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# **Irish retail bank profitability 2003 - 2018**

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## Abstract

This FS Note explores trends in the profitability of the Irish retail banking sector over the past 15 years, using a sample of 39 other EU banks as a comparison group. Changes in the net interest margin (NIM) are decomposed into the share and yield effects on assets and liabilities, respectively. This is the first such decomposition to focus on the banking system in Ireland. The results suggest that the low interest rate environment has coincided with an increase in the NIM of Irish banks but with a decrease in the NIM for a sample of other EU banks. In the case of Irish banks, the increase in the NIM is largely the result of a yield effect on liabilities (cheaper funding). Furthermore, there is some evidence that this effect may be diminishing in recent years.

## 1 Introduction

Over the past 15 years, the Irish banking system has moved from boom, to bust, to recovery. Indeed, as this FS Note demonstrates, the performance of the three main retail banks headquartered in Ireland has been more volatile than that of a sample of other systemically important euro area banks (Non-IE O-SII).<sup>1</sup> Moreover, this Note decomposes bank profitability into the respective contributions of the yield and share effects on assets and liabilities. This is the first such decomposition to focus on the banking system in Ireland and includes a comparison with the Non-IE O-SII group. In addition, this Note considers the evolution of bank profitability in the context of the low interest rate environment.

The profitability of the banking system is not merely of concern to shareholders: a sustainable level of bank profitability underlies both financial stability and economic growth. Financial stability is sustained by adequately capitalised financial institutions, and retained earnings - which form an important element of bank capital - depend on a bank's ability to turn a profit. Second, bank profitability has implications for the real economy. Access to credit for firms and households has an important role to play in stimulating economic activity, and a sustainably profitable banking sector is necessary to provide such financing over the long term. A third consideration, particularly in the case of Ireland, is that in order for the State to make a return on the bank recapitalisations that took place in the wake of the Financial Crisis, banks must generate profits. Finally,

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<sup>1</sup> Aggregated data for Allied Irish Banks, Bank of Ireland, and Permanent TSB. 39 banks from 14 euro area countries, between 2007 and 2017. For more detail see Section 2.

it is important to emphasize that, from a wider economic point of view, the effects of lending and deposit interest rates on consumers are important factors when considering developments in bank profitability.

This analysis finds that the volatility in the profitability of Irish banks is largely driven by two factors: loan loss provisions and write backs; and a yield/cost effect on loans and deposits. Provisions for bad loans significantly reduced banks' profitability during the Crisis.<sup>2</sup> Income on loans fell dramatically during this period, acting as a further drag on profitability. In the post-Crisis years, banks have benefited from reduced costs of funding, coinciding with low interest rates and quantitative easing. This has contributed to a return to profitability for the sector. However, while Irish banks have benefited more from lower funding costs than many banks in the euro area, these benefits appear to be diminishing in recent years.

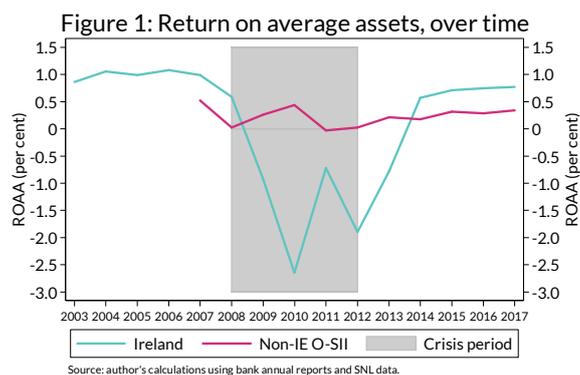
The analysis that follows is presented across three distinct periods: pre-Crisis (2003-2007), Crisis (2008-2012), and post-Crisis (2013-2017). This is motivated by trends in the aggregate data, which suggest that the underlying effects driving changes in profitability may be distinct in each period.

The next section describes the data, explains the measurement of bank profitability, and compares Irish banks to the Non-IE O-SII sample. Section 3 discusses recent literature on bank profitability in low interest rate environments. Section 4 explores broad trends in the balance sheets and income statements of Irish retail banks. The key findings from the decomposition of profitability into its components and effects is described in Section 5. Section 6 concludes.

## 2 Measurement of bank profitability

This section contains a description of the data underpinning this Note, an explanation of how bank profitability is measured, and an overview of bank profitability in Ireland relative to the Non-IE O-SII sample.

The data used in this Note consist of two samples: Irish retail banks, and non-Irish O-SII banks. The sample of Irish banks includes Allied Irish Banks, Bank of Ireland, and Permanent TSB, and covers the years 2003 to 2017. The Non-IE O-SII sample includes 39 O-SII banks from 14 euro area countries between 2007 and 2017.<sup>3</sup> The majority of these data are sourced from S&P Global Market Intelligence (formerly SNL), with some supplementary data taken directly from bank annual reports (Irish sample only). In each sample, annual data on assets and liabilities by type, along with their associated incomes and expense were collected.



