INTERNATIONAL MONETARY FUND

Monetary Policy Pass-Through to Interest Rates: Stylized Facts from 30 European Countries

Robert Beyer, Ruo Chen, Claire Li, Florian Misch, Ezgi O. Ozturk, and Lev Ratnovski

WP/24/9

2024
JAN

WORKING PAPER

IMF Working Paper
European Department

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Authorized for distribution by Helge Berger
January 2024

ABSTRACT: The extent to which changes in monetary policy rates lead to changes in loan and deposit rates for households and firms, referred to as 'pass-through', is an important ingredient of monetary policy transmission to output and prices. Using data on seven different bank interest rates in 30 European countries, different approaches, and the full sample as well as a subsample of euro area countries, we show that a) the pass-through in the post-pandemic hiking cycle has been heterogenous across countries and types of interest rates; b) the pass-through has generally been weaker and slower, except for rates of non-financial corporation loans and time deposits in euro area countries; c) differences in pass-through over time and across countries for most deposit rates are correlated with financial sector concentration, liquidity, and loan opportunities, and d) the effects of pass-through to outstanding mortgage rates on monetary transmission on prices and output are heterogenous across countries.

RECOMMENDED CITATION: Beyer, R.,Chen, R., Li, C., Misch, F., Ozturk, E., and Ratnovski, L. (2024). Monetary Policy Pass-Through to Interest Rates: Stylized Facts from 30 European Countries. IMF Working Paper WP/24/9

JEL Classification Numbers:	E43; E52
Keywords:	Monetary Policy Transmission; Monetary Policy Pass-Through
Author's E-Mail Address:	rbeyer@imf.org; rchen@imf.org; yli13@imf.org; fmisch@imf.org; eozturk@imf.org; lratnovski@imf.org

* Corresponding author.

** The authors would like to thank Oya Celasun, Luis Brandao Marques, Vincenzo Guzzo, Sebastian Weber, Pelin Berkmen, Mahir Binici, Ozge Emeksiz, Ezequiel Cabezon, Salvatore Dell'Erba, Fazurin Jamaludin, Rui Mano, Vina Nguyen, Yu Shi and ECB staff for useful comments. Kayla Qin, Agnesa Zalezakova and Wei Zhao provided useful assistance.

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Prepared by Robert Beyer, Ruo Chen, Claire Li, Florian Misch[1], Ezgi O. Ozturk, and Lev Ratnovski[2]

[1] Corresponding author.

[2] The authors would like to thank Oya Celasun, Luis Brandao Marques, Vincenzo Guzzo, Sebastian Weber, Pelin Berkmen, Mahir Binici, Ozge Emeksiz, Ezequiel Cabezon, Salvatore Dell'Erba, Fazurin Jamaludin, Rui Mano, Vina Nguyen, Yu Shi and ECB staff for useful comments. Kayla Qin, Agnesa Zalezakova and Wei Zhao provided useful assistance.

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1. Introduction

The post-pandemic surge in inflation has triggered the most aggressive monetary policy tightening in decades. This has, in turn, generated renewed interest in the aggregate effects of monetary policy. This paper analyzes the pass-through of policy rates in European economies to lending and deposit rates of credit institutions, referred to as bank interest rates, thereby providing insights into an important (but not the only) aspect of monetary policy transmission.

The impact of monetary policy-induced changes in loan and deposit interest rates for households and non-financial corporations (NFCs) is one of many channels through which monetary policy affects financial conditions, and thereby output and prices. Bank interest rates can affect agents' investment, consumption and saving decisions, debt service costs and savings income, as well as asset values, all of which affect real economic outcomes. The extent of pass-through of monetary policy rate changes to bank interest rates therefore affects monetary policy transmission and effectiveness. In turn, pass-through to bank interest rates can be influenced by financial sector concentration, liquidity, and the availability of deposits relative to profitable lending opportunities. These characteristics can affect incentives for banks to compete for deposits and potentially undermine pass-through in hiking cycles. Methodologically, analyzing pass-through has advantages: the effects of monetary policy on bank loan and deposit rates are arguably more direct, often with shorter lags and fewer confounding factors compared to monetary policy transmission on output and prices.

Focusing on monetary policy pass-through in European countries during the post-pandemic hiking cycle, this paper makes two key contributions to the previous literature. First, we compile data on seven different interest rates for 30 European countries both within euro area and non-euro area countries with independent monetary policy (defined as having no official peg and not being fully euroized). This dataset contains interest rates for key types of new loans and deposits of both households and NFCs. Second, we present a range of early evidence on stylized facts on monetary pass-through during the post-pandemic hiking cycle using a mix of descriptive statistics and regression analyses, both for the full sample of countries and a subset of euro area countries (EA-12 countries). In particular, we document that: a) the pass-through in the post-pandemic hiking cycle has been heterogenous across countries and types of interest rates; b) the pass-through has been weaker and slower relative to past hiking cycles, except for rates of new loans to NFCs and NFC time deposits (and controlling for the peculiarities of the current cycle including possible anticipation effects of low initial rates does not alter these finding qualitatively); c) the weakening of pass-through to deposit rates is in part associated with higher financial sector concentration, more ample deposits relative to loan opportunities, and liquidity; and d) using data on outstanding mortgages as an example, the effects of pass-through on aggregate monetary policy transmission are heterogenous across countries. Taking account of the peculiarities of the post-pandemic hiking cycle including possible anticipation effects and very low initial rates does not change these stylized facts.

Our paper contributes to the empirical literature studying monetary policy pass-through to bank interest rates, including in Europe. One strand of this literature focuses on the euro area and mostly covers the 2000s. For example, Sørensen and Werner (2006), Bernhofer and van Treeck (2013), Sander and Kleimeier (2006) document how pass-through differs across countries, interest rate types, and in the short vs. long run (see for example de Bondt, 2005, for a survey), and Saborowski and Weber (2013) examine the determinants of pass-through to the aggregate bank lending rate in a large panel of countries. Other papers focus on European

countries outside of the euro zone.[3] A meta-data study on interest rate pass-through, based on more than a thousand estimates from 50 studies, finds that the average pass-through from monetary policy rates to bank lending rates is around 0.8 (Gregor and Melecký, 2021).

Our paper is also related to another strand of the literature which exploits heterogeneity in the pass-through across banks within countries. For instance, Wang et al. (2022) use data on U.S. banks and show that bank market power affects pass-through, and that the effects depend on the level of the policy rate. Kho (2023) uses country- and bank-level data from 13 euro area countries from before the post-pandemic hiking cycle and shows that the degree of banking sector concentration has asymmetric effects on pass-through to overnight (O/N) deposit rates during tightening and loosening cycles. López-Quiles (2021) estimates pass-through to money market interest rates using transaction-level data of the largest banks in the euro area.

Importantly, our paper overcomes a critical limitation of the existing literature by covering the post-pandemic hiking cycle and uses data on individual countries or covering only a subset of euro area countries. Hence, our paper is related to recent studies analyzing the pass-through during the post-pandemic hiking cycle, which all report findings that are consistent with ours. For example, for the euro area, Byrne and Foster (2023) find that pass-through is generally weaker now relative to previous cycles, Messer and Niepmann (2023) find that pass-through to deposit rates has been more sluggish than in the past, Lane (2023a and 2023d) reports that the pass-through to NFC loans has been strong and that loan rates started to rise before the ECB hiked its policy rates in July 2022, and Lane (2023c) finds weaker pass-through to O/N deposit rates than to time deposit rates in the post-pandemic hiking cycle. For other European economies, Cabezon and Kovachevska (2024) finds that pass-through in North Macedonia is weaker compared to regional peers and the euro area, and Binici (2024) attributes relatively weak pass-through in Malta in the post-pandemic tightening cycle to abundant liquidity in the banking system.

The paper is organized as follows: Section 2 discusses conceptually the role of policy pass-through in overall monetary policy transmission. Section 3 describes the data. Section 4 presents stylized facts on monetary policy pass-through. Section 5 concludes.

2. The Role of Policy Pass-Through for Monetary Policy Transmission

Monetary policy usually uses the short-term money market interest rate as its operational target. The money market rate is transmitted via financial markets to deposit and lending rates of credit institutions (‘bank interest rates’), and through them to the broader economy. The ability of the central bank to achieve its ultimate objectives—price, financial, and overall macroeconomic stability—hinges in part on the transmission of the policy rate to other interest rates. In turn, bank interest rates affect the macroeconomy through several related channels:

1. ***Interest rate channel****:* Changes in interest rates alter firm investment behavior and household consumption and saving choices. Higher real interest rates increase the hurdle (break-even) rates for investment, thereby reducing it, and they make saving more attractive, which in turn reduces

[3] For example, Gregor and Melecký (2018) focus on pass-through to lending rates in Czech Republic, Egert et al. (2007) study the interest rate pass-through in five central and eastern European countries, Becker et al. (2012) analyze the pass-through to mortgage rates in the UK, and Hansen and Welz (2011) analyze the pass-through to lending and deposit rates in Sweden.

consumption. This is the standard neo-classical channel of monetary policy (Goodfriend and King, 1997).

2. ***Cash flow channel**:* Changes in interest rates affect agents' income and costs relating to existing assets and liabilities that carry variable interest rates. In other words, tighter monetary policy can directly increase interest income and debt service costs, but the cash flow effects depend on whether households and firms are net borrowers or savers and their exposure to variable rate debt and deposits. With different propensities to consume or invest across households and firms, this channel can affect aggregate macroeconomic outcomes (see, e.g., Auclert, 2019).[4] Low pass-through to deposit rates may matter in this context given that many households in Europe are net savers.
3. ***Balance sheet channel**:* Higher interest rates reduce the value of assets used as collateral, thereby tightening agents' financial constraints. For firms, this amplifies the neoclassical impact of interest rates on investment, while for households this can alter the consumption of durable goods (Kiyotaki and Moore, 1997). Additionally, wealth effects (lower asset valuations due to higher interest rates) reduce the households' propensity to consume (Lettau and Ludvigson, 2004).
4. ***Banking channel**:* Higher interest rates tend to be associated with higher bank net interest rate margins, thereby increasing bank profits (Borio et al., 2017). Interest rates may also affect bank funding conditions, as higher deposit rates may increase deposit supply. Higher bank profits and ample deposits may increase bank lending capacity (Kashyap and Stein, 2000; Drechsler et al., 2017).[5]

Table 1: Effects of monetary policy pass-through to bank interest rates onto the real economy

Channels that directionally weaken the effects of monetary policy tightening shown in orange

Channels of MP transmission	Mechanism of channel during MP tightening	Effects of higher pass-through during MP tightening	
		Effects of higher pass-through to loan rates	Effects of higher pass-through to deposit rates
Interest rate channel	Higher hurdle rate for new investment, and higher savings remuneration	Less investment	More saving → Less consumption
Cash flow channel	Higher interest income and debt services cost for existing exposures	Lower cash flow → Less consumption and investment	Higher cash flow → more consumption and investment
Balance sheet channel	Lower value of collateral	Tighter non-price credit conditions → Less investment	
Banking channel	Lower banks' net worth	Tighter bank funding conditions → Less lending	
	Higher cost of bank funding		More supply of deposits → More lending

On balance, a higher pass-through of monetary policy to interest rates tends to strengthen monetary policy transmission through each of these channels (Table 1). However, a higher pass-through to deposit rates can

[4] The non-financial sector in a given economy may predominantly consist of either losers or winners, so that the aggregate effects do not net out even if the marginal propensities to invest and consume are identical. In that case, the aggregate consumption and investment effects could be offset by changes in the volume of loans through changes in credit conditions.

