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Central Bank Quarterly Bulletin



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# Notes

1. The permission of the Government has been obtained for the use in this Bulletin of certain material compiled by the Central Statistics Office and Government Departments. The Bulletin also contains material which has been made available by the courtesy of licensed banks and other financial institutions.
2. Unless otherwise stated, statistics refer to the State, i.e., Ireland exclusive of Northern Ireland.
3. In some cases, owing to the rounding of figures, components do not add to the totals shown.
4. The method of seasonal adjustment used in the Bank is that of the US Bureau of the Census X-11 variant.
5. Annual rates of change are annual extrapolations of specific period-to-period percentage changes.
6. The following symbols are used:

e estimated	n.a. not available
p provisional	. . no figure to be expected
r revised	– nil or negligible
q quarter	f forecast
7. Data on euro exchange rates are available on our website at [www.centralbank.ie](http://www.centralbank.ie) and by telephone at 353 1 2246380.

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## Forecast Summary Table

	2015	2016 <sup>e</sup>	2017 <sup>f</sup>	2018 <sup>f</sup>
<b>Real Economic Activity</b>				
(% change)				
Personal consumer expenditure	4.5	3.0	3.0	2.5
Public consumption	1.2	5.3	2.0	2.0
Gross fixed capital formation	32.7	45.5	8.4	7.9
Exports of goods and services	34.4	2.4	4.4	4.0
Imports of goods and services	21.7	10.3	5.8	5.2
Gross Domestic Product (GDP)	26.3	5.2	3.5	3.2
Gross National Product (GNP)	18.7	9.0	3.3	2.8
<b>External Trade and Payments</b>				
Balance-of-Payments Current Account (€ million)	26,157	12,544	13,043	12,856
Current Account (% of GNP)	10.2	4.7	4.6	4.3
<b>Prices, Costs and Competitiveness</b>				
(% change)				
Harmonised Index of Consumer Prices (HICP)	0.0	-0.2	0.7	1.2
<i>of which:</i> Goods	-3.1	-3.1	-0.9	0.2
Services	3.0	2.5	2.1	2.1
HICP excluding energy	1.0	0.4	0.1	1.3
Consumer Price Index (CPI)	-0.3	0.0	0.7	1.3
Nominal Harmonised Competitiveness Indicator (Nominal HCI) <sup>1</sup>	0.4	n.a.	n.a.	n.a.
Compensation per Employee	2.7	2.8	2.8	2.8
<b>Labour Market</b>				
(% change year-on-year)				
Total employment	2.6	2.9	2.6	1.9
Labour force	0.5	1.2	1.0	1.0
Unemployment rate (ILO)	9.4	7.9	6.4	5.6
<b>Technical Assumptions<sup>2</sup></b>				
EUR/USD exchange rate	1.11	1.11	1.06	1.06
EUR/GBP exchange rate	0.73	0.84	0.87	0.87
Oil price (\$ per barrel)	53.70	43.14	56.20	55.50
Interbank market – Euribor <sup>3</sup> (3-month fixed)	-0.02	-0.27	-0.33	-0.33

<sup>1</sup> Based upon the annual change in the average nominal HCI.

<sup>2</sup> The technical assumption made is that exchange rates remain unchanged at their average levels in mid-March. Oil prices and interest rates are assumed to move in line with the futures market.

<sup>3</sup> Euribor is the rate at which euro interbank term deposits are offered by one prime bank to another, within the euro area. Daily data from 30 December 1998 are available from [www.euribor.org](http://www.euribor.org).



## Comment

While gauging the strength of the economy is complicated by the distortions surrounding headline national accounts measures, the evidence from a broad range of domestic spending and activity data is that the Irish economy continues to grow at a healthy pace, supported by the strength of domestic demand. Underpinning economic performance over the past year has been an acceleration in employment growth, which picked up significantly over the course of 2016, offering evidence of tangible improvement in economic recovery and suggesting some forward momentum into 2017. Looking ahead, while the overall growth outlook remains relatively positive, as has been the case for some time now, uncertainty persists in relation to the external environment and risks to the forecasts are weighted to the downside.

Despite the concerns about Brexit and the weakness of sterling, recent evidence points to a broadening of recovery on the domestic side of the economy, with consumer spending continuing to grow solidly and the revival of the construction sector gaining traction. Growth in underlying domestic demand over the past year has been supported by strong and broad-based growth in employment, which, in 2016, grew at its fastest rate in almost a decade. Since the low point reached in 2012, employment has grown by over 200,000, at an average annual rate of almost 2.5 per cent, while employment outside of the construction sector has now moved above the previous peak reached in the first-half of 2008.

The cumulative effect of these gains has helped incomes to recover and supported solid growth in consumption in recent years (see Box C, page 15). Allied to strengthening growth in underlying investment, which excludes the volatile components of intangibles and aircraft, this has underpinned recovery on the domestic side of the economy and, to date, has outweighed the negative impact of external factors.

Looking ahead, the main impetus to growth in 2017 and 2018 is expected to come from the projected strength of domestic demand, reflected in solid growth in consumer spending and underlying investment. The main driver of growth will be continuing gains

in employment and incomes, though some moderation in employment growth from current rates is projected over the forecast horizon. Notwithstanding this gradual moderation, underlying domestic demand is projected to grow by 4.0 per cent in 2017 and by 3.5 per cent next year.

While the central forecast is for economic activity to continue to grow at a healthy pace, risks to these forecasts are to the downside. The outlook is characterised by uncertainty about the external environment, both in relation to Brexit and the changing international political and economic policymaking landscape. Looking at the wider international picture, there are also risks related to the potential for changes to broader international taxation and trade arrangements.

Both in the short term and the longer term, the economic impact of Brexit on Ireland is set to be negative. Reflecting this, the Central Bank revised down its economic forecasts in the wake of the UK referendum. To date, in the absence of any weakening in the UK economy, the impact of Brexit has mainly been experienced through the sizeable depreciation of sterling against the euro. In addition, however, those sectors with a high dependency on exports to the UK remain exposed to any future adverse UK economic developments and also the threat of new barriers to trade. Consequently, sectors such

as agri-food, clothing and footwear and tourism could be affected disproportionately.

While exporters selling to the UK are most immediately affected, there are additional channels by which shifts in the sterling-euro exchange rate affects the economy. First, in many domestic sectors, the market share of domestic firms could be affected by import competition from the UK. Second, many domestically-orientated firms are suppliers to exporters or rely on employees in exporting firms as customers. Third, sterling depreciation may be associated with an increase in cross-border shopping, including a greater volume of online purchases from UK websites.

While these are adverse forces, it is also important to point out that a weaker sterling may benefit some firms that rely on imported inputs from the UK and that real income gains to households due to cheaper imports from the UK may, in part, be recycled into higher spending on domestically-produced goods and services.

Over the longer term, Irish firms will have to adapt to the post-Brexit environment. The current uncertainty about the future UK-EU relationship may delay investment plans. In turn, as clarity about the post-Brexit world emerges, firms will have to develop new strategies to respond to the new configuration. In the event of higher trade barriers between the UK and the EU, some firms may plan to serve UK customers through FDI into the UK, while others may search for new export markets. In the other direction, some UK firms may look to set up affiliates in Ireland both to serve the Irish market and as a platform for EU-wide trading.

Turning to global risk factors, any increase in protectionism is sure to pose a challenge for Irish-resident exporters and, especially, the multinational sector. This is of most concern to firms that export primarily to countries that might seek to penalise importers relative to domestic producers, but the complex characteristics of global value chains and

inter-sectoral linkages mean that the impact of protectionism will also affect firms and locations through indirect channels. Shifts in tax policies and exchange rates are additional factors that may influence the strategies of multinational firms in the coming years. Given the importance of the multinational sector to the Irish economy, monitoring and assessing external developments in these areas must be a high priority for domestic policymakers.

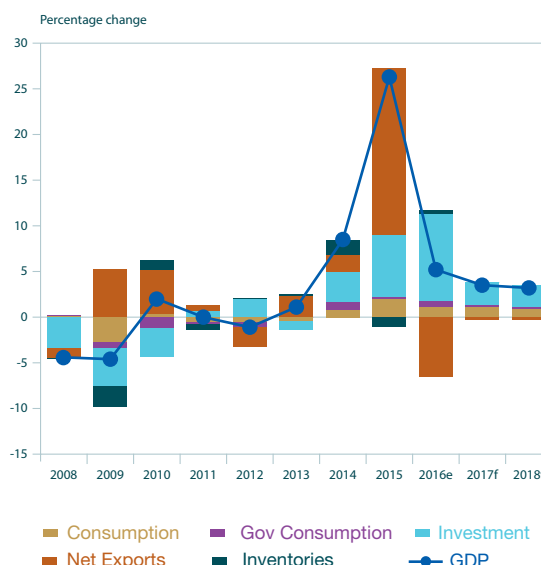
With regard to the monitoring and measurement of domestic developments, the planned implementation by the CSO of the recommendations of the Economic Statistics Review Group (ESRG), beginning from mid-2017, will provide new, supplementary statistics to overcome the evident limitations with the national accounts and to meet user needs for greater insight into Irish economic activity. The most significant development is the proposed publication of a new adjusted level indicator of the aggregate size of the domestic economy, GNI\*, which adjusts the existing measure of Gross National Income (GNI) for depreciation on foreign-owned domestic capital assets and the retained earnings of re-domiciled plcs (see Box B, page 12). The publication of GNI\*, along with adjusted presentations of the Balance of Payments and International Investment Position data, will provide reliable measures of the aggregate size of the Irish economy, of the role of foreign-owned firms and a more accurate picture of Ireland's international balance sheet. The availability of such data is to be welcomed and will enhance fiscal planning, the assessment of the sustainability of public and private debt stocks and many private sector decisions

# The Irish Economy

## Overview

- The outlook for growth this year and for 2018 had been revised upwards relative to the last Quarterly Bulletin reflecting stronger momentum in the domestic economy and an improved outlook for external demand. The economy is projected to expand in GDP terms by 3.5 per cent in 2017 and by 3.2 per cent in 2018. This follows estimated GDP growth of 5.2 per cent in 2016.
- In contrast to the preceding year when the headline National Accounts measures greatly overstated the underlying growth rate, GDP growth in 2016 was more closely in line with the underlying trend. However, this reflected offsetting impacts from the activities of multinational enterprises (MNEs) which inflated headline measures of both investment and imports and masked the underlying strength of goods exports. This, in turn, led to a significant overstatement of respective positive and negative contributions from domestic demand and net exports.
- It is likely that alternative measures of growth such as underlying domestic demand and Gross National Income (GNI)\* (see Box B), when available, will reveal a more balanced growth outlook for last year. It seems likely that domestic demand was the main growth driver with a broadly neutral contribution from net exports. An estimate of underlying domestic demand requires details of investment in intangible assets and machinery and equipment which were suppressed for confidentiality reasons in the latest Quarterly National Accounts. An estimate of GNI\* will be available with the publication of the annual National Accounts later this year.
- Domestic demand components (consumption and investment) will continue to drive growth over the forecast horizon. Total investment spending, which increased by 45.5 per cent in 2016, was inflated by a surge in the acquisition of intangible assets, which masked a strong underlying trend, which is expected to continue. Underlying investment (net of intangibles and aircraft related investment) is forecast to increase by 9.8 and 8.4 per cent in 2017 and 2018. Consumer spending is set to remain robust supported by a strong labour market and positive consumer sentiment. Consumption growth of 3 per cent is projected for 2017 moderating to about 2.5 per cent next year.

Chart 1: Contributions to GDP



Source: CSO and Central Bank of Ireland.

- A relatively muted export performance last year reflected weakness in contract manufacturing abroad by Irish based MNEs. This year and in 2018, excluding any volatility that might arise from contract manufacturing, exports are projected to broadly track demand in our main trading partners. Reflecting the improved outlook in these markets, this points to a pick-up in export volume growth to 4.4 per cent in 2017, easing to about 4 per cent in 2018. Import growth, boosted by the pick-up in export volumes and the robust trend in domestic demand, will remain strong and in excess of export growth. Accordingly, net exports are likely to make a small negative contribution to overall GDP growth.
- Following a robust performance last year, with employment growth of 2.9 per cent and a decline in unemployment to under 7 per cent by year-end, the strong labour market performance is expected to continue over the forecast period. Employment growth of 2.6 per cent this year and 1.9 per cent in 2018 should see numbers employed exceeding 2.1 million for the first time since 2008. The downward trend in unemployment quickened in the first quarter of this year, with the seasonally adjusted rate declining to 6.6 per cent in February. For the year as a whole, unemployment is forecast to average 6.4 per cent declining to 5.6 per cent next year.

- *Headline inflation, which was negative through much of last year turned positive in the first months of 2017 reflecting a pick-up in energy prices while underlying pressures remained subdued. Much of the weakness in inflation can be attributed to an appreciation in the euro sterling exchange rate, which passed through quickly to consumer prices. As this exchange rate effect begins to fade and the impact of higher energy prices begins to be felt, a modest rebound in inflation to 0.7 per cent in both CPI and HICP terms is forecast for 2017. An increase in HICP and CPI inflation to 1.2 per cent and 1.3 per cent is projected for 2018.*
- *As is to be expected given the highly open nature of the economy, the risks to the outlook are mainly external. The most immediate risks are related to Brexit and the uncertainty regarding the post-Brexit trading relationship between the UK and the European Union. The key points of recent commentary by the Governor, Deputy Governor-Central Banking and Bank Directors on Brexit are included in an information note elsewhere in this Bulletin.*

### Box A: The International Economic Outlook

By Monetary Policy Division

The euro area continues to recover and is benefitting from a supportive policy environment. Euro area GDP increased by 0.4 per cent during the fourth quarter of 2016. More recent sentiment data point to a faster increase in activity during the first quarter of 2017. The Composite Purchasing Managers' Index increased to 56 in February from 54 in January and the European Commission's Economic Sentiment Indicator remains well above its long run average. The European Central Bank has revised up projected euro area GDP growth in 2017 and 2018 by 0.1 percentage points. Euro area GDP is now forecast to increase by 1.8 per cent in 2017 and 1.7 per cent in 2018. Euro area HICP inflation climbed to 2 per cent year-on-year in February according to Eurostat. However, underlying price pressures, as measured by wage growth and core inflation, remain subdued.

The stance of fiscal policy across the euro area is now considered to be broadly neutral while monetary policy remains accommodative. ECB President Mario Draghi re-iterated at the March Governing Council press conference that policy rates are expected to remain at the same level for some time. Non-performing loans across the euro area's banking sector remain stubbornly high. Furthermore, high levels of unemployment continue to weigh on the euro area's recovery.

In the UK, activity has remained more robust than expected following the result of the referendum on EU membership last June. The OECD and the European Commission have revised up projected GDP growth during 2017 to 1.6 per cent and 1.5 per cent respectively in their latest forecasts. The main risk to the UK economy concerns the new economic and political arrangements that will be reached with the European Union after Article 50 was invoked in late March. The Bank of England has maintained an accommodative policy stance in recent months. At its February meeting, the Bank's Monetary Policy Committee left this stance unchanged. At the same time, inflation is expected to climb to 2.5 per cent later this year, overshooting the Bank's inflation target of 2 per cent.

Economic activity in the United States (US) picked up in the second half of 2016, and US GDP is expected to increase by around 2.3 per cent in 2017 and 2018. The new administration has signalled a shift towards more expansionary fiscal policy and more restrictive trade policy. However, the precise impact of these measures on US activity is still difficult to gauge as the policy measures remain unclear. Inflation continues to increase and is expected to reach 2.5 per cent in 2017, up from 1.3 per cent in 2016. Accordingly, the Federal Reserve increased the target for its main policy rate to between 0.75 per cent to 1 per cent at its March meeting. At the same time, Fed policymakers stuck with previous projections that there would be a total of three rate increases this year.

**Box A: The International Economic Outlook**  
By Monetary Policy Division

The global economy continues to recover and is expected to pick up modestly in 2017 and 2018. However, the prospects for the global economy are also subject to a number of risks including: a faster than expected rebound in energy prices, a further shift away from global trade, and a tightening of financial conditions in the world's emerging market economies. The recent recovery in energy prices has boosted the short term prospects for the world's main commodity exporters although this could jeopardise the recovery in the world's advanced economies. The rise in protectionist sentiment in a number of economies also represents a risk to global growth. Recalling that trade constitutes an important channel of technological transfer, any country that shifts towards protectionism is likely to incur a reduction in productivity growth over the medium term. Finally, a number of emerging market economies have incurred significant dollar liabilities over the past few years. Further increases in US interest rates or a strengthening in the dollar could quickly translate into tighter financial conditions for these economies.

**Table 1: Expenditure on Gross National Product 2016, 2017<sup>f</sup> and 2018<sup>f</sup>**

	2016 <sup>1</sup>		% change in		2017 <sup>f</sup>		% change in		2018 <sup>f</sup>
	EUR millions	volume	price	EUR millions	volume	price	EUR millions		
Personal Consumption Expenditure	96,090	3.0	1.0	99,962	2.5	1.4	103,896		
Public Net Current Expenditure	28,525	2.0	1.8	29,618	2.0	1.6	30,687		
Gross Domestic Fixed Capital Formation	77,795	8.4	2.3	86,259	7.9	2.3	95,243		
<i>Building and Construction</i>	16,532	12.7	3.9	19,359	10.2	3.9	22,171		
<i>Machinery and Equipment</i>	17,120	5.4	1.3	18,273	5.4	1.3	19,504		
<i>Intangibles</i>	44,142	8.0	2.0	48,627	8.0	2.0	53,567		
Value of Physical Changes in Stocks	1,928			1,928			1,828		
<b>TOTAL DOMESTIC DEMAND</b>	204,338	4.9	1.6	217,768	4.6	1.7	231,653		
<i>of which: Underlying Domestic Demand</i>	151,170	4.0	1.5	159,618	3.5	1.8	168,131		
Exports of Goods & Services	318,817	4.4	1.3	337,285	4.0	1.3	355,301		
<b>FINAL DEMAND</b>	523,155	4.6	1.4	555,053	4.2	1.5	586,954		
Imports of Goods & Services	-257,159	5.8	-0.2	-271,337	5.2	0.2	-286,152		
<i>Statistical Discrepancy</i>	-162			-162			-162		
<b>GROSS DOMESTIC PRODUCT</b>	265,834	3.5	3.1	283,554	3.2	2.7	300,640		
Net Factor Income from Rest of the World	-47,464	4.4	1.3	-50,205	5.4	1.3	-53,592		
<b>GROSS NATIONAL PRODUCT</b>	218,370	3.3	3.5	233,350	2.8	3.0	247,048		

<sup>1</sup> 2016 figures are estimates prior to the release of the 2016 National Income and Expenditure Accounts. *Machinery and Equipment Investment and Intangible Investment* figures were derived using internal calculations and were used to estimate *Underlying Domestic Demand*.

**Box B: GNI\*- A better measure of domestic economic activity**

By John Flynn<sup>2</sup>

Following the publication of the 2015 National Income and Expenditure results, it became broadly accepted that, while GDP and GNP continue to be the international standard indicators, they no longer provide a useful understanding of the domestic economy. In particular, headline national accounts aggregates and their components have become significantly affected by the complexities of activity in a highly globalised economy such as Ireland. This reflects the increasingly interconnected nature of business and its growing fragmentation across national borders. As a result, Irish national accounts data can include economic activity carried out elsewhere, or of ultimate benefit to those elsewhere, but formally recorded as part of Irish GDP or GNP.

The 2015 NIE results brought these issues into sharp focus, with real GDP registering growth of over 26 per cent and growth in real GNP recorded at almost 19 per cent. The 2015 results were driven by globalisation and, in particular, by balance sheet relocations to Ireland and the activity related to those relocations. The key development was a €300bn increase in the capital stock in 2015, which shows up in the International Investment Position (IIP) data in an equivalent increase in the level of external liabilities associated with direct investment in the first quarter of 2015. This essentially involved the relocation of intangible assets, in the form of intellectual property, to Ireland. These developments are shown in the chart and table.

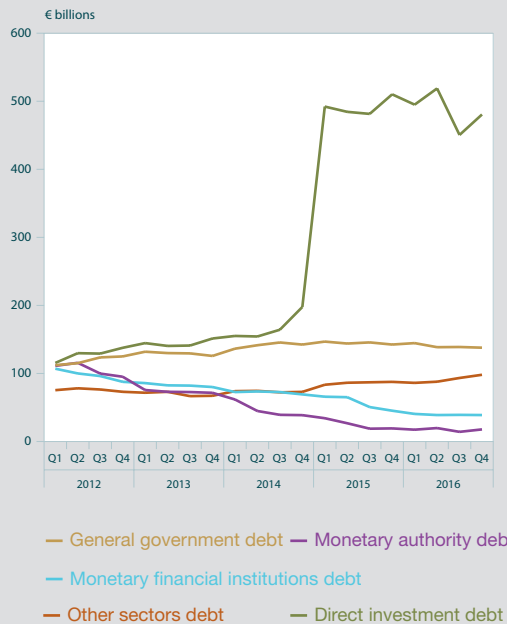
**Box B Table 1:** Gross capital stock of fixed assets, € bn

End of year	2010	2011	2012	2013	2014	2015
Current prices	614.4	628.2	662.6	694.4	756.4	1,087.9
Constant* prices	664.2	681.9	702.0	720.1	756.4	1,052.1

\*(2014)

Associated with the relocation of intangible assets was a very substantial increase in external contract manufacturing, which occurs when a company located in Ireland contracts a company abroad to manufacture products on its behalf. As a result, much of the output and employment associated with the increase in the capital stock took place outside of Ireland. However, with output and exports in the National Accounts now linked more closely to ownership rather than geography, the resulting production and net exports were recorded as Irish. As a result, the 2015 NIE results are dominated by the role of intangible assets, the globalisation of production processes and the residential location of the corporate structures of global firms.

**Box B Chart 1: External Debt (Non-IFSC)**



Source: CSO.

In response to the publication of the 2015 results, the CSO convened the Economic Statistics Review Group (ESRG)<sup>3</sup>, which was mandated to provide guidance to the CSO on how best to meet user needs for greater insight into Irish economic activity, taking account of the challenges inherent in providing a comprehensive picture of the highly globalised Irish economy.

<sup>2</sup> Irish Economic Analysis Division.

