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Deposit interest rates and monetary policy transmission

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Abstract
Banks play a key role in the transmission of monetary policy. Traditionally the analysis of the transmission mechanism has focused on banks' lending activities. However, deposits also play an important role in the transmission of monetary policy. We characterize the deposit market in Portugal and examine the pass-through of monetary policy to bank deposits. We find that there is an incomplete pass-through of monetary policy to deposit interest rates. A 100 bps increase in money market interest rates is reflected in an average 65 bps increase in new deposit rates over a year, i.e., the deposit beta is 65 bps. For the euro area, the corresponding deposit beta is 87 bps, suggesting a stronger pass-through. A similar exercise for credit suggests that the magnitude of the pass-through of monetary policy to loan rates is weaker (58 basis points). (JEL: E5, G21.)

1. Introduction

When the European Central Bank (ECB) changes monetary policy rates or adopts other monetary policy decisions, the transmission mechanism that will ultimately ensure that the price stability objective is achieved is complex and multidimensional. Indisputably, banks play a key role in this transmission mechanism. Through monetary policy operations, banks' funding costs and returns are shaped by central bank decisions. Banks will then pass through these changes to the economy.

Most of the literature on monetary policy transmission through banks has focused, until recently, on how monetary policy is transmitted through credit markets. When monetary policy tightens, banks' funding costs increase and this leads banks to charge higher rates on the loans they offer. Credit decreases at the intensive and extensive margin, i.e., firms and households borrow smaller amounts and are less likely to borrow overall. This credit contraction reflects not only a contraction in credit supply but also of credit demand, as investment opportunities deteriorate with higher interest rates, due to a decrease in the net present value of projects.

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More recently, the literature on monetary policy transmission has shifted its focus to the right-hand side of banks' balance sheets. The pricing of deposits also plays a key role in the transmission of monetary policy. Drechsler et al. (2017) show that when monetary policy tightens, the spreads that banks charge on their deposits widen, leading to deposit outflows, as deposits become a less competitive savings instrument. The outflow of deposits leads to a contraction in lending (deposit channel of monetary policy).

During the 2022-2023 tightening cycle, a public debate has emerged about the speed at which banks increased deposit interest rates. This led to the popularity of the concept of deposit betas, initially proposed by Drechsler et al. (2017). This concept allows to estimate the magnitude of the pass-through of monetary policy to deposit rates. In this article, we apply this methodology and examine the transmission of monetary policy through deposits in Portugal, using data for the period 1997Q4 up to 2023Q4. We find that the pass-through of monetary policy to bank deposit interest rates is incomplete. A 100 basis point increase in money market interest rates is reflected in an average 65 bps increase in new deposit rates, over a year. This compares to a slightly stronger pass-through in the euro area of 87 bps.

We also estimate the sensitivity of new loan interest rates to monetary policy. We find that the pass-through to loan rates is quite similar, thereby not sustaining the hypothesis of asymmetric pass-through in loans and deposits, through the business cycle.

The paper proceeds as follows. First, we describe the Portuguese deposit market and establish a set of stylized facts. Afterwards, we implement the methodology proposed by Drechsler et al. (2021) to compute the pass-through of monetary policy to deposit rates (the so-called deposit betas) for different deposit segments in Portugal. We extend the analysis to the euro area and we also examine the pass-through of monetary policy to loan interest rates.

2. Deposit market in Portugal: structural characteristics and recent evolution

In December 2023, total deposits held by banks in Portugal amounted to 341 billion euros (79% of banks' assets, 87% of their liabilities, and 107% of GDP). Deposits are the main financing source of banks and the main savings instrument of households and firms. Household deposits account for 63% of the total, while deposits of non-financial corporations account for 23%. The remainder refer to deposits of other financial institutions (12%) and public administrations (2%).

Figure 1 shows the evolution of deposits since the earliest period for which data is available (1979). Household deposits have always accounted for the largest share of total deposits. Deposits from firms have increased over the years, with a marked increase during the pandemic. Both household and corporate deposits have decreased since the record highs reached during the pandemic. The precautionary savings accumulated during this period have been used to finance investment and consumption, supporting the recovery of economic activity. In December 2023, household deposits were still