One common measure of bank profitability is return on average assets (ROAA).<sup>4</sup> The ROAA is the net income over the average total assets.<sup>5</sup> Figure 1, above, shows significant changes in the ROAA of Irish banks between 2003 and 2017, compared with a relatively flat trend for the Non-IE O-SII sample. Irish banks realised negative

<sup>2</sup> The Irish Financial Crisis, spanning 2008 to 2012.

<sup>3</sup> Of the 39 banks, data is only available for 38 and 32 for the years 2007 and 2017, respectively. It is worth noting that the Non-IE O-SII sample contains a broader mix of bank business models than in the case of the more traditional Irish retail bank sector. However, in robustness checks, the sample was split in two: banks whose funding consists mainly of deposits and banks whose funding mainly consists of other sources. This did not affect the results substantially and so the results of the wider sample are reported throughout this Note.

<sup>4</sup> Another common measure of bank profitability is return on equity (ROE). However, this Note uses the ROAA as a starting point to reflect how effective banks are at using their assets to generate a profit (Harvard Business Review, 2016).

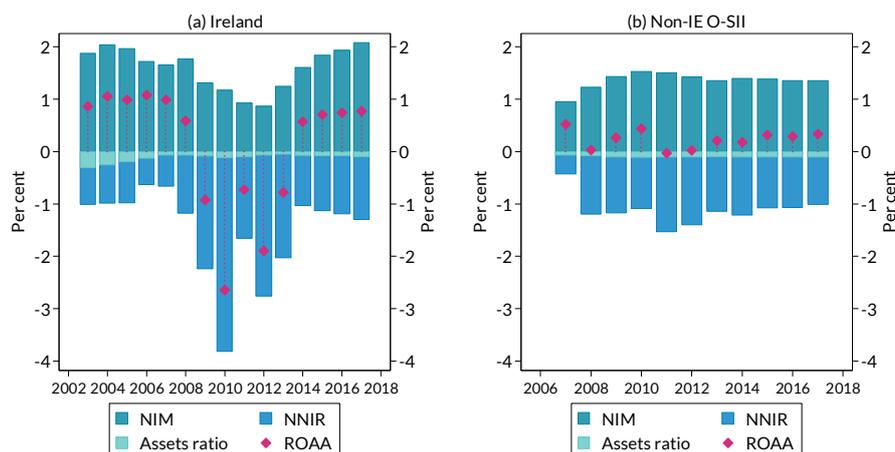
<sup>5</sup> Average total assets is the total assets in year  $t$  plus the total assets in year  $t-1$ , divided by two.

ROAA throughout the Crisis and this did not reverse until 2014. Since then, the ROAA has been less volatile but has yet to recover to pre-Crisis levels. The ROAA is an overall measure of a bank’s ability to generate earnings from its assets. It can be broken down into two measures of a bank’s financial health: (i) the net interest margin (NIM) and (ii) the net non-interest ratio (NNIR). The NIM is the ratio of net interest income (NII) to average interest earning assets.

The NNIR is the difference between non-interest income (such as fees and commission), and non-interest expense (such as operating costs, impairment provisions, and fines), divided by average total assets. The NNIR measures the effectiveness of fee generation compared to the expenses associated with running the business. While there is an important distinction between operating costs and impairment provisions, the NNIR is a catch-all term constructed to capture all contributions to net income that are not due to interest income or interest expense. Where negative, the NNIR reflects how much of the NIM must be sacrificed to cover the costs of running the entire business. The higher the absolute value of a negative NNIR, the lower the ROAA.

The NIM and NNIR, with some modification, sum to the ROAA. The modification is required because the NIM and NNIR have slightly different denominators: average interest earning assets and average total assets respectively. The *assets ratio*, defined here as the ratio of average financial assets to average total assets, takes account of this difference. This relationship is explained fully in the appendix, while Figure 2, below, shows a graphical representation.

Figure 2: ROAA components (NIM, NNIR, and Assets Ratio)



Source: author's calculations using bank annual reports and SNL data. Sufficient data is unavailable for Non-IE O-SII in the pre-Crisis period.

Regarding Figure 2, the volatility in the Ireland series (panel (a)), relative to the Non-IE O-SII group is immediately apparent. The NIM of Irish banks is visibly compressed during the Crisis period, coinciding with the decline in ROAA.<sup>6</sup> It is clear, however, that the biggest drag on bank profitability during the Crisis is captured by the NNIR. The dramatic movements in the NNIR during the Crisis years, relative to both the pre-Crisis period and the Non-IE O-SII group, are largely explained by impairment provisions. The percentage of assets set aside for impairments grew substantially between 2008 and 2011, as shown in Figure A1 of the appendix. This, together with large write-backs of provisions, explains the volatile nature of the NNIR. Although the volatility of the NNIR for Irish banks has reduced in recent years, it is nevertheless a drag on profitability. It has grown in magnitude in each year since 2014, and has offset much of the gains in the NIM over that period.