<sup>3</sup> Report of the Economic Statistics Review Group, December 2016.

**Box B: GNI\*- A better measure of domestic economic activity***By John Flynn*

The foundations for the analysis of how the activities of global firms should be captured in national accounting frameworks is set out in Lane (2017)<sup>4</sup> and emphasises the importance of two principles in arriving at a stable measure of overall economic performance - that the measure be robust to alternative accounting approaches and that it also be robust to alternative mechanisms by which the foreign investor is paid out. With regard to the work of the ESRG in generating a reliable measure of the size of the economy, this focussed attention on two sets of issues - first, the manner in which gross aggregates in the national accounts of globalised economies are distorted by relocations of intangible assets and the globalisation of production processes and, second, differences in the accounting treatment of net income for different types of firm.

The distorting effect of relocations of intangible assets arises from their impact on depreciation. Under the ESA2010 national accounting framework, intangible assets, such as intellectual property, are treated as non-financial assets requiring depreciation. Consequently, the capital assets in the relocated balance sheets led to a significant increase in the estimates for depreciation in 2015. As a result of this increase in depreciation charged in Ireland, on what is a foreign-owned portion of the capital stock, FDI-related profits attributable to the rest of the world are reduced. As these profits are a major part of the difference between Gross Domestic Product (GDP) and Gross National Income (GNI), the measurement of GNI was also affected by the balance sheet relocations. To correct for this distortion, the ESRG recommended that GNI be adjusted for depreciation on foreign-owned domestic capital assets. Doing so would ensure that the relocation of capital assets, which have little or no impact on actual domestic economic activity and remain under the control of the same ultimate beneficial foreign owners, would not have an impact on the measurement of domestic economic activity.

A second adjustment proposed by the ESRG was to correct for the difference in treatment between the net income of directly-owned foreign Multi-National Enterprises (MNEs) and re-domiciled plcs, that is firms with largely global operations and whose portfolio owners are foreign, but with a corporate structure that is headquartered in Ireland. In line with BOP methodology, income flows on FDI and non-portfolio debt are recorded as outflows, on accrual, while income flows on portfolio debt and equity are recorded on a cash basis. As a result, all net income is treated as an outflow for foreign-owned MNEs, whereas only dividends actually paid to shareholders are recorded as outflows for re-domiciled plcs. Accordingly, GNI, as currently calculated, is affected by the timing of dividend payouts. To overcome this distortion, which has been recognised for some years now, the ESRG recommended that GNI also be adjusted for the net income of re-domiciled plcs.

Combining these two adjustments, the ESRG recommended the compilation of an adjusted level indicator of the aggregate size of the domestic economy, GNI\*:

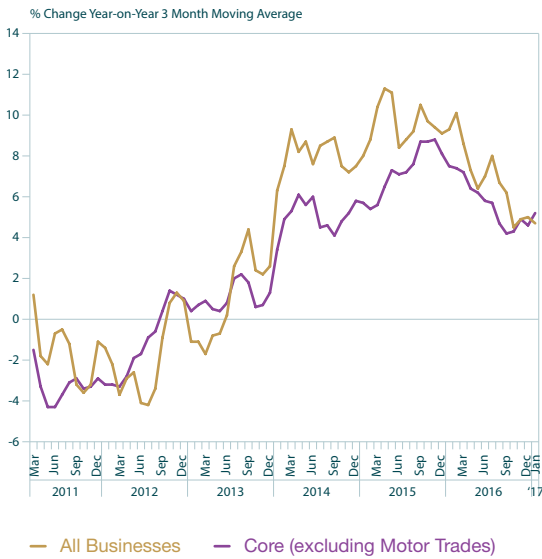
GNI\* = GNI appropriately adjusted for depreciation on foreign-owned domestic capital assets and the retained earnings of re-domiciled plcs.

The compilation of GNI\*, along with corresponding adjusted presentations of the BOP/IIP data, would provide reliable measures of the aggregate size of the economy, of the role of foreign-owned firms and a more accurate picture of Ireland's international balance sheet. The availability of such data would enhance fiscal planning, the assessment of the sustainability of public and private debt stocks and many private sector decisions.

At present, it is not possible to calculate a series for GNI\*. However, the CSO have committed to publishing an annual time series of this indicator as part of the annual NIE and BOP results in mid-2017 and to undertake further work to develop a quarterly series for GNI\*. As an illustration, adjusting the published figure for GNI in 2015 for the CSO estimate of the net income of re-domiciled plcs and also for the increase in the provision for depreciation in that year (on the assumption that this increase is largely related to the increase in the capital stock as a result of the balance sheet relocations), suggests that nominal GNI\* in 2015 was approximately two-thirds of the published 2015 nominal GDP figure and just over four-fifths of the published figure for nominal GNP. These estimates for 2015 broadly accord with an illustration provided by CSO at the time of the release of the Report of the ESRG. On the basis of currently available data, it is not yet possible to approximate GNI\* for earlier years.

<sup>4</sup> Philip R Lane, 'Notes on the treatment of Global Firms in National Accounts', Central Bank of Ireland Economic Letter, Vol. 2017, No. 1.

Chart 2: Index of Retail Sales



Source: CSO.

## Demand

### Domestic Demand Overview

For 2017 and 2018, domestic demand is expected to provide the main impetus to growth reflecting a robust outlook for consumption and investment spending. Labour market and income developments should lend further support to consumer spending over the forecast period despite significant risks on the external side (principally Brexit). The Bank's adjusted measure of domestic demand - *underlying domestic demand* - is projected to grow by 4 per cent in 2017 and by 3.5 per cent in 2018.

### Consumption

In 2017, personal consumption expenditure is forecast to grow by 3 per cent with 2.5 per cent growth anticipated for 2018. This outlook has been revised upwards since the last Bulletin, in part due to the strength in the labour market (discussed below). The close relationship between consumption and employment has been highlighted in previous Bulletins and is explored further in Box C.

The recent end-year Quarterly National Accounts (QNA) data point to estimated growth in consumption of 3 per cent in 2016, with seasonally adjusted growth of 0.7 per cent in the fourth quarter. The preliminary outturn for 2016 is below what was assumed in the last Bulletin, although revised annual figures will only become available later in the year. While goods consumption was robust (and tallied with higher frequency indicators such as retail sales), services consumption was much weaker.<sup>5</sup>

There is limited data available so far in 2017. Retail sales in January were strong with core sales (i.e. sales excluding motor trades) up 6.1 per cent year-on-year and overall sales up 4.9 per cent.<sup>6</sup> This follows from annual growth of 5.3 and 6.7 per cent respectively in 2016. Consumer sentiment (as measured by the KBC Ireland/ESRI survey) remains positive although the index fell in February with consumers remaining cautious, particularly in relation to employment.

<sup>5</sup> See Box A: "Recent trends in Personal Consumption Expenditure," in the Domestic Economy Chapter of the Central Bank of Ireland *Quarterly Bulletin No. 1, 2017*.

<sup>6</sup> In the 3-month period to end-January, core and overall retail sales were up 5.1 and 5.2 per cent year-on-year.

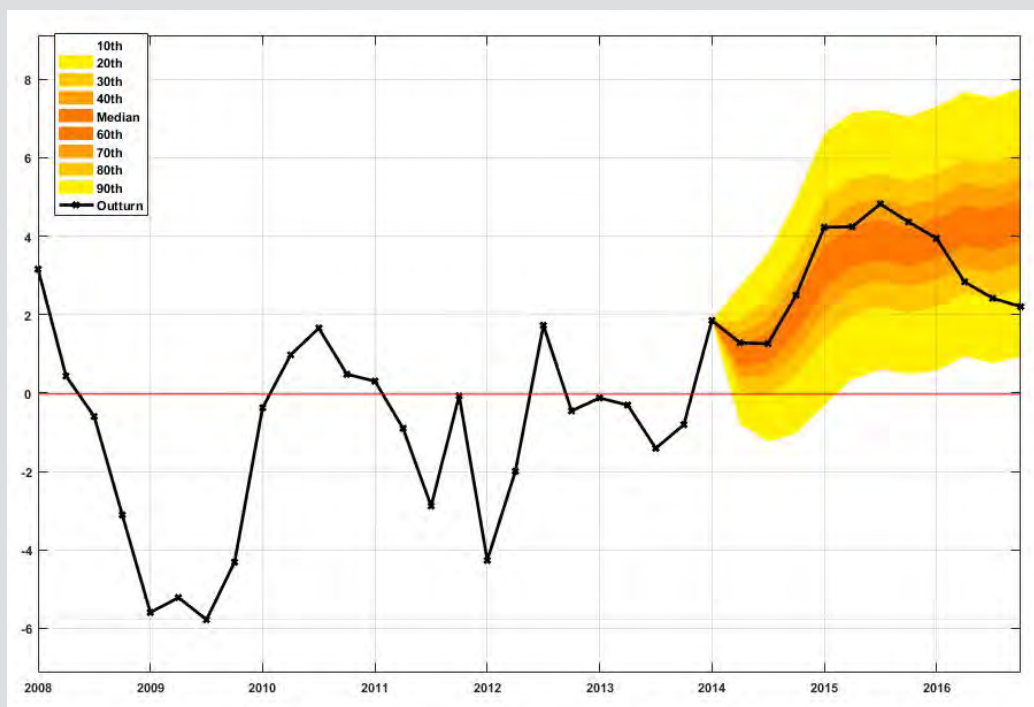


**Box C: Exploring recent drivers of personal consumption expenditure**

By Jonathan Rice and Stephen Byrne<sup>7,8</sup>

Personal consumption expenditure (PCE) is a reliable indicator of domestic economic activity. However, recent work by the Bank has highlighted that this series is prone to upward revision, particularly between the fourth quarter estimate and the release of the annual National Income and Expenditure Accounts. It is important to take this into account when forecasting consumption; that is, a forecast for 2017 is dependent on the 2016 base. The analysis that follows suggests that, given the strength of the underlying drivers of consumption, in particular the strong labour market, there is potential for upward revisions to the consumption figure when the forthcoming full year accounts are released. In this regard, this Box outlines results from two models used in the Bank to gain an understanding of the factors driving consumption.

**Figure 1:** In-sample Conditional Forecast



Source: CSO, Authors' calculations

Firstly, we conduct an in-sample forecast of consumption using a Bayesian vector autoregressive model (BVAR), estimated on data from 1999q1 to 2016q4. In this conditional forecast we use data on real disposable income (excluding income from property), employment, real house prices and the price of oil to predict an implied consumption path from 2014q1 to 2016q4, and compare this to the actual path of consumption in the QNA release. While the actual consumption path (black line) seems to fit the implied median consumption path rather well, there is a sharp drop-off from 2016q2 to 2016q4 (Figure 1). Therefore, if the relationship between the underlying drivers and consumption modelled in Figure 1 holds, this implies that preliminary quarterly estimates in 2016 may be revised upwards.

<sup>7</sup> Irish Economic Analysis Division.

<sup>8</sup> We thank Marta Banbura for sharing code used in this analysis and Diarmaid Smyth, Thomas Conefrey, Graeme Walsh and Michael O'Grady for helpful comments.

**Box C: Exploring recent drivers of personal consumption expenditure**  
By Jonathan Rice and Stephen Byrne

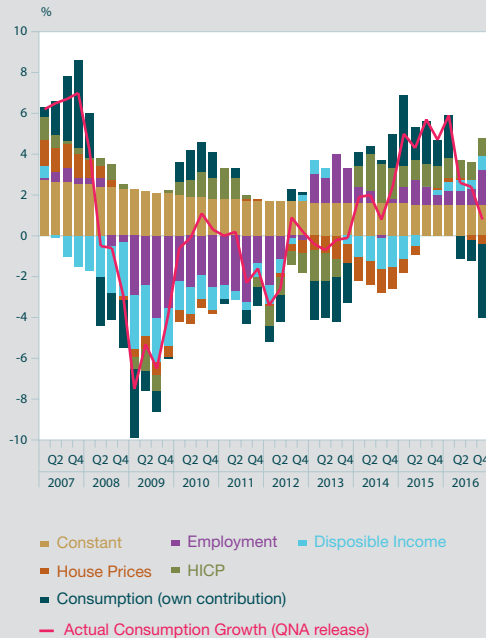
Our second model takes a systematic look at the main drivers of consumption. The results in Figure 2 show a historical decomposition based on a structural vector autoregressive (SVAR) model, where the impact of the consumption drivers are endogenously determined based on shocks to the underlying variables in the system<sup>9</sup>. The pink line is the observed year-on-year growth rate of consumption. It is clear that positive growth in this series over recent years has been largely driven by employment and weak consumer prices (HICP), as both low oil prices and exchange rate pass-through<sup>10</sup> have increased real disposable incomes. The dark blue columns represent the additional contribution of consumption (with three lags) beyond that which is estimated by the other drivers, and thus the large negative contribution in 2016q4 is a product of observed consumption growth in quarters 1, 2, 3 and 4 of 2016. Disregarding this 'own contribution' component, real consumption in 2016q4 is estimated to have reached its highest rate of year-on-year growth since prior to the financial crisis. The latest release of the QNA on the other hand indicates lower rates for quarterly consumption growth in 2016 than suggested by these underlying drivers.

In summary, this Box has used the historical relationship between consumption and the factors which drive it to give evidence of upside risk to the 2016 estimate of consumption. Both models show the labour market continues to be an important driver of the consumption profile. In recent years, low price inflation has also been an important contributor.

<sup>9</sup> The SVAR is estimated using quarterly data from 1999q1 to 2016q4 and year-on-year growth rates. Variables are ordered using economic intuition, where consumption is allowed to react contemporaneously to shocks in employment, disposable income, house prices and HICP. Lag length of three quarters is informed by Akaike Information Criteria (AIC).

<sup>10</sup> See Box C: "Exchange Rate Pass-through to Consumer Prices," in the Domestic Economy Chapter of the Central Bank of Ireland Quarterly Bulletin No. 1, 2017.

**Box C Figure 2: Historical Decomposition of Personal Consumption Expenditure**



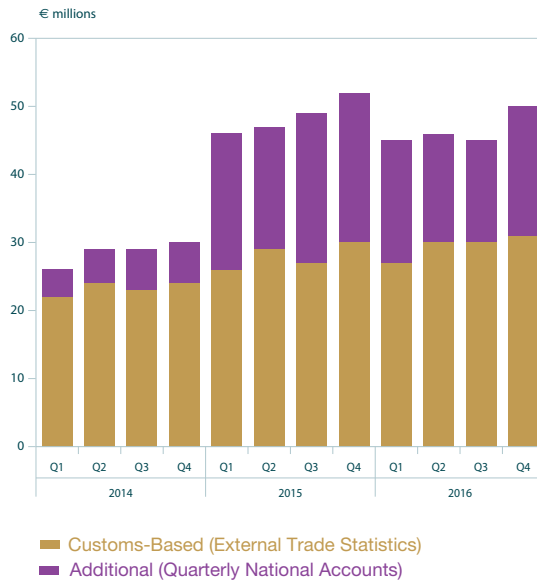
### Investment

Preliminary QNA data for 2016 reinforce the pattern evident in earlier data, with increasing volatility in headline investment figures being driven by fluctuations in aircraft purchases and investment in intangibles, in particular, intellectual property (IP) assets. Investment spending increased by an exceptional 162 per cent year-on-year in Q4 2016 due mainly to significant IP investment. The CSO have suppressed details of investment in intangibles and machinery and equipment for confidentiality reasons in the latest QNA.

However, using available trade data and the historical relationship between trade and investment in machinery and equipment (most of Ireland's machinery and equipment is imported), suggests IP-related investment in Q4 of approximately €28 billion – up 400 per cent year-on-year.

From the more limited investment data that was released in the QNA, underlying investment – i.e. investment net of the intangible assets and other transport equipment expenditures (mostly related to

**Chart 3: Year-on-Year Change in Goods Exports (Values)**



Source: CSO.

aircraft) – appears to be positive, although estimates for machinery and equipment are the subject of considerable uncertainty. Recent weak trends in core machinery and equipment investment are due to a base effect resulting from a significant investment in the Information and Communication Technology sector in 2014/2015.

Building and construction spending is accelerating, registering an increase of 13.7 per cent in 2016, driven by an increase in housing investment of 19 per cent and an increase in non-residential building of 11.4 per cent. House building is forecast to increase to approximately 19,000 and 23,000 new units in 2017 and 2018, from 15,000 additions to the housing stock in 2016. Non-residential construction investment is expected to remain buoyant, increasing by 10 and 8 per cent in 2017 and 2018.

Underlying investment (net of intangibles and aircraft related investment) is forecast to increase by 9.8 and 8.4 per cent in 2017 and 2018.

### Government Consumption

Government consumption grew by 5.3 per cent in 2016 according to the most recent set of QNA. For 2017 and 2018, the outlook for government spending is guided by the

announced measures in *Budget 2017*, with government consumption projected to increase by 2 per cent per annum on average.

## External Demand and Balance of Payments

### Exports and Imports

Preliminary estimates from the QNA suggest that the performance of exports weakened considerably during 2016 and particularly so during the second half of the year to yield an average annual increase of 2.4 per cent. Such a weakened outturn solely related to downward pressure from the goods side. As highlighted in the previous *Quarterly Bulletin*, the performance of goods exports has been affected over recent quarters by subdued levels of contract manufacturing, as illustrated by the reduced divergence between the customs-based External Trade Statistics and the QNA measure of goods exports – see Chart 3. In marked contrast, services exports strengthened appreciably during the final two quarters of 2016 to yield an average annual increase of 7.7 per cent in volume terms.

Among the most noteworthy developments during the final quarter of 2016 was the surge in imports, driven by a 54.8 per cent year-on-year increase in services. The strength of this outturn would appear to be almost entirely attributed to the business services sector and specifically, research and development arising from a sharp jump in the purchase of intellectual property assets. The pronounced rise in imports placed substantial downward pressure on the net export contribution to growth, which totalled to -6.5 percentage points on an average annual basis in 2016.

As regards the outlook for exports, the latest available sentiment indicators have been suggestive of continued strong growth in external demand - the Purchasing Managers' Index for the manufacturing and services sectors both point to a pronounced expansion in new export orders during the first two months of 2017. The assumptions for weighted external demand are also consistent with slightly stronger export growth in 2017, while the outlook for 2018 is unchanged relative to previous estimates. Furthermore,

**Table 2: Goods and Services Trade 2016, 2017<sup>f</sup> and 2018<sup>f</sup>**

	2016	% change in		2017 <sup>f</sup>	% change in		2018 <sup>f</sup>
	EUR millions	volume	price	EUR millions	volume	price	EUR millions
Exports	318,817	4.4	1.3	337,285	4.0	1.3	355,301
Goods	186,251	3.9	1.0	195,450	3.7	1.0	204,708
Services	132,566	5.1	1.8	141,835	4.4	1.7	150,593
Imports	257,159	5.8	-0.2	271,337	5.2	0.2	286,152
Goods	83,268	6.7	-1.5	87,485	5.2	0.0	92,013
Services	173,891	5.3	0.4	183,851	5.3	0.3	194,139

it is envisaged that Irish export growth will slightly exceed that of external demand in both years, owing to ongoing compositional shifts including the increasing role of some more dynamic services export sectors – see Box D. Reflecting these developments, the outlook for exports for this year has been revised upwards relative to the previous *Quarterly Bulletin*, with export volumes expected to increase by 4.4 per cent in average annual terms. Looking ahead to 2018, a corresponding increase of around 4 per cent is currently envisaged. Services exports are expected to continue to outpace goods over the forecast horizon, with the upward revision to total exports in 2017 concentrated in our outlook for services. It is important to note that these projections are subject to a high degree of uncertainty owing, in particular, to the unpredictable nature of contract manufacturing, the impact of which is assumed to be neutral over the forecast horizon. Risks surrounding the export outlook are tilted to the downside and relate predominantly to external factors and, in particular, the impact of Brexit.

The fundamental factors underpinning import growth, such as domestic activity levels and labour market performance, are expected to remain strong, albeit easing somewhat, over this year and next. Accordingly, an increase in overall imports in the region of 5.8 per cent and 5.2 per cent is envisaged in 2017 and 2018, respectively. Considerable uncertainty, however, also surrounds the outlook for

imports given the impact and importance of intellectual property-related imports and how these will evolve in view of recent developments. When combined with the export outlook, this suggests a small negative net export contribution to growth in both 2017 and 2018.

#### **Net Trade, Factor Incomes and International Transfers**

The trade balance is estimated to have narrowed in 2016, as the services deficit widened and the goods surplus declined, albeit to a lesser extent. Net factor income outflows also fell in 2016 due to the sizeable increase in inflows outpacing the more modest rise in outflows. Such increases in factor income inflows have been dominated by the profits of non-financial MNEs resident in Ireland receiving investment income inflows from overseas affiliates (See Box B). The activities of re-domiciled PLCs within Ireland has inflated key metrics within the Balance of Payments. In particular, the net income of these PLCs has had a sizable positive impact on net factor income and GNP – in 2015 this amounted to an estimated €4.8 billion (1.9 per cent of GDP). While 2016 data is not yet available, from 2009 to 2015 the net income of redomiciled PLCs averaged almost 3 per cent of GDP.<sup>11</sup>

<sup>11</sup> For more details, see: <http://www.cso.ie/en/media/csoie/methods/balanceofinternationalpayments/RedomiciledPLCs.pdf>

**Table 3: Balance of Payments 2016, 2017<sup>f</sup> and 2018<sup>f</sup>**

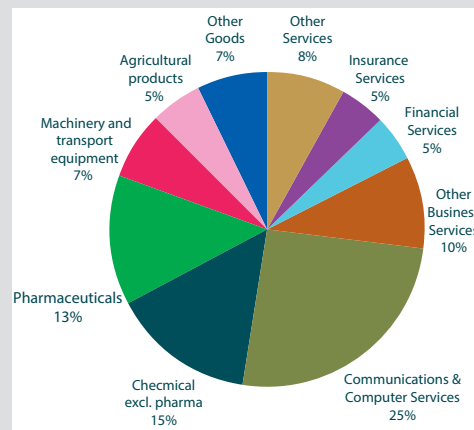
€ million	2016	2017 <sup>f</sup>	2018 <sup>f</sup>
Trade Balance	61,662	65,948	69,149
Goods	102,983	107,965	112,695
Services	-41,321	-42,017	-43,546
Net Factor Income from the Rest of the World	-46,417	-50,205	-53,592
Current International Transfers	-2,701	-2,701	-2,701
<b>Balance on Current Account</b>	<b>12,544</b>	<b>13,043</b>	<b>12,856</b>
(% of GDP)	4.7	4.6	4.3

**Box D: Sectoral Specialisation of Irish Exports**

By Suzanne Linehan, Paul Reddan and Diarmaid Smyth<sup>12</sup>

The sectoral profile of exports can be one of the key factors determining overall export performance<sup>13</sup>. For instance, the resilience of Irish exports amid the collapse in world trade volumes during 2009 essentially arose from the dominance of the broad chemicals sector and the less cyclical nature of demand for its output<sup>14</sup>. While sectoral concentration can be beneficial, allowing an economy to allocate resources more efficiently, high levels of sectoral concentration can create certain vulnerabilities, principally the risk of a sector-specific shock having an unduly large impact on export performance. Diversification at a sectoral level may therefore help to improve resilience to demand shocks. In an attempt to better understand the sectoral exposure of Irish exports, this Box examines which sectors Irish exports are specialised in and their evolution over time.

