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Financial Stability Notes

Rising interest rates and higher inflation: implications for the banking sector

Joe Morell, Frances Shaw, Paul Lyons and Fergal McCann

Vol. 2022, No. 15

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Joe Morell, Frances Shaw, Paul Lyons, Fergal McCann ⓡ [1]

Central Bank of Ireland

November 2022

Abstract

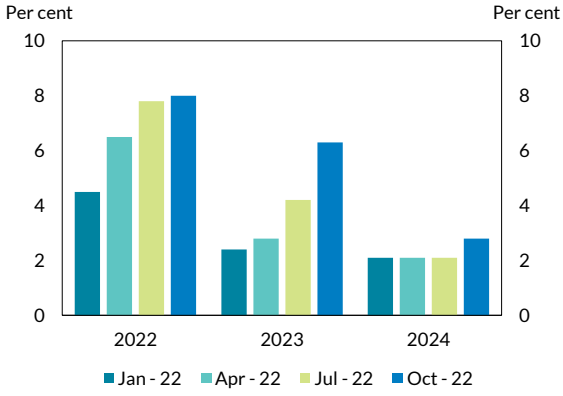
While higher inflation and higher interest rates are likely to bring downside economic risks to many economic sectors, the outlook is more balanced for the banking sector. In this Note we outline the various channels through which higher inflation and higher interest rates can both benefit and challenge the banking sector, with an empirical focus on Ireland. We conclude that, in the absence of a wider economic recession, benefits are likely to accrue to the Irish retail banking sector on net, primarily through banks' role in maturity transformation which is likely to lead to improving interest margins. While there is uncertainty around the path for loan impairments and provisioning, in a stress testing exercise, we show that adverse scenarios in which interest rates remain elevated lead to less severe outcomes for banks than scenarios where downturns are combined with low interest rates.

1 Introduction

Throughout 2022, inflationary pressures have been building. As of the *Quarterly Bulletin* for the fourth quarter of 2022, the Central Bank expects inflation in Ireland of 8 per cent for this year and 6.3 per cent in 2023 (Chart 1). Across the world, similar rates of inflation are common - euro area inflation reached 10.7% in October 2022. In response to this changing environment, central banks have been ending asset purchase programs and increasing interest rates. Across its July, September and October meetings, the ECB has increased all three of its key policy rates by 200 basis points and has signalled further interest rate increases are to come as it seeks to return inflation to its 2 per cent medium-term target. Throughout 2022, changes in the outlook for monetary policy have been reflected in upward shifts of the euro short-term rate (€STR) forward curves (Chart 2).

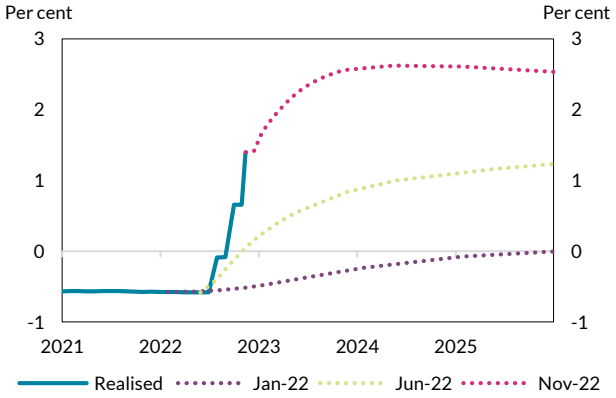
[1] Macro-Financial Division, Central Bank of Ireland. joe.morell@centralbank.ie. ⓡ Author ordering was generated with the American Economic Association's author randomization tool, code _2FFRzQpCzck. Thanks to Edward Gaffney, Vasileios Madouros, Anna Lalor and other Central Bank colleagues for helpful discussions. All views expressed in this Note are those of the authors alone and do not represent the official views of the Central Bank of Ireland.

Chart 1: Consumer Price Inflation Forecasts from Central Bank of Ireland - Quarterly Bulletin Forecasts



Source: Central Bank of Ireland
Notes: The chart reports inflation forecasts taken from the Central Bank of Ireland's Quarterly Bulletin series, where each QB forecast is based upon all available information at the point of publication

Chart 2: €STR Realised and Forward Curves



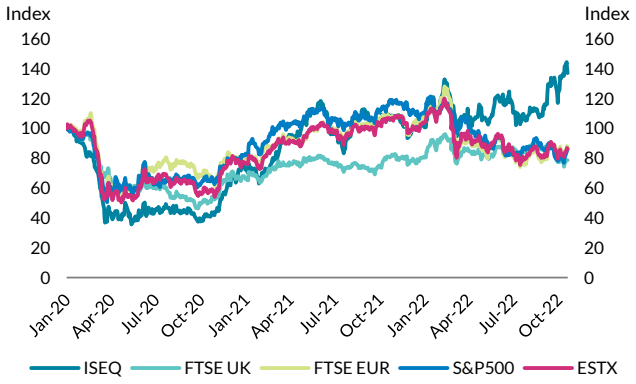
Source: ECB and Bloomberg
Note: The chart reports the realised €STR rates up until 16/11/2022 (Realised €STR) in addition to the €STR forward curves as at Jan-22, Jun-22 and Nov-22.

Interest rate increases and rising inflation are generally predicted to dampen economic growth, and will have associated negative implications for banks through increases in provisioning needs, increases in distressed loans and reduced valuations on securities. The more immediate and direct net effect of higher inflation and higher interest rates on the banking sector is, however, more uncertain than may be the case in other economic sectors. This is due to banks' unique role in maturity transformation, earning an interest spread in lending and securities investment relative to the rate paid to depositors and other liability holders. In an Irish context, market perceptions of the banking sector have been more favourable in comparison to other national banking indices in recent months (Chart 3). While this relative out-performance likely reflects a mix of factors, including the relative prospects of the Irish economy and the ongoing consolidation of the Irish banking system, these market expectations also suggest that Irish banks are relatively well placed to benefit from the emerging changes in the monetary environment.[2]

The relatively favourable position of Irish banks may also be a function of the sector's structural characteristics. In particular, Irish banks rank among the highest in Europe in terms of the share of net interest income share in total operating income (Chart 4). Consequently, any favourable developments to lending margins will, all else equal, transmit to underlying profitability to a greater extent in comparison to European peers.[3] Irish banks additionally have seen a large increase in customer deposits over recent years, as the pandemic reduced opportunities for consumers to spend. The increase in deposits was, on a propotional basis, among the largest in Europe (see Financial Stability Review: 2021 I). Given that deposits are likely more sticky than other types of liability, this also leaves Irish banks well-positioned to benefit from rising interest rates.