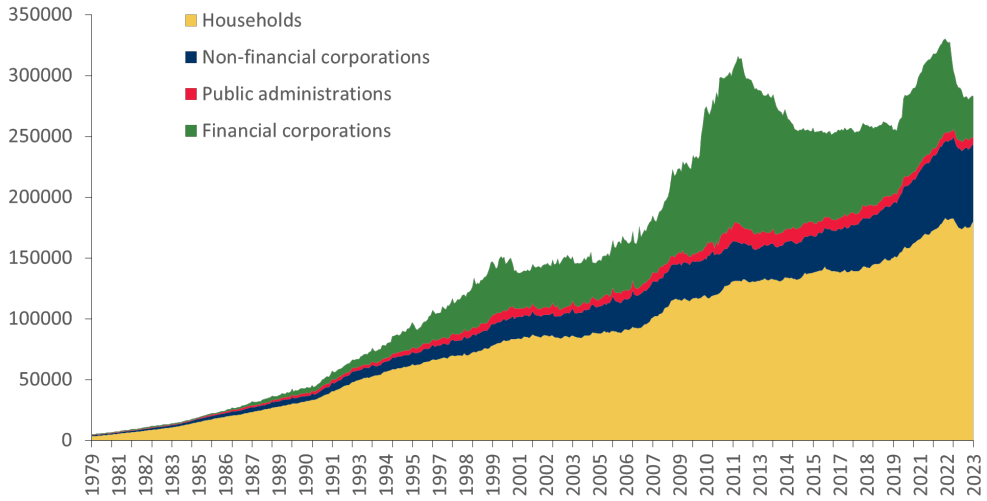

FIGURE 1: Deposits in Portugal, by institutional sector.

Source: Banco de Portugal.
Notes: The last observation refers to December 2023. The unit is million euros.

19.3% higher than immediately before the pandemic (February 2020). Non-financial corporations' deposits were 44.8% higher.

The decrease in deposits has been mostly concentrated in the recent period of monetary policy interest rate hikes. Household deposits started to decrease in August 2022, soon after the beginning of the hiking cycle (July 2022). They have decreased by 1.6% since that peak. Non-financial corporations' deposits reacted more slowly but more strongly, having decreased by 4.7% since the peak recorded in December 2022.

Deposits from other financial corporations also account for large amounts. These deposits display more cyclical variation, having reached peaks during the euro area sovereign debt crisis and the pandemic.

Most household deposits are deposits with agreed maturity or time deposits (Figure 2). This is traditionally the most important savings instrument in Portugal. Over the last four decades, deposits with agreed maturity accounted for more than 70% of total household deposits, on average. However, during the low-interest rate period that marked the previous decade, the share of these deposits decreased, reaching 50% in early 2022. As interest rates on deposits were at or close to zero for all types of deposits, households became broadly indifferent between overnight and agreed maturity deposits. Since interest rates began to increase, households gradually adjusted. Even though total deposits from households decreased throughout 2023, reflecting competition from other savings instruments, deposits with agreed maturity have been increasing. While total deposits decreased by 1.6% since July 2022, deposits with agreed maturity have increased 7.8%. The increase has been especially pronounced for deposits with agreed maturity between 1 and 2 years (38.4%).

Deposits of non-financial corporations display a different composition. Firms typically prefer to have liquid claims. On average, only one-third of deposits have agreed maturity (Figure 3). This percentage also decreased during the last decade of very

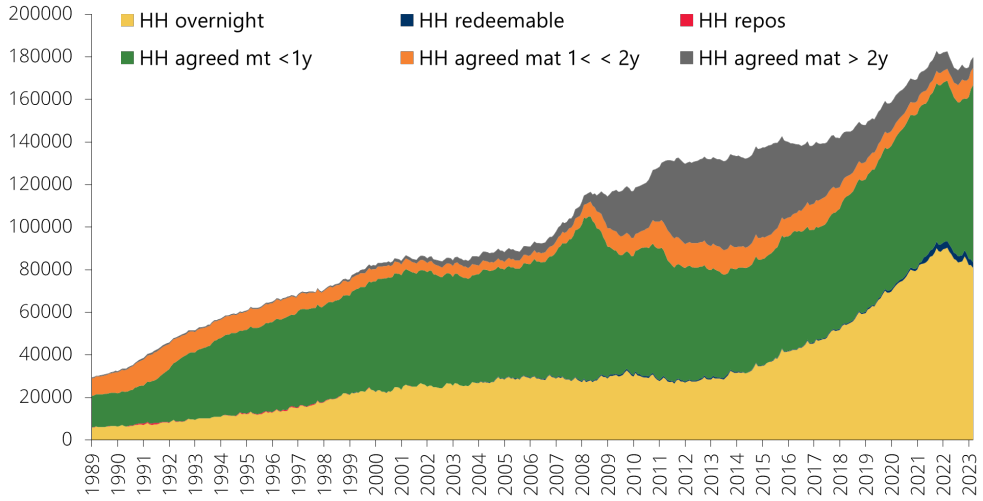

FIGURE 2: Household deposit stock in Portugal, by type of deposit.

Source: Banco de Portugal.
Notes: The last observation refers to December 2023. The unit is million euros. HH refers to households.

