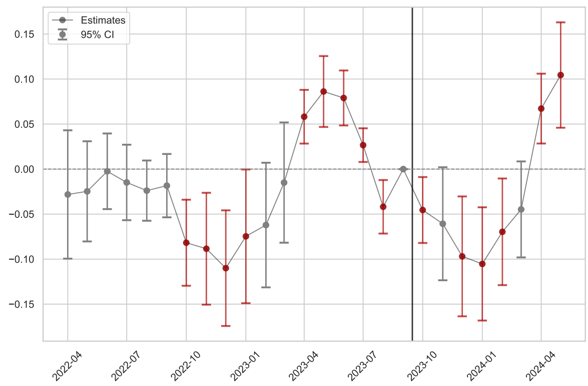
(b) First/Fourth quartile



(c) Above/Below Median



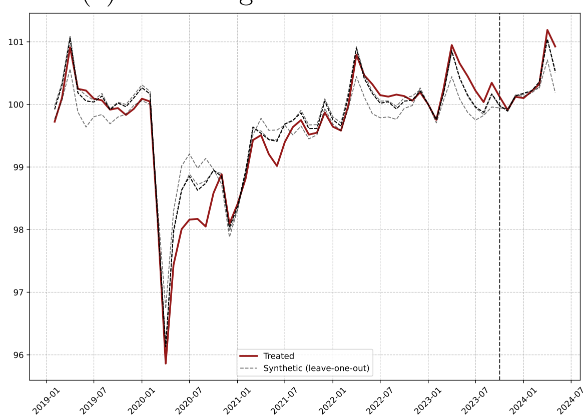
(d) First/Fourth quartile



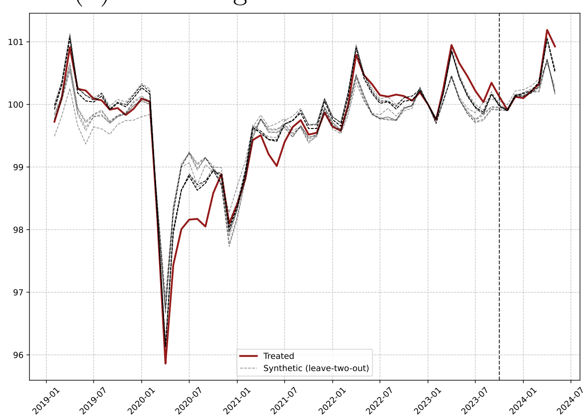
Note: The figure plots coefficients from a DiD specification: $\mathbf{C}_{c,t} = \boldsymbol{\alpha}_c + \boldsymbol{\beta}(\text{Treated}_c \times Post_t) + \mathbf{X}'_{c,t}\boldsymbol{\gamma} + \boldsymbol{\varepsilon}_{c,t}$, where $\mathbf{C}_{c,t}$ is the change in log seasonally adjusted fiscalized receipts in county c at time t, $\boldsymbol{\alpha}_c$ are county fixed effects, and $\mathbf{X}_{c,t}$ is a vector of county-level controls including lagged unemployment, employment, wages, and foreign tourist overnight stays. Standard errors are clustered at the county level. In Figures (a) and (b), treated and control counties are split by the change in the share of term deposits; in (c) and (d), by the share of high-liquidity individuals. Both splits are defined in Table D.1.