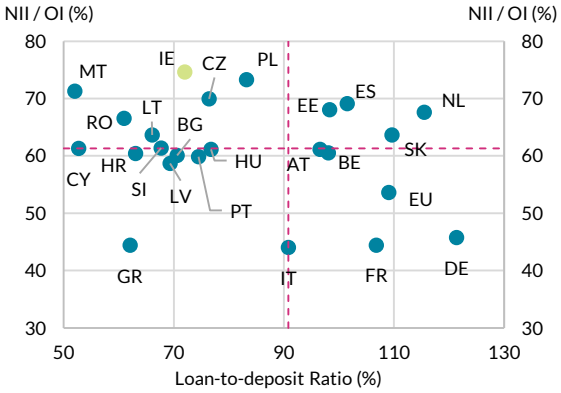
[2] The relative out-performance likely reflects the potential for scale resulting from the ongoing consolidation in the Irish retail banking market in addition to the relative outlook for the Irish economy, which is among the most favourable in Europe (see Summer 2022 Economic Forecast, European Commission).
[3] Conversely, in the years preceding the ECB's June 2022 announcement to increase policy rates by 50bps, the negative interest rate environment had negatively impacted Irish bank profitability owing to their relatively large reliance on net interest income.

Chart 3: Irish banks have outperformed other international banking sectors since 2020



Source: Bloomberg
Notes: Equity price indices have been indexed to 100 at Jan 2020. "ISEQ" denotes the ISEQ Financials index, "FTSE UK" denotes the FTSE ASX Banks GBP index, "FTSE EUR" denotes the FTSE It All Sh Banks EUR index, "S&P500" denotes the S&P 500 BANKS INDEX and "ESTX" denotes the ESTX Banks (EUR) Pr index.

Chart 4: Irish banks have higher NII shares and lower loan-to-deposit ratios than European peers



Source: Central Bank of Ireland
Note: NII / OSI denotes the net interest income share to total operating income. The dashed lines reflect the median values across Europe.

In this *Note*, we trace out the channels through which the emerging high-inflation-high-rate environment is likely to affect the banking sector over the short to medium term. We highlight four broad channels of transmission:

a) borrower resilience, with a focus both on higher borrowing costs and squeezed budgets;
b) maturity transformation and net interest income;
c) loan demand and balance sheet size;
d) valuation in securities portfolios.

Empricially, we focus on the Irish domestic retail banking sector, placing Irish banks in an international context when discussing each channel where possible. We conclude that Irish banks are particularly well-placed to benefit from higher interest rates due to the building up of borrower resilience over the last decade which is likely to mitigate default risks somewhat; their reliance on traditional lending and deposit taking which amplifies the potential benefit from interest margins, and their relatively low sensitivity to valuation effects in their fixed income portfolio, likely to experience valuation pressures in a period of tighter monetary policy.

In assessing the impact of a higher inflation and higher interest rate environment on the banking sector, we assume that monetary policy is effective in bringing inflation back to target in the medium-term.[4] As such, the impact across various transmission channels that we consider in this *Note* are typically short-term. There does exist, however, a large literature that finds that periods of high and sustained inflation lead unambiguously to adverse developments within the banking sector over the longer-term, for example through weaker levels of financial development and less credit relative to economic activity (Boyd et al, 2001; Khan et al, 2006; Agarwal and Baron, 2022).

2 Risk Channel A- borrower resilience

The impact of higher inflation can negatively impact borrower's credit risk (their financial resilience) either indirectly through the the erosion of real disposable income (***expenditure channel***) or directly as debt servicing costs rise due to monetary tightening and/or lower economic growth

[4] Indeed, in the ECB's macroeconomic projections for September 2022, the HICP inflation rate is forecast to revert back to target by reaching 2.3 per cent by 2024. See here for more details.

(***debt servicing channel***). Both channels will negatively impact bank profitability as higher provisioning may be required in anticipation of future loan losses. Further, these channels will be amplified if higher inflation and higher interest rates lead to broader general equilibrium effects which reduce aggregate demand and ultimately weaken the labour and housing markets[5].

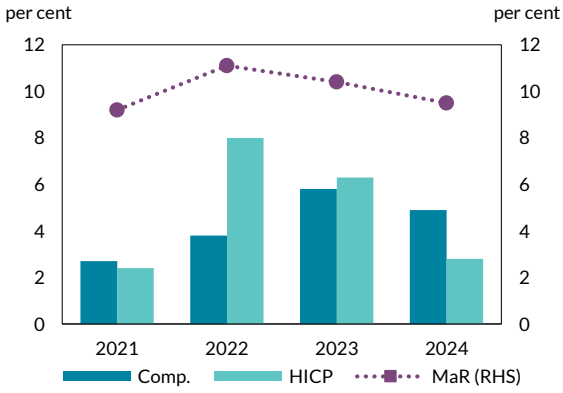
2.1 Expenditure Channel

Rising prices can create debt sustainability issues for borrowers as the potential reduction in disposable income implies less resources available to service debts. Adhikari (2022), in a recent study, captures this for Irish mortgagors, quantifying the proportion of borrowers deemed to be at risk of meeting their debt obligations due to a rise in the cost of essential spending.

The author estimates that 9 per cent of households were at risk of missing mortgage payments based on the amount of residual income available after essential expenditure at the starting point, which proxies the pre-pandemic position (Chart 5). Under central expectations of an inflation rate of 8 per cent in 2022, which compounds observed inflation from March 2020 to end-2021, non-housing inflationary pressures would have direct effects on some borrowers' resilience, increasing the share of borrowers at-risk slightly, to 11.1 per cent.