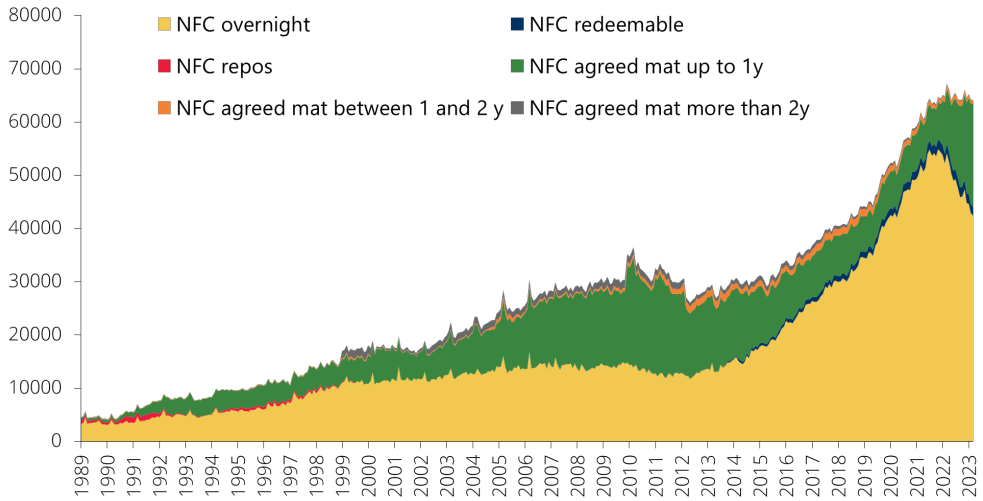

FIGURE 3: Non-financial corporations deposit stock in Portugal, by type of deposit.

Source: Banco de Portugal.
Notes: The last observation refers to December 2023. The unit is million euros. NFC refers to non-financial corporations.

low-interest rates. In mid-2022, only 12% of corporate deposits had agreed maturities. Since then, these deposits increased markedly and represented 31% of deposits by December 2023.

The recent developments in deposit growth and composition reflect, among other factors, changes in monetary policy. The main refinancing rate increased from 0% in June 2022 to 4.5% in September 2023. This is the fastest and steepest monetary policy tightening episode since the creation of the euro area. Even though deposit interest rates did not go below zero during the past decade, unlike in other euro area countries, they were very close to zero, at all maturities and for all types of deposits (Figure 4). Since

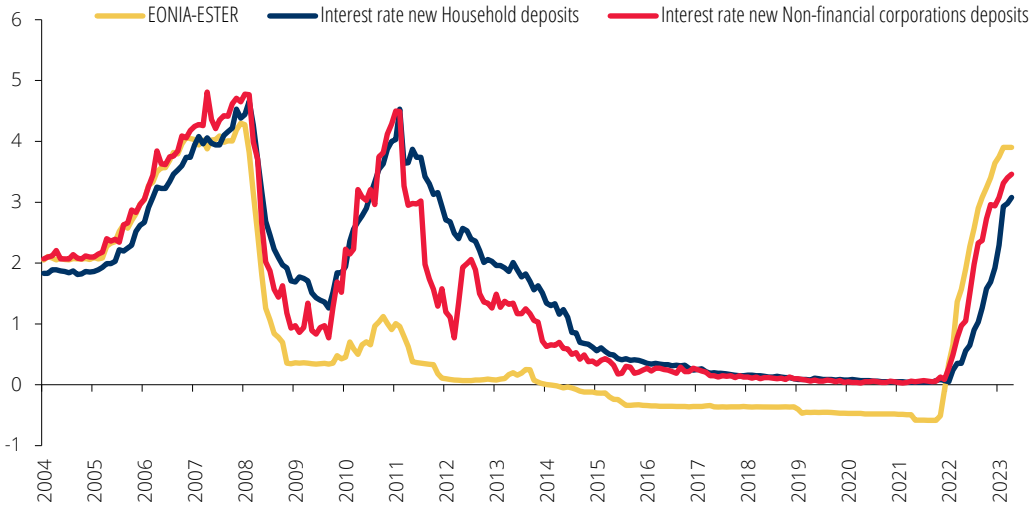

FIGURE 4: Monetary policy and deposit interest rates (new business).

Source: ECB for EONIA-ESTER and Banco de Portugal for interest rates on deposits.
Notes: The interest rates on deposits refer to new business and to agreed maturity deposits. The last observation refers to December 2023.

the end of June 2022, rates on new deposits increased 3.01 p.p. for households and 3.40 p.p. for firms. These increases were comparable to those in the euro area, where similar interest rates on deposits increased 2.99 and 3.81 p.p., respectively.

Figures 5 and 6 show the correlation between the increase in deposit rates and deposit inflows in the euro area. The increase in household deposits does not seem to be significantly larger in countries that increased interest rates more. However, for deposits of non-financial corporations, there seems to exist a positive correlation. In countries where deposit interest rates for firms increased more markedly, there was also a larger inflow of deposits.