**Box D Figure 1: Irish Export Shares - 2015**



Source: WTO.

A basic decomposition of Irish exports by sector indicates that, when combined, the pharmaceuticals, chemicals and computer services sectors accounted for in excess of 50 per cent of Irish exports in 2015 (Figure 1). To examine the degree of sectoral concentration of exports in more detail, we rely upon Balassa Indices of revealed comparative advantage using the following formula<sup>15</sup>:

$$BI_i = \left( \frac{X_{i,ie}}{\sum X_{ie}} \right) / \left( \frac{X_{i,world}}{\sum X_{world}} \right), \text{ where:}$$

$BI_i$  = Balassa Index for sector  $i$ ;  $X_{i,ie}$  = exports of sector  $i$  by Ireland;  $\sum X_{ie}$  = total goods/services exports by Ireland;  $X_{i,world}$  = world exports for sector  $i$ ;  $\sum X_{world}$  = total world goods/services exports.

<sup>12</sup> Irish Economic Analysis Division.

<sup>13</sup> See Byrne, S. and O' Brien, M., 2015, The Changing Nature of Irish Exports: Context, Causes and Consequences, Quarterly Bulletin No. 2 2015.

<sup>14</sup> For more details on the role of the pharma-chem sector, see Enright and Dalton (2014), 'The Impact of the Patent Cliff on Pharma-Chem Output in Ireland', Journal of Statistical and Social Inquiry Society of Ireland Vol, WLIII.

<sup>15</sup> Balassa (1965). This is a commonly cited metric and often used in the analysis of international trade developments. While it offers a simple and straight forward way of comparing sectors and countries, there are certain limitations surrounding its predictive ability. Also, in the context of increasingly globalised trade, contract manufacturing and the crossed lines between goods and services trade, a degree of caution is warranted.

**Box D: Sectoral Specialisation of Irish Exports**

By Suzanne Linehan, Paul Reddan and Diarmaid Smyth

A Balassa Index (BI) value above 1 indicates that the share of exports from sector *i* in Ireland is greater than the corresponding world average and vice versa for scores below 1. We draw on data from the World Trade Organisation (WTO) database for trade in goods and services for Ireland and the rest of the world. These data allow analysis of thirteen goods and seven services sectors. Figure 2 presents the Balassa Indices for selected key sectors for the years 2005 and 2015; sectors of minimal specialisation have been excluded.

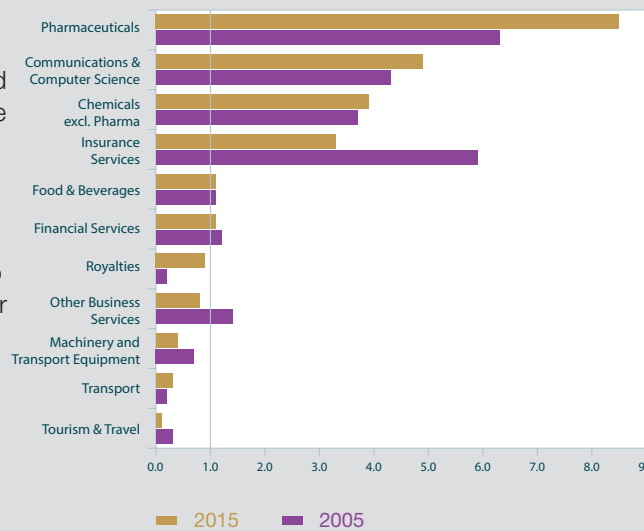
Looking first at the results for 2015, Figure 2 suggests that Ireland has an index value exceeding 1 and is therefore highly specialised relative to the world average in four key sectors - pharmaceuticals, computer services, other chemicals (i.e. excluding pharmaceuticals) and insurance services.<sup>16</sup> The highest BI value in any one sector by a sizable margin is found in pharmaceuticals, with an index value of 8.5. Such a finding is in line with the sectoral profile illustrated in Figure 1 above. The food and beverages sector together with financial services have BI values of close to 1 pointing to sectoral shares broadly in line with their respective global averages. Ireland is relatively less specialised in sectors such as machinery and transport equipment as well as in tourism and travel. It is however important to note that these high level Balassa Indices can conceal important intra-sector variations. For example, Ireland exports significant amounts of medical and surgical instruments/devices (SITC category 872), however these are subsumed within the much broader miscellaneous manufacturing articles (SITC 8) category.

Comparing index values in 2005 with their corresponding 2015 values suggests that the overall sectoral profile of Irish exports has not changed dramatically. Many of the sectors with an index value above 1 in 2005 remained so in 2015. Ireland extended its sectoral specialisation in areas such as pharmaceuticals, chemicals and computer services. Conversely, specialisation in the areas of insurance services and to a much lesser extent, in the manufacture of machinery and transport equipment has declined. Such a combination of developments broadly suggests that Irish exports may be progressing towards more high-technology/research-intensive products.

<sup>16</sup> Royalties cover payments and receipts for the use of intangible assets and proprietary rights (i.e. patents, copyrights).

<sup>17</sup> For completeness and also arising from concerns over the impact of contract manufacturing, we also assessed earlier years but the results are much the same.

**Box D Figure 2: Balassa Indices, Ireland 2005 and 2015<sup>17</sup>**



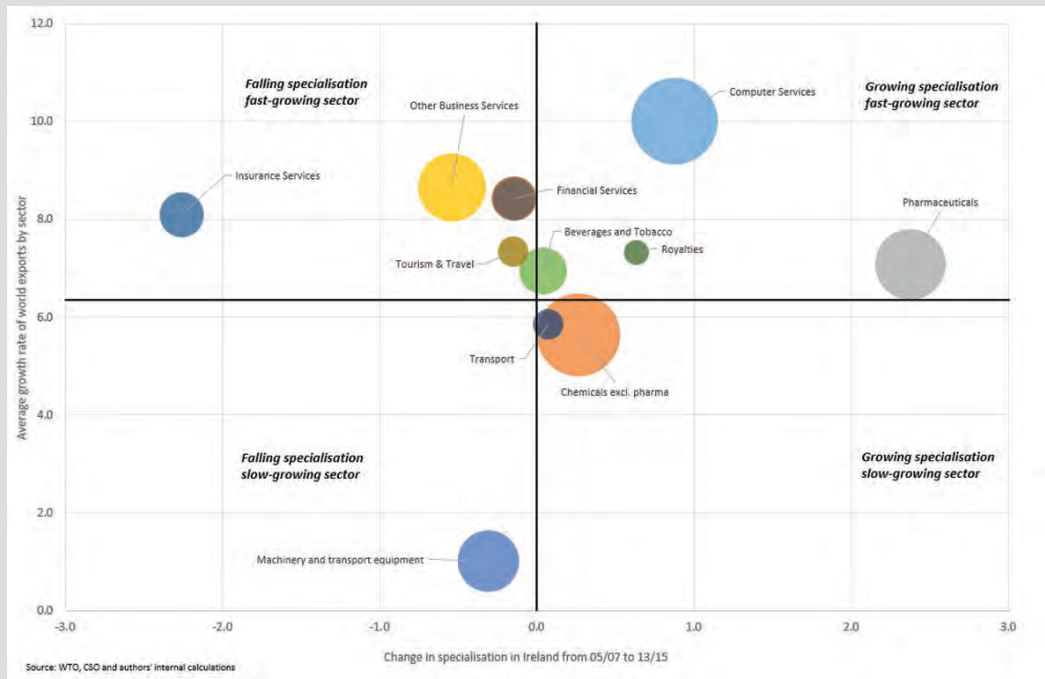
Source: WTO, CSO.

**Box D: Sectoral Specialisation of Irish Exports**

*By Suzanne Linehan, Paul Reddan and Diarmaid Smyth*

A further consideration is whether the above increases in sectoral specialisation have occurred in fast or more moderate growing sectors. In Figure 3, we plot the change in Balassa values against world export growth between 2005 and 2015. On this basis, Ireland has increased its specialisation in predominantly high growth sectors – most notably, pharmaceuticals and computer services. In contrast, specialisation in slower-growth sectors, such as the manufacture of machinery and transport equipment has declined. The figure also suggests that Ireland’s sectoral share in insurance services and, to a lesser extent, financial services declined despite export growth exceeding the world average.

**Figure 3: Change in Ireland’s Sectoral Specialisation and World Export Growth<sup>18</sup>**



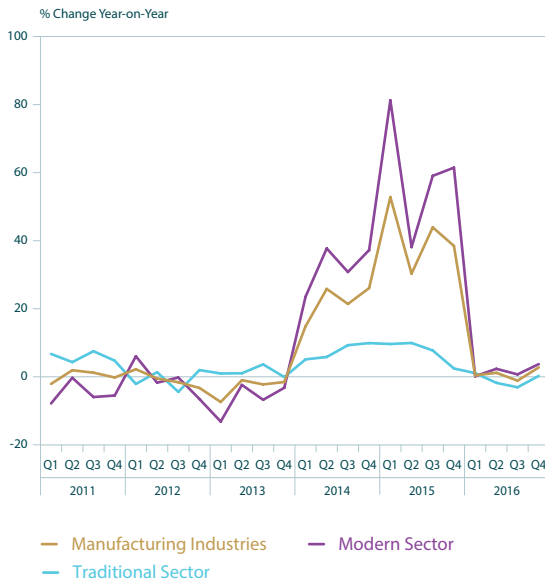
In summary, Ireland’s overall sectoral profile has not changed dramatically over the last decade or so. Sectoral specialisation in areas such as pharmaceuticals, chemicals and computer services has been extended. The finding that increased specialisation has largely taken effect in high growth sectors, such as pharmaceuticals and computer services is encouraging as it bodes well for the prospects for Irish exports. The analysis in this Box could be further enhanced by undertaking a more detailed analysis of sectoral specialisation of exports – such as looking at value added metrics and in particular employment and wage shares in Ireland relative to competitor countries.

<sup>18</sup> The size of the bubbles is determined by the share of exports in total exports.

**Supply**

On the output side, the latest QNA data confirm a strong performance for 2016. On the services side, the broad other services sector grew by an average rate of 6.0 per cent in 2016, with the distribution, transport, software and communications sector and public administration up 7.8 and 4.4 per cent, respectively. Agriculture, forestry and fishing grew by 6.2 per cent on average although

growth slowed through the course of the year. Building and construction grew strongly in 2016 (as discussed in the investment section), with average growth of 11.4 per cent. Overall industrial output grew by a more moderate 2.4 per cent. However, it should be noted that this sector is influenced by the activities of multinationals, which led to extraordinary gains in 2015.

**Chart 4: Volume of Industrial Production**

Source: CSO.

Monthly industrial production and turnover data showed a decrease of 10.5 per cent on an annual basis for the manufacturing sector in January. The modern sector contracted by 13.2 per cent. However, these series are volatile and heavily influenced by the activities of multinational corporations. The traditional sector opened 2017 strongly, with growth of 4.7 per cent. This follows a strong end to the year when the traditional sector saw an increase of 3.7 per cent. These consecutive months of growth stand in contrast to the weak performance of the traditional sector throughout 2016.

The Investec manufacturing PMI suggests that growth was strong at the start of the year, with readings of 55.5 and 53.8 for January and February, respectively (values above 50 signifying expansion). The new exports order component had a reading of 57.6 with the employment indicator also signifying expansion with a value of 53.8. On the services side, the CSO's monthly services index for 2016 showed growth of 5.4 per cent on 2015. All components of the Investec Services PMI showed expansion for February with the overall index at 60.6.

## The Labour Market

The labour market is expected to continue performing very strongly over the forecast period with employment growth of 2.6 per cent projected in 2017 and 1.9 per cent in 2018. This is equivalent to an additional 91,000 persons at work and would bring employment to over the 2.1 million threshold (for the first time since 2008).

The labour market outlook builds on an exceptionally robust outturn in 2016 – numbers at work increased by 2.9 per cent, with the labour force up by 1.2 per cent. This resulted in a sharp decline in the rate of unemployment – to an average rate of 7.9 per cent (down 1.6 percentage points in the year)<sup>19</sup>. Within this, the long-term unemployment rate (i.e. those unemployed for more than a year) fell to 3.6 per cent – a 7 year low – for more details on long-term unemployment and labour supply implications see Box E.

The downward trend in unemployment quickened in recent months – the seasonally adjusted rate fell below 7 per cent at the end of 2016 and decreased further to 6.6 per cent in February. This points to a continuation of robust employment growth in the early part of the year. For the year as a whole, the unemployment rate is expected to average 6.4 per cent. This forecast assumes growth in the labour force of 1 per cent this year. In 2018, the unemployment rate is expected to fall further (although the pace of decline will moderate) to 5.6 per cent with numbers in the labour force rising by a further 1 per cent.

In 2016, the performance of the Irish labour market was exceptionally robust with broad based employment gains across the main sectors. In the final quarter of the year all 14 sectors recorded employment gains with numbers at work increasing by 65,100 year-on-year – with close to a fifth of the gains recorded in the fast growing construction sector. Most of the employment was again generated in services – specifically in the areas of professional services, information and communications and accommodation

<sup>19</sup> The seasonally adjusted unemployment rate declined to 7.1 per cent in the fourth quarter of 2016.



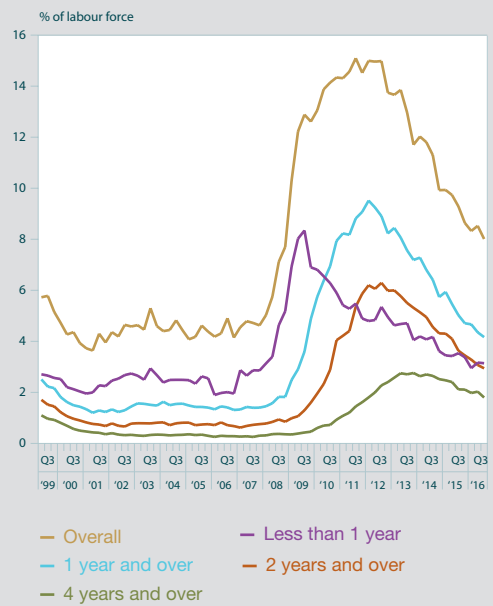
**Box E: Recent Trends in Long-Term Unemployment and Inactivity in the Irish Labour Market**  
 By Thomas Conefrey<sup>21</sup>

The improvement in the labour market provides the most tangible evidence of the recovery in the economy after the economic and financial crisis. As discussed elsewhere in this Chapter, 2016 saw strong employment growth of 2.9 per cent accompanied by a fall in the seasonally adjusted unemployment rate to 7.1 per cent in the last quarter of 2016. While these headline aggregates signal an impressive general recovery, this Box examines the extent to which labour market outcomes for at risk groups such as the long-term unemployed, those with low educational attainment and individuals outside the labour force have kept pace with the overall recovery.

A well-documented characteristic of the increase in unemployment during the recession was that it became increasingly long-term in nature as the downturn in the economy persisted from 2008 to 2012/2013; in Q4 2009 38 per cent of the unemployed had been out of work for more than a year, by Q4 2013 this proportion had increased to 61 per cent. Research indicates that an individual's likelihood of exiting unemployment declines as the duration of unemployment increases as a long spell in unemployment can lead to skills losses and disillusionment (O'Connell et al., 2012).<sup>22</sup>

The official definition of long-term unemployment refers to all those who have been unemployed for 12 months or more. Figure 1 indicates that the pace of decline in the standard measure of long-term unemployment (one year or more – blue line) has been steep, falling by more than half from its peak in early 2012 by the end of 2016. In absolute terms, of the 180,000 reduction in overall unemployment between Q3 2011 and Q4 2016, 112,000 were long-term unemployed while 70,000 had been unemployed for less than a year. Given that long-term unemployed individuals make up the majority of the unemployment pool, the larger reduction in long-term unemployment is not surprising. Despite the reduction in long-term unemployment since 2012, the long-term unemployment rate in Q4 2016 was still almost three times higher than its average from 2000-2007.

**Box E Figure 1: Unemployment by Duration**



Source: Eurostat and Quarterly National Household Survey, CSO.

<sup>21</sup> Irish Economic Analysis Division.

<sup>22</sup> O'Connell, P.J., McGuinness, S. and Kelly, E. "The Transition from Short- to Long-Term Unemployment: A Statistical Profiling Model for Ireland". Economic and Social Review, volume 42, no. (1).

**Box E: Recent Trends in Long-Term Unemployment and Inactivity in the Irish Labour Market**

By Thomas Conefrey

Taking into account the depth and length of the recent downturn, an expanded breakdown of long-term unemployment, beyond the standard measure of all individuals unemployed for more than 12 months, is useful to examine. This is because those in very long-term unemployment, for example more than three or four years, may be more disadvantaged than individuals who experienced a shorter unemployment duration of one or two years. Figure 1 shows that the unemployment rate for individuals who have been out of work for more than four years has been particularly slow to decline. The unemployment rate for this cohort increased from around 0.4 per cent immediately prior to the crisis to a peak of 2.8 per cent by Q4 2013. Since then, while the overall unemployment rate more than halved, the unemployment rate for individuals out of work for more than four years has fallen only marginally, by less than a percentage point in the three years from Q3 2013 to Q3 2016. Of the 39,900 workers unemployed for more than four years as of Q3 2016, almost 80 per cent are males and one third of these are aged 50-64.

**Box E Table 1:** Population Aged 15 and over by Economic Status, thousands

	Q4 2007	Q4 2013	Q4 2016	Change: Q4 16-Q4 13
<b>Labour force</b>	<b>2,260.6</b>	<b>2,163.1</b>	<b>2,195.6</b>	<b>32.5</b>
Employed	2,156.0	1,909.8	2,048.1	138.3
<i>Of which:</i>				
part-time underemployed	NA	143.3	92.0	-51.3
Unemployed	104.6	253.2	147.4	-105.8
<b>Not in the labour force</b>	<b>1,283.1</b>	<b>1,434.3</b>	<b>1,459.3</b>	<b>25.0</b>
<i>Of which:</i>				
Potential additional labour force	20.0	49.3	31.8	-17.5
<i>Of which:</i>				
Seeking but not available	5.8	16.6	11.3	-5.3
Available but not seeking	14.2	32.6	20.4	-12.2
<i>Of which: discouraged workers</i>	3.4	19.0	9.3	-9.7
Others	1,263.1	1,385.0	1,427.5	42.5
<b>Total persons (15 and over)</b>	<b>3,543.7</b>	<b>3,597.4</b>	<b>3,654.8</b>	<b>57.4</b>

Source: Quarterly National Household Survey, CSO.

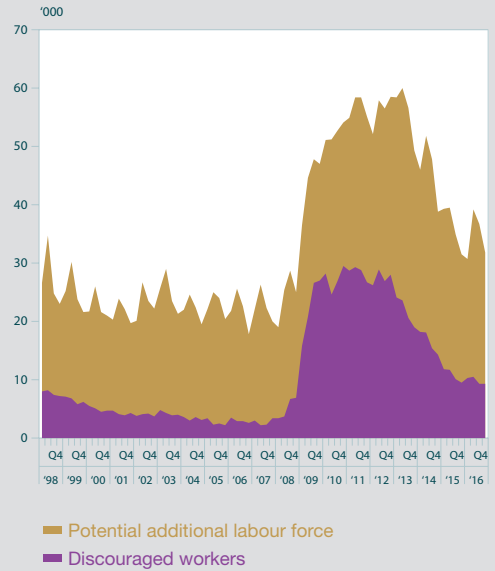
The economic crisis also saw a sharp fall in labour force participation (see Byrne and O'Brien (2016) and Linehan and McIndoe-Calder (2016)).<sup>23</sup> This indicates that there may be a significant cohort of individuals who are currently not classified as unemployed but are not in employment and are available for work (Table 1). As well as those in very long-term unemployment, there is a risk that individuals in this group could become persistently detached from the labour force. The QNHS contains data on the Potential Additional Labour Force (PALF, Table 1 and Figure 2). This is defined as the sum of the two groups: persons seeking work but not immediately available and persons available for work but not seeking. Individuals in the PALF are not part of the standard labour force, which encompasses only employed and unemployed people, however, they have a stronger attachment to the labour market than other persons not in the labour force.

**23** Byrne, S. and O'Brien, M. 2016. "Understanding Irish Labour force Participation". Central Bank of Ireland Research Technical Paper 01/RT/16. Linehan, S. and McIndoe-Calder, T. 2016. "Labour Force Participation of the Under 25 Age Group: An Analysis of Recent Developments". Central Bank of Ireland Quarterly Bulletin no. 1 2017.

**Box E: Recent Trends in Long-Term Unemployment and Inactivity in the Irish Labour Market**  
 By Thomas Conefrey

As shown in Figure 2, the number of individuals classified as being part of the Potential Additional Labour Force has declined substantially from the peak levels recorded in early 2013. This has been driven, in particular, by a reduction in the number of discouraged workers. While emigration may account for some of the decline, it is possible that as labour market conditions have improved, individuals on the margins of the labour market have moved back into the labour force by taking up employment or by resuming job search. This latter explanation would be consistent with some increases in labour force participation observed in 2016 (see Linehan and McIndoe-Calder, 2016).