[5] See also Lane (2023a) for a discussion of this channel. Obviously, there are other monetary policy transmission channels which do not directly depend on interest rate pass-through; see, for example, Cevik et al. (2023), Lane (2023a), and Mishkin (1996) for more details on the interest rate channels discussed here and a comprehensive list of monetary transmission channels more broadly.

create ambiguous effects in some cases. For instance, higher pass-through in a hiking cycle reduces private investment and consumption through a higher hurdle rate for new investment and savings remuneration, but this effect is weakened by higher cash flows from the existing stock of savings.

3. Data

We compile a dataset on loan and deposit interest rates of credit institutions in 30 European economies using data from central banks and statistical agencies, referred to as bank interest rates. Our data includes seven different types of interest rates: interest rates on overnight deposits and time deposits, both for households and NFCs, consumer loans, mortgages, and loans to NFCs. The interest rates generally refer to new deposits and loans, but we also collect data on interest rates of outstanding mortgages.[6]

Our data is at monthly frequency and constitutes an unbalanced panel, spanning 30 European countries that are either part of the euro area or have independent monetary policy (in the sense that they do not have hard pegs or are completely euroized). Two thirds of countries have data on all seven types of interest rates (Annex Table A2). Some series reach back to 2003, but for some countries the time coverage is considerably shorter. The average number of years per country is 17.8. We complement this data with information on the monetary policy rate, prices (HICP and core HICP inflation) and economic activity (industrial production). To examine the role of potential determinants of pass-through, we also collect longer time series on banking sector concentration (Herfindahl–Hirschman index using bank assets) and the loan-to-deposit ratio as a proxy of financial sector liquidity.

Annex Tables A2, A3 and A4 contain details about the country coverage of bank interest rates and the complete list of variables with broad definitions and sources. There are some minor differences in the exact definition of interest rates. For instance, some interest rates are collected using the universe of credit institutions, whereas others refer to all or only a subset of banks. In addition, in some countries, the household sector encompasses non-profit organization serving households, but in others it does not. While these differences imply that the interest rate series are not perfectly comparable across countries, they are too small to materially affect our results. Reassuringly, the result for the euro area, which should be perfectly comparable across countries, are qualitatively similar to the results based on the overall sample.

4. Stylized Facts

4.1 In the post-pandemic hiking cycle, pass-through has been heterogeneous across sectors, loan and deposit types, and countries

We document the pass-through to each of the seven bank interest rates (time and O/N deposit rates for both households and NFCs, and rates for mortgages, consumer loans and NFC loans) in the post-pandemic monetary policy tightening cycle. We compute bank interest rate betas, defined as the ratio of the cumulative increase in bank interest rates to the cumulative increase in the policy rate. For the purpose of this exercise, we only use data from the post-pandemic hiking cycle and truncate the data for

[6] In some time series, there is the distinction between pure new business and new business combined with renegotiations. We generally use pure banks rates for new business, but for NFC loan rates in Czech Republic, Cyprus, Estonia, Finland and Romania countries, we use information from both series to compile data series with fewer gaps.

each country in the month of the first rate hike until three months after the last hike (or the first rate cut or the end of our sample, whatever is shorter); see Annex Table A1 for the start and end dates of the post-pandemic hiking cycle of each country. The results are as follows.

First, there is heterogeneity across different types of loans and deposits (Figure 1). We find that the pass-through is on average highest for loans to NFCs, followed by time deposits, and weakest for overnight (O/N) deposits. The response of mortgage rates to changes in the policy rate lies in between them. In part, this heterogeneity in pass-through could be linked to differences in the maturity of the underlying loans and deposits, whereby a longer maturity can weaken the link between policy rates and bank rates. For instance, compared to NFC loans, which often have shorter maturities, it is plausible that mortgage rates respond less to policy rate changes, as term premia and other factors affect longer-maturity loans (the maturity of mortgages differs significantly across countries – see Section 4.5). These findings are broadly consistent with the existing literature. The relatively weak pass-through to deposit rates, especially overnight deposit rates, is consistent with the notion that high switching costs give banks market power in deposit markets but runs counter the hypothesis that longer duration weakens the link between policy and bank rates (see Polo, 2021, for a discussion). Messer and Niepmann (2023) also document that pass-through to O/N deposit rates has been weaker than to time deposit rates in the post-pandemic cycle.

Second, there is significant heterogeneity across countries, both in the dispersion of the pass-through across different rates and the level of the pass-through (Figure 2). Some of these cross-country differences can reflect differences in financial sector concentration, liquidity, and profitable lending opportunities relative to savings as we discuss below. In addition, public policies that cap lending rates or impose floors on deposit rates could also play a role. For instance, Hungary introduced temporary mortgage interest rate caps, with the stated rationale of helping households with rising debt service payments (Valderrama, 2023).[7]

[7] The IMF's integrated macroprudential policy (iMaPP) database contains comparable cross-country data on the use of such tools. However, at the time of writing, the most recent data refers to 2021 and does not contain measures that were introduced since the beginning of the post-pandemic hiking cycle.

Figure 1: Bank Interest Rate Betas

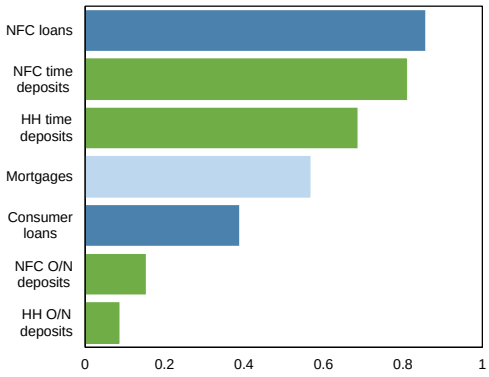
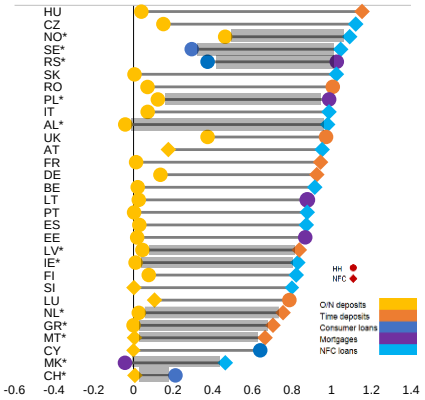


Figure 2: Bank Interest Rate Betas by Country



Sources: ECB; Haver analytics; country authorities; and IMF staff calculations.
Note: Ratio of cumulative change in interest rates relative to cumulative changes in the policy rate from month of first rate increase to three months after last rate increase (or the first rate cut or the end of the sample, whichever is shorter) in the post-pandemic tightening cycle. Figure 1 represents the unweighted average of up to 30 countries. Countries with a shaded area for the range of interest rate betas in Figure 2 indicate that at least one bank rate is not available. Thus, Figure 2 does not imply a cross-country ranking of the combined pass-through to all bank rates, not all of which are available for all countries. For example, for Switzerland, the NFC and household time deposit rates, the aggregate mortgage rate and the aggregate NFC loan rate are not available, but evidence suggests that the pass-through to flexible rate mortgages has been strong (see Annex Table A2 for details on data). For Norway, the end month has been shifted back one month in order to have more than one rate available.

Third, there are differences across customer types (or sectors): the pass-through to NFC deposit rates generally exceeds the pass-through to household deposit rates (Figures 3 and 4). This finding holds for nearly all countries, which could suggest greater market power of credit institutions vis-à-vis households relative to NFCs and reflect lower stickiness of NFC deposits.

Figure 3: Overnight Deposit Rate Betas

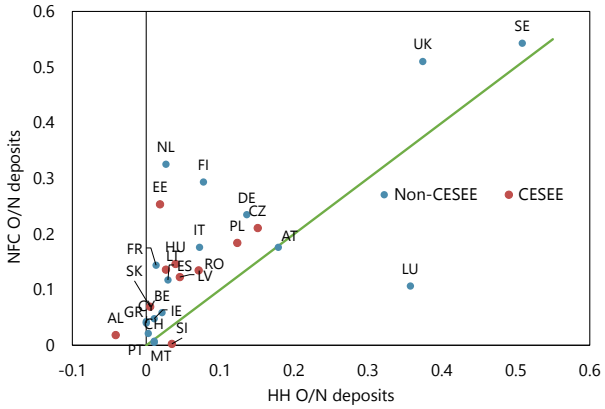
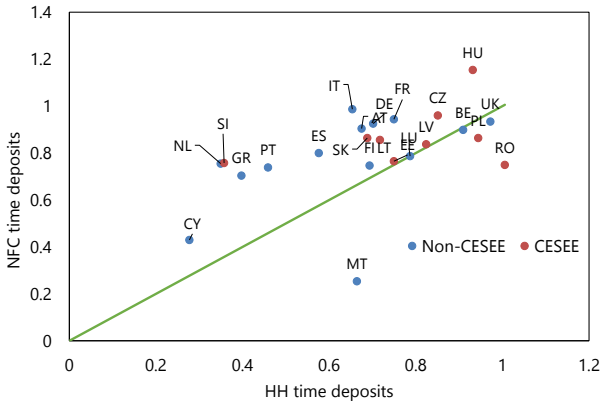


Figure 4: Time Deposit Rate Betas



Note: Ratio of cumulative change in O/N and time deposit interest rates relative to cumulative changes in the policy rate from month of first rate increase to three months after last rate increase (or the first rate cut or the end of the sample, whichever is shorter) in the post-pandemic tightening cycle.

4.2 The pass-through has been weaker this time, except to NFC loan rates

We now compare the magnitude of the pass-through during the post-pandemic tightening cycle to previous tightening cycles. To this end, for each country, we first identify the previous tightening cycle

with the largest policy rate increase covered by our data, referred to as 'comparator cycle'. In the case of the euro area, Poland, Romania, Sweden, and the UK, the comparator cycle covers the 2005-2008 pre-GFC monetary policy tightening. For some countries, there is either no data available for any previous hiking cycles (e.g., Albania and Switzerland), or the comparator cycle is different (e.g., Czech Republic, Hungary, and Serbia); see Annex Table A1 and A4 for details. The post-pandemic tightening cycle has been generally more rapid and larger in magnitude than the comparator cycles. The average cumulative policy rate increases in the post-pandemic cycle amounted to 595bps, compared to 231bps in the comparator cycles. In addition, the pace of the increase averaged around 35bps per month, compared to 15bps per month during the comparator cycles.