3. The transmission of monetary policy through deposits: deposit betas

3.1. Channels of monetary policy transmission

Banks play a key role in the transmission of monetary policy. There is a vast literature on the bank lending and bank-balance sheet channels (Bernanke and Blinder, 1988; Bernanke and Gertler, 1995; Kashyap and Stein, 1994, 1995, 2000; Stein, 1998; Kishan and Opiela, 2000; Jiménez et al., 2012), as well as on the bank risk-taking channel (Adrian et al., 2019; Maddaloni and Peydró, 2011; Jiménez et al., 2014; Ioannidou, Ongena, and Peydró, 2015; Martinez-Miera and Repullo, 2016; Dell'Ariccia, Laeven, and Suarez, 2017; Paligorova and Santos, 2017; Bonfim and Soares, 2018). There are also attempts to integrate these channels (Bittner et al., 2023, Wang et al., 2022).

More recently, it has become clear that banks' funding structure is also relevant for the transmission of monetary policy. Drechsler et al. (2017) show that when monetary policy tightens, the spreads that banks offer on their deposits widen (defined as the difference

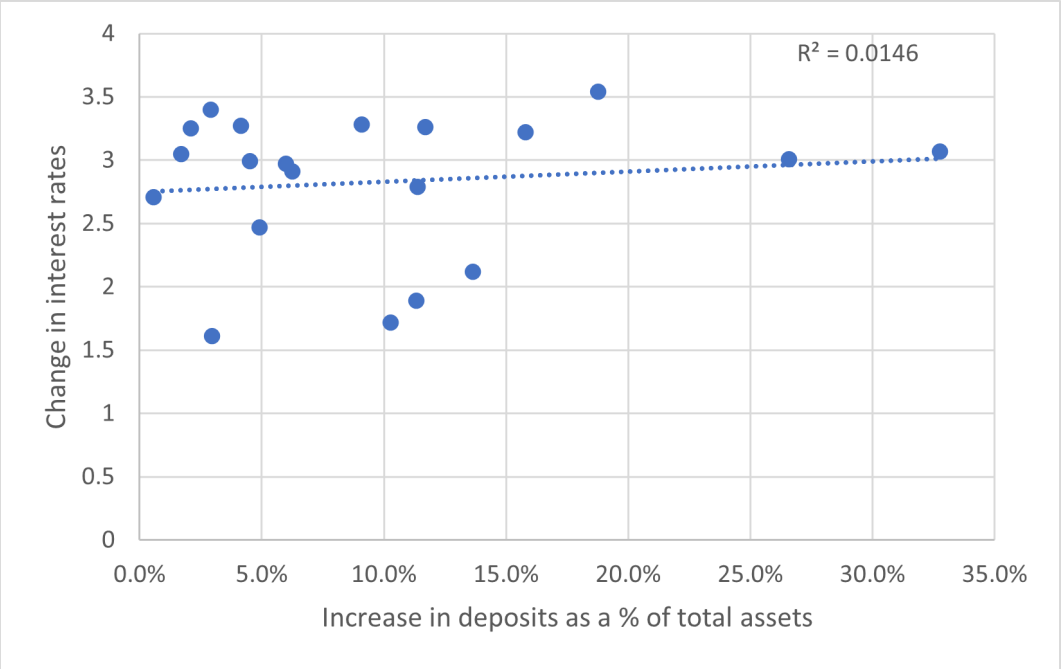

FIGURE 5: Change in interest rates and deposit inflows in the euro area - households.

Source: ECB and authors' calculations.
Notes: The x-axis displays the deposit inflow between June 2022 and December 2023, as a percentage of total bank assets in June 2022 for each euro area country. The y-axis displays the change in interest rates on deposits with agreed maturity during the same period.