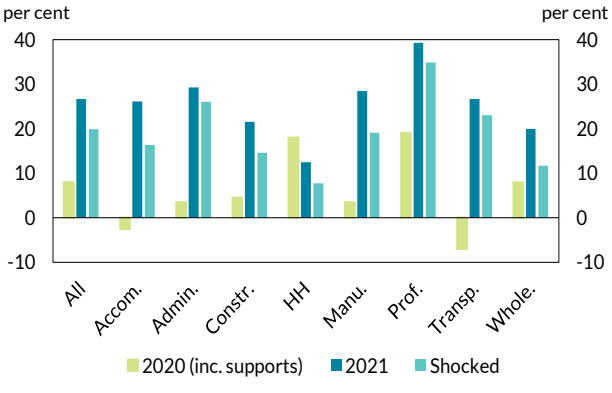
Similarly, the resilience of Irish SMEs may be adversely impacted via the expenditure channel. Based on 2021 survey data for small Irish businesses, wage costs and costs of purchases make up 70 per cent of expenditure on average, while direct enegy costs make up only 10 per cent. To assess the impact of rising SME input costs that may prevail under increasing inflation, Central Bank of Ireland analysis simulates a 5 per cent increase in wages in addition to a 30 per cent increase in energy costs and purchase costs (these shocks were calibrated based on observed data and the time of drafting the 2022h1 *Financial Stability Review)*. Furthermore, the analysis assumes that SMEs are only able to raise revenues by 2 per cent, implicitly modelling a demand elasticity effect that results from higher output prices. The results of the simulation reveal that, on average, profit margins would fall 7 percentage points under this scenario, with close to 15 per cent of Irish SMEs making operating losses (Chart 6).

Chart 5: Proportion of mortgage borrowers at risk before and after the inflation shock



Source: Household Budget Survey and Central Bank of Ireland calculations.
Notes: Buffer = (After Tax Income – Mortgage Payment – Non-housing essential spending). Borrowers are defined as being "at risk" (MaR) where [Buffer < 0.1*Mortgage Payment]. Estimates of essential spending is constructed by stripping out one-off expenditure on appliances, college fees, sport, holidays and other forms of leisure from total expenditures. Inflation (HICP) and compensation per employee (Comp.) are taken from the 2022 Q4 Quarterly Bulletin.

Chart 6: Average gross profit rate for SMEs realised in 2021 and under hypothetical inflation shocked scenario by sector



Source: Department of Finance Credit Demand Survey and CSO, Central Bank of Ireland analysis published in *Financial Stability Review 2022:I*
Note: Average gross profit to turnover realised by SMEs in 2021 and adjusted for 30 per cent energy, 30 per cent purchases, 5 per cent wage cost inflation (consistent with the Central Bank's Quarterly Bulletin forecast), and a 2 per cent turnover increase by sector. For reference, the chart also shows the gross profit margin across NACE sectors as at 2020, where the impact of the wage subsidy scheme and the COVID Restrictions Support Scheme (CRSS) has been accounted for.

[5] However, the focus of our Note is to consider the more immediate and direct channels of higher inflation and higher interest rates. Quantifying the subsequent general equilibrium effects are beyond the purview of this Note.

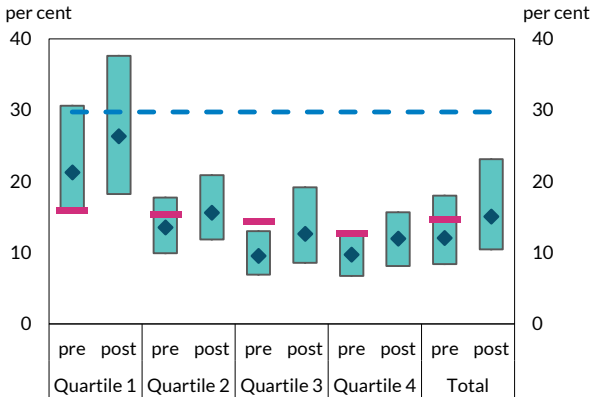
The extent to which these effects will pass through to banks' impairments will depend on the financial buffers of these SMEs, the sustainability of their debt positions, and their capacity to pass through price increases to customers without experiencing significant falls in demand. As with the previous exercise, the analysis above is carried out under a baseline macroeconomic scenario of continued but slowing growth, in the absence of incorporating wider general equilibrium recessionary effects which may arise under more adverse economic implications of higher inflation. Further, the inflation outlook is changing rapidly and the analysis presented in this section will be updated at regular interval over the coming months to capture this evolving environment.

2.2 Debt Servicing Channel

In addition to the expenditure channel highlighted above, borrower resilience will be weakened directly through higher debt servicing costs as monetary authorities raise policy rates to counter above-target inflation. High rates of mortgage fixation on new lending in recent years will insulate borrowers to some extent. Despite this, there remains over half of the outstanding stock of mortgage loans on either Standard Variable Rate (SVR) or Tracker products, with exposure to rising policy rates. In what follows, we present further scenario analysis based on household survey data to examine the impact on mortgage servicing burdens relative to gross income (MSTI) under a 2 percentage point increase in mortgage rates in addition to a 5 per cent random unemployment shock among mortgage borrowers.[6]