Figure D.3: Robustness to control group specification I: Donor exclusion

(a) Excluding one donor at a time

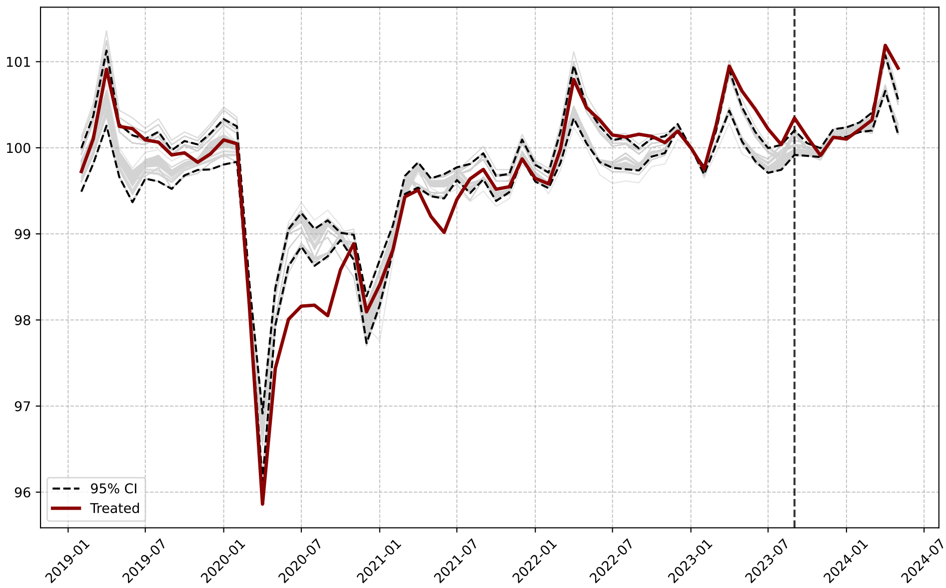


(b) Excluding two donors at a time



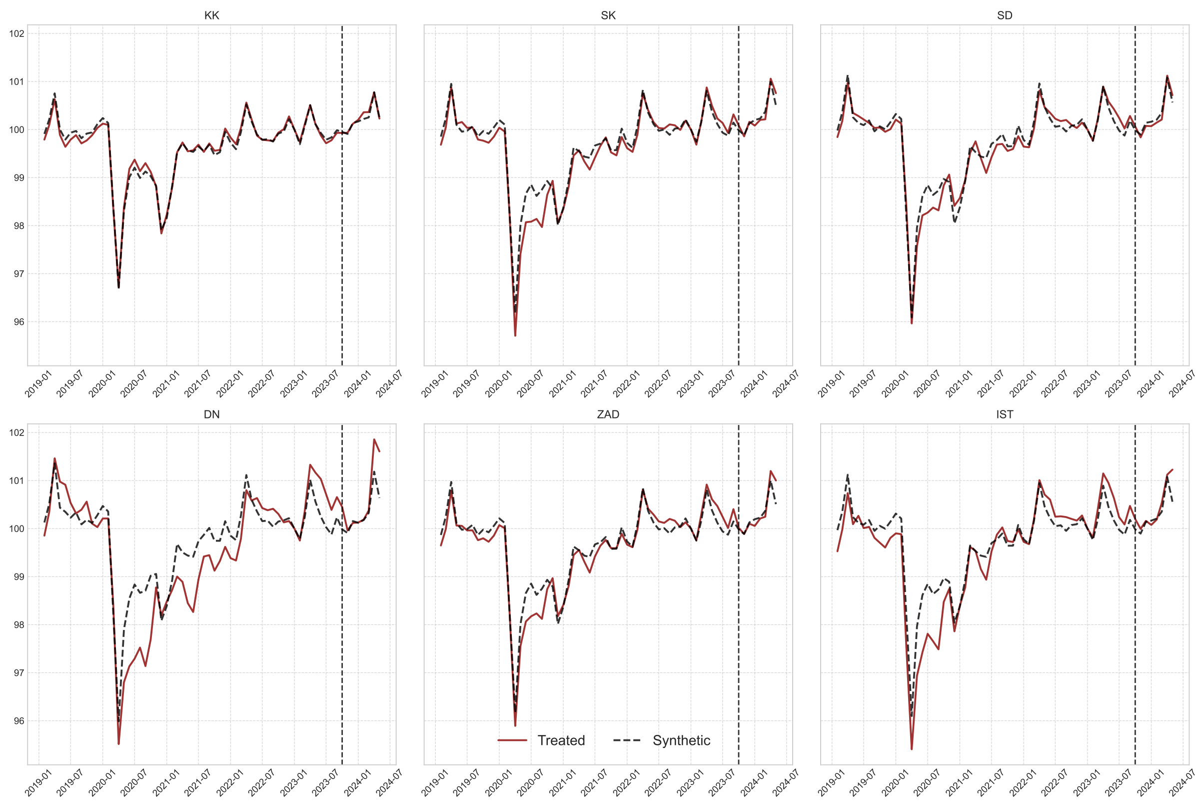
Note: This figure shows robustness checks where the synthetic control is re-estimated multiple times while systematically altering the donor pool, following the leave-one-out procedure in Abadie et al. (2015). In panel (a), each control county is excluded one at a time, and a new synthetic control is computed for the treated group. In panel (b), all unordered pairs of counties are excluded ("leave-two-out"), and the model is re-estimated accordingly. This ensures that results are not driven by a single donor or pair of donors (see also Ferman et al., 2020).