**Box E Figure 2: Potential Additional Labour Force**



Source: Quarterly National Household Survey, CSO.

Using data from the QNHS, potential labour supply can be examined in further detail by extending the analysis beyond the standard measure of unemployment and including other jobless individuals who consider themselves available for work. The QNHS contains four broader measures of potential labour supply in addition to the standard measure of unemployment. Figure 3 shows the standard unemployment rate at 2016 Q4 (unadjusted) as well as four wider measures of unemployment which are reported by the CSO. Individuals who are outside of the labour force but are available for work include passive jobseekers, discouraged workers and others not engaged in education. Within the labour force, part-time underemployed workers are another group who consider themselves available for additional work. Part-time underemployed workers are individuals currently working part time who are willing and available to work additional hours. Including these groups, along with the individuals characterised as unemployed, the broadest measure of unemployment or potential labour supply rises to 13.4 per cent in Q4 2016. (Table 2 and Figure 3).

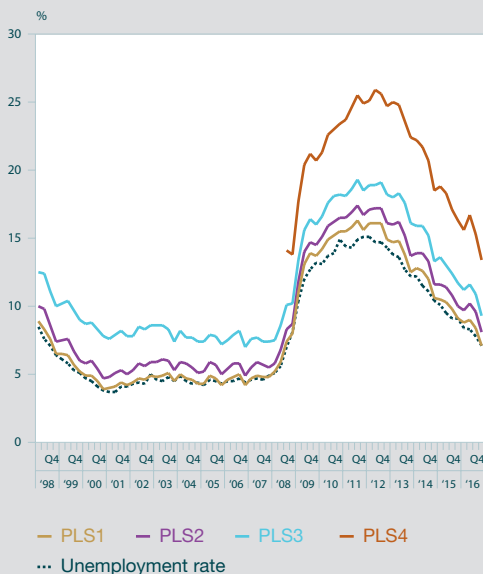
**Box E: Recent Trends in Long-Term Unemployment and Inactivity in the Irish Labour Market**  
By Thomas Conefrey

**Box E Table 2:** Indicators of Potential Labour Supply at Q4 2016

		%
PLS1	Unemployed persons plus discouraged workers as a percentage of the Labour Force plus discouraged workers.	7.1
PLS2	Unemployed persons plus Potential Additional Labour Force as a percentage of the Labour Force plus Potential Additional Labour Force.	8.1
PLS3	Unemployed persons plus Potential Additional Labour Force plus others who want a job, who are not available and not seeking for reasons other than being in education or training as a percentage of the Labour Force plus Potential Additional Labour Force plus others who want a job, who are not available and not seeking for reasons other than being in education or training.	9.3
PLS4	Unemployed persons plus Potential Additional Labour Force plus others who want a job, who are not available and not seeking for reasons other than being in education or training plus part-time underemployed persons as a percentage of the Labour Force plus Potential Additional Labour Force plus others who want a job, who are not available and not seeking for reasons other than being in education or training.	13.4

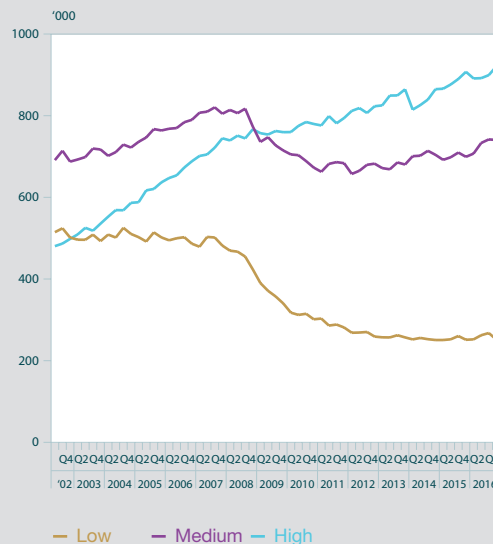
The inclusion of part-time underemployed workers distinguishes the broadest measure of unemployment (PLS4) from the other estimates in Table 2. The number in part-time underemployed has been on a declining trend since early 2013 but there were still 92,000 workers in this category in Q4 2016, equivalent to two thirds of the total number classified as unemployed (Table 1). This indicates that a continuation of the recent trend of declining part-time underemployment has the potential to significantly boost labour supply in the coming years.<sup>24</sup>

**Box E Figure 3:** Indicators of Potential Labour Supply, %



Source: Quarterly National Household Survey, CSO.

**Box E Figure 4:** Employment by Educational Attainment, thousands



Source: Quarterly National Household Survey, CSO.

<sup>24</sup> See Bercholz and FitzGerald (2016) for a description of trends in female labour force participation during the crisis and the potential impact on labour supply over the next five years: ([https://www.esri.ie/pubs/QEC2016AUT\\_SA\\_Bercholz.pdf](https://www.esri.ie/pubs/QEC2016AUT_SA_Bercholz.pdf)). O'Brien and Smyth (2015) has a discussion of growth and capacity constraints in the Irish economy after the crisis: (<http://www.centralbank.ie/publications/Documents/Quarterly%20Bulletin%20No.%204%202015.pdf>).

**Box E: Recent Trends in Long-Term Unemployment and Inactivity in the Irish Labour Market**  
By Thomas Conefrey

From a position of health in 2007, the Irish labour market experienced a significant deterioration during the years of the economic and financial crisis. By late 2013, the majority of the unemployed were classified as long term unemployed having been out of work for a year or more. A significant number had exited the labour force entirely. The data presented here indicates that the general improvement in the labour market has helped to alleviate long-term unemployment and reduce the number of workers marginally attached to the labour force. Nevertheless, important challenges remain before the legacy effects of the crisis are fully resolved. In particular, the unemployment rate for individuals out of work for more than 4 years is almost five times higher than at the outset of the crisis and has fallen only marginally from its peak. Moreover, when the potential additional labour force of passive job seekers, discouraged workers as well as underemployed workers are considered along with the unemployed, the resulting broader measures of unemployment are higher than the current standard estimate and still well above pre-crisis levels. From a policy perspective, improving the educational attainment of the very long-term unemployed and individuals currently outside the labour force will be a key determinant of these individual's future labour market prospects. This is clear from Figure 4 which shows employment growth by educational attainment. Of the 203,000 net new jobs created since Q1 2012, over half have been take up by individuals with a third level qualification or higher (blue line in Figure 4). In contrast, employment for those with only primary education has been on a persistent decline and in Q4 2016 was almost around 18,000 lower than early 2012.

**Table 4: Employment, Labour Force and Unemployment 2015, 2016, 2017<sup>f</sup>, 2018<sup>f</sup>**

	2015	2016	2017 <sup>f</sup>	2018 <sup>f</sup>
Agriculture	110	113	113	113
Industry (including construction)	374	394	412	426
Services	1,481	1,513	1,547	1,572
<b>Total Employment</b>	<b>1,964</b>	<b>2,020</b>	<b>2,073</b>	<b>2,111</b>
Unemployment	203	176	142	126
Labour Force	2,167	2,193	2,215	2,237
Unemployment Rate (%)	9.4	7.9	6.4	5.6

Note: Figures may not sum due to rounding.

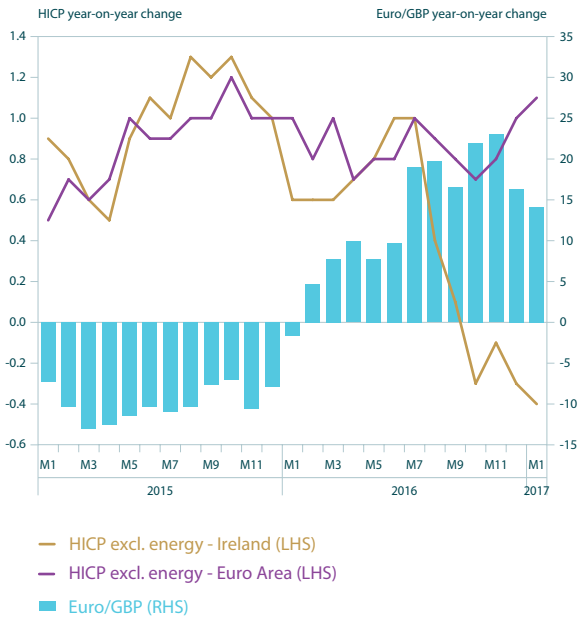
and food. Growth in the services sector has been a feature of the recovery. While the level of employment is broadly comparable to that which prevailed during the last upturn (in 2006/07), the composition is now markedly different. In 2007, the construction sector directly accounted for close to 1 in 8 jobs, whereas now this ratio is closer to 1 in 14.<sup>20</sup>

**Pay**

For 2017 and 2018, economy wide compensation levels are set to rise further with projected annual increases of 2.8 per cent in both years in compensation per employee – the same rate as estimated for 2016. Detailed earnings data on wages and salaries for the years up to 2016 will be published in the CSO's forthcoming *National Income and Expenditure Accounts*. This forecast is supported by the robust outlook for the labour market and recent data from the *Quarterly Non-financial Institutional Sectoral Accounts*. With inflation

<sup>20</sup> These data are based on employment shares from the most recent *Quarterly National Household Survey (QNHS)*. These data are subject to change once Census data is fully incorporated.

**Chart 5: Irish and Euro Area Inflation**



Source: Eurostat.

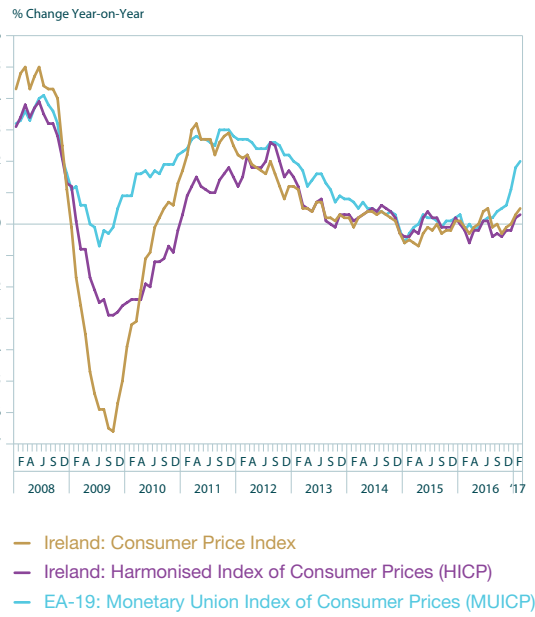
likely to remain subdued over the forecast horizon (averaging less than 1 per cent), these increases would constitute significant gains in real terms

## Inflation

### Consumer Prices

While euro area inflation has picked up, inflation in Ireland remains subdued. The Harmonised Index of Consumer Prices (HICP) registered an increase of just 0.3 per cent year-on-year in February 2017, with a month-on-month increase of 0.5 per cent. HICP inflation excluding energy however remains in negative territory (Chart 5). Weakness in sterling likely contributed to downward pressure on consumer prices in Ireland as imports from the UK became cheaper. All else being equal, a rise in the value of the euro relative to sterling (a decline in sterling) serves to decrease the euro price that foreign producers selling in Ireland need to charge to maintain profits in their own currency. Weakness in sterling has, however, been partially offset by strength in the dollar.

**Chart 6: Consumer Prices**



Source: CSO.

Energy prices for consumers returned to positive year-on-year rates in December 2016 and January 2017 following sustained declines since mid-2013. Recent oil price increases are the main factor driving energy prices. In line with this, headline HICP rates are expected to increase in 2017, driven mainly by the energy component; the HICP is expected to rise by 0.7 per cent in 2017 while the HICP excluding energy is expected to remain muted at around 0.1 per cent. The increase in energy prices is expected to pass through to the broader goods components in 2018, with an increase of 1.2 per cent forecast for the HICP – similar to the expected rate for the Consumer Price index.

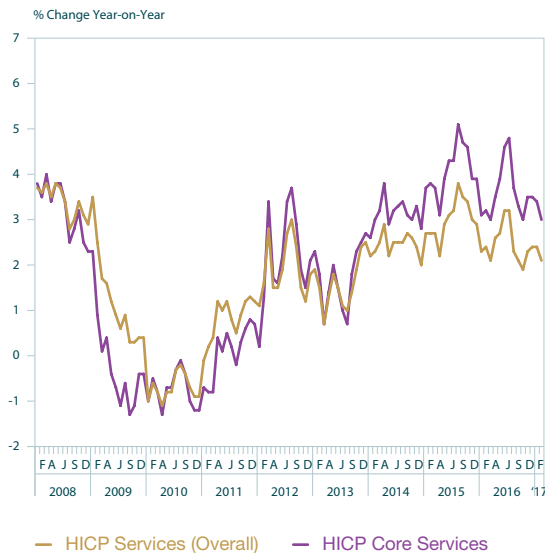
The trend for the last number of years has been one of negative price pressures from the goods side (most of which is imported) with positive price pressures on the services side. Over the coming year, the negative drag from goods side is expected to moderate, again mainly due to anticipated energy price increases. Goods prices are forecast to decline by just 0.9 per cent in 2017, following a decline of 3.1 per cent in 2016. Services prices, on the other hand, are expected to increase by

**Table 5: Inflation Measures - Annual Averages, Per Cent**

Measure	HICP	HICP excluding Energy	Services <sup>a</sup>	Goods <sup>a</sup>	CPI
2012	1.9	0.9	1.9	1.9	1.7
2013	0.5	0.6	1.6	-0.4	0.5
2014	0.3	0.5	2.5	-1.7	0.2
2015	0.0	1.0	3.0	-3.1	-0.3
2016 <sup>e</sup>	-0.2	0.4	2.5	-3.1	0.0
2017 <sup>f</sup>	0.7	0.1	2.1	-0.9	0.7
2018 <sup>f</sup>	1.2	1.3	2.1	0.2	1.3

a Goods and services inflation refers to the HICP goods and services components

**Chart 7: Services Sector Inflation**



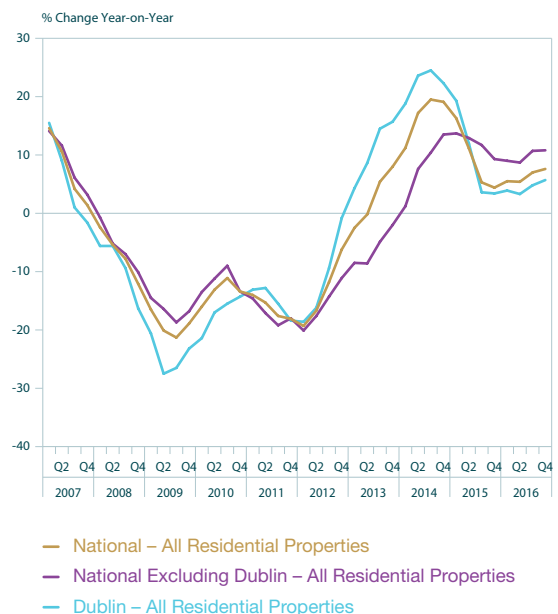
Note: Core Market Services equals HICP services excluding telecommunications, alcohol and administered services.  
Source: CSO.

2.1 per cent this year, following increases of 2.5 per cent in 2016. Residential rents (which are now 12 per cent higher than the peak in 2007), and insurance prices are among the factors driving services price increases.

**Residential Property**

Residential property prices increased by 7.9 per cent in January 2017 on an annual basis. Property prices excluding Dublin increased by 11.3 per cent over this period while prices in Dublin rose by a more moderate, but still

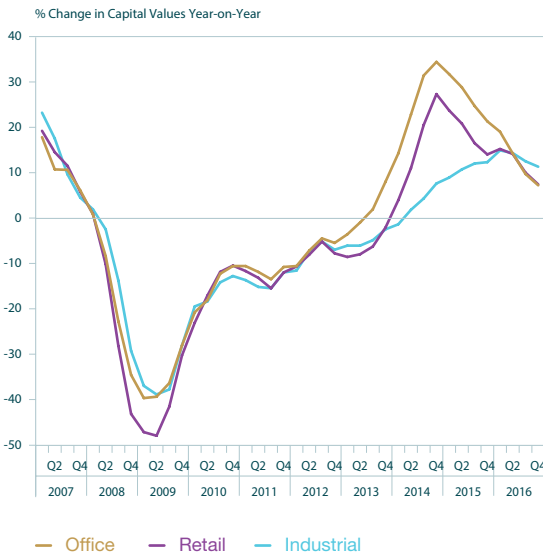
**Chart 8: Residential Property Price Indices**



Source: CSO.

strong, 5.3 per cent. With existing supply constraints and strong demand, property price inflation is unlikely to moderate significantly in the short term.

The latest Residential Tenancies Board data for Q4 2016 showed that rents increased nationally by 7.8 per cent on an annual basis. Excluding Dublin, rental prices increased by 7.2 per cent while prices rose by 9 per cent in Dublin.

**Chart 9: MSCI/IPD Irish Commercial Property Index**

Source: MSCI/IPD.

On the supply side, 14,932 houses were completed in 2016. This represented a 17.9 per cent increase on 2015. Planning permissions were granted for 5,814 houses/apartments in the third quarter of 2016. This represents a large annual increase of 3,110 units (115 per cent). Through the first 3 quarters of 2016, planning permissions were granted for 12,046 units, a 33 per cent increase on the same period in 2015. A large part of this increase is centred on the Dublin region although other areas, such as the South-West, have also seen significant rises.

### Commercial Property

The latest data from the MSCI/IPD<sup>25</sup> show that commercial property price increases moderated slightly in the fourth quarter of 2016. On an annual basis the office, retail and industrial sectors recorded increases of 7.3, 7.5 and 11.4 per cent, respectively. Overall commercial property prices expanded by 7.4 per cent. The Bank's latest Macro Financial Review (December 2016) conducts a detailed analysis of developments in the commercial property sector.

## Competitiveness

Sterling has remained weak in relation to the euro in the opening months of 2017. The euro opened the year at £0.85 and has fluctuated higher at times, averaging £0.86 to mid-March. The euro appreciated moderately against the US dollar in the same period, by about 1.5 per cent. On an annual basis to mid-March, the euro was 3.6 per cent weaker against the dollar and 12.1 per cent stronger in relation to sterling.

The latest Harmonised Competitiveness Index (HCI) data for February 2017 show that the nominal HCI decreased by 0.6 per cent on an annual basis. In real terms, the HCI fell by 2.3 per cent when deflated with consumer prices and 0.7 per cent when deflated with producer prices. These developments suggest an improvement in competitiveness in Ireland, with the declines in the real series driven by downward price pressures in the Irish economy.

## The Public Finances

### Overview

The general government deficit was 1.6 per cent of GDP in the third quarter of 2016, broadly unchanged from the same period in 2015. This remains consistent with the 1 per cent of GDP contraction estimated in the Budget (from 1.9 to 0.9 per cent) for the year as a whole. A large (€2.1 billion) capital transfer that took place in the final months of 2015 was not repeated last year, however, while the Exchequer position (excluding transactions with no general government impact) ended the year some €570 million (16 per cent) ahead of profile. The debt-to-GDP ratio recorded a more notable decline in the first nine months of last year, falling from 85.6 to 77.1 per cent, although it should be noted that this ratio is affected by revisions to 2015 GDP. A gross debt ratio of 76 per cent was projected for 2016 in the Budget.



**Table 6: Analytical Exchequer Statement for February 2017 (€ millions)**

	February 2017 €m	February 2016 €m	Annual Change (%)	Outturn vs Profile (%)
<b>Revenue</b>	<b>9,163</b>	<b>8,993</b>	<b>1.9</b>	<b>36</b>
– Tax revenue	7,509	7,215	4.1	294
– Appropriations-in-aid	1,654	1,778	-7.0	-8
– Other Revenue	69	94	-26.4	-25
<b>Expenditure</b>	<b>9,505</b>	<b>9,175</b>	<b>3.6</b>	<b>-94</b>
– Current Primary Expenditure	8,652	8,481	2.0	-96
– Capital Expenditure	445	287	55.2	2
– Interest on National Debt	408	407	0.2	0
<b>Balance</b>	<b>-273</b>	<b>-88</b>	<b>-210.8</b>	<b>130</b>

**Source:** Department of Finance

Note: The figures in the Table exclude transactions with no general government impact, giving a closer approximation to the General Government balance.

### **Exchequer Returns<sup>26</sup>**

Fiscal data for 2017 is currently quite limited, with Exchequer returns available for the first two months of the year. Over that period, and excluding transactions which do not affect the general government balance, revenue has been broadly on target, with expenditure a little below expectations. The subsequent 2016 outturn, a deficit around €100 million better than profiled at Budget time, is also consistent with developments in the early part of 2017 (see Table 6).

Revenue grew by 1.6 per cent in the year to February, and was €40 million ahead of profile. Within that, tax revenue was a solid 4.1 per cent higher relative to the previous year. In a reversal of the two most significant tax trends of 2016, the over-performance was driven by favourable developments in VAT, while corporation tax receipts – though still expanding by close to 10 per cent - were weaker than anticipated. VAT receipts came in €212 million ahead of profile. Much of this is likely to be accrued back to 2016 thereby boosting last year's general government outturn. The remaining two of the 'big four' tax heads, income tax and excise, also came in below expectations although it is

too early in the year to suggest that these developments will continue, particularly given robust developments in the labour market. Non-tax revenue was marginally weaker in annual terms. Expenditure increased by 3.6 per cent, but was nevertheless close to €100 million (1 per cent) below expectations. Interest payments on the national debt were stable from the previous year, with current spending up marginally. The most notable development was a 50 per cent annual increase in capital spending, although this was fully expected.

### **Funding and Other Developments**

The State's funding requirements for 2017 are relatively modest, with €6.3 billion of bonds set to mature over the course of the year and an Exchequer deficit of just over €2 billion projected in Budget 2017. The National Treasury Management Agency (NTMA) has set an issuance target of €9 to €13 billion for 2017 and was successful in raising half of the upper end of this target - €6.5 billion - in the first quarter of the year. This included €4 billion raised via the syndicated sale of a new 20-year Treasury bond in January. In addition, the final €500 million of the floating rate Treasury bond due to mature in 2043 has been cancelled.

<sup>26</sup> The figures in this section exclude transactions with no general government impact, giving a closer approximation to the General Government balance. These figures are provided by the Department of Finance in its Analytical Exchequer Statement.