By comparison, each series of the Non-IE O-SII sample (panel (b)), has been less volatile and the NNIR has been on a broadly downward trend, in absolute terms, since 2011. The NIM has not changed profoundly over this period, however, and the net result is only minor gains in the ROAA. The implication is that, in order to increase profitability, European banks must improve the efficiency of their operations (reduce the magnitude of the NNIR) or offset inefficiency losses through an increase in NIM (increase income from lending, while reducing

<sup>6</sup> In fact, this compression was likely even more severe than shown here due to the fact that, prior to IRFS 9, banks could book income from interest on non-performing loans that might never be realised.

funding costs). In such a scenario, prevailing interest rates may be central to the outcome. This raises the question of whether the NIM can be increased sufficiently to boost profits and how efforts to do so may be affected by the low interest-rate environment.

### 3 The literature

One of the key issues facing Irish banks in recent and upcoming years is the unconventional monetary policy of the ECB, and its potential future normalisation. There are a number of channels through which low interest rates can affect the NIM. These are perhaps best summarised in a speech given by ECB executive board member Benoît Cœuré in 2016.

Cœuré identifies the following channels for short-run effects: (i) a negative effect through intermediation risk, whereby people withdraw deposits and move to hoarding cash. (ii) a positive effect where, as rates fall, the value of fixed income securities on a bank's balance sheet goes up, increasing profits. (iii) a further positive effect as banks carry out maturity transformation. By borrowing short term at relatively low costs, and lending long term in the expectation that rates will increase over the long run, banks can increase their income.

Over the long run, examples of how low interest rates can affect the NIM are: (i) a negative effect where net interest income (NII) is reduced due to a flattening of the yield curve. (ii) a negative effect, even for a given yield curve, as when interest rates drop, yields on assets will decline to a greater extent than funding costs; particularly for banks that are heavily reliant on retail deposits. This is because deposits tend to have low and sticky interest rates, and banks are reluctant to impose negative deposit rates. (iii) a possible positive effect in the case of floating-rate loans, is that borrowers will find it easier to service their loans, reducing the number of defaults. However, this may be offset by the fact that the larger the share of floating-rate loans, the faster the negative impact on NII will take hold.<sup>7</sup> In summary it appears that, setting aside intermediation risk, the net short-run effects are expected to be positive, while the net long-run effects are expected to be negative.

In their cross-country analysis Brenman, Eich, and Saleheen (2018) find no systematic positive relationship between the slope of the yield curve and the NIM.

Recent empirical analysis by Cruz-Garcia, de Guevara, and Maudos (2017) finds a quadratic relationship between profitability and interest rates, where the variation in profitability is greater at low interest rates. This, they argue, suggests that there is a trade-off between economic growth and financial stability when rates are low. Prolonged periods of low interest rates will have a negative effect on bank profitability, and therefore on financial stability. These findings are similar to those of Claessens, Coleman, and Donnelly (2017) and of Borio and Gambacorta (2017).

However, when the impact of low interest rates on macroeconomic conditions is controlled for, Altavilla, Boucinha, and Paydro (2017) find that profitability is not negatively affected. Ahtik, Banerjee and Schipper (2015) find that, in the case of Slovenia, interest rates had a significant and negative affect on the NIM during the Crisis period but a significant and positive affect on the NIM in the non-Crisis period. Ahtik, Banerjee and Remsak (2017) suggest that the effect of interest rates on profitability is also likely to differ by country depending on credit growth conditions, as banks may offset low margins by expanding their balance sheets.

### 4 Underlying trends

As presented in Section 2, the Crisis period coincides with a substantial decrease in the NIM of domestic Irish retail banks. To be precise, the NIM drops from 1.77 per cent in 2008 to 0.87 per cent in 2012 (see Table A1 of the appendix). The data for the years prior to the Crisis paint a more varied picture, with two annual increases and three annual decreases in the NIM giving an overall downward trend. Indeed Holton, Kelly, Lydon, Monks, and O'Donnell (2013) identify an overall downward trend in the NIM of Irish banks in the decade to 2009. They

<sup>7</sup> The share of fixed-rate loans varies greatly by jurisdiction. In the US, fixed-rate mortgages make up the majority of home loans, often fixed for the duration of the mortgage. Even where rates are floating in the US, they are linked to an index. By comparison, in Ireland, floating rate loans are common and the rates are usually at the discretion of the respective loan provider.

find that the pre-Crisis compression of the NIM was greater in Ireland than in other OECD countries: dropping by roughly half between 1999 and 2009. In effect, it appears that there was a long-run downward trend in NIM and that the Crisis accelerated the rate of decline. In the post-Crisis period, banks have witnessed a rapid recovery in their NIM, to 2.08 per cent in 2017; the highest level in the 15-year series.

Movements in the NIM can be the result of changes in net interest income or changes in the balance sheet, i.e. yield effects or share effects. For example, income on loans may increase relative to the income on other assets (yield effect), and this may lead to a change in the respective shares of loans and other assets (share effect) as a bank aims to maximise profits. As another example, the cost of deposits may decrease relative to other forms of funding (yield effect), leading to a rebalancing of the funding structure (share effect).