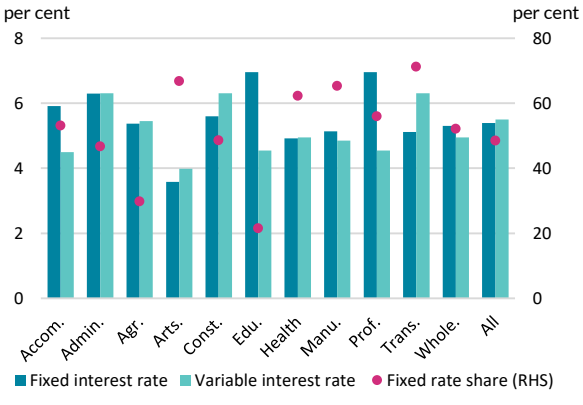
The results suggest that the median MSTI would rise by approximately 3 percentage points from 12 per cent MSTI to 15 per cent MSTI over the entire income distribution (Chart 7). The rise in mortgage servicing burdens is particularly pronounced for lower-income mortgage holders, rising over 5 percentage points from 21.2 per cent MSTI to 26.3 percent MSTI at the median, which would mean most mortgage holders in this group would have higher debt service burdens than those on new lending in 2021. Given that these households are also most adversely impacted via the *Expenditure* channel, higher rates are likely are likely to compound the adverse implications for resilience in light of higher inflation. For borrowers outside the bottom quartile, owing both to higher usage of fixed rates (see next section for more detail) and to more prudent borrowing positions taken over the last decade, this adverse shock to mortgage prices and incomes would continue to leave most borrowers at MSTI levels that would not, in isolation, imply materially concerning levels of repayment risk. Median MSTI in each of the top three quartiles would be lower after the shock than median MSTI on new mortgage lending in 2021, which is subject to macroprudential regulation.

Chart 7: Lower-income mortgage borrowers began the period with the highest repayment burdens, and would be most exposed to an adverse scenario



Source: Household Finance and Consumption Survey (HFCS), Central Bank of Ireland calculations, Central Bank of Ireland Monitoring Templates Data.

Chart 8: SME lending – Fixed Shares and interest rates



Source: Central bank of Ireland, loan-by-loan level data.
Note: Data includes Irish SME term loans for the 5 Irish retail banks. The table shows the median interest rates for by NACE category on

[6] While the 2 percentage point increase in mortgages rates is tied to a baseline projection of rate rises, the additional 5 per cent random unemployment shock is to added to assess the resilience of mortgagors under additional adversity.

Notes: Box chart depicts the distribution of MSTI ratio between the 25Th and 75th percentiles. Key assumptions in the adverse macro scenario: 1) 5 per cent random unemployment shock on the individual level for those in employment. Individual employment incomes fall to max jobseekers benefit. 2) 2 percentage points increase in mortgage interest rate for adjustable rate mortgages only. The pink lines represent the median MSTI by income quartile, based on new mortgage lending data for 2021, In-Scope PDH lending only. Dashed blue line represents a 30 per cent threshold level, indicative of higher-risk exposures.

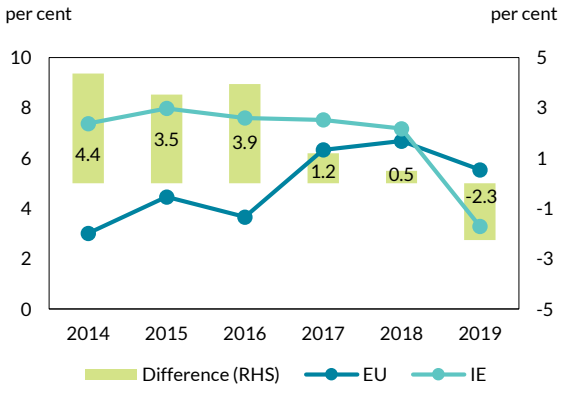
Irish SME term loans at June 2021. Select sectors shown, 'All' contains all NACE sectors except real estate.

On SME lending, approximately half of SME outstanding loan balances are on a variable rate (Chart 8), with the split between fixed and variable being heterogeneous across sectors. Chart 8 shows the share of fixed rate loans by sector along with the interest rates by sector for fixed and variable term SME loans respectively. Sectors with a greater proportion of variable interest rate loans include Agriculture, Education and Administrative and Support Services. Compared to mortgages, the maturity profile of SME lending is relatively short, implying that interest payments make a smaller proportion of total loan repayments, but leading to heightened refinancing risk for borrowers when compared to the mortgage market. For those SMEs operating in energy intensive sectors such as manufacturing and accommodation and food, the impact of higher debt servicing costs on resilience will be further compounded through higher input, including in particular, costs.

3 Risk Channel B- maturity transformation and interest income

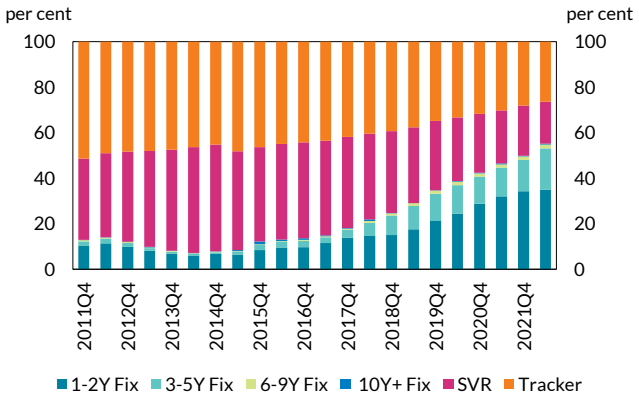
In the years preceding the COVID-19 pandemic, declining profitability had been a key theme for the Irish banking sector (Chart 9). High costs had compounded the sector's high reliance on net interest income which had been squeezed in the prevailing low interest rate environment.[7] The prospect of higher interest rates therefore presents an opportunity for the sector which remains heavily geared towards maturity transformation, with traditional deposit taking and lending being at the core the business model. The extent to which bank lending margins benefit from rate rises will be influenced by among other factors: (i) the share of fixed versus floating loans on bank balance sheets; (ii) funding structure; (iii) second-round effects that could emerge via deteriorating asset quality and further increased provisioning needs and (iv) the pace and path of future monetary policy actions.

Chart 9: Return on Equity in the years preceding the pandemic



Source: Central Bank of Ireland and BankFocus
Notes: EU denotes the median RoE from a representative sample of European banks.

Chart 10: Interest rate types on outstanding mortgage loans



Source: Central Bank of Ireland loan-by-loan level data.
Note: Data refers to per cent of outstanding balances (EUR) of the 5 Irish retail banks by interest rate type. Fixed interest rate buckets show the amount outstanding according to the residual maturity of the fixed contracts (and not the original fixed maturity). SVR stands for standard variable rate mortgage type, Tracker mortgages track a reference rate directly.