Figure D.4: Robustness to control group specification II: Monte Carlo resampling of the donor pool



Note: The figure is based on Monte Carlo resampling of the donor pool. At each iteration, a new set of donor counties is drawn with replacement, and a synthetic control is estimated. The figure summarizes the distribution of post-treatment effects across 1,000 such re-estimations, providing a reference for how sensitive results are to alternative donor compositions (see Cattaneo et al., 2021; Chernozhukov et al., 2021, for formal inference frameworks based on resampling).

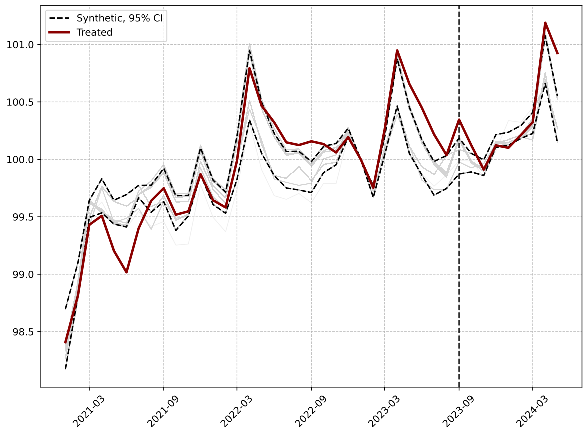
Figure D.5: County-level synthetic control estimates



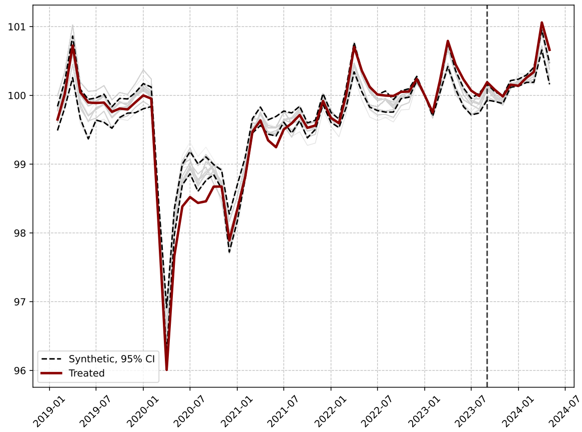
Note: This figure reports separate synthetic control estimates for each treated county, as in Cavallo et al. (2013). Instead of pooling the treated group into a single unit, the method is applied individually, constructing county-specific synthetic controls using the same pre-treatment predictors and donor pool.