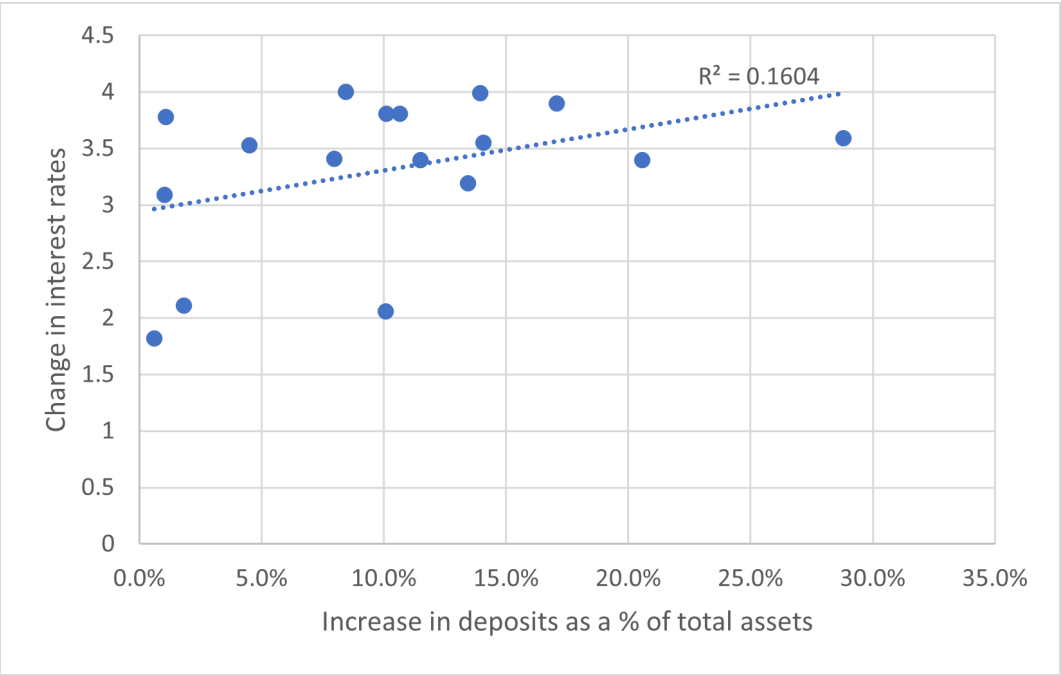

FIGURE 6: Change in interest rates and deposit inflows in the euro area - firms.

Source: ECB and authors' calculations.
Notes: The x-axis displays the deposit inflow between June 2022 and December 2023, as a percentage of total bank assets in June 2022 for each euro area country. The y-axis displays the change in interest rates on deposits with agreed maturity during the same period.

between the market interest rates and the deposit interest rate. i.e., the yearly income on the deposit franchise per unit of deposits). This creates a deposit outflow, as deposits become a less competitive savings instrument. This deposit channel of monetary policy works through the market power that banks have in deposit markets. Drechsler et al. (2021) show that banks are insulated from interest rate risk created by their maturity mismatch if they actively match the sensitivities of their income and expenses.

3.2. Methodology

To examine the transmission of monetary policy through deposits in Portugal, we follow Drechsler et al. (2021) and estimate deposit betas using the following specification on a panel of Portuguese banks:

$$\Delta\text{Deposit expenses}_{i,t} = \alpha_i + \eta_T + \sum_{\tau=0}^{3} \beta_{\tau}^{Exp} \Delta\text{Monetary Policy}_{t-\tau} + \varepsilon_{i,t} \quad (1)$$

The coefficient of interest is β. It captures how much banks increase deposit interest rates as a response to a change in monetary policy rates. For instance, a deposit beta of 0.6 means that deposit rates increase 60 bps for each 100 bps increase of monetary policy rates over the past year (as in Drechsler et al. (2021), we aggregate the coefficient over four quarters).

The dependent variable is the quarterly change in deposit expenses (i.e., interest paid to depositors), scaled by average monthly deposits of households and firms in bank i, in quarter t. To compute deposit expenses we use data from Monetary and Financial Statistics on interest rates and deposits. ΔMonetary Policy refers to the change in monetary policy rates. To follow the methodology proposed by Drechsler et al. (2021), we should use the main refinancing rate of the ECB (which would be the equivalent of the Fed Funds rate used in their paper). However, during a large part of our analysis period, this rate has been at zero. During this period, the ECB adopted a wide array of unconventional monetary policy tools that effectively loosened monetary policy beyond this zero lower bound. To overcome this, in our baseline estimates, we report the results using the money market interest rate (EONIA/ESTER), which varies more than the main refinancing rate.

We use three lags of rate changes to capture the cumulative effect of changes over a full year. We control for bank and year fixed effects (α_i and η_T, respectively). Bank fixed effects control for time-invariant bank-specific characteristics that may affect deposit pricing. Year fixed effects control for macroeconomic and financial developments that may also affect deposit pricing, at annual frequency.

3.3. Results

Figure 7 depicts the deposit betas estimated for different deposit products. We first report the results for total deposit expenses and then we report results for deposits of non-financial corporations (overnight and with agreed maturity) and of households (for the same segments). We find that deposit rates show a muted reaction to monetary