This analysis suggests that across all countries, pass-through as measured by interest rate betas was generally weaker during the post-pandemic tightening cycle than in the comparator cycles. Put differently, more and faster tightening was accompanied by weaker pass-through per percentage point increase in the policy rate. The interest rate betas during the post-pandemic cycle expressed as percent of the corresponding betas in the comparator cycle are shown in Figure 5. These results remain broadly unchanged if we only consider EA-12 economies (referred to as 'euro area' in the charts, which have the same cycles and data coverage). These findings are broadly robust to assuming that anticipation effects imply that pass-through at least for some bank rates begin up to six months before the actual policy rate hikes (Annex Figure A1). They also apply to most individual countries (Figure 6). For instance, the pass-through to household O/N rates and mortgage rates has been generally smaller in the post-pandemic tightening cycle.

Figure 5: Pass-Through in Post-Pandemic Relative to the Comparator Cycle

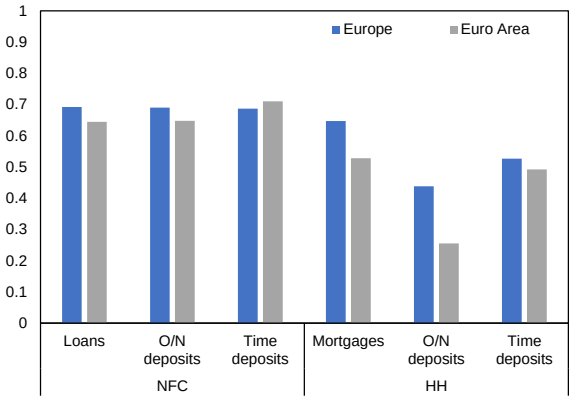
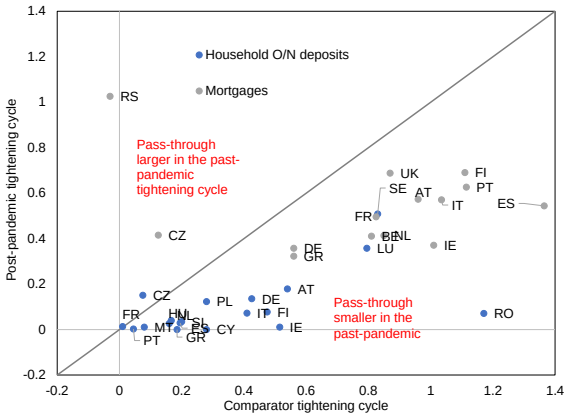


Figure 6: Pass-Through to O/N Deposit and Mortgage Rates



Note: Figure 5 shows the unweighted average of the ratio of interest rate betas in the post-pandemic period relative to the interest rate betas in the comparator cycle. The interest rate betas are defined as the cumulative change in interest rates relative to cumulative changes in the policy rate from the month of the first rate increase to three months after last rate increase (or the first loosening, or the end of sample, whichever is shorter). Figure 6 shows interest rate betas of the post-pandemic and the comparator cycles. Both Figures only contain countries that have comparator cycles as per Annex Table A1.

Next, to broaden the analysis beyond the single largest previous cycle, we compare the pass-through during the post-pandemic tightening cycle to all other previous tightening cycles using regression analysis. We follow the exchange rate pass-through literature (Burstein and Gopinath, 2014), which

Messer and Niepmann (2023) recently applied to deposit rates, and estimate the following equation in a panel setting to assess how changes in policy rates are associated with changes in bank rates:

$$r_{i,t} - r_{i,t-1} = \alpha_i + \sum_{k=0}^{K} \beta_k^T \Delta s_{i,t-k}^T + \sum_{k=0}^{K} \beta_k^{TPP} \Delta s_{i,t-k}^T d_{i,t-k} + \sum_{k=0}^{K} \beta_k^L \Delta s_{i,t-k}^L + \beta^d d_{i,t} + \sum_{k=0}^{K} \theta_k^1 \Delta IP_{i,t-k} + \sum_{k=0}^{K} \theta_k^2 \Delta CPI_{i,t-k} + \varepsilon_{i,t}, \quad (1)$$

where $r_{i,t}$ denotes an interest rate of country *i* in month *t*, α_i is a country fixed effects, $\Delta s_{i,t}$ denotes changes in the policy rate, with the superscript *T* (*L*) referring to rate hikes (cuts); $d_{i,t-k}$ is a dummy variable that is one for the post-pandemic tightening cycle. This allows for different pass-through for policy rate hikes and cuts, implying that β_k^L is the pass-through for loosening and β_k^T is the pass-through for tightening (both for lag *k*), and for a different pass-through in the post-pandemic tightening cycle ($\beta_k^T + \beta_k^{TPP}$).

In contrast to the interest rate betas used so far, this regression controls for confounding factors. We include the contemporaneous and *K* lags of the 12-month log change in industrial production (*IP*) and core consumer price inflation (*CPI*) to control for changes in deposit and credit demand. We estimate the regression separately for NFC loan rates, mortgage rates, as well as time and O/N deposit rates of NFCs and households. Standard errors are clustered at the country level. The estimated pass-through based on Eq. (1) is broadly robust to including the lagged levels and lagged changes of the bank interest rates, as well as year fixed effects; see Annex Figure A2.[8]

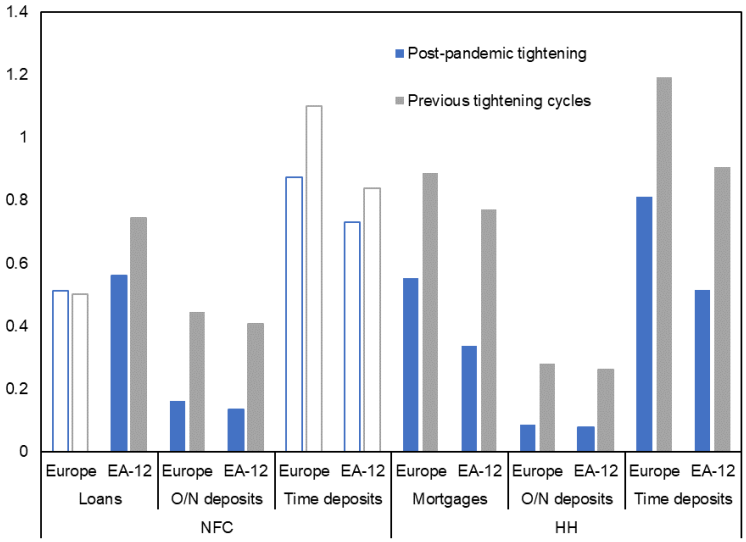
In Figure 7, we report the long-run pass-through of the different rates separately for the post-pandemic cycle and all earlier tightening periods. The long-run pass-through is defined as the cumulative effect of a policy rate change over *K* consecutive periods and given by $\sum_k^K \beta_k^T$ (and by $\sum_k^K \beta_k^T + \sum_k^K \beta_k^{TPP}$ for the post-pandemic tightening cycle). We set *K=6* but our results are similar with longer lags.

The results confirm that the pass-through is significantly weaker in the post-pandemic cycle than in previous tightening cycles, both in the full sample and among EA-12 countries, except for NFC loans in the full sample and NFC time deposits in both samples. The declines are large: On average across both samples, the differences in the estimated pass-through between previous tightening cycles and the post-pandemic cycle are 0.2 for HH and NFC O/N deposits and 0.4 for HH time deposits and mortgages, and all statistically significant at the ten percent level.[9] A difference in pass-through of 0.2 implies that of a given policy rate hike, 20 percent less is passed on to bank interest rates. For NFC loans, the differences are not significant at conventional levels in the full sample.

[8] Including the lagged change of the interest rate somewhat increases the long-run pass-through to lending rates.

[9] The relatively large decline for pass-through to mortgage rates is partly caused by the very low pass-through to mortgage rates in some countries in which mortgage rates increased considerably before the ECB started its post-pandemic tightening cycle.

Figure 7. Estimated Policy Pass-Through: Post-pandemic Tightening vs. Previous Tightening Cycles



Note: Pass-through estimated based on Eq. (1). The differences between solid bars are statistically significant at least at the 10 percent level.

4.3 The pass-through has been slower this time, except to NFC loan rates

Another aspect of the pass-through is how fast changes in policy rates translate into changes in lending and deposit rates. To analyze the speed, we first estimate impulse response functions for policy rate hikes (month-over-month increase in monetary policy rates) using the local projection model proposed by Jordá (2005). As in the previous subsection, we compare the post-pandemic and all previous tightening cycles and again separately include one variable for positive shocks (i.e., policy rate hikes) to account for tightening episodes, and a separate variable for negative shocks (i.e., policy rate cuts) to account for loosening episodes. We estimate the following equation:

$$r_{i,t+h} - r_{i,t-1} = \alpha_i^h + \beta_1^h \Delta s_{i,t}^T + \beta_2^h \Delta s_{i,t}^L + \sum_{j=1}^{h-1} \beta_3^h \Delta s_{i,t+h-j}^T + \sum_{j=1}^{h-1} \beta_4^h \Delta s_{i,t+h-j}^L + \beta_5^h \Delta s_{i,t-1}^T + \beta_6^h \Delta s_{i,t-1}^L + \beta_7^h \Delta r_{i,t-1} + \sum_{t=0}^{6} \theta_1^h \Delta IP_{i,t} + \sum_{t=0}^{6} \theta_1^h \Delta CPI_{i,t} + \varepsilon_{i,t} \quad (2)$$

in which *i, t, and h* refer to the country, month, and the horizon of the projection, respectively, Δs^T refers to policy rate hikes and Δs^L refers to policy rate cuts. As in the previous section, the regressions assess how changes in policy rates are associated with changes in bank rates and include controls for the year-over-year change in industrial production, $\Delta IP_{i,t}$, year-over-year change in core inflation, $\Delta CPI_{i,t}$, and country fixed-effects α_i^h In addition, we include controls for policy changes that are in between the time of the

change and the time of the cumulative response, $\Delta s_{i,t+h-j}^{T}$, and the first lag of the month-over-month change in the monetary policy rate, $\Delta s_{i,t-1}^{T}$.[10] Standard errors are clustered by country.