Examining trends in asset and liability balances between 2003 and 2017, in Figure 3, we observe that balance sheets grew markedly in the five years prior to the Crisis, and shrank almost as quickly in subsequent years. That readjustment has slowed but continued through 2017. The decline in deposits has been steady since 2009 but it is not clear that this is a result of disintermediation – a withdrawal of deposits due to unattractive rates or a decision to invest in alternative assets. In any event, Brunnermeier and Koby (pending) find that intermediation risk is dependent on a reversal rate – an interest rate at which the cost of depositing cash surpasses the benefits. While some Irish banks have begun charging negative rates on certain deposit categories, this is not widespread practice (Central Bank of Ireland, 2017).

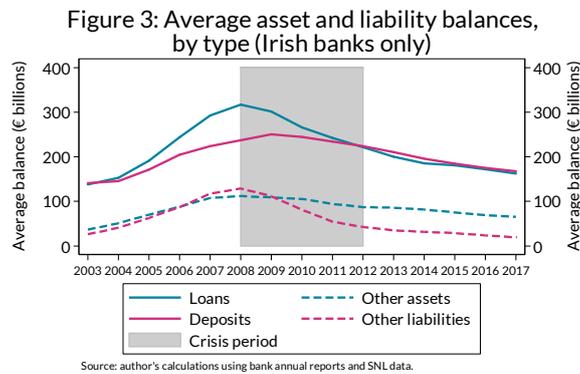


Figure 4 provides some more insight into what caused such a large decrease in the NIM over the Crisis period. Interest income on loans halved in the first year and continued to fall thereafter. Meanwhile, the expense associated with deposits did not fall in proportion to income and actually increased towards the end of the Crisis. This coincided with two rate increases by the ECB in 2011 and reduced margins further still. In the years since the Crisis, the cost of deposits has reduced considerably. These movements suggest that falls in deposit related expenses might be the dominant driver of changes in the NIM of Irish retail banks over the period considered.

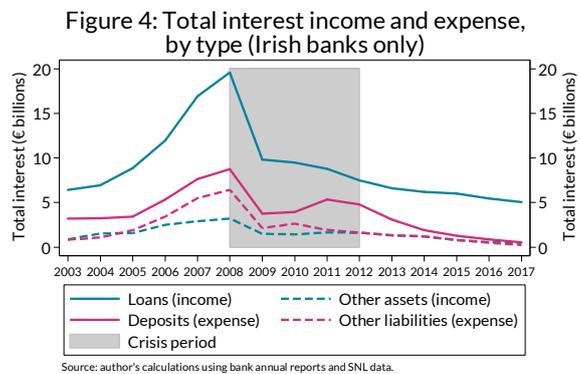
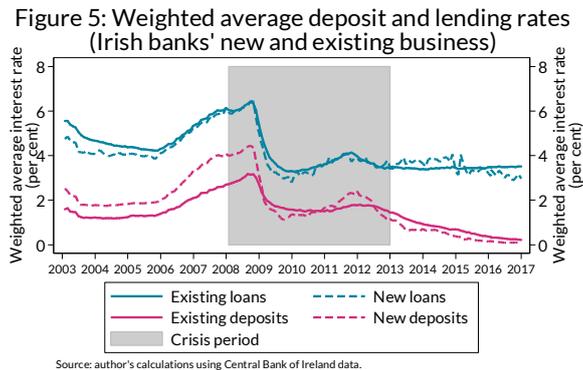


Figure 5 shows how rates on new and existing lending fell sharply in 2009. At the same time, more diverse sources of funding meant that the costs associated with new deposits far outstripped the cost of existing

deposits. These movements contributed to a diminishing NIM in each of the 5 years of the Crisis period. While these trends are informative, the next section decomposes changes in the NIM into respective balance sheet and interest rate movements.

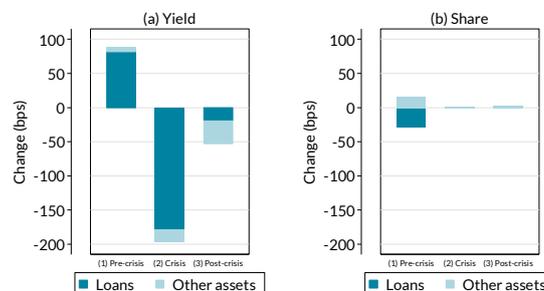


## 5 Key findings – NIM Decomposition

This section summarises the key findings of the decomposition of the NIM of Irish banks using the methodology of Covas, Rezende, and Voitech (2015). A comparison with the Non-IE O-SII sample is included. The methodology decomposes changes in bank profitability into the respective contributions of the yield and share effects on assets and liabilities. In brief, the yield effect of an asset or liability is determined by holding the share of that asset or liability constant. Similarly the share effect of an asset or liability is determined by holding the yield on that asset or liability constant. The appendix contains a full explanation of the decomposition methodology and the complete set of results (Table A1).