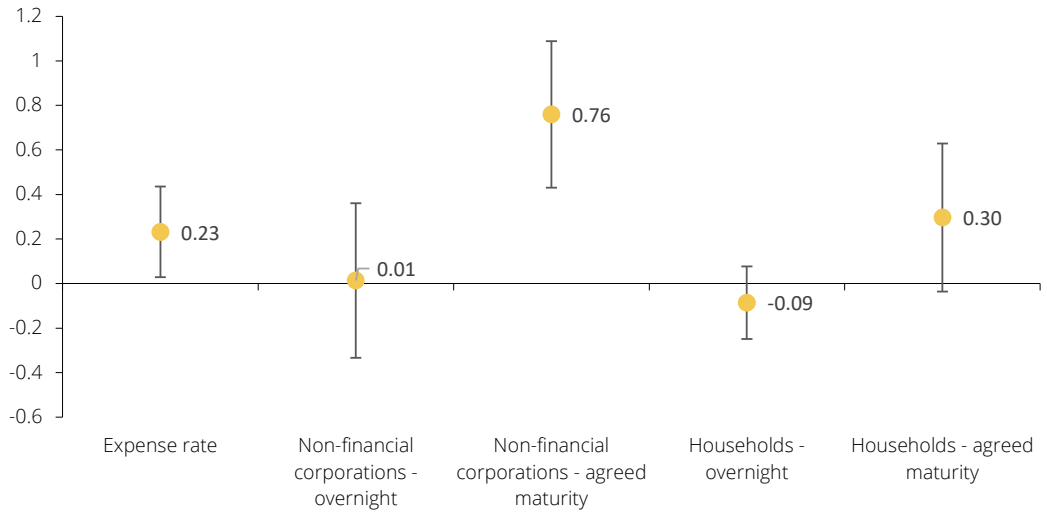

FIGURE 7: Deposit betas, by deposit type, outstanding amounts.

Source: Banco de Portugal and authors' calculations.
Notes: Deposit betas estimated using equation 1. Deposit betas capture how much banks increase deposit interest rates as a response to a change in monetary policy rates. Estimated using outstanding amounts of deposits. Confidence intervals at 95% level.

policy changes when we consider the outstanding amounts of deposits. For total deposit expenses, the deposit beta is 0.23. For each 100 basis points increase in money market interest rates, banks' deposit expenses increase 23 basis points. The small pass-through should reflect the effective zero lower bound on deposit rates (Heider et al., 2019). Even though deposit rates were very close to zero between 2015 and 2021, monetary policy was actually much more accommodative. This means that banks were making losses on deposits for this entire period, as they were offering to depositors rates that were higher than their financing cost in monetary policy facilities.

When we look separately into different deposit categories we observe that deposit betas are close to zero for overnight deposits, both for households and firms (0.01 and -0.09, respectively). This is not surprising, as overnight deposit rates are often very small and are not expected to strongly react to monetary policy decisions. The same cannot be said for deposit betas on deposits with agreed maturities. In this case, we find higher deposit betas. For firms, the deposit beta is 0.76, which means that for each 100 bps increase in money market rates, deposit interest rates on corporate deposits with agreed maturity increase by 76 bps. The beta for similar household deposits is smaller (0.30). This suggests that corporate deposits are more sensitive to pricing and banks manage deposit pricing (on deposits with agreed maturity) more actively to maintain a competitive position.

The repricing of the outstanding amount of total deposits may be somewhat slow, notably for deposits with agreed maturity. In Figure 8 we report deposit betas for new deposits. The overall deposit beta is 0.65. For firms, the deposit beta is 0.95 and for households 0.59. In this analysis. we disaggregate more in terms of deposit maturity. We find that deposit betas are higher for new corporate deposits with an agreed maturity

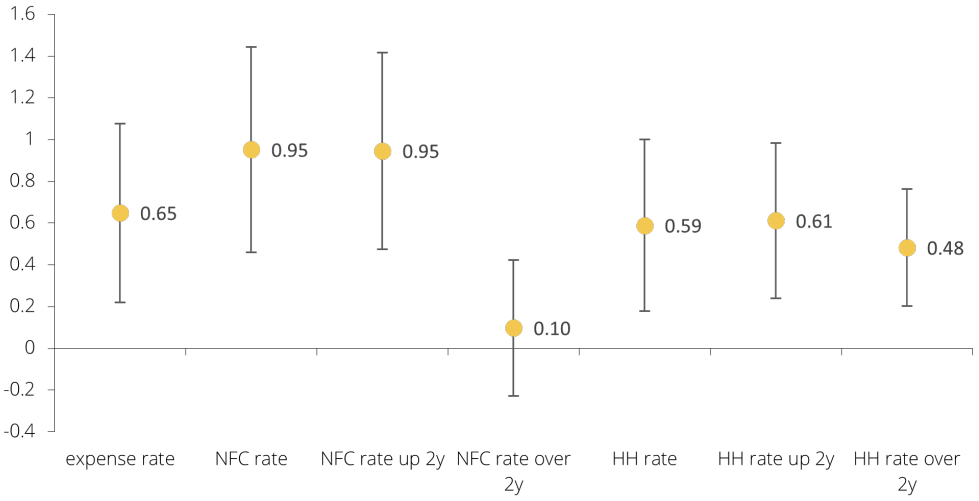

FIGURE 8: Deposit betas, by deposit type, new business.