## An Timpeallacht Gheilleagrach

Cé gur doiligh neart an gheilleagair a mheas mar gheall ar an saobhadh a bhaineann le tomhais phríomha na gcuntas náisiúnta, tá fianaise ann ó raon leathan sonraí maidir le caitheachas agus gníomhaíochta intíre go leanann geilleagar na hÉireann de bheith ag fás ar luas measartha maith agus go bhfuil neart an éilimh intíre ag tacú leis an bhfás sin. Tá luasghéarú ar an bhfás fostaíochta le bliain anuas mar bhonn taca leis an bhfeidhmíocht eacnamaíoch, rud a chuireann fianaise ar fáil go bhfuil feabhas soiléir tagtha ar an téarnamh eacnamaíoch agus a thugann le fios go bhfuil fuinneamh faoin téarnamh sin ag dul isteach in 2017. Ag féachaint romhainn, cé go bhfuil an t-ionchas don fhás foriomlán dearfach tríd is tríd, mar a bhí le tamall anuas, tá éiginnteacht ann i gcónaí i ndáil leis an timpeallacht sheachtrach agus is rioscaí ar an taobh thíos iad na rioscaí do na réamhaisnéisí.

D'ainneoin na himní a bhaineann le Brexit agus le laigeacht steirling, tugtar le fios ó fhianaise le déanaí go bhfuil leathnú ag teacht ar an téarnamh ar an taobh intíre den gheilleagar, sa mhéid go leanann an fás láidir ar chaiteachas tomhaltóirí agus go bhfuil luathú ag teacht ar an mborradh faoin earnáil tógála. Bhí fás láidir, leathan ar fhostaíocht mar bhonn taca leis an bhfás ar an mbunéileamh intíre le bliain anuas. In 2016, bhí an fhostaíocht ag fás de réir an ráta ba thapúla le beagnach deich mbliana anuas. Ón bpointe is ísle in 2012, tá méadú 200,000 tagtha ar fhostaíocht de réir meánráta bhliantúil um 2.5 faoin gcéad, fad atá an buaicphointe a baineadh amach roimhe seo sa chéad leath de 2008 sáraithe anois ag an bhfostaíocht lasmuigh den earnáil tógála.

Le héifeacht charnach na ngnóthachan seo, cuidítear leis an téarnamh ar ioncam agus tacaítear le fás láidir ar thomhaltas le blianta beaga anuas (féach Bosca C, leathanach 15). I dteannta leis an neartú fairs ar bhuninfheistíocht, lena n-eisiatar na gnéithe luaineacha den infheistíocht i sócmhainní doláimhsithe agus in aerárthaí, bhí sé seo mar bhonn taca faoin téarnamh ar an taobh intíre den gheilleagar agus, go dtí seo, is mó a iarmhairt ná iarmhairt dhiúltach tosca seachtracha.

Ag féachaint romhainn, meastar go dtiocfaidh príomhspreagadh an fháis in 2017 agus 2018 ó neart réamh-mheasta an éilimh intíre, rud a léirítear sa dlúthfhás ar chaiteachas tomhaltóirí agus ar bhuninfheistíocht. Beidh an méadú ar fhostaíocht agus ar ioncam mar phríomhspreagadh an fháis, ach meastar go maolódh an fás ar fhostaíocht anuas ó na

rátaí reatha thar thréimhse na réamhaisnéise. D'ainneoin an mhaolaithe de réir a chéile, meastar go dtiocfaidh fás 4.0 faoin gcéad ar an mbunéileamh intíre in 2017 agus go dtiocfaidh fás 3.5 faoin gcéad air an bhliain seo chugainn.

Cé gurb é an réamhaisnéis phríomha go leanfaidh gníomhaíocht eacnamaíoch de bheith ag fás ar luas measartha maith, is rioscaí ar an taobh thíos iad na rioscaí do na réamhaisnéisí seo. Is í an éiginnteacht a bhaineann leis an timpeallacht sheachtrach saintréith an ionchais. Baineann an éiginnteacht sin le Brexit agus leis an tírdhreach polaitiúil idirnáisiúnta agus ceaptha beartais eacnamaíoch, ar tírdhreach é atá i mbun athraithe. Ag breathnú ar an bpictiúr níos leithne idirnáisiúnta, tá rioscaí ann freisin a bhaineann leis an ionchas go mbeidh athruithe ar shocruithe idirnáisiúnta cánach agus trádála.

Sa ghearrthéarma agus san fhadtéarma araon, is cosúil go mbeidh iarmhairt eacnamaíoch dhiúltach ag Brexit ar Éirinn. Dá bhrí sin, tá athbhreithniú anuas déanta ag an mBanc Ceannais ar a réamhaisnéisí eacnamaíocha i ndiaidh an reifrinn sa Ríocht Aontaithe. Go dtí seo, agus d'uireasa aon lagaithe ar gheilleagar na Ríochta Aontaithe, tá iarmhairt Brexit le brath go mórmhór trí dhímheas an phuint steirling in aghaidh an euro. Ar a shon sin, na hearnálacha sin a bhíonn spleách ar onnmhairí chuig an Ríocht Aontaithe, tá siad neamhchosanta i gcónaí ar aon fhorbairtí díobhálacha eacnamaíocha RA amach anseo agus ar an mbagairt a bhaineann le bacainní nua ar thrádáil. Dá bhrí sin, d'fhéadfaí go ndéanfaí difear díréireach d'earnálacha amhail agraibhia, éadach agus coisbheart agus turasóireacht.

Cé gurb iad na honnmhaireoirí a dhíolann earraí leis an Ríocht Aontaithe an dream a dhéanfar difear láithreach dóibh, tá bealaí breise ann trína bhféadfaidh athruithe ar an ráta malairte idir steirling agus an euro difear a dhéanamh don gheilleagar. Ar an gcéad dul síos, d'fhéadfadh iomaíocht allmhairithe ón Ríocht Aontaithe difear a dhéanamh do scairmhargadh gnólachtaí intíre in go leor earnálacha intíre. Ar an dara dul síos, is soláthraithe d'onnmhaireoirí iad go leor gnólachtaí atá dírithe go hintíre nó bíonn siad ag brath ar fhostaithe i ngnólachtaí onnmhairithe mar chustaiméirí. Ar an tríú dul síos, féadfaidh go bhfuil baint ag an dímheas steirling le méadú ar shiopaadóireacht trasteorann, lena n-áirítear líon ceannachán níos mó ar líne ó shuíomhanna gréasáin na Ríochta Aontaithe.

Cé gur tosca díobhálacha iad seo, ní mór a rá go bhféadfaidh go rachaidh steirling níos laige chun sochair do ghnólachtaí áirithe a bhíonn spleách ar ionchur allmhairithe ón Ríocht Aontaithe agus go bhféadfaidh gnóthachain fíorioncainm do theaghlaigh de bhun allmhairí níos saoire ón Ríocht Aontaithe a athchúrsáil mar chaiteachas níos airde ar earraí agus ar sheirbhísí arna dtáirgeadh go hintíre.

Go fadtéarmach, beidh ar ghnólachtaí Éireannacha oiriúnú do thimpeallacht iar-Brexit. D'fhéadfadh go gcuirfeadh an éiginnteacht a bhaineann le caidreamh RA-AE amach anseo moill ar phleananna infheistíochta. Dá réir sin, beidh ar ghnólachtaí straitéisí nua a fhorbairt chun freagairt don timpeallacht nua de réir mar a thagann soiléireacht chun cinn maidir le domhan iar-Brexit. I gcás ina mbeidh bacainní níos airde trádála i gceist idir an Ríocht Aontaithe agus AE, féadfaidh go mbeartóidh roinnt gnólachtaí go bhfreastalóidh siad ar chustaiméirí sa Ríocht Aontaithe trí infheistíocht dhíreach eachtrach sa Ríocht Aontaithe fad a lorgóidh gnólachtaí eile margáí onnmhairíochta nua. Sa treo eile, féadfaidh go bhféachfaidh roinnt gnólachtaí sa Ríocht Aontaithe le cleamhnaithe a bhunú in Éirinn chun freastal ar an margadh Éireannach agus chun gníomhú mar ardán don trádáil ar fud AE.

Ag díriú ar thosca riosca dhomhanda, is cinnte go dtabharfaidh méadú ar chaomhnaitheacht dúshlán d'onnmhaireoirí a bhfuil cónaí orthu in Éirinn agus go háirithe don earnáil ilnáisiúnta. Beidh sé seo ina ábhar imní do ghnólachtaí a mbíonn earraí á n-onnmhairíú acu go

príomha chuig tíortha a fhéachfaidh le pionós a ghearradh ar onnmhaireoirí i gcomórtas le táirgeoirí intíre ach ciallaíonn saintréithe casta slabhraí breisluacha domhanda agus nascálacha idirearnálacha go ndéanfaidh caomhnaitheacht difear do ghnólachtaí agus do cheantair trí bhealaí indíreacha freisin. Tosca breise a fhéadfaidh tionchar a bheith acu ar straitéisí gnólachtaí ilnáisiúnta sna blianta atá le teacht is ea athruithe ar bheartais cánach agus rátaí malairte. I bhfianaise a thábhachtaí atá an earnáil ilnáisiúnta do gheilleagar na hÉireann, ní foláir do lucht déanta beartais intíre ardtosaíocht a thabhairt d'fhaireachán agus do mheasúnú a dhéanamh ar fhorbairtí seachtracha sna réimsí seo

Maidir le faireachán agus tomhas a dhéanamh ar fhorbairtí intíre, nuair a chuirfidh an Phríomh-Oifig Staidrimh moltaí an Ghrúpa um Athbhreithniú Staidrimh Eacnamaíoch chun feidhme ó lár na bliana 2017, cuirfear staidreamh nua, forlíontacha ar fáil lena sárófar na teorainneacha follasacha a bhaineann leis na cuntais náisiúnta agus lena bhfreastalófar ar riachtanais an úsáideora chun léargas níos fearr a fháil ar ghníomhaíocht eacnamaíoch na hÉireann. An fhorbairt is suntasaí is ea foilsíú beartaithe táscaire nua leibhéil choigeartaithe maidir le méid chomhiomlán an gheilleagair intíre, OIN\*, lena gcoigeartaítear an tomhas reatha ar Ollioncam Náisiúnta (GNI) i leith dímheasa ar shócmhainní caipitiúla intíre faoi úinéireacht eachtrach agus ar thuilleamh coimeáda cuideachtaí poiblí teoranta (féach Bosca B, leathanach 12). Le foilsíú OIN\*, i dteannta le cur i láthair choigeartaithe Chomhardú na nÍocaíochtaí agus sonraí maidir le Staid Infheistíochta Idirnáisiúnta, cuirfear ar fáil tomhais iontaoifa ar mhéid chomhiomlán gheilleagair na hÉireann agus ar ról gnólachtaí faoi úinéireacht eachtrach agus léargas níos beaichte ar chlár comhardaithe idirnáisiúnta na hÉireann. Fáilteofar roimh sholáthar na sonraí sin, rud a chuirfidh feabhas ar phleanáil fhioscach, ar an measúnú ar inmharthanacht stoc fiachais phoiblí agus phríobháidigh agus ar go leor cinní san earnáil phríobháideach.

# Financing Developments in the Irish Economy

## Overview

Financial indicators for the household sector have been strong in recent months, which has resulted in an improvement in debt sustainability metrics. Irish households reduced debt as a proportion of disposable income more than any country in the European Union (EU) over the past year. This reduced debt combined with increases in asset values, resulted in household net wealth increasing by 3.9 per cent in Q3 2016. Very long-term mortgage arrears cases saw their largest quarterly decline since the peak in June 2015. While debt levels continue to decline from high levels, the reduction in mortgage debt is being primarily driven by repayment of buy-to-let (BTL) mortgages, with recent quarters seeing the first consistent series of positive net principal dwelling houses (PDH) lending. However, based on debt as a proportion of disposable income, Irish households remain among the most indebted in the EU.

Irish-resident private sector deposits in Irish-resident banks increased by 1.4 per cent over the year to January 2017. The strong deposit inflows recorded from non-financial corporations (NFCs) continued, but the growth in household deposits has moderated slightly in recent months. The large outflows from other financial intermediaries (OFIs), and insurance corporations and pension funds (ICPFs) observed in 2016 have shown signs of stabilising. In particular, OFIs recorded net deposits inflows of €2.6 billion in the 3-months to January 2017.

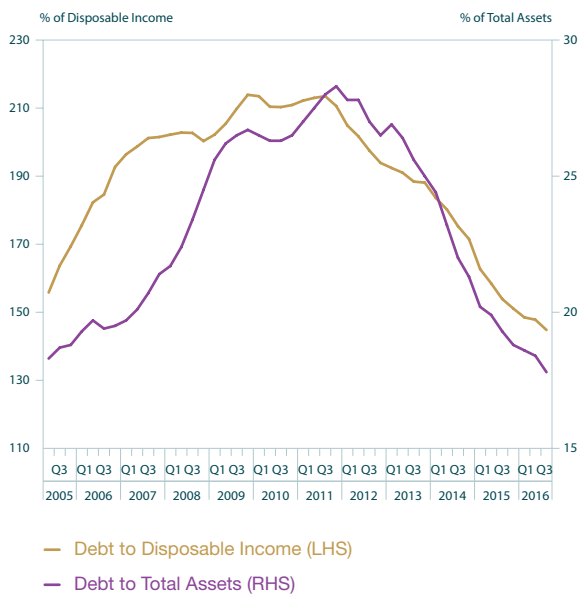
Growth of the non-bank financial industry continues, with the number of financial vehicle corporations (FVCs) registered in Ireland reaching the highest level on record at end-2016. The value of assets, however, continues to decline as large mortgage-backed security vehicles continue to shrink. Net inflows into Irish-resident investment funds (IFs), and money market funds (MMFs) remained positive in the final quarter. The combined net asset value (NAV) of these entities amounted to €2,084 billion at the end of 2016.

## Household Sector

Irish households reduced debt as a proportion of disposable income more than any country in the EU over the past year. Despite this however, they continued to be the fourth most indebted country in the region. During Q3

2016, household debt levels fell by €0.9 billion to €145.3 billion, resulting in the lowest level of household debt since the first quarter of 2006. Indicators of household debt sustainability have also improved (Chart 1). Debt as a proportion of total assets decreased from 19.3 to 17.8 per cent in the 12-months to Q3 2016, while Irish

Chart 1: Household Debt Sustainability



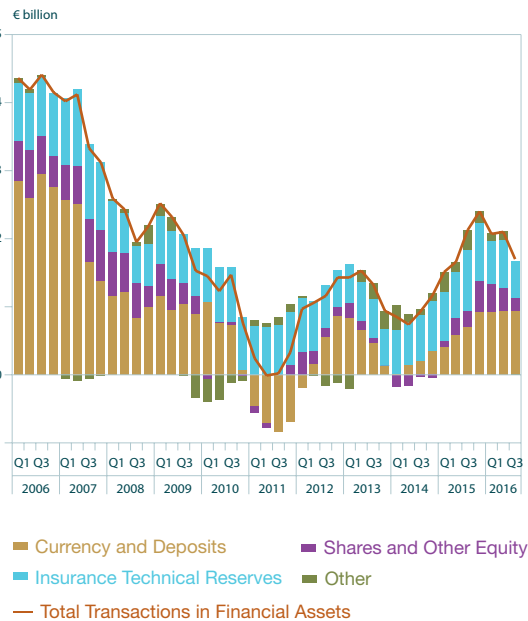
Sources: Quarterly Financial Accounts, Central Bank of Ireland; Quarterly National Accounts, CSO.

household debt as a proportion of disposable income fell by 9.1 percentage points to 144.8 per cent over the same period.

Household net worth<sup>1</sup> grew by a notable 3.9 per cent in the third quarter of 2016 to reach €661 billion or €141,427 per capita. The increase in net worth was mostly driven by a rise in housing assets (€18.4 billion). This was largely due to rising house prices over the quarter. Financial assets also rose in the third quarter increasing household wealth by €5.5 billion, largely reflecting an increase in the value of insurance technical reserves, and increased holdings of currency and deposits. Household liabilities fell slightly during the quarter, declining by €1.2 billion. In comparison to the post-crisis low of €454.1 billion in June 2012, household net worth has risen by 45.6 per cent and is now just 7.9 per cent lower than the historic peak of Q2 2007.

Household investment in financial assets remained positive during the third quarter of

Chart 2: Household Transactions in Financial Assets - Four Quarter Moving Average



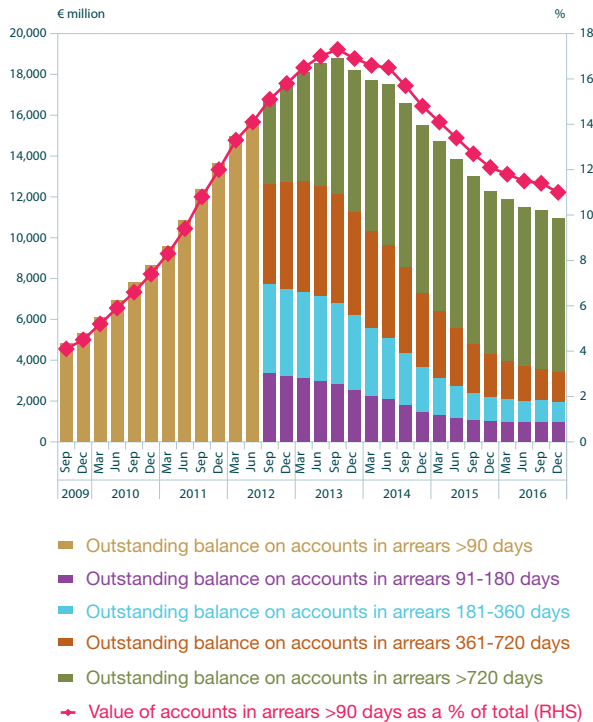
Sources: Quarterly Financial Accounts, Central Bank of Ireland; Quarterly National Accounts, CSO.

2016, albeit at a lower level than in previous quarters, primarily reflecting a reduced rate of investment in insurance technical reserves, and shares and other equity (Chart 2). Total transactions in financial assets fell from €2.1 billion in Q2 2016 to €1.7 billion in Q3 2016. The majority of households' financial investments were in the form of currency and deposits, which accounted for 56 per cent (€0.9 billion) of total transactions in financial assets in Q3 2016.

In line with improving economic trends, the fourth quarter of 2016 marked the thirteenth consecutive quarterly decline in the number of mortgages on PDHs in arrears over 90 days (Chart 3). At end-December, 77,493 mortgages were in arrears, a decline of 2.6 per cent relative to the previous quarter. The majority of arrears categories, including the over 720 days category, declined in Q4. The fall in arrears over 720 days was 3.2 per cent, representing the largest quarterly decline in these very long term arrears cases to date.

<sup>1</sup> Household net worth is defined as the sum of housing and financial assets minus their liabilities.

Chart 3: PDH Accounts in Arrears over 90 Days



Source: Residential Mortgage Arrears and Repossessions Statistics, Central Bank of Ireland.

The number of accounts in arrears over 720 days has now declined 12.1 per cent since the peak in mid-2015. Nevertheless, arrears remain a significant issue for households and their creditors, with the outstanding value of PDH mortgage accounts in arrears over 720 days almost €7.6 billion at the end of 2016. Accounts in arrears over 720 days now constitute 43 per cent of all accounts in arrears, and 88 per cent of arrears balances outstanding.

Though the economy is growing and the number of non-performing loans have fallen, households continue to repay more than they borrow. Loans to households<sup>2</sup> from Irish-resident banks declined by 2.5 per cent in January 2017 compared with the same period in 2016. However, the growth rate in loans for consumption purposes continues to accelerate and was growing at 5.3 per cent in the year to January 2017. Outstanding mortgage loans

declined by €914 million in the year to January 2017. Although household loans continue to decline, this is occurring at a reduced rate compared to earlier periods.

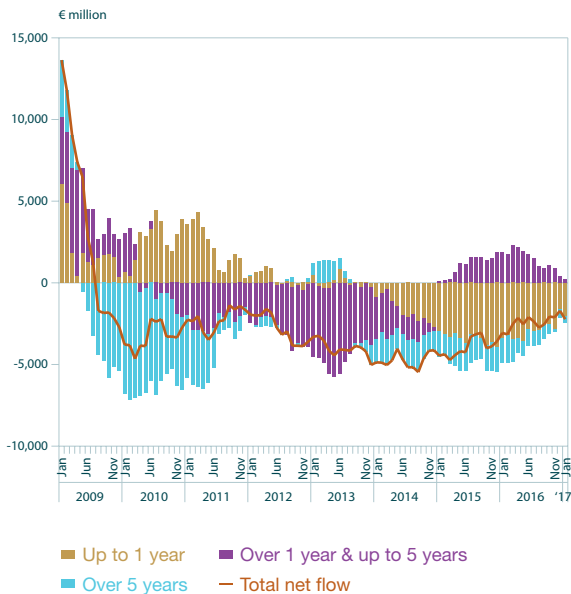
Developments in mortgage loans continued to differ across segments of the market. PDH mortgages have increased by €400 million (0.7 per cent) in 2016. In contrast, BTL mortgages declined by €1.3 billion or 9 per cent. Within the PDH category, the value of mortgages with a fixed rate continued to grow strongly during 2016 increasing by 21 per cent albeit, from relatively low volumes. Tracker mortgages continued to decline with net repayments of over €1.6 billion, and a reduction of 6.6 per cent in outstanding amounts over the year.

The latest available interest rate data indicate that borrowing costs are falling for households. The weighted average interest rate on new mortgage agreements (excluding renegotiations) stood at 3.36 per cent at end-January 2017. This represents a decline of 25 basis points over the past 12 months. The most pronounced fall in PDH mortgage rates was observed for standard variable rate and 1-3 year fixed rate mortgages which fell by 35 basis points and 39 basis points, respectively, in 2016.