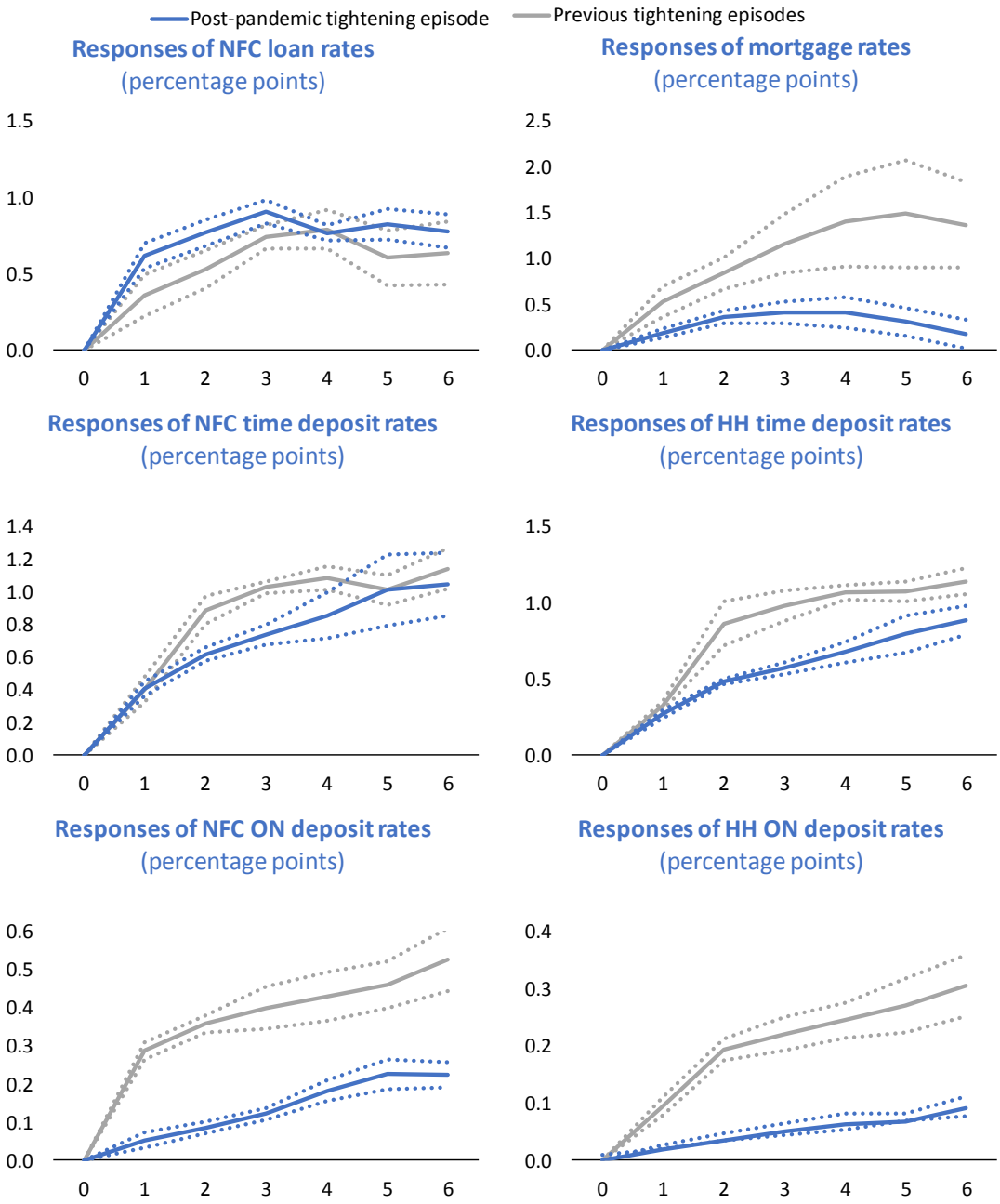
Figure 8 presents impulse response functions (IRFs) of interest rates to monetary policy hikes in the post-pandemic tightening cycle and in previous tightening episodes using panel local projections. The IRFs in Figure 8 are broadly consistent with the previous section in the sense that the pass-through in the post-pandemic cycle has been weaker than in previous tightening cycles for most interest rates. By contrast (but in line with the earlier results), the pass-through to NFC loan and NFC time deposit rates is similar.

These IRFs imply that the pace of pass-through to rates of has been slower in the post-pandemic cycle compared to the earlier tightening episodes, with some caveats and exceptions. Eyeballing the pace of pass-through from the slopes of the IRFs suggests that for NFC loans and time deposits, the pass-through was slow but over time caught up to some extent to the pass-through in previous tightening cycles. With respect to mortgage and O/N deposit rates, the pass-through was slower and weaker, with no catch-up over time.

We then use a simple quantitative measure of the pace of pass-through, namely the peak response divided by the time it takes to reach the peak. The peak response is defined as the largest significant response within the six months after the hike (where significance is defined as within one standard deviation). Figure 9—partially based on the IRFs in Figure 8—and Figure 10—based on country-by-country impulse response functions—confirm these results in a more formal way for the whole sample and the euro area. Annex Figure A3 includes a country-by-country comparison between the pace of pass-through in the post-pandemic hiking cycle and previous tightening episodes.

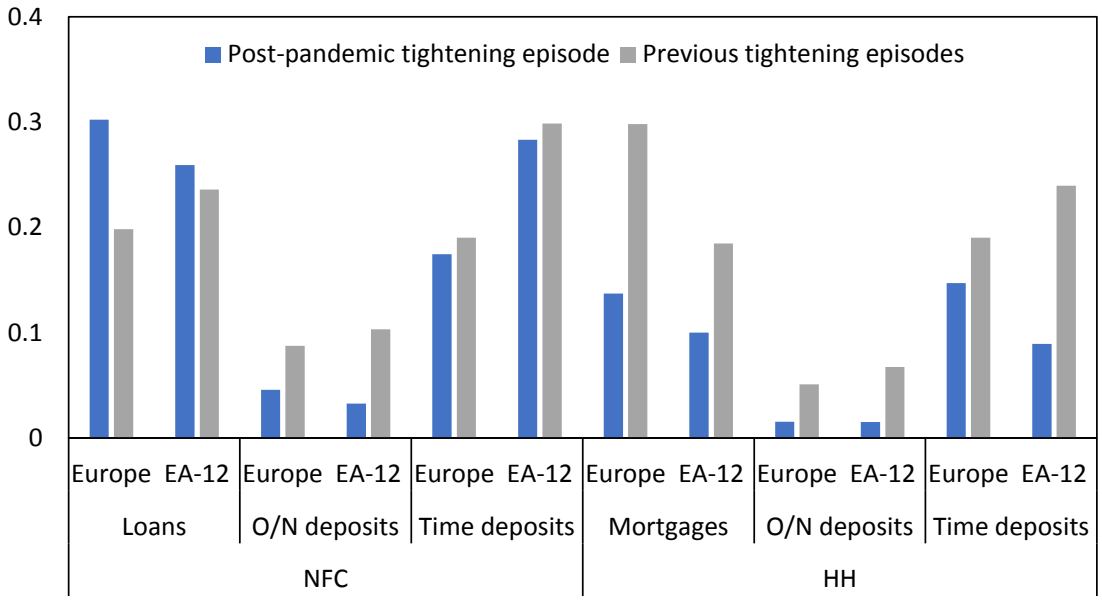
[10] Methodologically, both equations 1 and 2 yield the same pass-through under some conditions.

Figure 8. Cumulative Responses of Interest Rates to Monetary Policy Rate Hikes



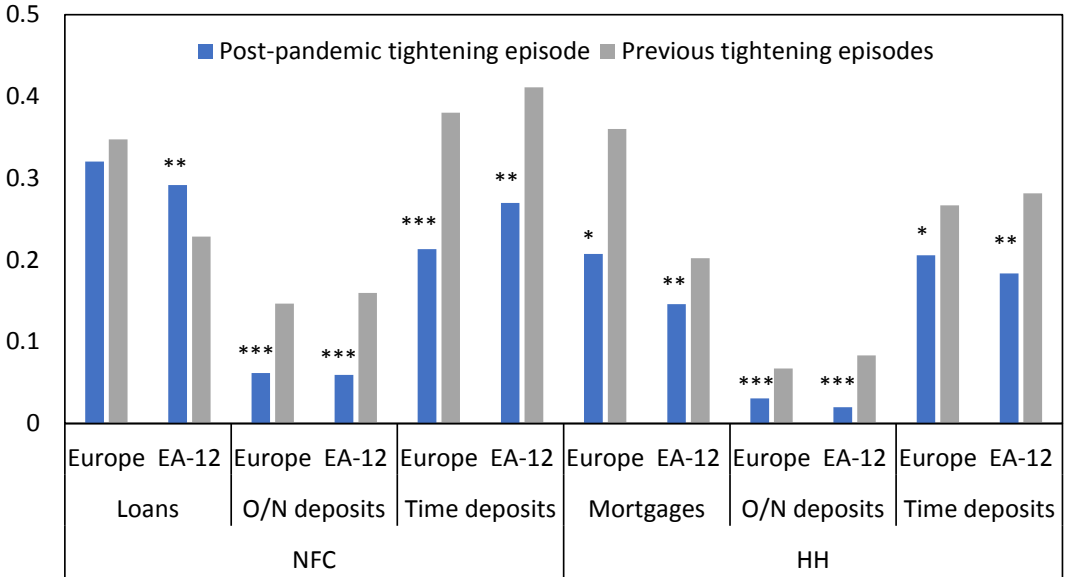
Notes: The solid lines show the responses to the changes in the monetary policy rates derived from panel local projection. The dotted lines show the 68 percent confidence interval (+/- 1 standard deviation).

Figure 9: Pace of Pass-through to Interest Rates: Panel Local Projection



Note: This figure Is based on the panel local projection responses shown in Figure 8.

Figure 10. Average Pace of Country-Specific Pass-Through to Interest Rates



Note: This graph takes the simple average of the country-specific results gathered through impulse response functions. The pace of the transmission is measured as the ratio of the magnitude of the highest response to the time of to get that response. ***, **, * indicate that the difference between post-pandemic tightening episode and earlier tightening episode is statistically significant at 99 percent, 95 percent, and 90 percent confidence intervals, respectively.

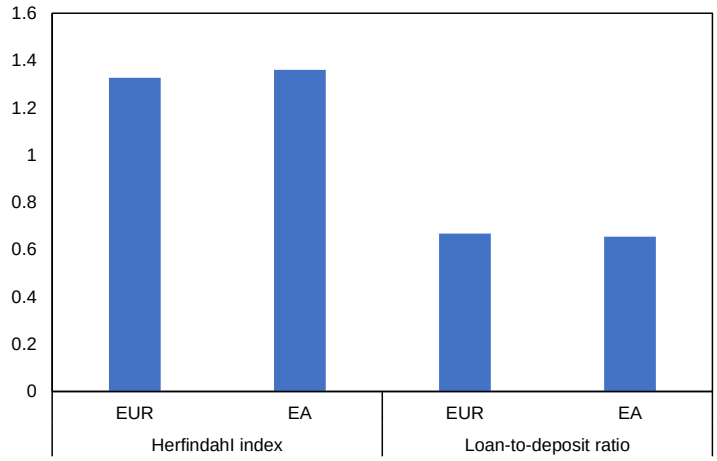
4.4 Lower banking competition, ample household and NFC deposits, and high banking liquidity are sometimes associated with lower deposit rate pass-through

This subsection empirically examines two potential determinants of monetary policy pass-through econometrically: banking sector competition (captured via financial sector concentration) and the volume of household and NFC deposits relative to loans (captured by the loan-to-deposit ratio) in our full sample. In a separate cross-section analysis, we explore the role of liquidity more broadly.