Source: Banco de Portugal and authors' calculations.
Notes: Deposit betas estimated using equation 1. Deposit betas capture how much banks increase deposit interest rates as a response to a change in monetary policy rates. Estimated using new deposits. Confidence intervals at 95% level. NFC refers to non-financial corporations and HH to households.

of up to two years. This is the segment in which monetary policy passed through more strongly. For new corporate deposits with longer maturities, the interest rate sensitivity to monetary policy is much smaller. Again, the pricing of household deposits is less sensitive to monetary policy. Most of the reaction is also concentrated in deposits with an agreed maturity of up to two years.

To make sure that our results are not dependent on the specificities of the empirical design, we replicate the estimate of deposit betas using an array of different methodological choices. Besides computing deposit betas for outstanding amounts and new deposits at the quarterly level, we also run our deposit beta estimates at the monthly level and use monthly averages at the quarterly level. The results remain broadly unchanged.

4. Deposit betas in the euro area

During the 2022-2023 tightening cycle, deposit rates in Portugal have increased, but at a slower pace than in most other euro area countries. That said, deposit rates had been higher than in most other countries during the previous decade. This can lead to differences in deposit betas in Portugal and the euro area.

To examine this, we considered that it could be insightful to estimate Equation 1 for the euro area and compare the results to those obtained for Portugal. Instead of estimating the equation for a panel of Portuguese banks, we estimate it for a panel of euro area countries:

$$\Delta\text{Deposit expenses}_{c,t} = \alpha_c + \eta_T + \sum_{\tau=0}^{3} \beta_{\tau}^{Exp} \Delta\text{Monetary Policy}_{t-\tau} + \varepsilon_{c,t} \qquad (2)$$

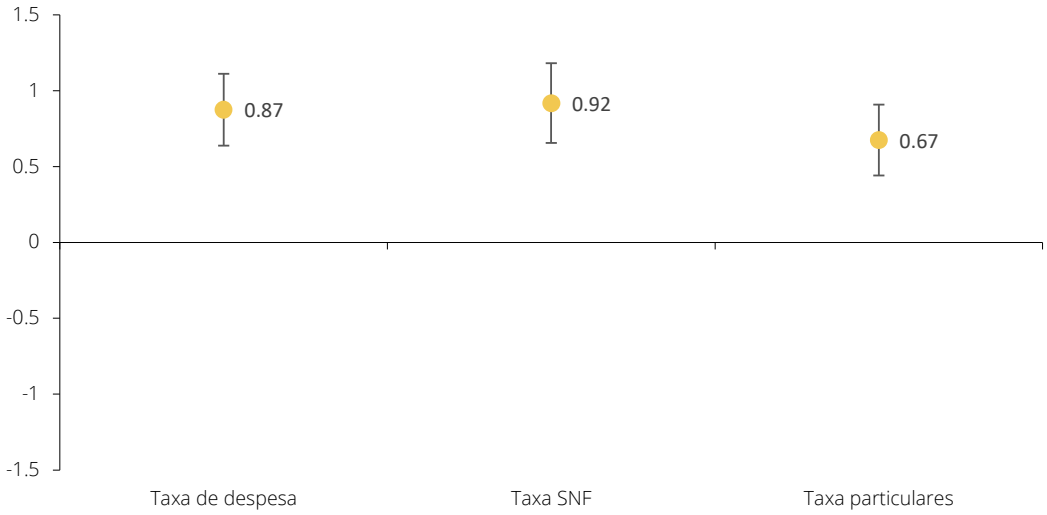

FIGURE 9: Deposit betas for the euro area, new business.

Source: European Central Bank and authors' calculations.
Notes: Deposit betas estimated using equation 2. Deposit betas capture how much banks increase deposit interest rates as a response to a change in monetary policy rates. Estimated using new deposits for each euro area country. The countries included are AT, BE, CY, DE, EE, ES, FI, FR, HR, IE, IT, LT, LV, MT, NL, PT, SI and SK. Confidence intervals at 95% level. NFC refers to non-financial corporations and HH to households.

where instead of bank i we have country c. We use data on interest expenses for Austria, Belgium, Cyprus, Germany, Estonia, Spain, Finland, France, Croatia, Ireland, Italy, Lithuania, Latvia, Malta, Netherlands, Portugal, Slovenia, and Slovakia, for the period September 2004 to December 2023. The results on deposit betas are reported in Figure 9.

The deposit beta for firms in the euro area is 0.92 for new corporate deposits and 0.67 for new household deposits. Deposit betas are slightly higher for corporate deposits in Portugal (0.95, compared to 0.92), suggesting a stronger pass-through of monetary policy to deposit rates. For households, the pass-through seems to be stronger in the euro area than in Portugal (0.67, compared to 0.59 in Portugal).