## Non-Financial Corporation Sector

Irish statistics on the NFC sector are significantly impacted by the activities of large resident multinational corporations (MNCs). Consequently, the NFC balance sheet can vary significantly quarter-on-quarter. Following on from increases in the second quarter of 2016, NFC debt fell substantially by €62.8 billion during the third quarter. The decline predominantly reflected restructuring and redomiciling activities of large MNCs (accounting for €58.3 billion of the decline). Continued debt reduction by NFCs with Irish monetary financial institutions also contributed to the decrease in debt (€0.9 billion), albeit to a much lesser extent. Debt as a percentage of GDP fell to 231.5 per cent. This represented a decline of 28.5 percentage points in the third

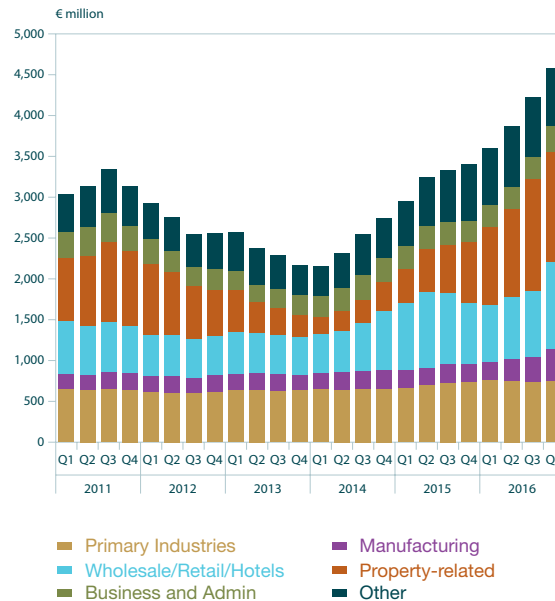
<sup>2</sup> Adjusted for loan sales and securitisations.

**Chart 4: Loans to NFCs – Net Flows by Category of Original Maturity**

Source: Money and Banking Statistics, Central Bank of Ireland.

quarter highlighting the volatile nature of the NFC debt indicators in Ireland due to the MNC sector. Despite the significant decline in NFC debt to GDP, Irish-resident NFCs continued to be the second most indebted in the EU.

Outstanding loans by Irish-resident credit institutions to Irish-resident NFCs declined by 4.9 per cent in the year to January 2017 (Chart 4). Over the past number of years, medium-term loans (i.e. loans with an initial maturity of 1-5 years) have been the only category of loans registering positive growth rate, but this has now moderated. Trends in business credit show that gross new lending to non-financial, non-property related SMEs was €3,235 million in 2016, 22.3 per cent higher than in 2015. New lending in Q4 2016 exceeded €1 billion for the first time since the series began in 2010. New lending to the hotel sector was particularly strong with new credit advances growing to €140 million in 2016 up from €78 million in 2015. Lending to SMEs for property investment/development also

**Chart 5: Gross New Lending to SMEs by Sector (12 Month Moving Average)**

Source: Business Credit and Deposits Statistics, Central Bank of Ireland.

increased sharply during 2016, and was some 84 per cent higher compared to 2015.

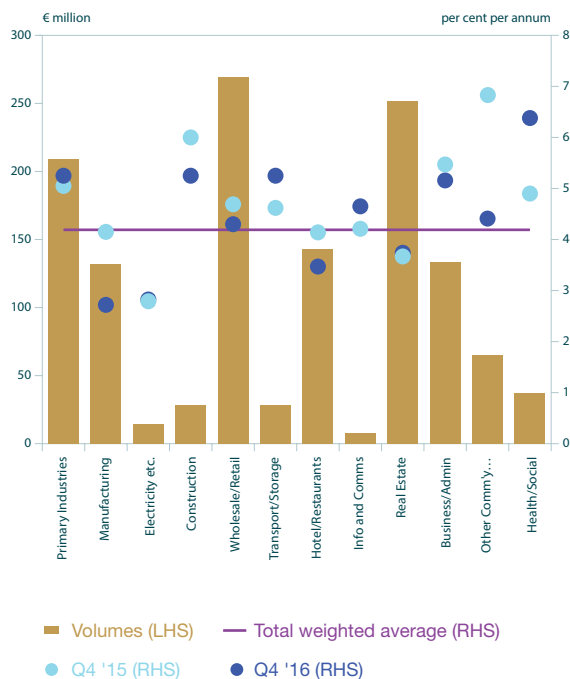
The cost of borrowing has remained broadly unchanged for Irish-resident NFCs with the average cost of 2.21 per cent on new NFC loans in January 2017. The weighted average interest rate on new non-financial SME loans during the final quarter of 2016 was 4.19 per cent (Chart 6). This represents a 44 basis point decline over the year. Rates on existing SME loans continue to be lower than new lending rates across almost all SME sectors. On average, rates on existing non-financial SME loans were 119 basis points lower than new loans at end-2016.

## Government Sector

Government debt increased by 1.7 per cent to €235.1 billion in the third quarter of 2016. The increase in debt was primarily reflected in an increase in both short- and long-term debt securities issued by the government.



**Chart 6: SME New Lending Interest Rates and Corresponding New Lending Drawdowns (Q4 2016)**



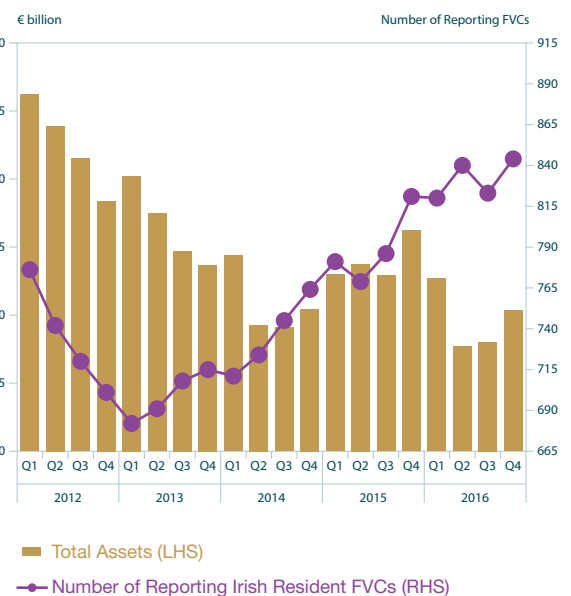
Source: Business Credit and Deposits Statistics, Central Bank of Ireland.

Yields on Ireland's 10-year benchmark government bonds moved closer to 1 per cent towards end-2016 as German bond yields moved from negative to positive. In the case of Ireland, these yields began to ease back into the New Year but there has continued to be some minor fluctuations in recent months and by mid-March, the yield stood 61 basis points higher than six months previously. The spread between Irish and German 10-year bonds had narrowed to 0.59 per cent in mid-January. This had widened to 0.85 per cent by early-February before narrowing again.

### Financial Sector

The funding position of Irish-resident credit institutions remained positive in recent months, with deposits from the Irish-resident private sector increasing by 1.4 per cent over the year to January 2017. While NFCs continued to record strong annual deposit inflows increasing by 7.7 per cent in the year to January, the growth rate in household deposits has moderated slightly growing by 1.9 per cent over the same period. The large outflows from OFIs, and ICPFs that occurred

**Chart 7: FVC Total Assets and Number of Reporting Irish Resident FVCs**



Source: Financial Vehicle Corporations Statistics, Central Bank of Ireland.

during 2016 have shown signs of stabilising. This is particularly true for OFIs, where net deposits inflows amounted to €2.6 billion in the 3-months to January 2017. Net lodgements by Irish households grew by 1.9 per cent over the year to January 2017. Irish households' funding of the Irish banking system continues to grow with banks holding €9.2 billion more household deposits than loans at end-January 2017. By contrast, in early 2009 household loans exceeded deposits by €53.5 billion. Bank funding from the Central Bank of Ireland has remained low and relatively stable in recent months, amounting to €7.3 billion at the end of January.

The NAV of IFs resident in Ireland increased by 4.4 per cent over the final quarter of 2016, reaching €1,606 billion. This was due to a combination of valuation increases (€38.6 billion) and net inflows (€29 billion) during the quarter. Bond funds had the largest inflows, amounting to €13.5 billion. Overall IFs experienced valuation gains of 4 per cent in Q4, although the magnitude and sign differed across fund types, with bond and equity funds seeing the largest increases. These valuation

gains were mainly driven by derivatives. Hedge and other funds saw a 2 per cent and 5 per cent decrease, respectively, with negative revaluations of derivatives a common factor for both fund types. US equity holdings witnessed the largest movement across country issuers, with a 10 per cent increase in value (€22 billion) over the final quarter of 2016.

While debt security holdings rose by €26 billion over the quarter, they also saw a €2 billion negative revaluation. The United Kingdom, Japan, and France were the country issuers whose debt securities registered the largest negative revaluations. For each country the fall in value was driven by government debt securities. The UK witnessed the largest absolute decrease, with UK government bond holdings losing €8 billion in value over Q4 2016.

The NAV of MMFs resident in Ireland at end-December 2016 was €478.2 billion. Investor net inflows were €22 billion in the final quarter of 2016 but activity was largely concentrated in December — 94 per cent of total gross inflows for the quarter occurred during the month.

Total debt securities held by MMFs at end-2016 amounted to €373 billion. The €27 billion increase in total debt securities from September was primarily reflected in higher holdings of US and French debt securities, which rose by €11 billion and €8 billion, respectively.

The size of the Irish-resident FVC sector decreased by 7 per cent in 2016 to €402 billion assets. Despite this decline in assets, the number of FVCs resident in Ireland reached a historical high of 844 vehicles at year end. New activity was mainly driven by smaller vehicles issuing corporate asset-backed securities. This is in line with the longer-term trend seen in FVC registration, characterised by a decline in large mortgage-backed-securities vehicles and an increase in smaller asset-backed securities vehicles. Euro area FVC total assets decreased by 1.2 per cent over the year. By end-2016, Ireland's share of euro area FVC assets stood at 22.3 per cent, a decline of 1.3 percentage points over the year.

### Box A: The Irish Funds Sector – Flows as an Investor Sentiment Indicator by Eduardo Maqui<sup>3</sup>

#### Introduction

Investor sentiment is a key component of behavioural finance research. Several indicators capturing investor sentiment have been studied to date, including investor surveys on expected stock returns, consumer confidence indicators, fund flows, combined indices and other measures to explain market returns.<sup>4</sup> Among the alternative indicators, the academic literature has paid particular attention to equity fund flows as an indicator of investor sentiment. Although somewhat mixed, empirical evidence shows that net flows into and out of equity funds tend to explain market price returns. By gauging underlying investor sentiment trends and behavioural modes, fund flows also serve as an informative measure for economic policy analysis. This box looks at Irish-resident fund flows as an investor sentiment indicator, in the context of recent global financial and political developments.

#### Irish Fund Flows as an Investor Sentiment Indicator

The funds sector in Ireland accounts for a significant portion of the total Irish-resident financial sector and is composed of investment funds (IFs) and money market funds (MMFs).<sup>5</sup> Given the significance of Irish-resident IFs and MMFs within the euro area<sup>6</sup> and the global nature of the Irish financial sector, Irish fund flows may be a valuable indicator capturing investor sentiment.

<sup>3</sup> Statistics Division, Central Bank of Ireland.

<sup>4</sup> Several academic references have empirically studied the relationship between investor sentiment indicators and market returns. For a comprehensive review of the related behavioural finance literature, see: Subrahmanyam, A., "Behavioural Finance: A Review and Synthesis", *European Financial Management*, Vol. 14, No. 1, 2007, 12-29.

<sup>5</sup> In terms of total assets, IFs and MMFs accounted for around 60 per cent of the total Irish financial sector in the third quarter of 2016.

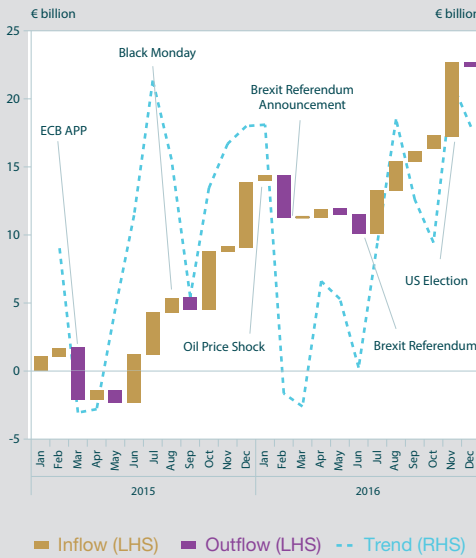
<sup>6</sup> The size of the Irish-resident MMFs sector stood close to €485 billion in total assets at end-2016, representing around 40 per cent of the aggregated balance sheet for the euro area. Total assets of Irish-resident IFs amounted to €2,424 billion at end-2016, a 20 per cent share of the euro area aggregated balance sheet.

**Box A: The Irish Funds Sector – Flows as an Investor Sentiment Indicator**  
by Eduardo Maqui

IFs provide investors with access to diversified investment portfolios consisting primarily of bond and equity securities. Net flows into equity IFs in particular, reflect, for the most part, investor risk appetite though imperfectly given the wide range of investment strategies reflected therein. MMFs broadly invest in high-quality liquid financial products and are most often used as a vehicle for secure short-term investments. Inflows into MMFs are therefore indicative of investor risk aversion, and may be an informative investor sentiment indicator.

A number of international episodes between 2015 and 2016 provide the setting for an initial exploration of fund flows as an investor sentiment indicator.<sup>7</sup> The trend in investor net flows vis-à-vis Irish-resident equity IFs is shown in Box A Chart 1. Peaks and troughs in particular, reflected by cumulative inflows and outflows, capture changes in investor sentiment around the key episodes. The month of the introduction of the ECB APP saw some contrarian bearish behaviour in equity flows, perhaps reflecting some flows from equity to debt securities. Risk aversion declined in the following months, however, until a substantial equity market correction, referred to as the ‘Black Monday’ event, took place in late August, with a slight outflow from equity IFs in the month immediately after the event. Investor sentiment followed a bullish trend until the period around the oil price shock, and experienced a reversal in the month of the announcement of the Brexit referendum. Risk appetite remained muted until June 2016, when flows out of equity IFs led by EUR- and GBP-denominated funds reflected risk aversion around the UK decision to leave the EU. Bullish investor sentiment was mostly evidenced since then and until the US election in November 2016, with inflows into USD-denominated equity IFs particularly strong.

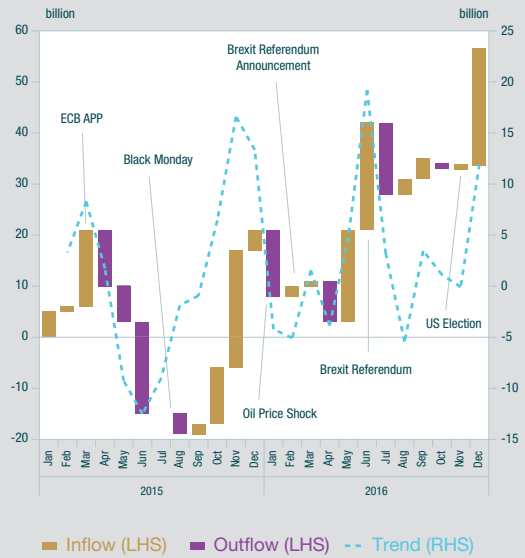
**Box A Chart 1: Equity Investment Funds: Net Investor Flows**



Note: Net investor flows are calculated by netting out monthly fund share purchases and redemptions in funds' shares/units. 'Inflows' are positive net investor flows, and 'Outflows' are negative net investor flows. 'Trend' represents the two-month moving average.

Source: Investment Funds Statistics, Central Bank of Ireland.

**Box A Chart 2: Money Market Funds: Net Investor Flows**



Note: Net investor flows are calculated by netting out monthly fund share purchases and redemptions in funds' shares/units. 'Inflows' are positive net investor flows, and 'Outflows' are negative net investor flows. 'Trend' represents the two-month moving average.

Source: Money Market Funds Statistics, Central Bank of Ireland.

<sup>7</sup> In particular, policy events such as the introduction of the ECB's asset purchase programme (APP) in March 2015 or distress episodes in financial markets as the collapse of the Chinese equity market ('Black Monday') in August 2015, or the oil price shock in January 2016. More recently, global political uncertainty in the context of the UK Brexit referendum announcement and decision in February and June 2016, and the US presidential election in November 2016, are also a good context to study fund flows as a proxy of investor sentiment.

**Box A: The Irish Funds Sector – Flows as an Investor Sentiment Indicator***by Eduardo Maqui*

Box A Chart 2 shows the trend, peaks and troughs in investor net flows into and out of Irish-resident MMFs as a complementary investor sentiment indicator. Risk aversion was perceived pre-announcement of the ECB APP, with the reversal towards higher risk sentiment immediately after the introduction of the programme mainly driven by GBP-denominated funds. This behaviour lasted until the 'Black Monday' episode, following which there was a strong flight-to-safety with inflows into MMFs. Risk aversion unwound somewhat in January 2016, but this did not prove to be a turning point given the oil price shock in late January and the announcement of the Brexit referendum in February. Investor behaviour followed a risk-averse pattern, with money flowing into MMFs in anticipation of the Brexit referendum in June, which unwound somewhat after the decision. Investor sentiment was relatively stable during the following period until the US election in November, with substantial inflows into MMFs mainly driven by USD-denominated funds.<sup>8</sup> This coincided with inflows into USD-denominated equity IFs, which suggests a more general investor rotation towards US assets. This highlights the importance of using multiple indicators as complements in order to have a better understanding of investor sentiment.

**Conclusion**

Analysis of fund flows tends to reveal trends in investor sentiment that are congruent with expected bullish and bearish behavioural modes around recent international events. Flows into and out of MMFs, which have been somewhat unexplored in the literature, appear as an informative investor sentiment indicator. Given the size and international characteristics of the sector in Ireland, flows into and out of this particular fund type may be a valuable complementary indicator for economic policy analysis and investment strategy. This box illustrates the potential for such analysis, with further work concentrating on comparisons across various sub-categories and other sentiment indicators to better understand the implications of policy measures and developments in international markets across fund types and asset classes.

<sup>8</sup> Flows into USD-denominated MMFs domiciled in Ireland during this period may be also explained by US MMF regulatory reforms (<https://www.sec.gov/news/press-release/2014-143>) which became effective on 14 October 2016.

# Brexit: Analytical Frameworks, Policy Frameworks, and Authorisation Frameworks

There has been considerable commentary in recent months by the Governor, Deputy Governor – Central Banking, and the Directors of the Central Bank of Ireland on Brexit. This information note summarises some of key points made in the first quarter of 2016.<sup>1</sup>

## **Analytical frameworks**

Disentangling the potential macroeconomic, financial stability, regulatory, and legal effects of Brexit is no easy task. A common theme across each factor is uncertainty. The global intermediation role of international financial centres poses additional analytical challenges in understanding the implications of measured international financial flows for the real economies of individual countries. For instance, the role of international financial centres makes it more difficult to assess the underlying interconnections between national macro-financial conditions, national macro-financial policies and the scale and composition of international financial flows. Coupled with disruptive types of innovation that create new markets and products, it is essential for policymakers to take a global perspective in managing the transition to the new post-Brexit regime. This is of particular importance given the role of non-European investors and financial intermediaries to the functioning of the European financial system.

From a macroeconomic perspective, the conditions of the UK's exit and the terms, timing and impact of the trade deal will be a key determinant for assessing the macroeconomic, financial and currency market effects. Turning to financial stability, new business lines and new firms bring new opportunities, new challenges and new risks for the Irish economy. These factors need to be considered in the context of European or global financial markets. In terms of regulation, uncertainties around passporting and the basis for access to the Single Market is relevant for financial firms considering their future access to the EU and UK markets as the case may be. Global distribution networks with investors across multiple jurisdictions add particular complications. The intrinsic volatility of highly-open economies means that domestic economic policies should be firmly focused on

underpinning stability by ensuring resilience in the face of external shocks.

## **Policy frameworks**

For financial services, the Bank operates under a common framework for regulation and supervision. This should ensure other broader considerations – beyond supervision or regulation- drive location policy. At a European level, regulatory authorities operate as part of the European System of Financial Supervision (ESFS) which promotes consistent application of European legislative requirements. This is a decentralised, multi-layered system of micro- and macro-prudential authorities, separated according to the respective sectoral area – banking, insurance and securities markets. The objective of the ESFS is to develop unified rulebooks and to support consistent and coherent financial supervision and the effective implementation of the rules in the financial sector. It also aims at preserving financial stability, promoting confidence in the financial system as a whole, and providing sufficient protection for consumers.

For banks, the Single Supervisory Mechanism (SSM), provides the framework for authorisation and supervision across the Banking Union. For insurance, the European Insurance and Occupational Pensions Authority's (EIOPA) work on supervisory convergence through the supervisory handbook and peer reviews helps ensure a certain and consistent supervisory approach across the EU. For securities markets, the European Securities and Markets Authority's (ESMA) mission is to promote convergence in investor protection and the achievement of stable and orderly markets.

This commonality of approach is critical to ensure that there will be no 'race to the bottom' for firm's location decisions; that the risk of regulatory arbitrage is mitigated; and that any of the financial stability risks which could arise as a result of a diminution of regulatory standards are avoided. The Bank is confident that the decision as to whether to locate elements of European business in Ireland or elsewhere will not be driven by different

approaches to booking practices, treatment of internal models, expectations regarding substance of the business, board structure, local risk management, and so on. Instead, it should be determined by other factors, be they infrastructure, skills, legal framework, or cultural. The Bank is working collegiately within the SSM, and the other European supervisory bodies and in bilateral discussions with other competent authorities to make sure that is the case, and not just for banking where it is more hardwired through the SSM.

### **Authorisation Frameworks**

The Bank's authorisation approach is deeply embedded in the European context. In deciding on applications for authorisation to do business in Ireland and Europe, the Central Bank adopts a structured, robust and risk based process by which firms that are authorised are expected to demonstrate compliance with EU and Irish requirements.

Where the Bank is asked to consider the authorisation of a firm in Ireland, the Bank will want to be satisfied that we are authorising a business or line of business that will be run from Ireland and which we will be effectively supervising. The Bank will expect there to be substantive presence here.

The authorisation of funds and other regulated entities is an important supervisory gateway and a significant operational activity of the Central Bank. The need for an efficient authorisation process becomes even more apparent in the context of external events – like Brexit - which may impact on the pipeline of authorisation applications. In some cases, applicant firms

will be similar to those already operating in Ireland. In others, these will be new firm types, new business models or new pieces of market infrastructure.

Higher degrees of complexity and interconnectedness of new firms underline the importance of taking an international perspective in our assessments of potential systemic risks. For new firms, it is particularly important we fully understand their interaction with broader group structures, should a firm intend to establish a subsidiary here.