Figure D.6: Robustness to alternative pre-period and treatment specification

(a) Sample starting in 2021



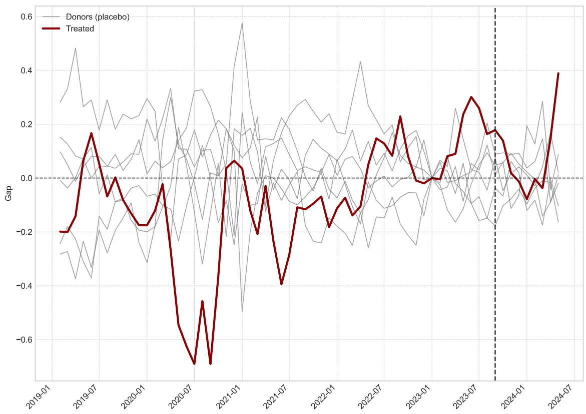
(b) Treatment split at the median



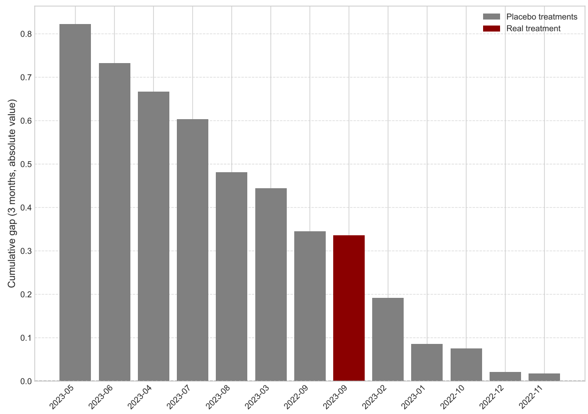
Note: This figure shows two alternative specifications. Panel (a) shifts the sample start date to 2021, reducing the length of the pre-treatment period and re-estimating the synthetic control accordingly; this is motivated by the finding in Ferman and Pinto (2021) that pre-treatment fit and bias depend on the length of the pre-treatment window. Panel (b) alters the treatment assignment rule: instead of quartile splits, counties are divided at the median change in term-deposit share, enlarging the donor pool. Both specifications are used to test sensitivity of results to sample timing and treatment definition (as in Abadie, 2021; Ferman et al., 2020).

Figure D.7: Placebo tests

(a) County placebo (never-treated units)

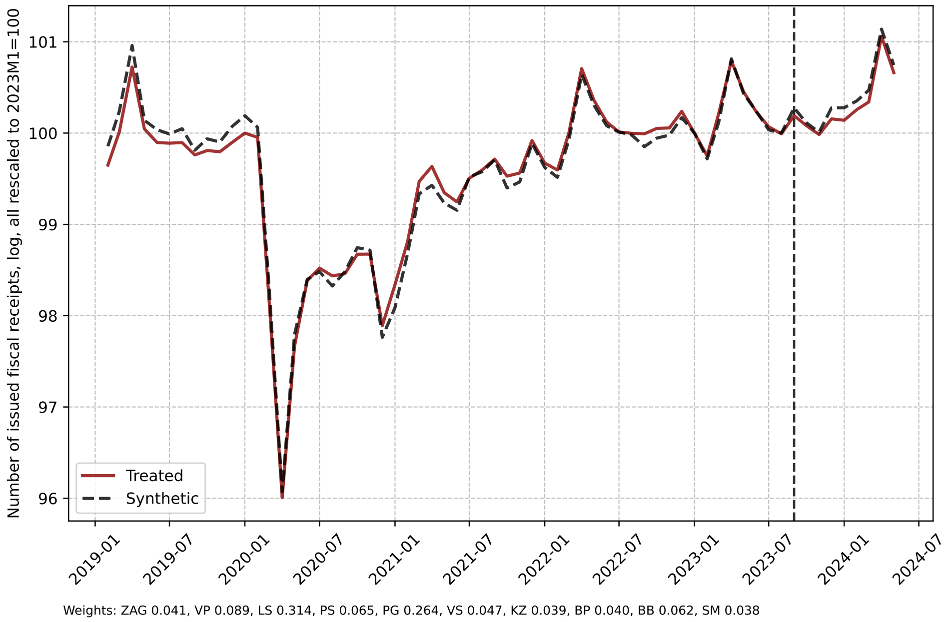


(b) Time placebo (false treatment dates)



Note: This figure presents placebo tests. Panel (a) applies the synthetic control procedure to counties that were never treated (all from the donor pool), generating a distribution of placebo effects to benchmark the treated effect against potential false positives, following Abadie et al. (2010). Panel (b) performs placebo-in-time tests by assigning false treatment dates to the actual treated group and re-estimating the effect (this is done 12 times; for each month in the year before the treatment), as in Abadie et al. (2015); the absolute effect at the true treatment date is then compared to placebo distribution. In both cases, the estimated effect for the treated counties falls well within placebo distributions, indicating that it is not distinguishable from what would be obtained by chance.