Concerning assets, over the 14 years considered, a net decline in the interest income on loans became a significant drag on the NIM of domestic Irish retail banks, as per Table A1.<sup>8</sup> Moreover, the cumulative yield and share effects on assets was negative, reducing the NIM by 175 basis points. By contrast, the cumulative contribution of the yield and share effects on liabilities over the same 14-year range has been positive by 195 basis points, dominated by a yield effect on deposits. In effect, when the full 14-year sample is aggregated there has been a net increase in the NIM of 20 basis points for Irish retail banks. This does not provide much by way of insight into factors driving the substantial variation in the NIM over the 14 years considered. For this reason, Figures 6 and 7 show the sub-total effects across three distinct periods: pre-Crisis, Crisis, and post-Crisis. These periods are purely indicative, are motivated by the trends discussed in Section 4, and provide a convenient summary of the movements in the NIM.

Figure 6: Assets' contribution from changes in yield and share (Irish banks only)



In Figure 6, it can be observed that, in the pre-Crisis period, the contribution of loans and other assets to the NIM was positive and that this was almost entirely a yield effect. Across the five years of the Crisis period, assets cause significant compression of the NIM, and this is driven primarily by a yield effect on loans – possibly

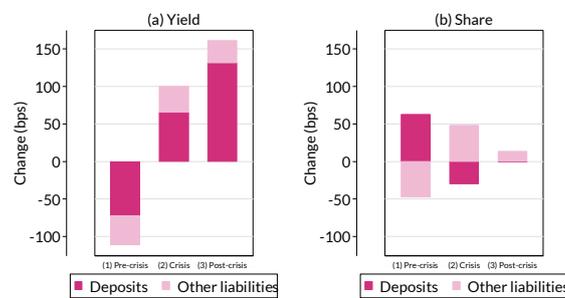
<sup>8</sup> While data are available for Ireland for 15 years, upon calculating changes in the NIM, data for only 14 years remain.

the result of a number of factors including the low interest rate environment and the prevalence of tracker mortgages. The post-Crisis period shows some reduction in the negative impact of loans but not yet a reversal: loans are still acting as a drag on the profitability of Irish banks, as are other assets (Figure 6).

It is quite striking that the net share effect on assets is negligible in all periods. The impact of changes in the shares of asset types in the pre-Crisis period was larger than in subsequent periods. This may be the result of efforts by banks to expand their balance sheets at a time of growing competition in the market. However, as the effect was in opposing directions for loans and other assets, the net share effect was small.

Figure 7 shows the contribution of liabilities and the underlying yield and share effects. On the yield side, we see a reverse of the pattern in Figure 6: liabilities compressed margins in the pre-Crisis period, largely driven by high costs of funding through deposits (a yield effect). The subsequent low interest rate environment allowed banks to fund themselves more cheaply, so that in the Crisis and post-Crisis periods, liabilities contributed positively to the NIM. In the Crisis period, this effect helps to offset the losses on loans somewhat but is not sufficient to prevent a decline in the NIM. In the post-Crisis period the effect is large enough to increase the NIM, more than offsetting the drag effect on the assets side.

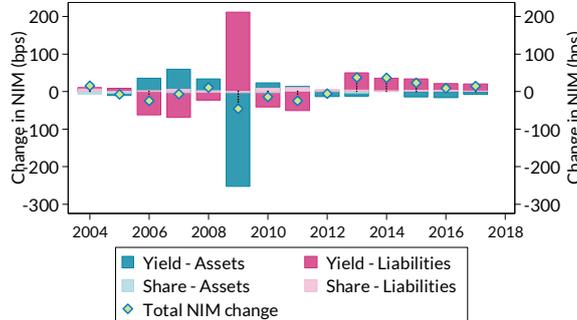
Figure 7: Liabilities' contribution from changes in yield and share (Irish banks only)



Source: author's calculations using bank annual reports and SNL data.

It is clear that the share effect is larger for liabilities than for assets but the net effect is still small, relative to the yield effect, and changes little across periods. Some of this share effect in the Crisis period is likely the result of moves by Irish banks to change their funding composition, as required by the 2011 Prudential Liquidity Assessment Review (PLAR). The PLAR aimed to place the banking sector on a more stable funding structure (Connor, Flavin and O’Kelly (2015)). This would have also affected the yield effect, as the increased demand for deposits increased their cost to banks.

Figure 8: Contribution due to yield and share, by assets and liabilities (Irish banks only)

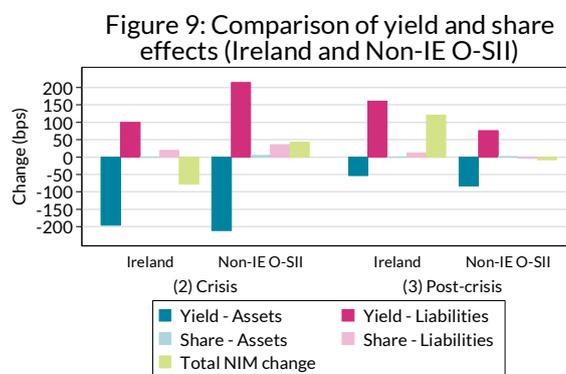


Source: author's calculations using bank annual reports and SNL data.