In a functioning market firms must be allowed to fail, subject to the deployment of recovery and resolution tools. And there is a resolution dimension to authorisation. In this context the Bank assesses issues such as retail deposit base, intra-financial system assets, type and concentration of lending, and assets under management. More broadly, legislation such as the Bank Recovery and Resolution Directive (BRRD) provides a harmonised framework for recovery and resolution across the European Union. The Central Bank, in its capacity as National Resolution Authority, has a key role under this framework in developing executable resolution plans for in-scope firms.

The Central Bank is committed to meeting these new challenges emerging from Brexit. Workforce and recruitment planning for next year reflects the additional resources needed to deal with applications that will come our way. This will take the form both of an increase in staff, that is additional staff recruited to the Central Bank in areas where additional numbers are needed, and contingency numbers for those areas they might be needed but it is not yet clear that they will be.

1 This information piece draws on:

- Remarks by Governor Philip R. Lane at European Financial Forum, Dublin Castle, "Globalisation and Innovation in Finance: Policy Challenges", 24 January 2017. Available [here](#).
- Remarks by Governor Philip R. Lane to the London Irish Business Society, "International Policy Trilemmas", 31st January 2017. Available [here](#).
- Remarks by Governor Philip R. Lane at the Cork Chamber of Commerce, "Prospects for the Irish Economy", 23 February 2017. Available [here](#).
- Remarks by Deputy Governor Sharon Donnery at the Irish Centre for European Law, Royal Irish Academy, Dublin, 'Some perspectives on Brexit', 22 February 2017. Available [here](#).
- Remarks by Gerry Cross, Director of Policy and Risk, at Irish Funds Breakfast Briefing on 13 January 2017 and the Central Bank's Independent Fund Directors Briefing on 16 January 2017, available [here](#).
- Remarks by Gerry Cross, Director of Policy and Risk, at Brexit and Asia: Implications for Financial Services in Ireland Event, 23 January 2017. Available [here](#).
- Remarks by Ed Sibley, Director of Credit Institutions Supervision, to the Association of Compliance Officers of Ireland, 14 March 2017. Available [here](#).
- Remarks by Director of Insurance Supervision, Sylvia Cronin, at KPMG Event, 'Towards certainty in uncertain times', 9 March 2017. Available [here](#).
- Remarks by acting Director of Securities & Markets Supervision, Grainne McEvoy, at Irish Funds Breakfast Briefing on 13 January 2017 and the Central Bank's Independent Fund Directors Briefing on 16 January 2017. Available [here](#).
- Remarks by Directors of Asset Management Supervision, Michael Hodson, at PWC's Alternative Investment Funds Seminar, 2 February 2017. Available [here](#).

## Signed Articles

The articles in this section are in the series of signed articles on monetary and general economic topics introduced in the autumn 1969 issue of the Bank's Bulletin. Any views expressed in these articles are not necessarily those held by the Bank and are the personal responsibility of the author.

# The Balancing Act: Household Indebtedness Over the Lifecycle

by Apostolos Fasianos, Reamonn Lydon and Tara McIndoe-Calder

## Abstract

This article examines household indebtedness immediately after the Global Financial Crisis by comparing Ireland, the UK, the US, and the Euro Area. The article focuses on patterns of indebtedness across age-groups. The paper is the first to carry out this type of cross-country analysis of household debt burdens and its distribution across different household types. Compared to all other countries, Irish borrowers born from the mid-1960s through to the very early-1980s have substantially higher levels of debt – both in absolute terms and relative to their incomes. However, the low interest rate environment that has prevailed since 2008 has been particularly beneficial to these highly indebted Irish households, resulting in a debt-service burden (the ratio of debt repayments to income) that is broadly in line with that in other countries. However, in relative terms, a far greater proportion of Irish borrowers on variable rate loans are also exposed to potential interest rate rises in the future. We show that a 1 to 2% interest rate rise reduces the disposable income after debt repayments of a typical borrower by between 2 and 4%, with larger impacts for younger borrowers. As well as the impact on household spending from lower disposable incomes, there could also be financial stability implications, depending on how increases in the debt service burden affect households' ability to repay debt.



## 1. Introduction

One of the costliest lessons of the recession in Ireland is the negative economic consequences that result from having too much household debt. In the run-up to the housing market collapse, rising household debt helped to stoke house prices and consumption to unsustainable levels, creating imbalances in the economy. In the aftermath of the financial crisis, the overhang of household debt also proved to be a significant destabilising factor. Household debt reduction has been a constant feature since 2008, with household credit falling by between 2 and 6% year-on-year since the end of 2008. In this article we show that in aggregate, debt reduction is likely to continue in the short term with the return to debt accumulation in the medium term likely to occur only slowly. We see two reasons for this scenario. First, borrowers that took out mortgage debt during the peak years of the housing bubble remain highly indebted, both relative to their own incomes and when we compare them with patterns of household indebtedness in other countries. For the typical borrower in this group, the remaining loan-term is around 25 years, meaning that a large share of mortgage repayments is still going towards interest payments as opposed to reducing the size of the initial mortgage debt (the principal amount of the mortgage). Second, the flow into indebtedness from younger borrowers remains very low by comparison, both as a result of fewer households becoming mortgaged homeowners compared with earlier years and much smaller mortgages due to the fall in house prices and tighter lending standards.

Previous Central Bank articles by Cussen and Phelan (2011) and Lawless, Lydon and McIndoe-Calder (2015) highlight the rapid expansion of household debt in the early 2000s, when house-price growth outstripped disposable income growth by a factor of three-to-one.<sup>1</sup> We expand on this work by comparing the financial situation of Irish, UK,

US and European households, focusing on patterns of indebtedness across age groups. For European comparisons, we draw on the latest wave of the *Household Finance and Consumption Survey*, which was released in December 2016. We combine this with household survey data from the US and UK to create a harmonized database with information on debt, assets and incomes covering the period 2012-14. These comparisons show that whilst in all countries debt-levels are concentrated in the mid/late-30s to early-50s age-group, in Ireland the levels of debt for these key age cohorts are especially high – that is, households where the head of household was born between the mid-1960s and the very early-1980s that borrowed to buy housing at the peak of the market.

The level and the distribution of household debt is important for monetary policy, financial stability and the real economy. Household debt and its distribution is likely to affect the economy's recovery path through different channels. There is already a vast literature covering all of these areas including, for example, Eggertson and Krugman (2012) on monetary and fiscal policy; Minsky (1992) on financial stability; and Fisher's (1933) seminal 'Debt Deflation' work. The effects of accumulated household debt on economic activity have been extensively discussed in the empirical literature in the light of the Global Financial Crisis. Dynan (2012) and Mian and Sufi (2013) show that highly indebted US households reduced their spending by significantly more during the recession, even after controlling for differences in the income shocks households experienced. For the UK, Bunn and Rostom (2015) also show that indebted households saw larger cuts in spending following the financial crisis. For Ireland, Lydon (2013) shows that over-indebted households (households in mortgage arrears) spend significantly less on average compared to households with no debt.

<sup>1</sup> In real terms, average house prices grew by 73% between 2000 and 2007, compared to just 27% for personal disposable income.

Highly indebted positions also leave households vulnerable to monetary policy shocks such as interest rate increases, especially in countries such as Ireland and the UK where mortgagors have predominantly variable rate contracts (i.e. tracker and SVR mortgages), see DeBelle (2004). To quantify this, one of the exercises we carry out for this article is to simulate the impact of interest rate rises on mortgage repayments and discuss the implications for household spending and the debt-service burden (the ratio of mortgage repayments to income).

Our primary interest in this article is household indebtedness over the lifecycle, and specifically understanding how the age-indebtedness profiles of Irish households compares with those in other countries. This article contributes to the growing literature on 'life-cycle portfolio facts' with a focus on liabilities.<sup>2</sup> To a certain extent, we would expect Ireland to be most like the UK because both countries share common cultural and policy backgrounds for example, tax treatment of owner-occupied housing; and similar rental markets, largely delivered privately, with relatively little legislative certainty for renters. These commonalities encourage home-ownership and retention of homes as a major asset for both consumption and investment reasons. In Ireland, when compared to other countries including the UK, the high concentration of debt within some groups stands out largely as a consequence of the property boom of the mid-2000s. The boom in Ireland occurred however, in conjunction with several key phenomena which may have amplified the accumulation of household debt here versus the levels achieved in comparator countries. For example, homeownership was expanding, facilitated not only by credit expansion and a construction boom but also by an expanding labour force (in turn due to increases in domestic labour force participation and net inward migration in the prime working age cohorts); rapidly growing incomes (themselves largely the result of a long awaited convergence with other European countries)

and expansionary monetary policy in a growing economy (Honohan, 2009).

The remainder of the article proceeds as follows. Section 2 describes the data. Section 3 explores several important aspects of the age-indebtedness profiles across the countries/regions. Section 4 examines the risks in Ireland associated with high household debt levels concentrated in one main form of debt (property). Section 5 concludes.

## 2. Data

This article uses data from the Household Finance and Consumption Survey (HFCS) for the Euro Area (HFCN, 2016), the Wealth and Asset Survey for the UK (ONS, 2016), and the Survey of Consumer Finances (SCF) for the USA (Bricker et al, 2014).

The HFCS is a large survey representative of the national populations in European economies with detailed information on households' balance sheets. In this article we use the data from the second wave, published in December 2016. The data in the survey refers to 2014 for the majority of countries. Table 2.1 provides an overview of the data sources.

The UK Wealth and Assets Survey is a longitudinal household survey in which UK households are interviewed every two years. Each wave comprises over 20,000 households and for this exercise we employ the latest available wave that corresponds to the period from July 2012 to June 2014 (ONS, 2016).

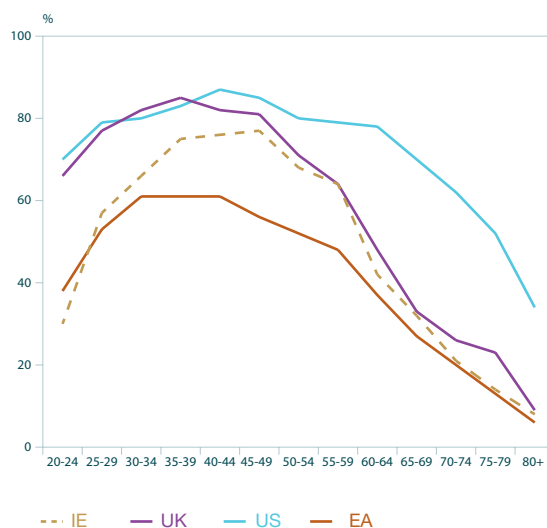
Lastly, the Survey of Consumer Finances for the US is a triennial cross-sectional survey of US households that includes information on the balance sheets of over 6,000 households conducted by the Federal Reserve Board (Bricker et al, 2014). By construction, the three surveys ask interviewees different questions, leading to slightly different categorisations of the household balance

<sup>2</sup> While there is extensive work on asset allocation and efficient portfolio choice over the life-cycle (Ameriks and Zeldes, 2004; Fagereng et al, 2015), the composition of the liabilities side of the households' balance sheet is still a relatively understudied research area, recent contributions include Bankowska et al. (2015), Iacoviello and Pavan (2013) and McIndoe-Calder (forthcoming). Other research on cross-country differences in balance sheet composition using survey data include Sierminska and Doorley (2012), Christelis, Georgarakos and Haliassos (2013), Badarizna (2016) and Christelis, Ehrmann and Georgarakos (2015).

**Table 2.1:** Overview of survey used

	HFCS Wave 2	WAS Wave 4	SCF
Fieldwork	Belgium (2014-15), Germany (2014), Estonia (2013), Ireland (2013), Greece (2014), Spain (2011-12), France (2014-15), Italy (2015), Cyprus (2014), Latvia (2014), Luxembourg (2014), Hungary (2014), Malta (2014), Netherlands (2014-15), Austria (2014-15), Portugal (2013), Slovenia (2014), Finland (2014)	Great Britain (2012 – 2014)	United States (2013)
# Households in survey	74,935 (between 999 and 12,035 per country)	20,241	6,026

**Chart 3.1:** Proportion of households with any debt, by age (per cent)



Source: HFCS, SCF, WAS.  
 Note: Euro Area households excludes Ireland.

sheets in the raw datasets. We performed appropriate transformations in all three surveys to make the samples as comparable as possible. All monetary values have been converted, where appropriate, to nominal Euros. All the calculations use sampling weights to ensure the data represent the countries' populations.

### 3. Age-indebtedness profiles

In many developed economies, household leverage grew substantially in the years prior to the financial crisis. The life-cycle model predicts an inverted U shape of asset accumulation as households age. Households'

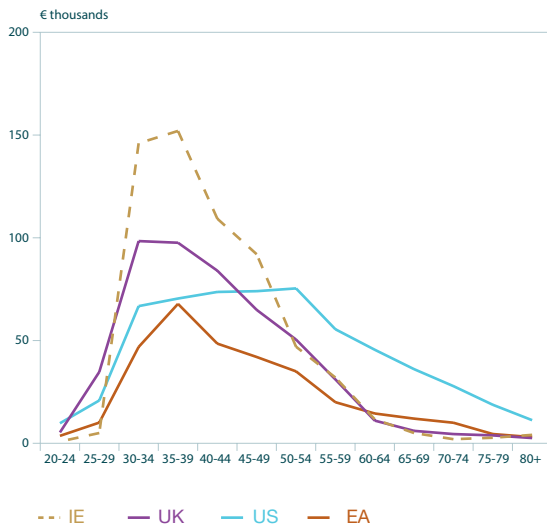
savings rates tend to be lower for younger households, increase with productivity and income in the middle of the age distribution, and decrease in old age when households run down their assets to support consumption in retirement. Thus, in the early stages of their life, it might be rational for households to borrow against future income in order to smooth their consumption or undertake investment decisions (Modigliani and Brumberg, 1954; Tobin, 1967).

Figure 3.1, which plots the share of households in a given age category with any debt, shows that the likelihood of holding debt rises from young to middle age, declining in older-age. There are, however, significant differences across countries. For example, across almost every age-group, Euro Area households (excluding Ireland) are significantly less likely to hold debt. Irish households look similar to UK households, with the exception of under-35s, where Irish households look more similar to their Euro Area counterparts. For young (under-35) households the US is similar to the UK, however older US households are substantially more likely than European households to hold debt, over half of households headed by someone over-65 hold some debt.<sup>3</sup>

Ireland, the UK, and the USA, are three developed economies with relatively comparable consumer credit markets, who have all been exposed in one way or another to the financial crisis. In all three countries, the decline in the property market was

<sup>3</sup> The reason for the apparent 'graying of American debt' has been discussed in several articles; see for example Brown et al. (2016). Generational explanations around the aging of the original baby-boomers – a group who have grown-up with the financial liberalisation which expanded consumer credit in the US – and the declining size of the more debt-averse Great Depression generation are often cited. Although, this does not necessarily explain the cross-country differences we observe.

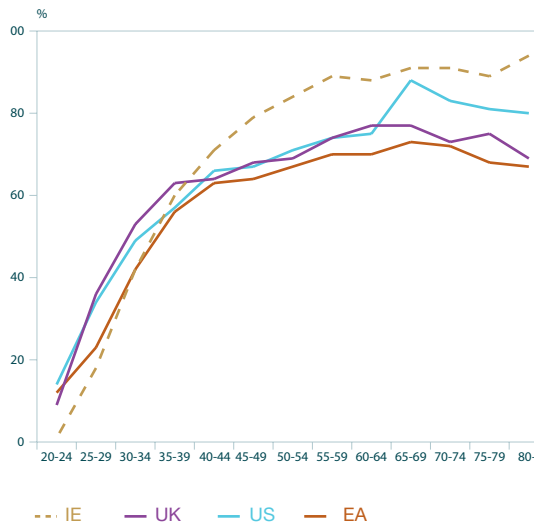
**Chart 3.2:** Median value of total debt, conditional on holding debt, by age (€)



Source: HFCS, SCF, WAS.

Note: Euro Area households excludes Ireland.

**Chart 3.3:** Home-ownership rate, by age (per cent)



Source: HFCS, SCF, WAS.

Note: Euro Area households excludes Ireland.

preceded by a credit-fuelled property boom, which left considerable portions of their populations indebted and often in negative net worth.<sup>4</sup> Notwithstanding these similarities, the composition of debt varies remarkably from country-to-country. For instance, whilst younger households in both the UK and US face a growing student debt burden, it is slightly older and middle-aged Irish households that really stand out. The differences are largest when we compare average euro-values of debt. However, even after controlling for income differences across the age distribution – both within and across countries – the relatively high levels of household indebtedness amongst Irish borrowers between the ages of 35 and 50 (in 2013) are remarkable.

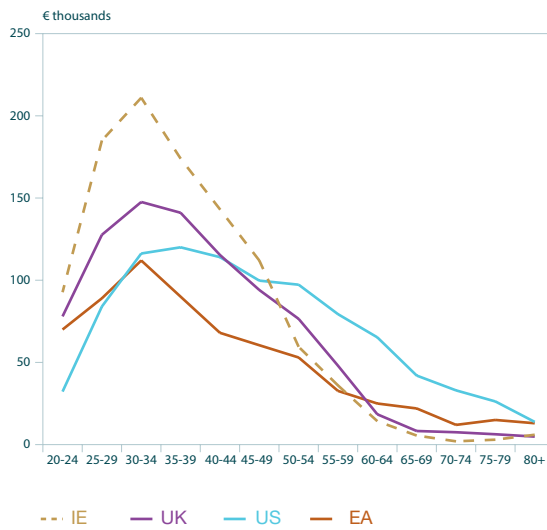
Figure 3.2 shows the median value of all debt (in thousands of euro) across age groups, *conditional on holding debt*. Borrowers aged between 35 and 50 in 2013 – or alternatively, born from the mid-1960s through to the early-1980s – stand out with debt levels 40 per cent higher than their next closest comparator households, in the UK. The relatively higher levels of debt in Ireland result from a combination of higher home-ownership rates (Figure 3.3) and larger mortgages secured against these properties (Figure

3.4) in comparison to European, British, or US households. Home-ownership rates for 40 to 55 year-olds in Ireland range from 70 to 90%, compared to around 65 to 75% in the Euro Area. It is however notable that home-ownership rates amongst under-35s are actually *lower* in Ireland, when compared with the UK and US. This represents a sharp reversal of the situation less than 10-years earlier. In the 2005 *Household Budget Survey* (CSO, 2007) homeownership rates amongst under-35s were significantly higher, in the region of 40-50% and broadly in-line with what we see for the UK and US in 2013/14. If the lower-level of home-ownership rates amongst under-35s persist – which depends on a whole range of inter-related factors including preferences, supply in the rental market and credit supply and demand – then we can expect to see *significantly* lower levels of indebtedness into the future for Irish households.

Debt holdings typically comprise of a range of loan types. For households where the value of their assets is greater than their debts (positive equity, or “A>D” in Figures 3.5 and 3.6), across all four comparator regions, over 50% of debt is related to property (Figure 3.5), including Household Main Residence (HMR) mortgages.

<sup>4</sup> See Fitzpatrick and McQuinn (2007) for evidence on the mutually reinforcing relationship between property prices and mortgage credit in an Irish context.

**Chart 3.4:** Median value of total debt, conditional on holding debt and being a homeowner, by age (€)



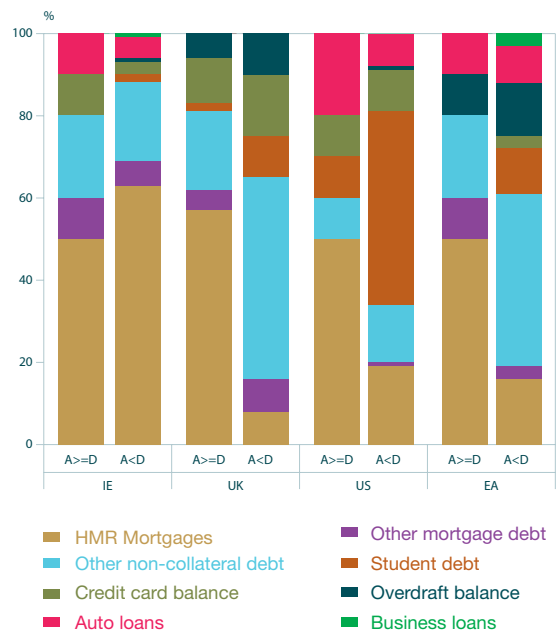
Source: HFCS, SCF, WAS.

Note: Euro Area households excludes Ireland.

Where the value of a household's debt is greater than that of its assets (negative equity, or "A<D") however, the composition of debt is more concentrated in Ireland, with over 70% in property loans; and more varied for the UK, US and Euro Area where property accounts for less than one fifth of debt holdings while student debt, credit cards, overdrafts and other non-collateralised loans make up large shares. In the UK and the Euro Area, non-collateralized debt, including different forms of arrears, account for the lion's share of debt held by households with negative net wealth. In the US, for those households where debt exceeds the value of assets, student debt is by far the biggest share of total debts, a finding that echoes expected life cycle behaviour, with young households acquiring debt to increase their income prospects (via human capital investment). The variation across countries implies different banking norms but also variations in demand for different debt types, for example, a much lower demand for education related debt in Europe than in the US.

In all four countries/regions, we observe the proportion of households with negative net worth declining with age (Figure 3.6a). This is not surprising, as young households with

**Chart 3.5:** Composition of debt, by age and country/region (per cent)



Source: HFCS, SCF, WAS.