[7] It is important to note, however, that the domestic retail banks do actively hedge interest rate risk, the cost of which has increased significantly in recent quarters.

Within the retail banking sector's mortgage book, there has been a growing shift away from variable rate mortgages, towards fixed-rate mortgages (Chart 10). In the short-term, periods of higher and unanticipated inflation reflect a real transfer of wealth from the banking sector (lenders) to borrowers, since debt obligations are typically priced in nominal terms (Doepke and Schneider, 2006). Such wealth transfers will be compounded where debt contracts are specified on fixed rates, since the real value of interest payments will be eroded to a greater extent. Still, around half of outstanding mortgage balances are on a variable type mortgage (SVR or Tracker), which would likely generate an immediate increase in interest income when interest rates rise. In addition, even for fixed-rate mortgages, fixation periods are relatively short, meaning that bank margins would be supported through borrowers refinancing at higher interest rates after a relatively short period of time.

On the funding side, Irish banks are predominantly funded by retail deposits[8] which typically tend to respond less than rates on longer-term asets in a period of monetary tightening (Borio et al, 2017). This finding may be particularly relevant in the current context of excess liquidity, in which the banking system has currently ample retail deposits. In such an environment, the need for banks to compete and raise deposit rates to attract further deposit funding is weaker. Further, the move from five to three retail banks might mean that banks have greater capacity to boost potential margins relative to banks in economies with a more competitive banking sector. However, the recent recalibration of the third series of targeted longer-term refinancing operations (TLTRO III)[9] and the removal of negative deposit rates on customers[10] of the Irish retail banks will act as a headwind in net interest income generation for the sector as rates rise.[11]

To capture how the composition of the sector's lending book and funding structure interacts with potential rate rises, we make use of detailed loan-level data collected by the Central Bank of Ireland in addition to individual balance sheet item (IBSI) data on Irish bank liabilities. We then make use of the ECB's September-22 macroeconomic projections to examine how the system-wide net interest margin (NIM) evolves if interest rates were to follow the projected path for the 3M euribor rate over 3 years. For comparative purposes, we repeat this exercise using the ECB's June-22 macroeconomic projections for the 3M euribor rate. Given that the monetary policy outlook has changed between these two dates, we include the June projections to highlight how changes in the path and pace of future monetary policy actions will influence lending margins. Under both projections, we observe significant improvements in the net interest margin, increasing by 41 and 59 basis points over the three year scenario if interest rates were to follow the June and September projections respectively.

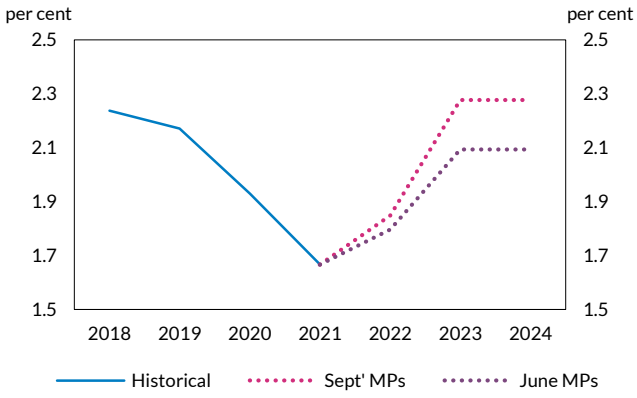
[8] As at June 2022, the share of total deposits to total liabilities stood at 88 per cent.

[9] The recalibration will increase the interest rate on such funding. For more details, please see - https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr221027_1~c8005660b0.en.html.

[10] These include corporate customers and high net worth individuals. These customers had previously been subject to negative deposits rates.

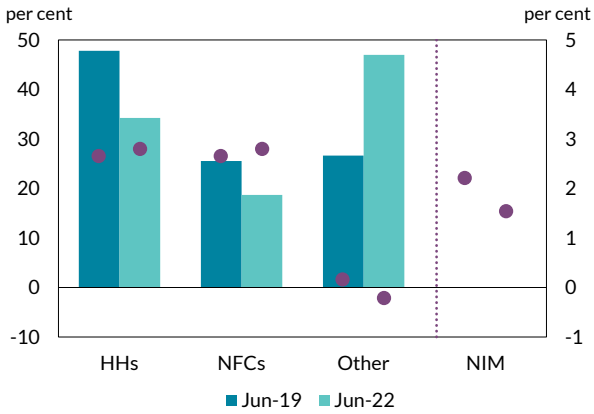
11 Furthermore, the level of capitalisation in a banking sector has also been shown to be a determinant of subsequent interest rate pass-through, where pass-through is typically found to be decreasing in the capital ratio (Gambacorta, 2008; Holton and Rodriguez d'Acri, 2015; Byrne and Kelly, 2019; Altavilla et al, 2020).

Chart 11: NIM Projections



Source: Authors' own calculations.
Notes: The chart shows the impact on the weighted average net interest margin under different interest rate projections. The "June MPs" projection assumes that policy rates change by the same magnitude as forecasted for the 3M Euribor as forecasted in the ECB's June macroeconomic projections. The "Sept' MPs" projection assumes that policy rates change by the same magnitude as forecasted for the 3M Euribor as forecasted in the ECB's September macroeconomic projections. Under both projections, we assume a static balance sheet.for the household and NFC portfolios considered in this analysis.

Chart 12: Asset Shares and NIMs



Source: CBI and authors' own calcualtions
Note: The bars reflect the share of lending to respective counterparties as a percentage of total interest earning assets (left axis). The dots reflect the respective net interest margins across counterparty (right axis). "HHs" denotes lending to households, "NFCs" denotes lending to non-financial corporations and "Other" denotes lending to all other counterparties. Central bank reserves are included in the latter category.