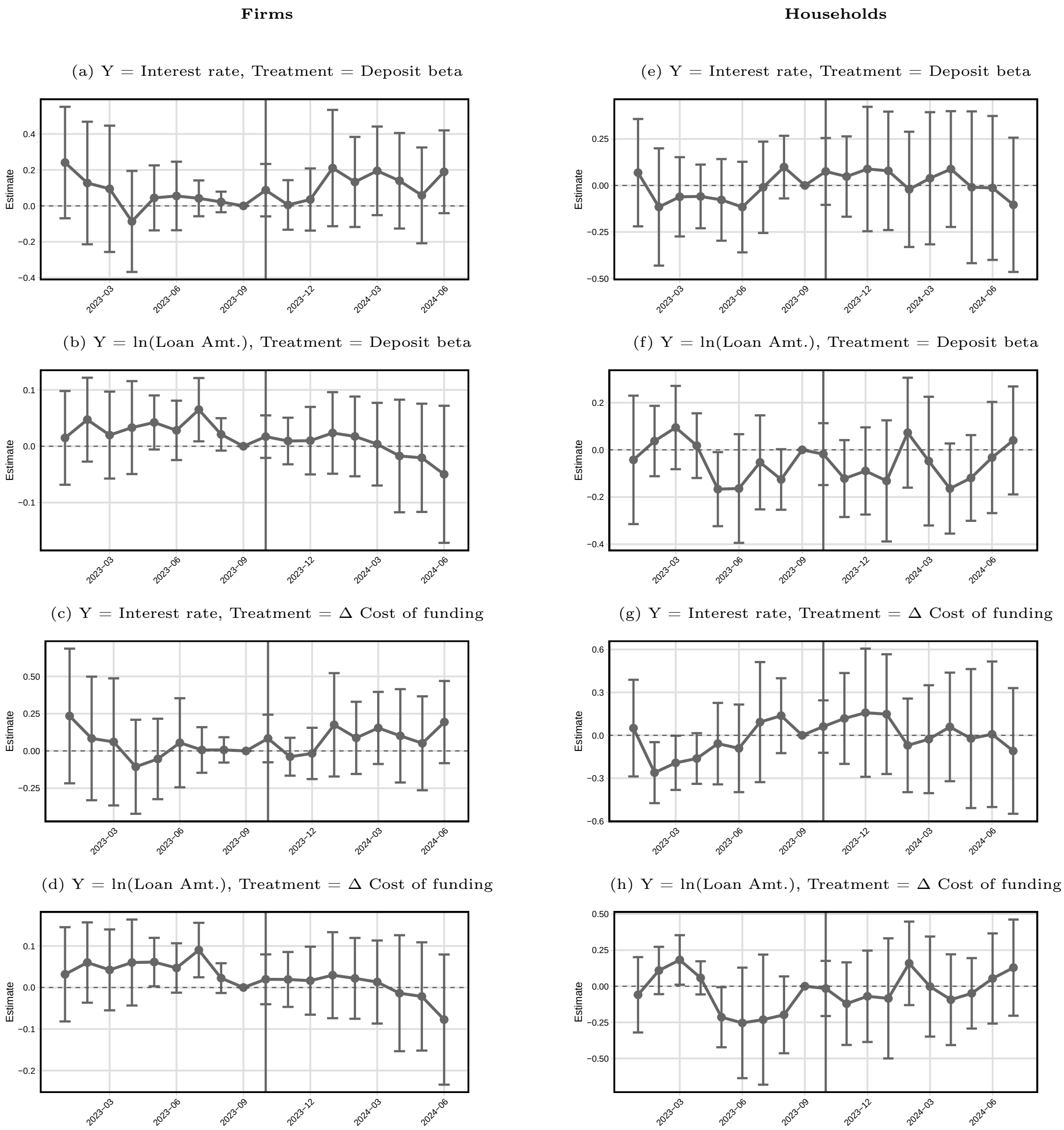
Figure D.8: Robustness to measure of treatment-control split: treatment - share of high-liquidity individuals in a county



Note: Instead of directly using change in share of term deposits, treated counties in this specification are those with share of high-liquidity individuals above median (exact counties in treated and control groups shown in Table D.1). Everything else is the same as in original specification. This exercise follows the recommendation in Abadie (2021) to assess sensitivity to the treatment assignment mechanism.