Conceptually, it seems plausible that more concentrated banking sectors could lead to lower monetary policy pass-through to deposit rates during tightening cycles. When banks compete less, deposit rates may increase less than the policy rates. At the same time, more concentrated banking sectors could be associated with higher pass-through to loan rates, again a result of lower competition. The Herfindahl index—a measure of concentration—of total assets of credit institutions suggests that bank concentration in Europe has been increasing modestly over time (Figure 11). Increasing financial sector concentration may have hence contributed to the lower pass-through to deposit rates and higher pass-through to lending rates during the post-pandemic tightening cycle, but we do not find any supporting evidence in this regard.

In addition, the volume of household and NFC deposits in combination with profitable lending opportunities (proxied by the loan-to-deposit ratio, LTD) determine incentives for banks to compete for deposits and hence pass-through to deposit rates. However, there is no clear theoretical link between loan-to-deposit ratios and the pass-through of loan rates. The LTD has fallen over time (Figure 11), consistent with evidence on post-pandemic excess savings (McGregor et al., 2022), and the sluggish recovery which undermine lending opportunities and loan volumes (see Lane, 2023b, for evidence of declining loan flows).

Figure 11. Financial Market Characteristics: Post-Pandemic Relative to Comparator Cycle
(ratio)



Note: The bars on the left shows the ratio of the average Herfindahl index in the post-pandemic cycle to that in the comparator cycle for the full sample and euro area countries.

To estimate the impact of financial sector concentration and liquidity empirically, we use Eq. (1) from Section 4.2, but with the interaction term now indicating whether a given country has a high financial sector concentration or loan-to-deposit ratio. Countries are classified every year into two groups based on year-specific medians. We estimate the same equation as before:

$$r_{i,t} - r_{i,t-1} = \alpha_i + \sum_{k=0}^{K} \beta_k^T \, \Delta s_{i,t-k}^T + \sum_{k=0}^{K} \beta_k^{TA} \, \Delta s_{i,t-k}^T d_{i,t-k} + \sum_{k=0}^{K} \beta_k^L \, \Delta s_{i,t-k}^L + \beta^d d_{i,t} + \sum_{k=0}^{K} \theta_k^1 \, \Delta IP_{i,t-k} + \sum_{k=0}^{K} \theta_k^2 \, \Delta CPI_{i,t-k} + \varepsilon_{i,t}, \quad (3)$$

where variables are defined as above but the dummy $d_{i,t-k}$ is now one when the country characteristic (concentration or loan-to-deposit ratio) is above the median. To compare the pass-through across groups, we compare $\sum_k^6 \beta_k^T$ to $\sum_k^6 \beta_k^T + \beta_k^{TA}$.

The results suggest that high concentration (and hence low competition) lowers pass-through to some deposit rates. This holds both in the full sample and among EA-12 economies, but not all differences across all rates and both samples are statistically significant at the 10 percent level (Figure 12). Differences in the pass-through to NFC deposit rates, for example, are not significant at conventional levels in the EA-12 sample. The results for pass-through to loans are either non-conclusive or far from statistically significant, indicating that competition is a less important driver of lending rates.

A higher loan-to-deposit ratio is mostly associated with stronger pass-through to some deposit rates. While the differences are less pronounced, three of them are statistically significant at the 10 percent level, with a higher statistical significance in the euro area (Figure 13); differences in the pass-through to time deposit rates are not significant in either sample. The finding that loan-to-deposit ratios seem to play a greater role in explaining pass-through in the euro area would be consistent with the generally more sluggish recovery and fewer profitable loan opportunities in the euro area.[11]

Figure 12. Financial Sector Concentration and Pass-Through

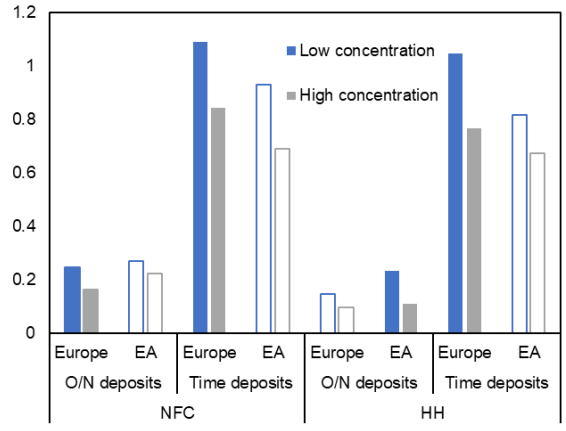
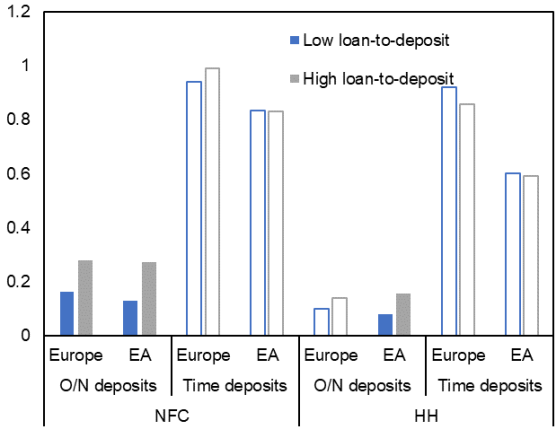


Figure 13. Loan-to-Deposit Ratio and Pass-Through



Note: Pass-through estimated based on Eq. (3). The differences between solid bars are statistically significant at least at the 10 percent level.

[11] In Annex Figure A4, we show that there is some correlation between financial sector concentration as well as LTD levels and cross-country differences in pass-through in the post-pandemic tightening cycle.

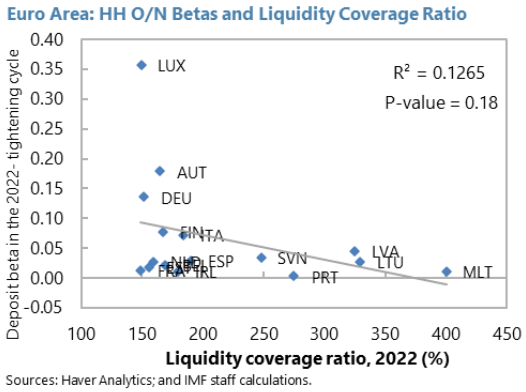
Liquidity more generally can also lead to weak pass-through. More liquid banks require less stable funding (of which deposits are part) to support the same volume of lending, implying that higher bank liquidity could induce banks to compete less for deposits, hence undermining pass-through to deposit rates. By contrast, the effects of liquidity on pass-through to loan rates are ambiguous. More liquid banks may compete in credit markets more, as they have a higher capacity to lend, or may compete less when bank liquidity increases in times when banks are less willing to lend (or when lending demand is weak). High bank liquidity – as seen during the post-pandemic tightening cycle – could therefore also explain weak pass-through to deposit rates, not least because the post-pandemic tightening cycle takes place in times of high bank liquidity. Bank liquidity is driven by several factors, including regulatory changes (such as the introduction of liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR)), bank risk-management improvements in the post-GFC period, and past QE which has reduced private holdings of government debt and raised bank deposits (which has contributed to excess reserves in the banking system, defined as bank deposits at central banks minus minimum required reserves).

In Figure 14 we explore simple correlations between bank liquidity and monetary policy pass-through based on cross-country data for the euro area. *The analysis confirms a statistically significant negative association between bank liquidity—as captured by the LCR—and NFC O/N deposit betas, consistent with the theoretical predictions.* However, the relationship with household deposit betas is negative but not significant, and the relationship with bank excess reserves is statistically insignificant at conventional levels (even if corrected for outliers).[12] The analysis shows no correlation between bank liquidity and loan rate betas (neither for NFC nor for household loans), consistent with the ambiguous theoretical predictions.

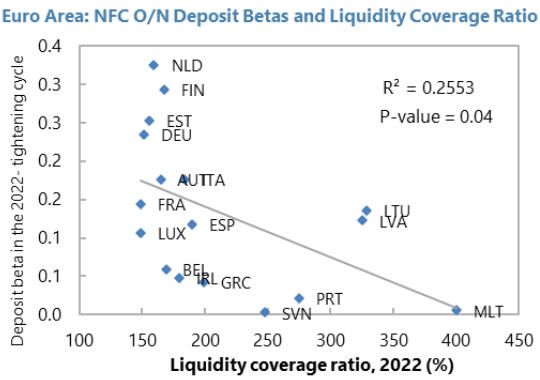
Another argument why pass-through has been weaker in the post-pandemic tightening relates to the fact that in some countries, the post-pandemic tightening cycle started from zero or negative rates. As Abadi et al. (2023) argue, pass-through could be lower around the zero-lower bound. In a robustness check, we again estimate differences between the post-pandemic tightening cycle and previous cycles, in analogy to Eq. (1), but we include two dummies for tightening in the regression model - one capturing increases from positive policy rates and one capturing increases from zero or negative rates. While the differences in pass-through become smaller, the effects are almost negligible quantitatively. We therefore conclude that the negative or zero starting values weakened pass-through, but that the effects were relatively small in the current setting (see Annex Figure A5).

[12] While excess reserves do not affect monetary policy pass-through to interest rates based on country-level data, recent analysis based on bank- and loan-level data by Fricke et al. (2023) suggests that the transmission of monetary policy tightening differs across banks depending on their level of excess reserves.

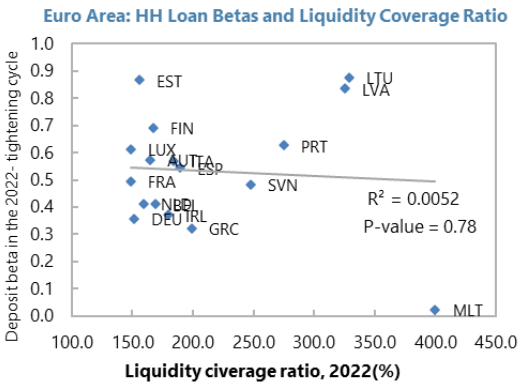
Figure 14: Correlation between interest rate betas and the liquidity coverage ratio as well as excess reserves



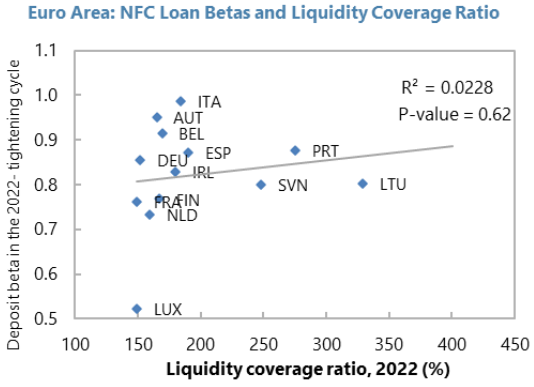
Sources: Haver Analytics; and IMF staff calculations.