In addition to the interest rate channel discussed above, Irish bank profitability may also benefit from a re-adjustment of portfoilios towards higher yielding assets. For example, the increase in deposits absorbed by the Irish retail banking sector were among the largest in Europe during the COVID-19 pandemic, leading to depressed loan-to-deposit ratios (see Financial Stability Review 2022 I, chart 67) due to large holdings of liquid assets. Chart 12 reports the relative shares of lending and the respective lending margins across various counterparties for the Irish retail banking system. Between 2019 and 2022, the share of assets extended to central banks increased from 7.2 per cent in 2019 to 32 per cent in 2022, while the the associated margin declined from 0.08 per cent to -0.1 per cent over the same time frame.

Lending margins on household and NFC lending have increased in line with Central banks tightening monetary policy to counter inflationary pressures. A re-adjustment of lending shares towards pre-pandemic weightings, when households and NFC loans constituted larger total asset shares, along with the removal of negative interest rates on reserves at central banks, should further support profitability as the marginal return on lending increases.[12]

4 Risk Channel C- loan demand and balance sheet size

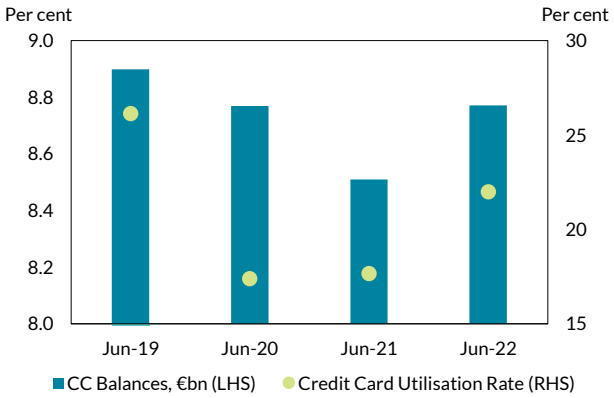
Along with spreads themselves and credit risk, the size of the book of interest-earning assets will be another key determinant of banks' profitability. All other things equal, there are two potential headwinds to income generation related to asset volumes. Firstly, due to the price elasticity of demand, higher interest rates on new lending will curtail loan demand to some degree. Secondly, higher inflation and borrowing costs are likely to lead to a reduction in aggregate demand, which would also constrain loan demand, above and beyond the direct price effects. On the other hand, a higher inflation environment may lead to an expansion in nominal balances. Furthermore, banks may see an increased drawdown of pre-committed credit lines, both for households and businesses struggling under the elevated cost of living and doing business. This last channel is likely to increase interest-earning assets for banks, for whom undrawn facilities currently represent 11.4 per cent of

[12] As discussed in *Financial Stability Review 2022 I*, (Chart 68), these portfolio composition effects accounted for approximately 0.4 percentage points of the decline in NIMs in 2021.

total assets, and will offset to some extent the broader effect of weaker new lending demand on banks' interest-earning assets.[13]

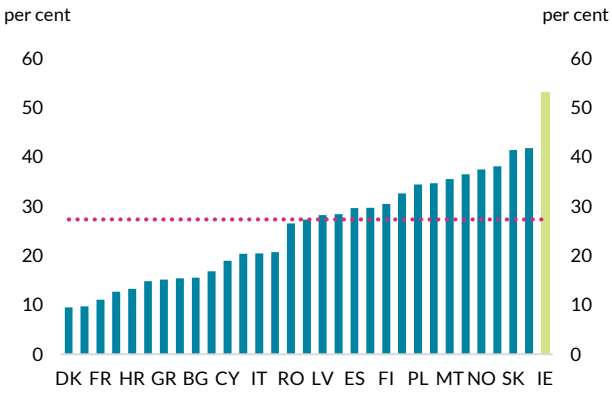
Evidence from the 2022 Q3 Bank Lending Survey for Ireland suggests that firms' loan demand was largely unchanged in Q3. However, loan demand is expected to decline in Q4. By contrast, loan demand from households for both house purchases (HP) and consumer credit (CC) increased in Q3, and is expected to soften in Q4. The recent increase in demand for consumer credit may be seen in Chart 13, which reports a large increase in CC balances held by the Irish retail banking system in recent quarters in addition to an increase in the utilisation rate on credit cards. Haughwout et al. (2022) find similar evidence for the US in which credit card balances also increased significantly in the first quarter of 2022 due to inflation on consumer goods and services typically purchased using credit cards.

Chart 13: Consumer Credit Balances and Credit Card Utilisation Rates



Source: Central Bank of Ireland
Notes: "CC Balances" denote aggregate credit for consumption loan balances for AIB, BOI and PTSB. The credit card utilisation rates are calculates as the outstanding balance divided by total credit card limit amount. Data for utilisation rates are sourced from the CCR.

Chart 14: Share of Mortgages to Total Loans and Advances.



Source: EBA Risk Dashboard and Central Bank of Ireland
Notes: The chart presents the share of mortgages (Loans collateralised by residential immovable property) to total loans and advances as at Jun-22 at a country level. IE denotes the weighted average figure for AIB, BOI and PTSB.

Additionally, banks with longer-maturity assets such as mortgages are likely to be less exposed to lower loan demand, given that expected amortisation of the existing stock of loans happens at a slower pace, necessitating less new lending to maintain balance sheet size. Based on the current profile of the mortgage portfolio, around 7 per cent of Irish mortgage balances are likely to be paid down in a typical year, for example.[14] Banks with larger corporate lending books, where loan terms are far shorter and refinancing is a more prevalent feature, are more exposed to shrinking balance sheets in the event of a fall in loan demand, or difficulties facing borrowers in refinancing at higher interest rates. In a European context, Irish banks have a relatively high share of mortgages in the their total lending portfolio, which leaves them more insulated than peers on this channel (Chart 14).