Taking a different view of the data, Figure 8 shows the change in NIM and the yield and share effects by year. The share effects are negligible in each year, while the yield effect is generally substantial. Specifically the yield effect on liabilities dominates in every year save for 2009 and 2012. It is clear that the reduced cost of funding for banks has contributed to a significant increase in the NIM since the series low-point of 2012. However, this positive effect has been diminishing in each of the subsequent four years. This is in line with the theories, noted

in Section 3, that the effects of low interest rates are likely positive in the short run but negative over the long run.

With this in mind, the contrasting results presented in Figure 9 are particularly interesting. First, it is noteworthy that the direction of the yield effect is the same for assets and liabilities across both groups and in both periods, but the magnitudes are considerably different. Second, the share effect is very small for both samples across both periods. The result is that the total NIM change observed in each period is markedly different for both samples. The drag on profitability created by the yield effect on assets is broadly similar for both groups in the Crisis period. However, Irish banks were unable to offset these losses through the yield effect on liabilities, meaning that the NIM of Irish banks was compressed, while it expanded for the other group. One possible explanation of this is the efforts of Irish banks to secure safer sources of funding through deposits during the Crisis. This may have pushed banks' funding costs up, relative to the rest of the euro area, offsetting some of the gains from overall reductions in funding costs. Figure 5 (above) provides some support for this case: rates on new deposits were substantially higher than rates on existing deposits for much of the Crisis period. The initial increase is possibly due to the intensification of deposit gathering by banks, while the later increase coincides with initial monetary policy tightening by the ECB in 2011.



Source: author's calculations using SNL data. Sufficient data for Non-IE O-SII in the pre-Crisis period is unavailable.

In the post-Crisis period, the NIM of Irish banks has increased significantly while the NIM for the other group has declined. This may be a result of greater competition for deposits in the rest of the euro area, pushing deposit rates up and as a result reducing the positive contribution of liabilities in the low-interest rate environment. This competition is also likely to reduce the interest income on loans, further compressing margins. Conversely, Irish banks were in a position to benefit from low funding costs combined with historically low levels of competition to increase their margins substantially over the period.

At this point, it is evident that the impact of the low-interest rate environment on bank profitability has differed across samples. This raises the question of whether banks may benefit from a return to higher interest rates or whether this too will differ across the two samples.

## 6 Conclusion

The profitability of the Irish retail banks has varied greatly over the past 15 years, and particularly since the onset of the Crisis. Much of this variation is explained by fluctuations in the NNIR, largely due to provisioning and write-backs associated with bad loans. Irish banks' NIM also varied considerably across the Crisis and post-Crisis periods. In the Crisis period, assets – specifically loans – contributed most to change in the NIM, dragging profitability down. In the post-Crisis period, liabilities – chiefly in the form of deposits – contributed most, helping to increase the NIM of Irish banks. These contributions were almost entirely the result of yield effects – changes in income and expense associated with lending and borrowing. Given the dominance of the yield effect, the low interest rate environment provides some interesting context.

Theory suggests that, overall, the effects of low interest rates may be positive in the short run, while becoming negative over the long run. In the case of Irish banks there is some evidence to support this as, while the NIM

has improved significantly since the Crisis, the effect has been diminishing recently. If this theory holds, a return to higher interest rates may boost the profitability of Irish banks further, by increasing the return on loan assets.

Another important finding is that when compared with a sample of euro area banks, all operating in a low interest rate environment, the effects on profitability vary and are uncertain: other factors must be at play.

One possible factor is competition. The retail banking sector in Ireland became much more concentrated during the Crisis and remains so (Central Bank of Ireland, Household Credit Market Report, (2017)). More market power allows for wider margins – greater profits. These conditions may attract market entrants in the future and increased competition may place downward pressure on margins but this remains to be seen. In a more competitive market, banks seeking to increase their ROAA would be forced to reduce their costs through efficiencies (thereby reducing their NNIR). In turn, greater competition in the market may benefit Irish consumers through reduced costs and increased choice (Lane 2016). This increased competition may depend on deeper European financial integration to create a level playing field for potential new entrants (Draghi, 2018).

A second possible factor is the wider macroeconomic environment. As the economy grows, borrowers will be in a better position to repay loans and may be more likely to seek credit, creating the potential to boost bank profits. Moreover, improved economic conditions have allowed banks to write back provisions significantly in recent years, thereby increasing profits.

Further research into the competition and macroeconomic factors in the Irish context would be informative, given how the findings of this FS Note differ considerably between the Irish banks and the sample of Non-IE O-SII banks.