E Appendix - Effect on Loan Supply

Figure E.1. Parallel trends



Note: The figure shows event-study estimates with September 2023 as the omitted reference period. For firms, the specification is $y_{f,b,t} = \alpha + \sum_{\tau \neq \text{Sep. 2023}} \beta_\tau (\text{Treatment}_b \times \mathbf{1}\{t = \tau\}) + \gamma X_{b,t-1} + \delta_{I,c,S,t} + \mu_{b,f} + \varepsilon_{f,b,t}$, where $y_{f,b,t}$ is either the lending rate or ln(outstanding loan amount). For households, the specification is $y_{h,b,t} = \alpha + \sum_{\tau \neq \text{Sep. 2023}} \beta_\tau (\text{Treatment}_b \times \mathbf{1}\{t = \tau\}) + \gamma X_{b,t-1} + \delta_{c,I,t} + \mu_{b,c} + \varepsilon_{h,b,t}$, where $y_{h,b,t}$ is either the lending rate or ln(new loan amount) for housing loans. Treatment_b is measured either by the bank's *ex ante* deposit beta or by the change in the bank's household deposit funding cost. $X_{b,t-1}$ denotes one-month-lagged bank controls, $\delta_{I,c,S,t}$ industry-by-location-by-size-by-time fixed effects, $\delta_{c,I,t}$ location-by-income-quartile-by-time fixed effects, $\mu_{b,f}$ bank-by-firm fixed effects, and $\mu_{b,c}$ bank-by-location fixed effects. Error bars denote 95% confidence intervals based on standard errors clustered at the bank level, using the LZ2 correction and a t-distribution with cluster degrees of freedom (Bell & McCaffrey, 2002; Imbens & Kolesár, 2016). Sources: credit registries for firms and individuals, and bank financial statements.

Table E.1: Bank Lending Effect with Khwaja–Mian Fixed Effects

	Firms			
Treatments:	Deposit beta		Δ Cost of funding	
Dep. var.:	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate
POST × Treatment	-0.030	0.048	0.045	0.078
	(0.026)	(0.028)	(0.028)	(0.067)
Bank controls	YES	YES	YES	YES
Firm × Time	YES	YES	YES	YES
Bank × Firm	YES	YES	YES	YES
Adj. R^2	0.922	0.891	0.923	0.894
Obs.	124,611	124,611	128,501	128,501

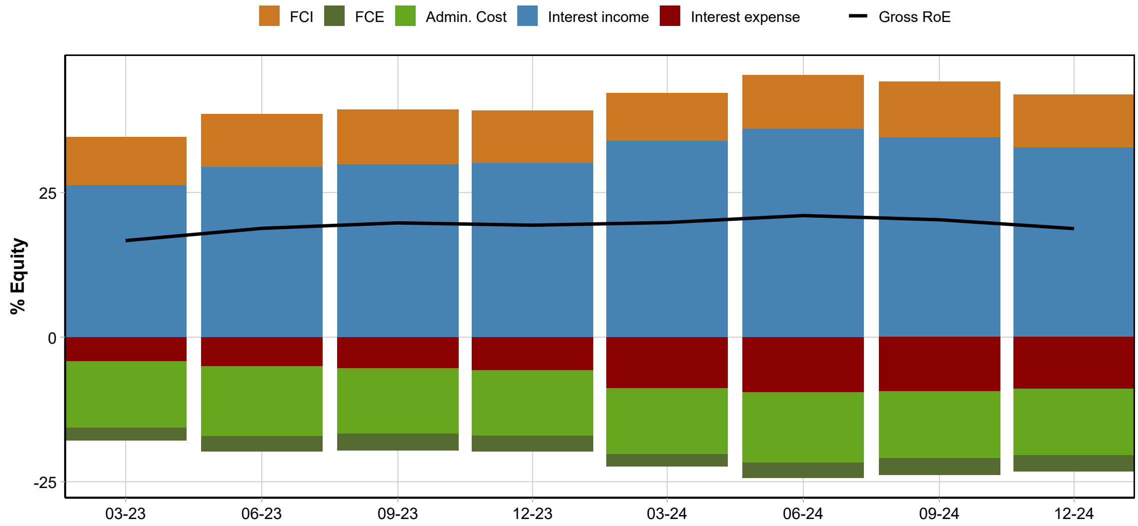
Note: Columns (1)–(4) estimate $y_{f,b,t} = \alpha + \beta(\text{Post}_t \times \text{Treatment}_b) + \gamma X_{b,t-1} + \delta_{f,t} + \mu_{b,f} + \varepsilon_{f,b,t}$, where $y_{f,b,t}$ is either ln(Loan Amount) or the interest rate on firm loans. $\delta_{f,t}$ denotes firm-by-time fixed effects, which absorb firm-specific credit demand shocks in each period, and $\mu_{b,f}$ denotes bank-by-firm fixed effects. Treatment_b is defined in two ways: Deposit beta is an indicator equal to 1 if bank b's ex-ante deposit beta, measured from June 2022 to September 2023, is above the sample median, and 0 otherwise; Δ Cost of funding is the change in bank b's household deposit funding cost between September and December 2023. $X_{b,t-1}$ denotes one-month-lagged bank controls: deposits-to-assets, non-performing-loan ratio, return on assets, excess-liquidity-to-assets, CET1 ratio, and loans-to-assets. Standard errors in parentheses are clustered at the bank level. Given the small number of clusters, we apply the LZ2 correction and compute confidence intervals using a t-distribution with cluster degrees of freedom (Bell & McCaffrey, 2002; Imbens & Kolesár, 2016). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Firm credit registry and bank financials.