Further mitigating this risk, recent acquisitions of assets from the two departing banks (Ulster Bank and KBC Ireland) by the remaining retail banks (Allied Irish Bank, Bank of Ireland and Permanent TSB) will further contribute to balance sheet expansion.[15]

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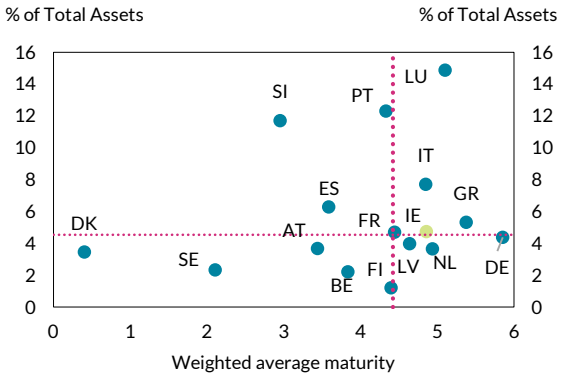
[13] Data on undrawn exposures based on June 2022 regulatory returns, weighted average for AIB, Bank of Ireland and Permanent TSB.
[14] Calculation based on year-ahead analysis of loans in the Central Credit Register at end-June 2021. Both cases where borrowers who repay all debts, for example by refinancing, and cases of contracted monthly amortization, are considered in arriving at an estimate of 7 per cent. However, the prospect of higher rates may increase pre-payment risk for banks as borrowers seeks to reduce their total interest bill.
[15] PTSB as entered a legally binding agreement to acquire approximately €7.6bn of Ulster Bank's retail, SME and asset finance business book. This transactions has since been approved by the Irish competition authority (CCPC).

Taking all of the above into account, we judge that the risk of a smaller balance sheet is unlikely to outweigh the potential benefits of higher margins, placing the remaining Irish retail banks in a strong position to benefit from wider lending spreads without offsetting effects on volumes. However, if higher interest rates and higher inflation is coupled with increasing unemployment, resultant further reductions in loan demand may eventually become constraining for bank profitability.

5 Risk Channel D – Securities Portfolios

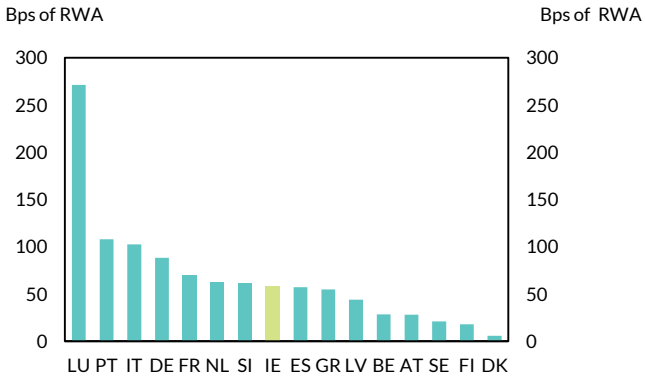
Banks' fixed income portfolios are another important channel of risk transmission. Increasing inflation and upward trends in interest rates may have implications for banks' fair value sovereign bond portfolios. In this section, we examine the impact of the latter i.e. how changes in interest rates impact bank capital via the sector's holdings of sovereign bonds measured at fair value. European banks hold portfolios of sovereign bonds for several reasons, including to satisfy liquidity requirements, for investment purposes and for use as collateral. As such, their sovereign bond portfolio can account for a large proportion of total assets. As at June 2021, on average, European banks held just under 5% per cent of their total assets as sovereign bonds held at fair value (2021 EBA transparency exercise).

Chart 15: Sovereign Exposure and Maturity Profile



Source: Central Bank of Ireland and EBA transparency exercise
Notes: IE sample includes BOI, AIB and PTSB. EU Bank sample includes banks that report both total assets and fair value sovereign exposure in the EBA TE. Sovereign exposure measured as per cent of total assets. Country level values are weighted averages of all banks from that country included in the TE. Exposures are direct sovereign exposures - gross carrying amount of non-derivative financial assets (net of short positions) for items at fair value through OCI, fair value through P&L and held for trading, Reporting date: 30-06-2021.

Chart 16: Capital Impact of 100bps Increase in Interest Rates on Banks' Sovereign Portfolios



Source: Central Bank of Ireland and EBA transparency exercise
Notes: IE sample includes BOI, AIB and PTSB. EU Bank sample includes banks that report both total assets and fair value sovereign exposure in the EBA TE. The valuation effect is due to the revaluation of fair value sovereign assets in isolation and does not include any offsetting effects due to hedging or other income sources such as NII. Exposures are direct sovereign exposures - gross carrying amount of non-derivative financial assets (net of short positions) for items at fair value through OCI, fair value through P&L and held for trading, Reporting date: 30-06-2021.

Recent increases in monetary policy rates have had a direct impact on sovereign yields resulting in increases across the yield curve for many sovereign issuers. In addition, market expectations about future changes in interest rates and inflation paths can also have an impact on the yield curve. As bond prices and yields move inversely, increases in bond yields will result in a decrease in the fair value of banks' fixed income portfolios. Of course, this is a simplified partial view of portfolio dynamics, as many banks will hedge their interest rate and/or credit spread risk which would dampen the impact on capital.[16]

[16] Irish retail banks generally enter into interest rate hedges to reduce the interest rate risk on their sovereign debt portfolios (see 2021 annual reports for Bank of Ireland and AIB for more details). Banks can still be exposed to fair value changes due to movements in credit spreads.

Using the EBA transparency exercise data, Chart 15 shows by country of bank, fair value sovereign portfolios as a proportion of total assets and the average maturity of the portfolio.[17] The average maturity can highlight the duration risk in the portfolio. The longer the maturity of a bond, ceteris paribus, the more sensitive it is to interest rate changes. As such, the decrease in fair value will normally be greater for a portfolio of long maturity bonds than short maturity bonds. Although these fair value movements will initally impact capital, should banks choose to hold to maturity, their value will ultimately converge to the par value. As shown in chart 15, Irish banks have an average portfolio maturity of just below 5 years and fair value sovereign holdings account for 5% of total assets both of which are close to European medians.

To quantify the impact of an interest rate increase on sovereign bond portfolios of European banks, we assume an upward parallel shift in the yield curve of 100bps.[18] The results of the exercise are shown in Chart 16 as a percentage of RWAs, which can indicate the expected impact on the CET1 ratio. The impact across all banks is negative and the valuation effects for Irish retail banks are close to the median. Intuitively, the largest impacts are seen by those countries with large sovereign portfolios as a proportion of total assets and/or longer average maturity portfolios.