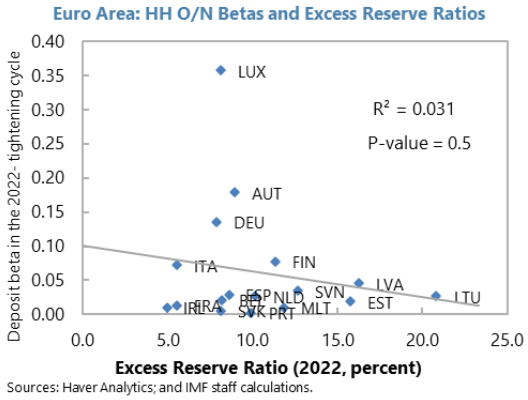
Sources: Haver Analytics; and IMF staff calculations.



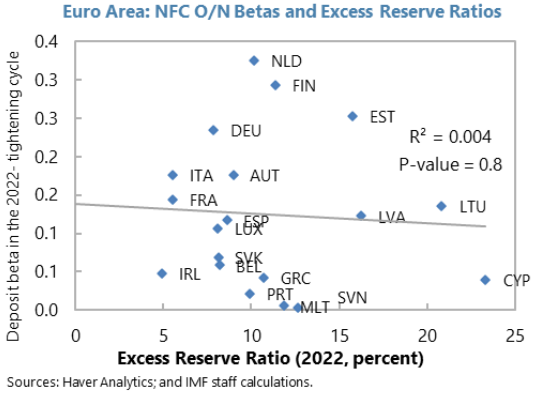
Sources: Haver Analytics; and IMF staff calculations.



Sources: Haver Analytics; and IMF staff calculations.



Sources: Haver Analytics; and IMF staff calculations.



Sources: Haver Analytics; and IMF staff calculations.

Note: Excess reserves are defined as bank deposits at central banks minus minimum required reserves (currently 1%) and are expressed in percent of total euro area MFI assets.

4.5 Pass-through to rates of existing mortgages weakened over time as the share of fixed rate mortgages increased, with heterogeneous effects across countries

In this subsection, we focus on pass-through to mortgage rates. Mortgages are the largest part of household debt in Europe, varying from about half of household debt in Hungary to more than 90 percent in the Netherlands. In this subsection, we focus on how pass-through to the rates of *existing* mortgages (which is determined by the share of flexible-rate mortgages and the average duration of fixed-rate mortgages)[13] varies and transmits monetary policy differently across countries.

First, since the GFC, the share of flexible-rate mortgages in new mortgages has decreased in many European countries, which reduces pass-through to the rates of outstanding mortgages, everything else equal (Figure 15). However, even fixed-rate mortgages are subject to repricing when the fixed term expires, implying that pass-through decreases with higher average duration of fixed-rate mortgages. Based on limited available information on average duration of household mortgages, there is large cross-country variations. For example, the majority of mortgage rates are fixed for periods longer than ten years in Belgium, whereas in the UK, mortgages have much lower maturities (but are still classified as fixed rate). Such variations also imply very different pass-through to the rates of outstanding mortgages (Figure 16).

Figure 15. Share of Flexible-Rate Mortgages (percent)

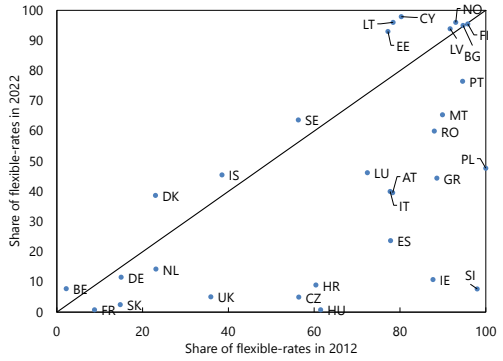
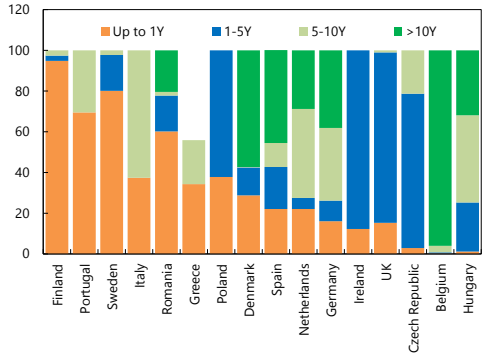


Figure 16. Maturity of Fixed-Rate Mortgages (percent, 2023Q2)



Sources: ECB; National Central Banks; The European Mortgage Federation; and IMF staff calculations
Note: In the left panel, we used 2012, 2022 or the closest year with data. In the right panel, data are not available for other types of mortgages in Greece. Data for the Netherlands are as of 2023Q1.

Second, the extent of pass-through to the rates of outstanding mortgages, and their likely effects for monetary policy transmission differ significantly across countries. As shown in Figure 17, while mortgage costs are more responsive to increases in policy rates in many central, eastern and southeastern countries, the relatively low share of households with mortgages limits the impact on the whole economy, softening monetary transmission. On the other hand, despite the high share of households with mortgages in countries like the Netherlands, the low pass-through mitigates monetary transmission. There are also countries with a low share of households with mortgages and low pass-through, in which policy rate changes have arguably the least effects.

[13] Flexible rate mortgages are defined as mortgages with an interest fixation of less than a year, whereas fixed rate mortgages are defined as mortgages with interest fixation of above one year.

Third, for some countries, strong pass-through to rates of outstanding mortgages in combination with high stock of mortgages can imply large aggregate changes in household debt service costs. In Figure 18, we quantify the aggregate changes in debt service costs in the post-pandemic cycle which are a function of the magnitude of the pass-through and the stock of outstanding mortgages. We proxy the changes in annual interest payments for mortgages by the change in the interest rate on existing mortgages multiplied by the stock of outstanding mortgages at the beginning of the cycle. The variation across euro area economies is large, with households in Portugal having experienced an increase of interest costs of more than 1.2 percent of GDP annually based on this approximation. However, as explained in Section 2, these effects cannot be equated to the aggregate output effects of monetary policy.

Figure 17. Pass-through and Share of Households with Mortgages (2021-23)

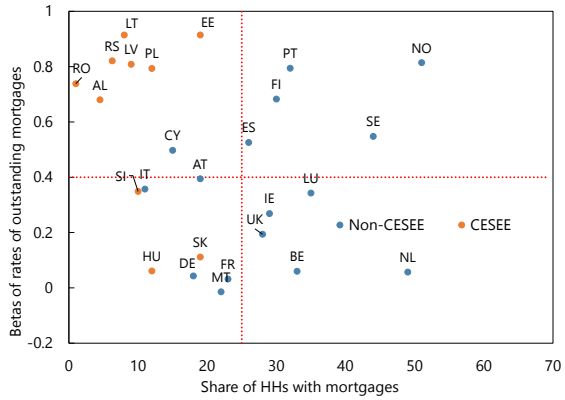
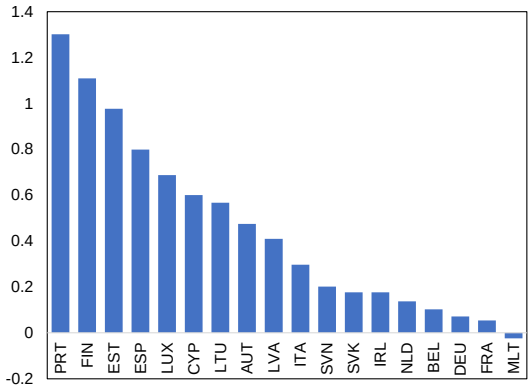


Figure 18. Changes in annual mortgage service costs due to ECB policy hikes

(percent of 2022 GDP and relative to 2022M7 mortgage stock)



Sources: ECB, Haver Analytics, national authorities, and IMF calculations.
Note: In the right panel, the ending date is August 2023.

5. Conclusions

The post-pandemic hiking cycle has been unprecedented in terms of the cumulative magnitude and pace of the policy rate increases. Yet, in this paper, we find compelling early evidence that the pass-through (relative to the change in policy rates) has been smaller and slower compared to the past, with some nuances across rates, samples, and methodologies. One exception are NFC loan rates, for which we do not find robust evidence of slower or weaker pass-through, in line with previous evidence; another exception relates to the pass-through to NFC time deposits, which is not significantly weaker. In addition, our impulse response functions suggest that the initially weak pass-through of NFC loan and time deposit rates caught up with historical averages over time.

Using regression analysis, we find some evidence that higher financial sector concentration, the volume of deposits relative to loans, and liquidity have contributed to weak pass-through to deposit rates. Finally, we show that the pass-through to the interest rate of existing mortgages can have potentially vastly different implications for monetary policy transmission depending on the volume of mortgage debt. Given that pass-through to interest rates is an important aspect of monetary policy transmission, insights into the strength and speed of pass-through to bank interest rates can help inform monetary policy decisions. In the context of the post-pandemic tightening cycle, slower pass-through implies longer lags in monetary policy transmission than in the past, but ultimately the same policy effects. Conceptually, anticipation effects (implying that some of the

pass-through occurred before the actual increase in policy rates) and negative or zero initial rates at the start of the post-pandemic cycle could have added to the weaker pass-through, but our results point to small effects.

Future research could revisit our results once more data becomes available to account for any potential lags in pass-through in the post-pandemic tightening cycle and further test the robustness of our results, including by using alternative measures of concentration. In addition, future research could expand our work by comparing the pass-through between hiking and loosening cycles, and analyzing the pass-through to NFC loan rates in a more granular way. A natural complement to our analysis is a more comprehensive analysis of the effects of monetary policy changes in conjunction with deposit and loan volumes, similarly to Lane (2023a, b), which together with our analysis of pass-through would provide a more comprehensive perspective on monetary policy transmission. For instance, Lane (2023c) shows that loan volumes in the euro area have weakened sharply starting from the end of 2022. In addition, some countries in our sample are partially euroized, implying that the pass-through to deposits and loans in domestic currency matters less. Future research could study the determinants and effects of pass-through in these countries which could be interdependent with the interest rate on euro denominated deposits and loans; see Chen et al. (2024) for a discussion on monetary policy transmission in partially euroized European countries.