Kang-Landsberg, Luck, and Plosser (2023) run a similar exercise on U.S. banks, using interest on outstanding deposit amounts. In their data, it is not possible to estimate deposit betas separately for household and corporate deposits. For total deposits, these authors estimate a one-year cumulative deposit beta of 0.4 in the recent rate hike cycle. However, the authors note that this was an exceptionally fast and large increase in the deposit beta, when compared to previous tightening cycles (reflecting the fast and steep increase in monetary policy rates during this cycle).

5. Credit betas

The academic literature and policy analysis have focused on the concept of deposit betas. That said, it is possible to apply the same methodology to examine the pass-through of

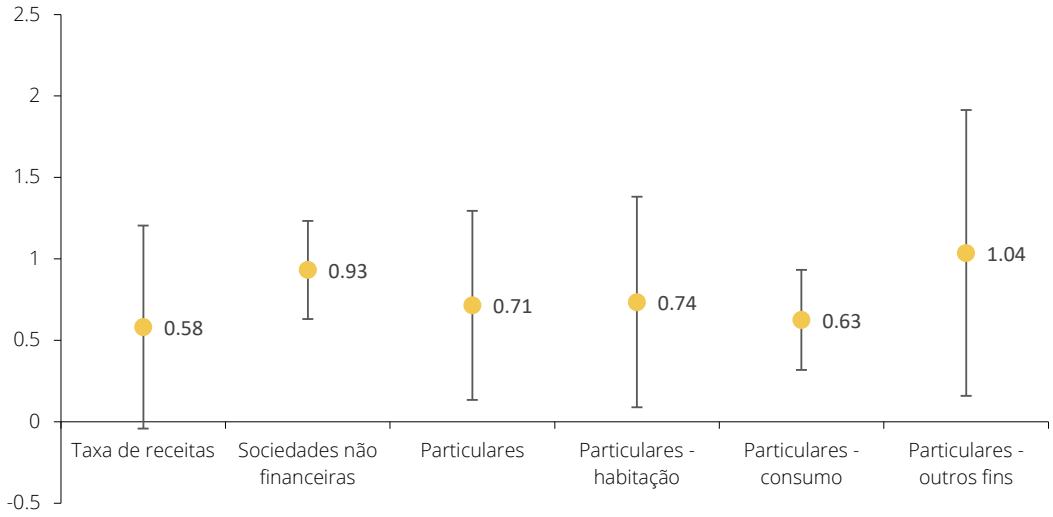

FIGURE 10: Credit betas, by loan type, new business.

Source: Banco de Portugal and authors' calculations.
Notes: Credit betas estimated using equation 3. Credit betas capture how much banks increase loan interest rates as a response to a change in monetary policy rates. Estimated using new business in bank loans. Confidence intervals at 95% level. NFC refers to non-financial corporations and HH to households.

monetary policy to lending rates and compute credit betas.We can adapt equation (1) so that:

$$\Delta\text{Credit revenues}_{i,t} = \alpha_i + \eta_T + \sum_{\tau=0}^{3} \beta_{\tau}^{Rev} \Delta\text{Monetary Policy}_{t-\tau} + \varepsilon_{i,t} \tag{3}$$

The only difference refers to the dependent variable, which now captures credit revenues, scaled by average monthly loans. Credit betas capture how much banks increase loan interest rates as a response to a change in monetary policy rates.

The results for credit betas estimated on new bank loans in Portugal are depicted in Figure 10. The overall credit beta is 0.58, which compares to 0.65 for the overall deposit beta on new deposits. This means that the pass-through of monetary policy was actually stronger for deposits than for loans, during the period considered. For corporate loans and deposits, the pass-through is very similar on both instruments (0.93 and 0.95, respectively). In contrast, banks are faster in adjusting interest rates on bank loans to households than on deposits. We estimate a credit beta of 0.71, which compares to a deposit beta of 0.59.

6. Concluding remarks

The effective transmission of monetary policy requires an adjustment not only on bank loan rates but also on deposit rates. In this article, we estimate deposit betas for the Portuguese economy. These betas capture how much of monetary policy rate changes pass-through to deposit interest rates.

The results show that there is an incomplete pass-through of monetary policy. This is not surprising, as the concept of deposit betas refers to the immediate reaction of deposit rates to monetary policy. Adjustments in interest rates reflect not only current monetary policy decisions but also expectations about their future path. As in many products, price adjustments may be sluggish and gradual.

We find that a 100 bps point increase in monetary policy rates is linked to a 95 bps increase in new deposit rates for firms and 59 bps for households, over a year (65 bps, when both segments are considered). The pass-through to loan rates is similar.

These results are broadly in line with those obtained in the euro area. That said, it should be noted that an important limitation of the analysis is that for most of the estimation period, interest rates were at the zero lower bound. This means that it is challenging to adequately measure monetary policy. The zero lower bound is expected to have conditioned the pass-through of monetary policy, notably to deposits, altering deposit betas. The estimation of deposit betas over longer periods may offer a deeper understanding of this channel of monetary policy transmission.

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