# Appendix

## Decomposition of the ROAA

The ROAA can be decomposed into the NIM and NNIR as shown below. The ROAA is the net income over the average total assets.

$$ROAA_t = \frac{\text{net income}_t}{\text{average total assets}_t}$$

The NIM is the ratio of net interest income to average interest earning assets.

$$NIM_t = \frac{\text{int. income}_t - \text{int. expense}_t}{\text{avg. int. earn. assets}_t}$$

The NNIR is the difference between non-interest income and non-interest expense, divided by average total assets.

$$NNIR_t = \frac{\text{non. int. income}_t - \text{non. int. expense}_t}{\text{average total assets}_t}$$

The NIM and NNIR, with some modification, sum to the ROAA, as shown below. The modification is required because the NIM and NNIR have slightly different denominators: average interest earning assets and average total assets respectively. The *assets ratio*, defined here as the ratio of average financial assets to average total assets, takes account of this difference.

$$ROAA_t = NIM_t \left( \frac{\text{avg. int. earn. assets}_t}{\text{average total assets}_t} \right) + NNIR_t$$

## Decomposition of the NIM

The following shows how to account for the contributions of the primary components of the balance sheet to changes in the NIM, as per Covas et al. (2015).

$CNIM_{i,t}$ , the contribution of asset type  $i$  to the NIM in year  $t$ , is defined as

$$CNIM_{i,t} = \frac{\text{int. income}_{i,t}}{\text{avg. int. earn. assets}_{i,t}} \times \frac{\text{avg. int. earn. assets}_{i,t}}{\text{avg. int. earn. assets}_t}$$

Where  $\text{int. income}_{i,t}$  and  $\text{avg. int. earn. assets}_{i,t}$  are the interest income and the average total value of asset type  $i$  in year  $t$  respectively.  $i = \{\text{bank \& customer loans, and securities \& other assets}\}$ . This means that the contribution of asset type  $i$  to the NIM in year  $t$  is the product of the average interest earned on asset type  $i$  and the share of these assets relative to the average total interest earning assets in that year. Extending this to liabilities, the contribution of liability type  $j$  in year  $t$  to the NIM in year  $t$  is defined as

$$CNIM_{j,t} = \frac{\text{int. expense}_{j,t}}{\text{avg. int. bear. liabil.}_{j,t}} \times \frac{\text{avg. int. bear. liabil.}_{j,t}}{\text{avg. int. earn. assets}_t}$$

Where  $\text{int. expense}_{j,t}$  and  $\text{avg. int. bear. liabil.}_{j,t}$  are the interest expense and the average total value of liability type  $j$  in year  $t$  respectively.  $j = \{\text{bank \& customer deposits, and other interest bearing liabilities}\}$ . This means that the contribution of liability type  $j$  to the NIM in year  $t$  is the product of the average interest paid on liability type  $j$  and the share of these liabilities relative to the average total interest earning assets in that year.<sup>9</sup> From here, the changes in contribution between year  $t$  and  $t-1$  are calculated as follows.

$$\begin{aligned} \Delta CNIM_{i,t} &= CNIM_{i,t} - CNIM_{i,t-1} \\ \Delta CNIM_{j,t} &= CNIM_{j,t} - CNIM_{j,t-1} \end{aligned}$$

<sup>9</sup> Note that the contribution of liabilities is calculated in terms of interest earning assets, as per the definition of the NIM.

Hence, by construction, the Covas et al., 2015, method ensures that the change in contribution of each type of asset and liability sums to the total change in the NIM. These contributions may be the result of: (i) changes in the return on (cost of) each asset (liability) type: change in yields, and (ii) changes in the make-up of the balance sheet: changes in shares. Decomposition of the NIM into yield effects of each asset type is given by

$$\Delta CNIMy_{i,t} = \left( \frac{int. income_{i,t}}{avg. int. earn. assets_{i,t}} - \frac{int. income_{i,t-1}}{avg. int. earn. assets_{i,t-1}} \right) \times \frac{avg. int. earn. assets_{i,t-1}}{avg. int. earn. assets_{t-1}}$$

Where  $\Delta CNIMy_{i,t}$  is the portion of change in the contribution of asset type  $i$  between years  $t$  and  $t-1$  explained by the change in the average interest earned by this asset type. The share of the asset type  $i$  is held constant at its  $t-1$  value. Changes in the share of each asset type are given by

$$\Delta CNIMs_{i,t} = \left( \frac{avg. int. earn. assets_{i,t}}{avg. int. earn. assets_t} - \frac{avg. int. earn. assets_{i,t-1}}{avg. int. earn. assets_{t-1}} \right) \times \frac{int. income_{i,t}}{avg. int. earn. assets_{i,t}}$$

Where  $\Delta CNIMs_{i,t}$  is the portion explained by the change in the share of asset type  $i$ . In this case, the average interest earned on asset type  $i$  is held constant at its value in  $t$ . For assets, therefore, the total contribution to the change in the NIM of yield and share respectively is given by

$$\Delta CNIM_{i,t} = CNIMy_{i,t} + CNIMs_{i,t}$$

Liabilities are treated similarly, with *int. income*<sub>*i,t*</sub> and *avg. int. earn. assets*<sub>*i,t*</sub> replaced by *int. expense*<sub>*i,t*</sub> and *avg. int. bear. liabil.*<sub>*i,t*</sub> respectively.<sup>10</sup>

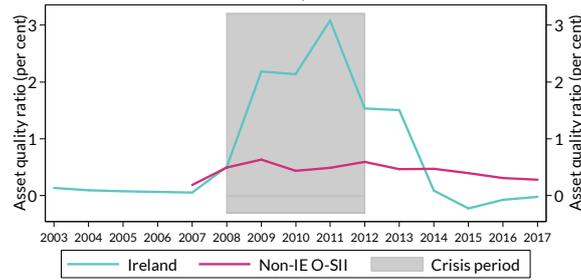
Table A1 includes the values corresponding to each component of the decomposition for Ireland and the Non-IE O-SIIs. These values sum to the total change in the NIM (column 15). All values are in basis points, save for the NIM (column 16), which is in per cent.