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Annex I. Data Description

Table A1: Post-pandemic Hiking Cycle and Comparator Hiking Cycle[14]

Country	Start	End	The number of policy rate hikes	Length of the cycle of hikes	Cumulative policy rate change in bps	Pace (bps/month)
Albania	Mar-22	Mar-23	6	12	250	21
Czech Republic	Aug-17	Feb-20	9	30	220	7
	Jun-21	Jun-22	9	12	675	56
Hungary	Jun-03	Nov-03	2	5	600	120
	Jun-21	Sep-22	15	15	1240	83
North Macedonia	May-16	May-16	1	1	75	75
	Apr-22	Jun-23	12	14	475	34
Norway	Sep-18	Sep-19	4	12	100	8
	Sep-21	Jun-23	11	21	375	18
Poland	Apr-07	Jun-08	8	14	200	14
	Oct-21	Sep-22	11	11	665	60
Romania	Nov-07	Aug-08	7	9	325	36
	Oct-21	Jan-23	11	15	575	38
Serbia	Oct-10	Apr-11	6	6	350	58
	Apr-22	Jul-23	15	15	550	37
Sweden	Jan-06	Sep-08	13	32	325	10
	May-22	Jul-23	7	14	375	27
Switzerland	Jun-22	Jun-23	5	12	250	21
United Kingdom	Aug-06	Jul-07	5	11	125	11
	Dec-21	Jun-23	13	18	490	27
Euro Area	Dec-05	Jul-08	9	31	225	7
	Jul-22	Jul-23	9	12	425	35
Average	*Previous comparator*		*6*	*15*	*255*	*35*
	Post-pandemic cycle		*11*	*14*	*533*	*38*

Note: A comparison episode to the post-pandemic tightening cycle is selected from the past tightening periods based on the largest cumulative policy rate change. The start date of each cycle is defined as the month of the first-rate hike, and the end date is chosen as the month of the last rate hike. We restrict the cycles to periods in which at least one rate is available.

[14] In some countries, the end of the post-pandemic tightening cycle is not covered by our bank interest rate data. Albania resumed monetary policy tightening in November 2023, and Norway resumed monetary policy tightening in December 2023.

Table A2: Country Coverage and Longest Time Span for the Bank Interest Rates

Country	Longest time span		HH time deposits	NFC time deposits	HH O/N deposits	NFC O/N deposits	Consumer loans	NFC loans	Mortgages
	Start	*End*							
Albania	*Dec-18*	*Aug-23*			✓	✓		✓	✓
Austria	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Belgium	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Cyprus	*Jan-03*	*Aug-23*			✓	✓	✓		
Czech Republic	*Jan-04*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Estonia	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Finland	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
France	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Germany	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Greece	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Hungary	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Ireland	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Italy	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Latvia	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Lithuania	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Luxembourg	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Malta	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Netherlands	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
North Macedonia	*Jan-15*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Norway	*Dec-13*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Poland	*Jan-04*	*Aug-23*	✓	✓	✓	✓		✓	✓
Portugal	*Jan-03*	*Aug-23*			✓	✓		✓	✓
Romania	*Jan-07*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Serbia	*Sep-10*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Slovak Republic	*Jan-03*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Slovenia	*Jan-03*	*Aug-23*	✓	✓			✓	✓	✓
Spain	*Jan-03*	*Aug-23*	✓		✓	✓	✓	✓	✓
Sweden	*Aug-05*	*Aug-23*	✓	✓	✓	✓	✓	✓	✓
Switzerland	*Jun-17*	*Aug-23*			✓	✓	✓		
United Kingdom	*Jan-03*	*Jul-23*	✓	✓	✓	✓	✓	✓	✓

Table A3: Excluded Countries in Comparisons of Pass-Through Over Time

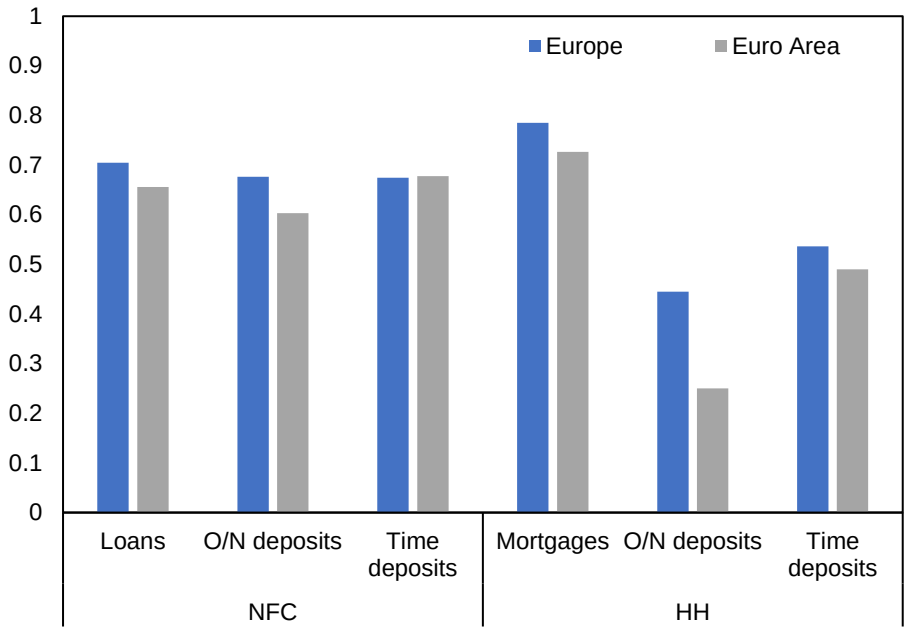
Bank rate	Excluded countries in comparisons of pass-through over time
HH time deposit rate	Albania, Greece, Serbia, Lithuania, Norway, Latvia, North Macedonia
NFC time deposit rate	Albania, Ireland, Finland, Greece, Lithuania, Luxembourg, Latvia, North Macedonia, Malta, Serbia, Norway, Sweden
HH overnight deposit rate	Albania, Greece, Serbia, Lithuania, Latvia, North Macedonia
NFC overnight deposit rate	Albania, Greece, Serbia, Lithuania, Latvia, North Macedonia
NFC loan rates	Albania, Greece, Hungary, Lithuania, Luxembourg, Latvia, Malta, North Macedonia, Poland, Sweden
HH mortgage rates	Albania, Greece, Hungary, Lithuania, Luxembourg, Latvia, Malta, North Macedonia, Poland, Sweden
HH time deposit rate	Albania, Greece, Serbia, Lithuania, Norway, Latvia, North Macedonia

Table A4: Variable Definitions and Sources

	Variables	Definition	Frequency	Data sources
Monetary policy rate	Policy rate	We use main refinancing operations (MRO) for ECB policy rate and short-term interest rate for non-euro area countries	Monthly	ECBnational central banks
Bank interest rates	HH O/N deposits	Interest rate on overnight household deposits	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	NFC O/N deposits	Interest rate on overnight non-financial corporation	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	HH time deposits	Interest rate on household time deposits with agreed maturity for new business	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	NFC time deposits	Interest rate on non-financial corporation deposits with agreed maturity for new business	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	Consumer loans	Interest rate on consumer loans with agreed maturity for new business	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	NFC loans	Interest rate on loans to non-financial corporation for new business	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
	Mortgages	Interest rate on new mortgages, all maturity	Monthly	ECB: MIR-MFI Interest Rate Statistics; national central banks
Financial sector characteristics	Concentration	We use Herfindahl index of total assets of credit institutions as a proxy for banking sector concentration	Annual	ECB
	LTD	loan-to-deposits ratio as proxy for volume of deposits relative to profitable lending opportunities	Monthly, Quarterly (EA19, Romania)	ECB, national central banks

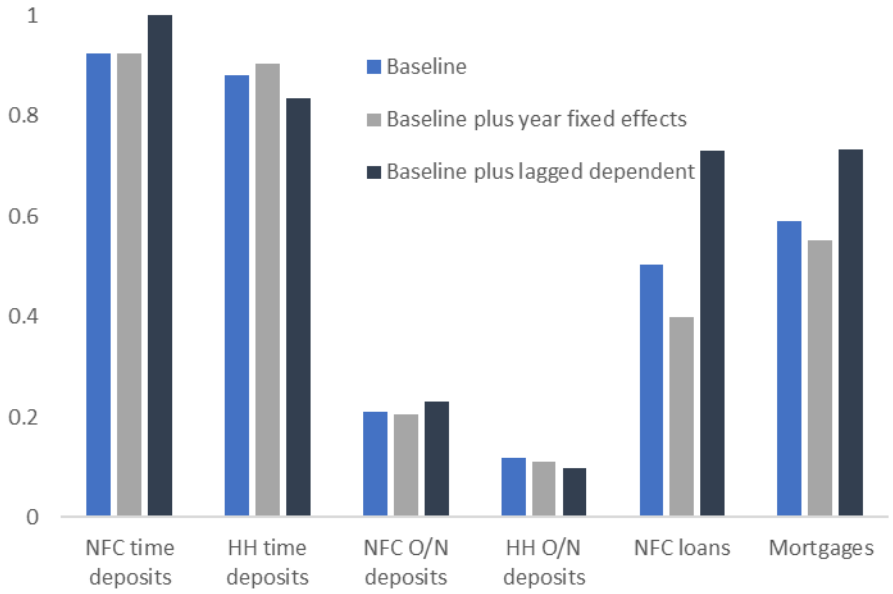
Annex II. Additional Charts and Results

Figure A1: Pass-Through in Post-Pandemic Relative to the Comparator Cycle (Pass-through computed starting from six months before first rate hike)