Table E.2: Lending to firms and interactions with bank-level heterogeneieties

Heterogeneities (H):	Excess Liquidity to Asset		Deposit HH to Asset		Δ HH Interest Expense to Equity		Δ HH Interest Expense to Profits	
Dep. var.:	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate
POST × H	0.004	0.018***	-0.002	0.008*	-0.026	0.047	-0.004	-0.000
	(0.002)	(0.006)	(0.002)	(0.004)	(0.037)	(0.080)	(0.002)	(0.006)
POST × Treatment	0.193	1.235**	-0.235	0.431				
	(0.151)	(1.569)	(0.204)	(0.557)				
POST × H × Treatment	-0.009*	-0.042**	0.005	-0.006				
	(0.005)	(0.019)	(0.005)	(0.013)				
Bank controls	YES	YES	YES	YES	YES	YES	YES	YES
IcSt	YES	YES	YES	YES	YES	YES	YES	YES
Bank × Firm	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R^2	0.936	0.913	0.936	0.913	0.936	0.913	0.936	0.913
Obs.	379,192	379,192	379,192	379,192	379,192	379,192	379,192	379,192

Note: Columns (1)–(4) estimate $y_{f,b,t} = \alpha + \beta(\text{Post}_t \times H_b) + \beta(\text{Post}_t \times \text{Treatment}_b) + \beta(\text{Post}_t \times H_b \times \text{Treatment}_b) + \gamma X_{b,t-1} + \delta_{I,c,S,t} + \mu_{b,L} + \varepsilon_{f,b,t}$, where $y_{f,b,t}$ is either ln(Loan Amount) or the interest rate on firm loans. Columns (5)–(8) estimate $y_{f,b,t} = \alpha + \beta(\text{Post}_t \times H_b) + \gamma X_{b,t-1} + \delta_{I,c,S,t} + \mu_{b,f} + \varepsilon_{f,b,t}$. Treatment_b is the change in bank b's household deposit funding cost between September and December 2023. H_b denotes the bank-level heterogeneity shown in the column heading: excess-liquidity-to-assets, household-deposits-to-assets, change in household interest expense relative to equity, or change in household interest expense relative to profits. Excess-liquidity-to-assets and household-deposits-to-assets are measured in September 2023. $X_{b,t-1}$ denotes one-month-lagged bank controls: deposits-to-assets, non-performing-loan ratio, return on assets, excess-liquidity-to-assets, CET1 ratio, and loans-to-assets. $\delta_{I,L,c,t}$ denotes industry-by-location-by-size-by-time fixed effects, and $\mu_{b,f}$ denotes bank-by-location fixed effects. Bank-level averages are 0.18 for Δ Cost of funding, 26.00% for excess-liquidity-to-assets, 47.00% for household-deposits-to-assets, 0.48% for Δ household interest expense-to-equity, and 6.68% for Δ household interest expense-to-profits. Standard errors in parentheses are clustered at the bank level. Given the small number of clusters, we apply the LZ2 correction and compute confidence intervals using a t-distribution with cluster degrees of freedom (Bell & McCaffrey, 2002; Imbens & Kolesár, 2016). $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Sources: Firm Credit Registry and bank financials.

Figure E.2: Profit and loss statement of Croatian Banking System



Note: The chart shows a decomposition of gross return on equity (RoE) into its key income and cost components. Bars represent the contributions of interest income, interest expense, fee and commission income/expenses, and administrative costs to RoE, while the black line shows the gross RoE over time. Since profit-and-loss (PnL) items are flow variables that cumulate over the year, quarterly PnL figures are annualized for comparability across quarters. Specifically, for each quarter q, each PnL component is annualized as $(4/q) \times$ PnL component. Source: Croatian National Bank

PUBLISHER
Croatian National Bank
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T. +385 1 4564 555
www.hnb.hr

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