Table A1: Results of various decompositions

	Asset-side Contributions							Liability-side Contributions							Total Effect		
	Loans			Other			Total assets effect	Deposits			Other			Total liabilities effect	Change in NIM	NIM (per cent)	
	Yield	Share	Total	Yield	Share	Total		Yield	Share	Total	Yield	Share	Total				
Year	1	2	3=1+2	4	5	6=4+5	7=3+6	8	9	10=8+9	11	12	13=11+12	14=10+13	15=7+14	16	
Ireland	2004	-9	-18	-27	13	12	25	-2	3	20	23	7	-13	-6	17	16	2.04
	2005	7	-8	-1	-19	4	-15	-16	16	12	28	-7	-12	-19	9	-7	1.96
	2006	20	1	20	16	-1	14	35	-41	11	-30	-22	-8	-30	-60	-25	1.72
	2007	63	-3	60	-4	1	-3	57	-50	20	-29	-20	-14	-34	-63	-6	1.65
	2008	29	5	34	4	-2	2	36	-15	2	-13	-9	-4	-12	-25	11	1.77
	2009	-214	-2	-216	-39	1	-38	-254	120	-8	112	92	5	97	209	-45	1.31
	2010	23	-6	17	0	3	3	20	-6	-8	-14	-36	17	-19	-34	-14	1.17
	2011	3	2	6	11	-1	10	16	-45	-9	-54	-6	20	13	-40	-24	0.93
	2012	-18	-1	-18	3	0	4	-14	11	-6	5	-6	10	4	8	-6	0.87
	2013	-5	-6	-11	-8	3	-5	-17	48	-1	46	3	5	8	54	37	1.24
2014	3	-2	1	-3	1	-2	-1	37	0	37	-1	2	0	37	36	1.61	
2015	-2	4	2	-14	-1	-15	-13	21	1	22	13	2	15	36	24	1.84	
2016	-10	2	-8	-6	-1	-7	-15	14	0	13	7	3	10	24	9	1.93	
2017	-5	0	-5	-3	0	-3	-7	12	0	12	8	2	10	22	14	2.08	
<b>Total</b>	<b>-114</b>	<b>-32</b>	<b>-146</b>	<b>-48</b>	<b>18</b>	<b>-29</b>	<b>-175</b>	<b>126</b>	<b>32</b>	<b>158</b>	<b>23</b>	<b>14</b>	<b>37</b>	<b>195</b>	<b>20</b>	<b>-</b>	
Non-IE O-SII	2008	32	-5	27	-3	5	2	29	3	3	6	-18	18	0	5	27	1.23
	2009	-91	6	-84	-116	-3	-119	-204	80	-4	75	129	10	138	213	21	1.43
	2010	-28	7	-21	-2	-4	-6	-27	20	-4	16	17	3	20	36	9	1.53
	2011	12	-2	10	1	1	2	12	-11	-2	-12	-12	10	-2	-15	-2	1.51
	2012	-5	-4	-8	-12	2	-10	-18	2	-1	1	5	4	9	10	-8	1.43
	2013	-23	-1	-23	-13	0	-12	-36	18	-1	17	15	-3	11	28	-7	1.35
	2014	-2	-3	-5	-3	1	-2	-6	8	0	8	-1	2	2	10	4	1.39
	2015	-14	-1	-15	-4	0	-3	-18	12	-1	10	3	4	6	17	-1	1.39
	2016	-13	4	-9	-1	-2	-3	-12	7	-2	5	3	0	4	8	-3	1.35
	2017	-8	3	-5	-4	-1	-5	-10	2	-1	1	8	0	8	10	0	1.35
<b>Total</b>	<b>-139</b>	<b>5</b>	<b>-133</b>	<b>-156</b>	<b>1</b>	<b>-156</b>	<b>-289</b>	<b>141</b>	<b>-14</b>	<b>127</b>	<b>149</b>	<b>47</b>	<b>196</b>	<b>323</b>	<b>40</b>	<b>-</b>	

<sup>10</sup> Note that *int. earn. assets*<sub>*t*</sub> (total interest earning assets) should not be replaced as the NIM is expressed in terms of interest earning assets.

Figure A1: Impairment provision as per cent of average total assets, over time



Source: author's calculations using bank annual reports and SNL data.  
 Asset quality ratio is here defined as the total impairment provision over the average total assets.  
 A low asset quality ratio is more desirable.

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