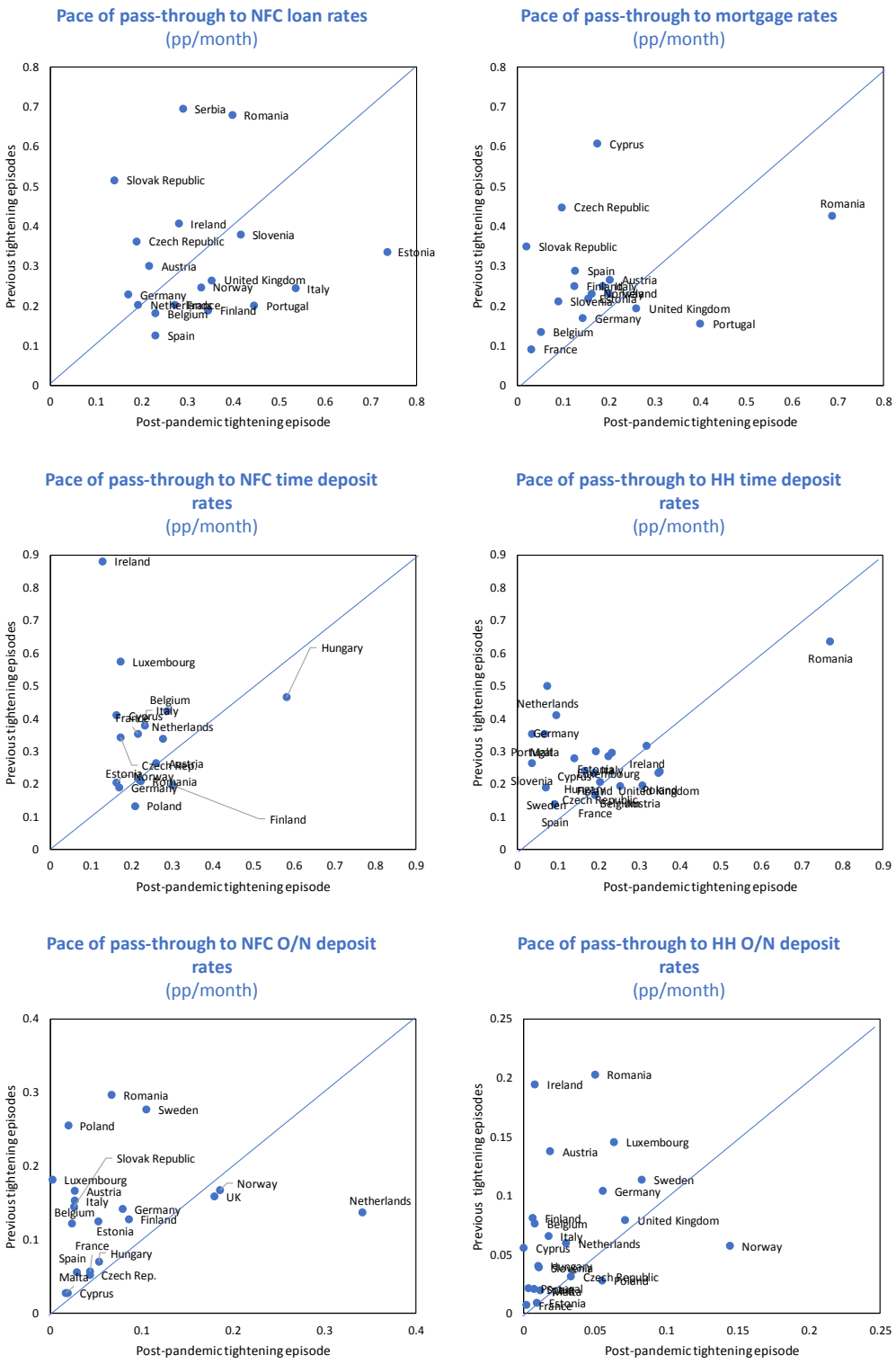
Note: Interest rate betas during the post-pandemic cycle expressed as percent of the corresponding betas in the comparator cycle as in Figure 5, but assuming that anticipation effects imply that pass-through at least for some bank rates begin up to six months before the actual policy rate hikes

Figure A2: Estimated Pass-Through with Different Types of Fixed Effects



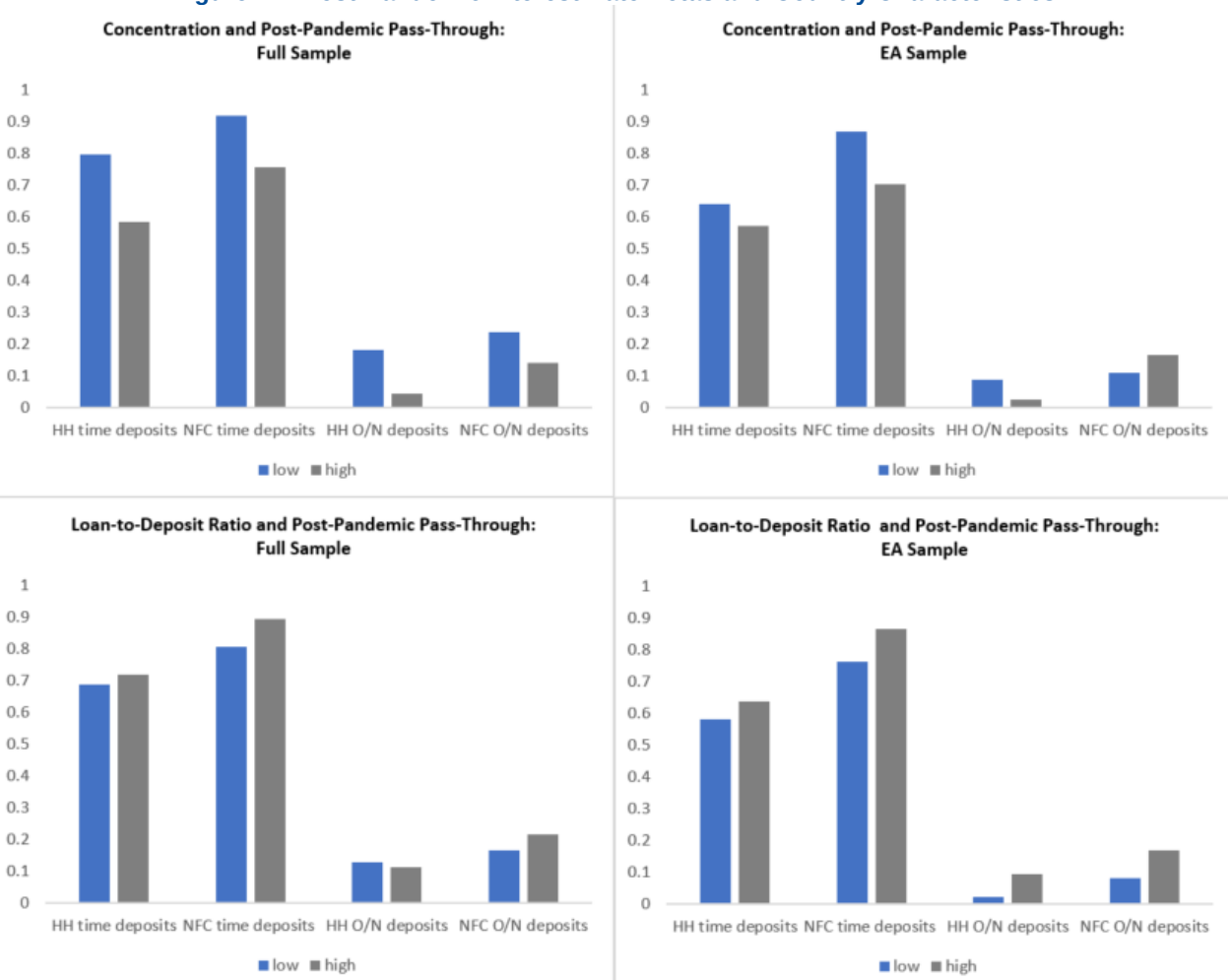
Note: This figure covers the entire sample for all periods and does not include any interaction terms.

Figure A3. Estimated Pace of Pass-Through by Country



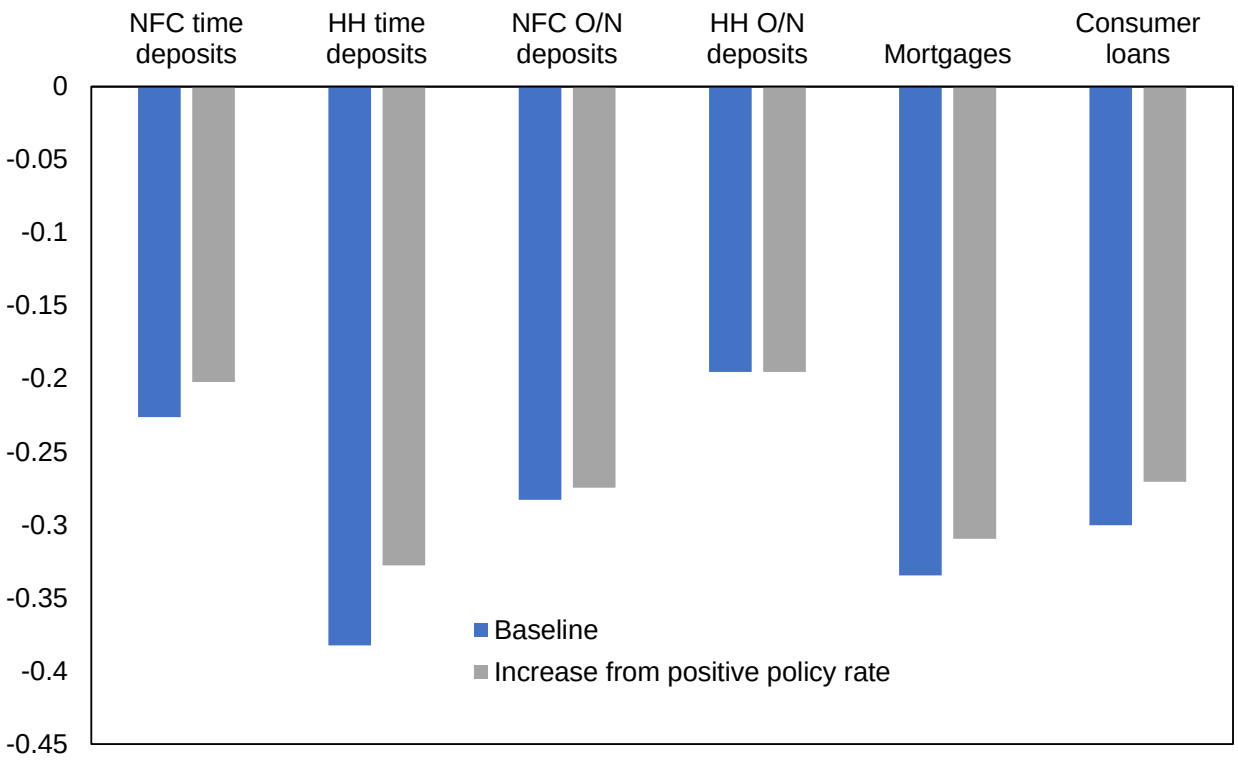
Note: Pace of pass-through estimated based on country-by-country impulse response functions. The pace of pass-through which is the peak response divided by the time it takes to reach the peak.

Figure A4: Post-Pandemic Interest Rate Betas and Country Characteristics



Note: Pass-through calculated as the ratio of cumulative change in interest rates relative to cumulative changes in the policy rate from month of first rate increase to three months after last rate increase (or the first rate cut or the end of the sample, whichever is shorter) in the post-pandemic tightening cycle.

Figure A5: Estimated Policy Pass-Through: Post-pandemic Tightening vs. Previous Tightening Cycles (controlling for different pass-through at zero or negative policy rates)



Note: Figure shows differences between post-pandemic and previous tightening cycles as estimated in analogy to Eq. (1) but with inclusion of two dummies for tightening in the regression model - one capturing increases from positive policy rates and one capturing increases from zero or negative rates.

PUBLICATIONS

Monetary Policy Pass-Thorough to Interest Rates: Stylized Facts from 30 European Countries

Working Paper No. WP/2024/009