6 Overall implications through the lens of stress testing

In the years preceding 2022, stress testing exercises had typically modelled adverse scenarios in the context of a low interest rate environment, in which economic stress is compounded by weak margins for banks. The onset of a changed interest rate outlook is therefore of particular relevance. In the final section, we demonstrate how the possibility of higher rates in an adverse scenario may cushion the negative impact of broader economic stress on bank capital.

For this application we simulate, for indicative purposes using an internal stress testing tool, the EBA 2021 adverse stress test scenario on the Irish banking sector (Chart 17).[19] To examine the potential mitigating impact of higher rates on bank capital, we generate an additional scenario ("Rising Rate") in which short-term rates rise by over 3 percentage points while holding all other macro variables fixed as per the original EBA 2021 scenario ("EBA").[20] The results are presented in Chart 18.

While both scenarios lead to significant declines in CET1 capital, the Rising Rate scenario is relatively less adverse. The mitigating impact of higher rates are predominantly seen through higher net interest income (P/L)[21] which leads to an additional 4.6 percentage points of CET1 capital relative to the EBA scenario. Conversely, higher rates also lead to larger impairment (Imp.) as the cost of debt servicing increases, leading to a higher probability of default (PD). However, estimates of impairment within our modelling framework do not accommodate any effects arising from the expenditure channel i.e. the reduction in borrower resilience arising from lower disposable income

[17] The EBA transparency exercise splits sovereign holdings by maturity buckets. To estimate the average maturity we use the bucket mid-point as the maturity for that bucket. For example, the maturity mid-point for the 1y-2y bucket is 1.5y.

[18] The price change in the sovereign bond holdings for a country group of banks, is estimated as $\frac{average\ duration_{j,m}}{1+YTM} * Carrying\ amount_{j,m} * 100bps$ where j is the issuer country of the bond and m is the maturity bucket. We proxy the banks duration by the residual maturity on the bond portfolio converted to a modified duration by dividing by the 1+YTM of the corresponding maturity bond yield. We follow a similar approach to that of IMF (2018).

[19] Please see here for more details on the EBA's 2021 adverse scenario.

[20] In effect, we eschew any general equilibrium effects associated with higher rates.

[21] Net interest income and impairment are the key determinants of changes in the profit/loss statement under our framework. For simplicity, we assume most other components of the profit/loss statement are held fixed over the stress test scenario, such as expenses. While it is likely that wage inflation will increase expenses over the scenario horizon, omitting this channel does not detract away from our key result which is isolating the impact of higher rates.

to service debts as this mechanism is largely absent from the data in which our credit risk models were estimated on.[22] F urthermore, we also observe a larger hit to the valulation of fixed-income portfolios (VE) due to higher interest rates.

On aggregate, the impact of higher rates results in a greater level of capital over the scenario due to the uplift in net interest income, suggesting that this channel is dominant when considering all of the forces analysed in this paper in a single framework. The effect is substantial: for a common macro scenario, an environment where interest rates are 300 basis points higher would lead to close to 270 basis points of additional CET1 captial for the Irish banking system in our scenario, under our chosen modelling assumptions for the purposes of this *Note*.

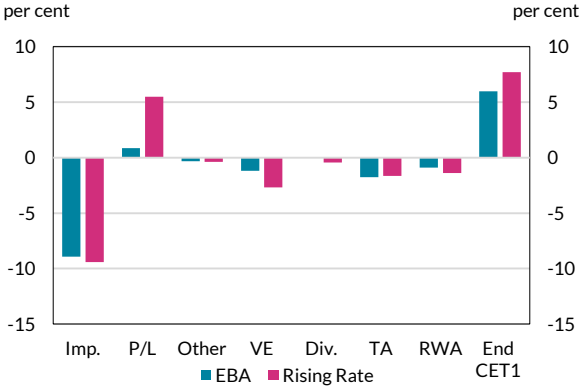
Chart 17: Adverse Scenario Used for illustrative Purposes in this *Note*

Per cent Per cent

	Y1	Y2	Y3
Unemployment (%)	9.3	9.8	10.5
RRE (%)	-7.1	-4.3	-2.7
CRE (%)	-18.1	-13.2	-5.1
Δ IR (EBA)	-0.2	0.0	0.0
Δ IR (RR)	0.3	1.9	1.1

Source: EBA 2021 Stress Test
Notes: Δ IR denotes the absolute change in short term interest rates over the two scenarios.

Chart 18: Scenario Waterfalls – a rising rate environment cushions the effect of a downturn on bank capital



Source: Authors' calculations
Note: "Imp" denotes impairment, "P/L" denotes other profit/loss items which captured net interest income, "Other" contains the impact of tax and other negligible items", "VE" denotes the impact of valuation effects arising from fixed income portfolios, "Div." denotes divdidends, "TA" denotes transitional arrangements, "RWA" denotes risk weighted assets and "End CET1" reports the CET1 ratio at the end of the horizon.

7 Conclusion

In this *Note* we have traced out the transmission channels of the emerging higher inflation, higher interest rate environment on the banking system. On aggregate, the impact of higher rates appears to be supportive of Irish bank profitability in the near term, in the absence of a wider deterioration in the economic outlook. Structural features of the Irish banking sector such as: (i) high dependence on net interest income, (ii) high share of deposit funding and (iii) relatively large stock of liquid assets (iv) low reliance on market instruments such as sovereign bonds, all contribute to the likely positive effects arising from higher rates compared to other European banking systems. However, potential pressures on borrower resilience owing to higher rates and squeezed real disposable incomes represent a headwind for bank profitability in the emerging high-inflation-high-rate environment. In particular, asset quality deterioration or the need to further increase provisions may adversely weigh on banking profitability. These effects will be compounded if higher inflation is coupled with weaker economic growth and higher unemployment, which may eventually become constraining for bank profitability

[22] However, the analysis presented in Section 2.1 serves as a useful starting point in thinking about how the expenditure channel is linked to financial distress. While important in an inflationary environment, we feel that omitting the effects of the expenditure channel does not detract away from the section's main aim, which is to assess the marginal impact on capital resources arising from higher interest rates.

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