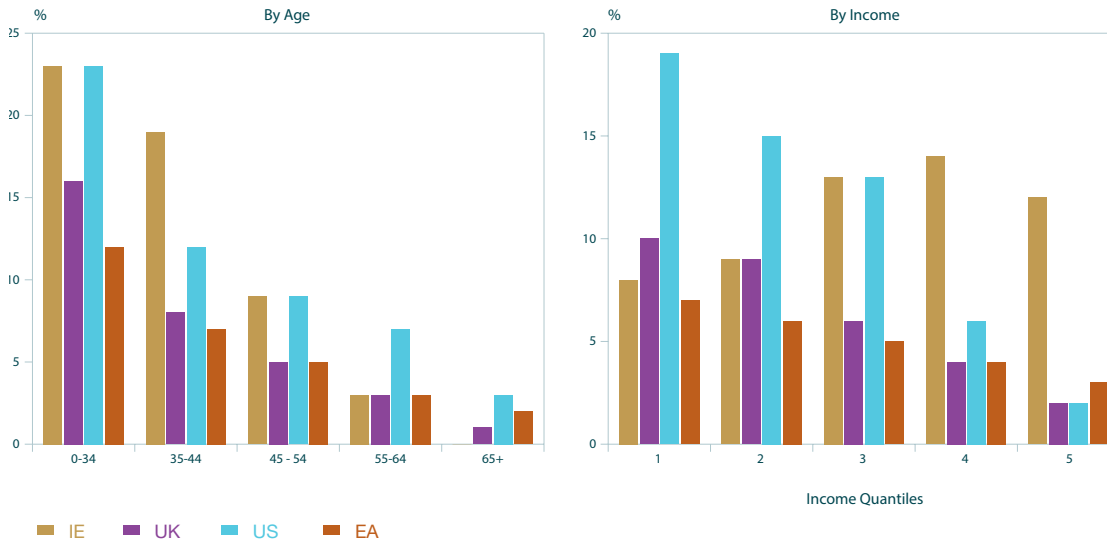
Note 1: Euro Area households excludes Ireland.

Note 2: Due to discrepancies between the construction of the various surveys we did not include business loans explicitly in the cases of the UK and the US. Instead, they are considered within the categories of "other mortgage debt" and "other non-collateral debt", depending on the presence of collateral. Similarly, no auto loans are specified explicitly in the UK, but are instead included in the "other non-collateral debt" category.

low assets but expectations of strong income growth become indebted with the anticipation of reducing their debt using their higher incomes later in life. Where Irish households do differ quite substantially from all other countries is in the proportion of negative net wealth households by income (Figure 3.6b). Whilst in most countries the incidence of negative net wealth declines as household incomes increase, in Ireland it broadly rises with income. Once again, this reflects the fact that negative net wealth in the Irish case in 2013 is largely a property-related phenomenon.

Figure 3.7 plots debt-to-(gross) income ratios. Here the differences narrow slightly for Irish, UK and Euro Area households. In fact, the standout pattern here is that older American households hold relatively high levels of debt, even controlling for income.

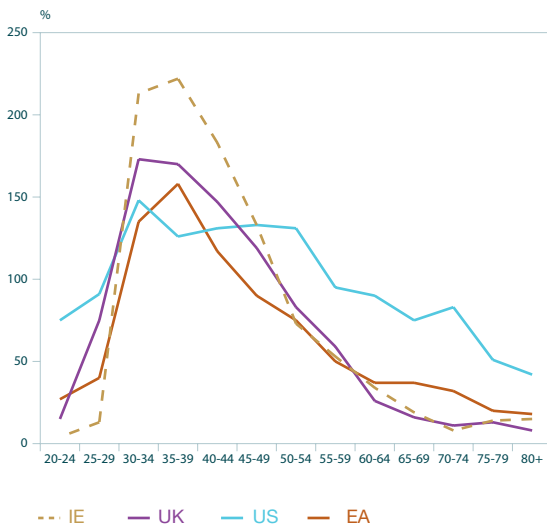
**Chart 3.6:** Share of households with negative net assets, by age and income (per cent)



Source: HFCS, SCF, WAS.  
 Note: Euro Area households excludes Ireland.

Despite holding such high levels of debt, the median debt service burden for households with a mortgage (ratio of debt repayments

**Chart 3.7:** Median debt-to-income ratio, conditional on holding debt, by age (per cent)



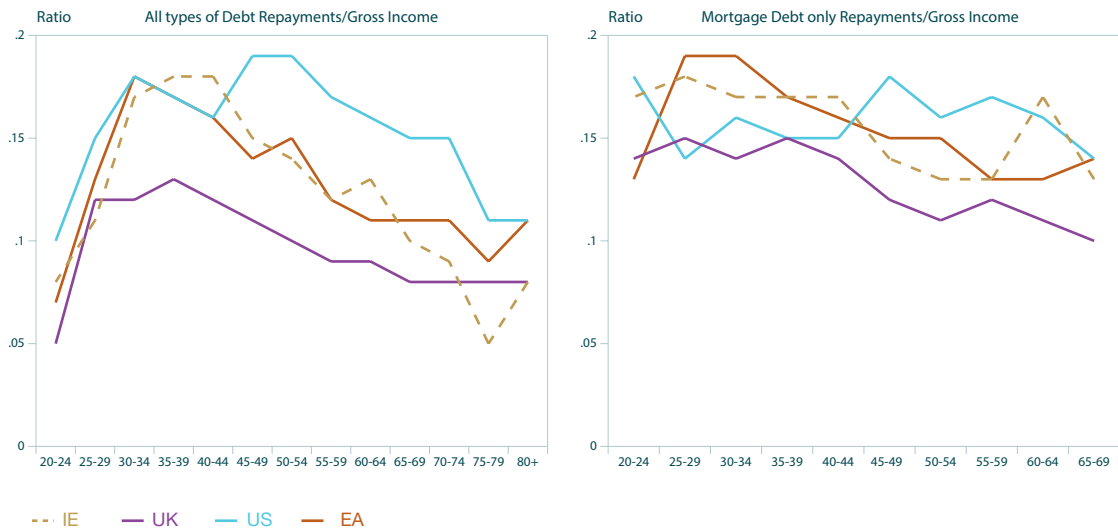
Source: HFCS, SCF, WAS.  
 Note: Euro Area households excludes Ireland.

to gross income) of Irish and Euro Area households is remarkably similar, even for very high debt households (Figure 3.8). Again, the debt-burden for older US households stands out when compared with the other countries.

There are three reasons why the debt service burdens are so closely aligned in Ireland and the Euro Area, despite such vastly higher debt levels in the former. Firstly, median gross incomes for those holding mortgage debt are significantly higher in Ireland, when compared with the rest of the Euro Area (Figure 3.9a). Second, for a given stock of debt, the value of repayments is declining in the loan-term and Irish households tend to have significantly longer loan-terms (Figure 3.9b). Indeed, both structure and maturity in Ireland have changed considerably over the boom years. For instance, Connor et al. (2012) show that long maturity loans - over 30 years - jumped from 10% to 35% between 2004 and 2007.

Third, during this period, Irish borrowers have significantly lower interest rates, when compared with their Euro Area counterparts (Figure 3.10a). This is due in part to tracker

Chart 3.8: Median debt-service (debt repayments/gross income), conditional, by age (ratio)



Source: HFCS, SCF, WAS.  
Note: Euro Area households excludes Ireland.

interest rate products in Ireland, i.e. 100% pass through from ECB base rate to the mortgage interest rate. During the 2004-2007 period, characterised by persistently low interest rates, the portion of trackers, as opposed to fixed or Standard Variable Rate (SVR) products, expanded. This is illustrated starkly in Figure 3.10b, which shows that, in 2013/14, almost 40% of Irish borrowers aged between 30 and 50 have an interest rate of less than 2%, compared with just 10% of households in the Euro-area.

The high proportion of fixed-rate loans amongst Euro area households, where pass-through from base rates to retail rates is typically lower, is the main reason for the difference between Ireland and the Euro Area in Figure 3.10. After 2013 however, mortgage interest rates in the Euro Area did decline. Tracker rate products in Ireland on new mortgages were not available from the onset of crisis. Since 2008 SVR and, to a lesser extent, fixed rate products have accounted for all new mortgages in Ireland. Further, the spread between the ECB policy rate and mortgage rates (both SVR and fixed) for new borrowers

in Ireland is higher than in the Euro Area. In January 2017 for example, the average interest rate on new lending for house purchase in the Euro Area was 1.77%. For Ireland, the interest rate was 3.19%.<sup>5</sup> Trackers, although facing significantly lower interest rates for higher value loans over longer maturities, were found to pay similar instalments on their loans when compared to non-tracker mortgagors (Kelly et al, 2015).

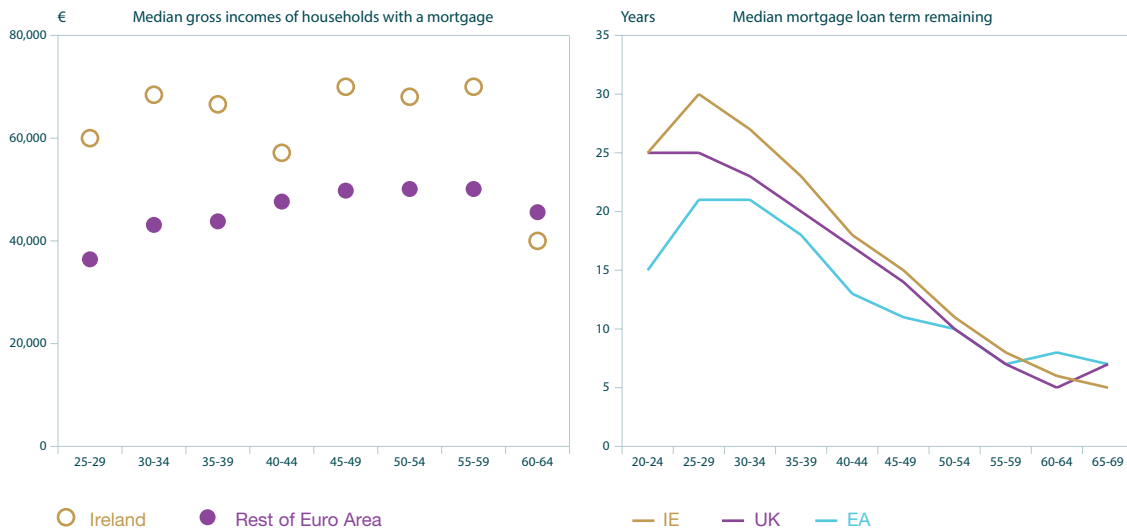
#### 4. Prospects for high debt households

Although this article has enhanced our understanding of the characteristics of high debt households in Ireland relative to their European and US counterparts, at least two questions remain:

- (1) Over what sort of time-frame will these high levels of indebtedness dissipate, and what are the implications for the overall stock of credit?

<sup>5</sup> Data from the [ECB Statistical Data Warehouse](#), series MIR.M.U2.B.A2C.A.R.A.2250.EUR.N and MIR.M.IE.B.A2C.A.R.A.2250.EUR.N.

Chart 3.9: Incomes and loan terms of mortgaged households, by age (€, years)



Source: HFCS, WAS.

Note: Euro Area households excludes Ireland. These charts use sampling weights and are also weighted by loan size. If we do not weight by loan size, the relative differences between Ireland and the Euro are unchanged, but the lines shift down marginally because households with larger loans also tend to have higher incomes.

(2) What are the medium-term risks, both for the households concerned and the wider economy, of the on-going high debt levels in these key demographics?

#### 4.1 Will the problem dissipate (soon)?

Despite substantial and on-going debt reduction in Ireland, it is unlikely that the high debt levels for boom-time borrowers will fall significantly in the near-term. As we show above, these debts have long loan terms (many of which were modified term extensions during the crisis). This means that aggregate debt levels for this cohort will change only slowly over time.

Using the simulation methodology<sup>6</sup> developed in Lydon and McIndoe-Calder (2017), we estimate that the median (average) HMR mortgage debt for the high debt cohort declined by around €17,000, from €150,000 (€167,000) to €133,000 (€150,000), between 2013 and end-2016. Applying the same methodology to all HMR mortgages and

aggregating up to the population of loans, we estimate a decline in the stock of 2013 mortgage debt between 2013 and 2016 of just over €20 billion. This far exceeds new lending over this period – i.e., new FTB and mover-purchaser loans totalled €6.8 billion and €5.9 billion respectively over the same period – contributing to the on-going decline in the stock of mortgage debt.<sup>7</sup> These calculations illustrate that, going forward, the key factor affecting the change in the overall stock of household credit in the economy will be the *flow* of new lending. In fact, recent figures released by the Central Bank show a large step-up in new mortgage lending in Q4 2016, which in turn pushed growth in total outstanding lending for house purchase into positive territory for the first time since 2009.

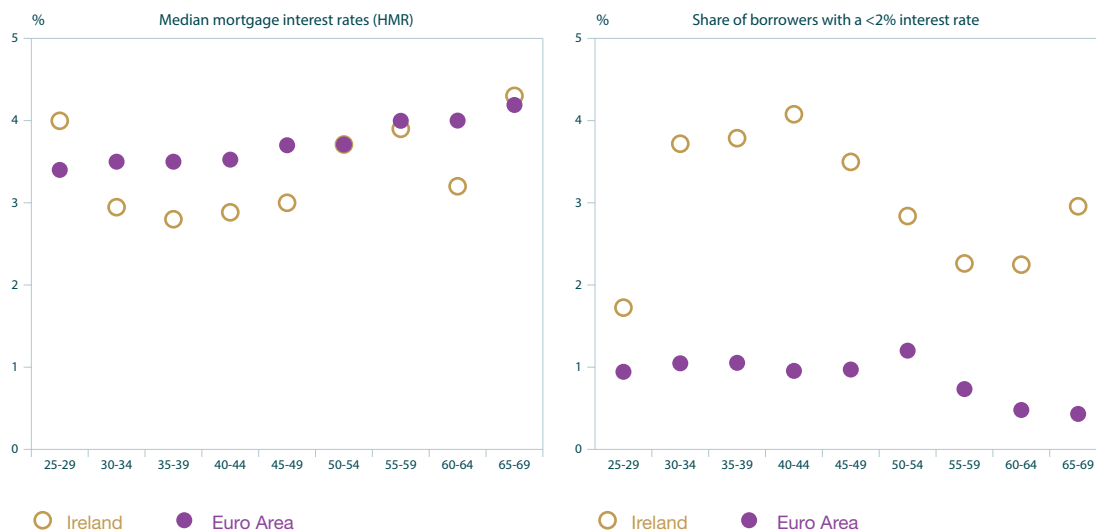
#### 4.2 What are the risks?

With monetary policy set for the Euro Area bloc as a whole, one concern is the exposure of variable rate borrowers to interest rate rises, and in particular those with tracker mortgages.

<sup>6</sup> We use detailed loan characteristics and standard amortisation formulas to calculate loan balances at end of 2016. We assume no top-ups and that non-property debt levels remain constant. Tracker interest rates evolve according to changes in the ECB MRO rate. SVR rates are held constant at 2013 levels.



Chart 3.10: Mortgage interest rates, Euro Area versus Ireland, by age (per cent)



Source: HFCS, WAS.

Note: Euro Area households excludes Ireland. These charts use sampling weights and are also weighted by loan size. If we do not weight by loan size, the relative differences between Ireland and the Euro are unchanged, but the lines shift down marginally because households with larger loans also tend to have higher incomes.

As Table 4.1 shows, the very low share of fixed-rate mortgage loans in Ireland (14%) versus the rest of the Euro Area (63%) means that a far greater proportion of Irish borrowers are exposed to interest rate changes. Whilst this has helped the 200,000 households with tracker loans during the prolonged period of low policy rates (Table 4.1) – Irish mortgage holders are exposed to a reversal of this process when interest rates begin to rise again in the future.

Using administrative data on HFCS household incomes<sup>8</sup> and changing the average tracker rate in-line with changes in the ECB policy rate, we estimate that the fall in interest rates over the 2010-14 period directly boosted the disposable incomes (after debt repayments) of tracker borrowers by between 5 and 10%. The income boost is highest for borrowers who took out larger mortgages between 2006 and 2008. In contrast, we find almost no benefit to

SVR borrowers from the lower interest rates between 2010 and 2014.

To gauge the likely change in mortgage repayments for a given change in interest rates in the future, we simulate repayments for a 1 and 2% rate increase (Figure 4.1). The calculations use 2013 values for term remaining and outstanding debt, the tracker interest rate is adjusted for the fall in the ECB policy rate since 2013. For early-term mortgages, the bulk of the repayment is accounted for by interest. Therefore, younger borrowers experience a larger increase in their repayments for a given interest rate change. For example, a 2% interest rate rise increases the median repayment for the 35-39 age-group by 23%, from €760 to €932. For 45-49 year-olds, the increase in repayments is just 15%, from €775 to €895 per month.

Figure 4.2 translates these payment changes to changes in disposable incomes net of

7 The data on new lending is from the Irish Banking and Payments Federation. The difference between estimated inflows and outflows described in the text broadly corresponds to the decline in the stock of loans for house purchase in the Central Bank Money and Banking Statistics, which was €9.5 billion over the same period (2014-16).

8 The main data source we use to track incomes is administrative data from tax returns on income from work over the 2005-14 period, which we link to individuals in the Irish HFCS dataset. Lydon and Lozej (2016) describe this data in detail. Lydon and McIndoe-Calder (2017) also use these data to track leveraging and deleveraging over the 2005-14 period.

**Table 4.1:** Share of households with a given interest rate type and average interest rate [bold] for HMR mortgages (2013/14)

	Ireland [share of households, average interest rate]						Other Euro Area countries			
	Fixed		Tracker		Other variable		Fixed		Variable	
<30	29%	<b>3.8</b>	19%	<b>1.9</b>	52%	<b>4.0</b>	57%	<b>4.0</b>	31%	<b>3.9</b>
30-34	19%	<b>4.4</b>	41%	<b>1.8</b>	40%	<b>4.0</b>	59%	<b>4.1</b>	36%	<b>3.7</b>
35-39	13%	<b>5.2</b>	44%	<b>1.9</b>	43%	<b>4.3</b>	63%	<b>4.2</b>	33%	<b>3.8</b>
40-44	14%	<b>4.7</b>	35%	<b>1.9</b>	51%	<b>4.2</b>	68%	<b>4.2</b>	29%	<b>3.9</b>
45-49	9%	<b>4.3</b>	32%	<b>1.9</b>	59%	<b>4.3</b>	65%	<b>4.1</b>	32%	<b>3.8</b>
50-54	15%	<b>5.3</b>	29%	<b>2.2</b>	56%	<b>4.5</b>	64%	<b>4.3</b>	33%	<b>3.9</b>
55-59	17%	<b>5.0</b>	26%	<b>2.7</b>	57%	<b>4.8</b>	64%	<b>4.3</b>	32%	<b>4.1</b>
60+	13%	<b>4.5</b>	27%	<b>3.0</b>	60%	<b>5.1</b>	57%	<b>4.4</b>	39%	<b>4.2</b>
Total	14%	<b>4.8</b>	35%	<b>2.0</b>	51%	<b>4.4</b>	63%	<b>4.2</b>	33%	<b>3.9</b>

Source: HFCS (2016), wave 2. Data for Ireland is 2013. Most other country data is 2014.

Note: The average ECB policy rate in 2013, when the fieldwork for the Irish block of the HFCS wave 2 survey was carried out, was 0.50% to 0.75%. It has since fallen to zero, which would put the average tracker rate closer to 1.25% or 1.5% in 2017.

mortgage repayments. The reduction in median disposable income for younger households (under-44) is in the region of 4% for a 2% increase in rates. The simulation, under these interest rate scenarios, does not account for changes in gross incomes. These may be materially important and likely, especially if interest rate rises occur with inflation, but are unlikely to equal the changes in repayments for the most indebted households. In fact, a better case scenario, i.e. an interest rate increase of 2% alongside a 2% increase in disposable income, would mitigate around half the after-debt-repayment income decline. This is because a 2% interest rise increases the repayment amount by roughly the share of repayments in disposable income at the median (around a fifth), thus the effects of an offsetting income increase are fairly linear.

The simulations here focus on borrowers with tracker loans, because, as we showed earlier, the significant proportion of tracker loans amongst very high debt borrowers has kept

their debt service relatively low since 2008, when compared with other Euro Area countries. When we carry out the same simulations for SVR borrowers, the increase in payments from a given interest rate increase is around 30% smaller, reflecting the fact that the outstanding balance on trackers is higher.<sup>9,10</sup> The impact on disposable income after debt repayments is roughly the same however, reflecting the fact that median disposable incomes after debt for tracker borrowers aged between 35 and 54 are around 26% higher than their SVR counterparts.

If the potential shocks we simulate here were to materialise in the future, the impact on the wider economy could be felt through two main channels: (i) household spending; and (ii) mortgage arrears. At the household level there are several reasons to think that interest rate increases could have an immediate and significant impact on spending. First, the consumption to income ratio for high-debt borrowers is very close to one ranging from

<sup>9</sup> The 2013 median HMR balance for a household with tracker loan was €140,000 (households aged 35-54), compared with €92,000 for SVR loans.

<sup>10</sup> Whilst the contractual arrangements for tracker mortgages mean 100% pass through from policy rate changes for a given margin, changes to interest rate setting practices for SVRs since 2009 (see Goggin et al., 2011) means it is not all clear how lenders might alter SVR rates (currently a 3% margin over the policy rate) in response to an increase in the policy rate in the future.

<sup>11</sup> See Carroll (1997) for the differences between consumption to income ratios of savers and borrowers using buffer-stock theory; high consumption to income ratios are found for mortgage holders in Ireland using a different data set in Danne and McGuinness (2016).

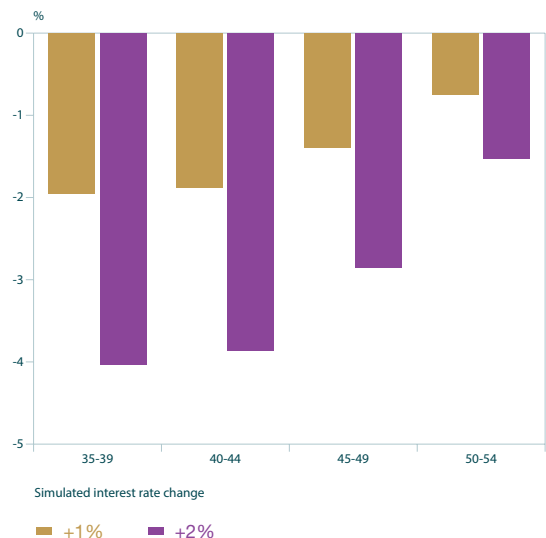
**Chart 4.1:** Simulated change in mortgage repayments, by age (€) for borrowers with a tracker mortgage



Source: Authors' calculations and HFCS.

Note: The base case is the average repayment given tracker interest rates in 2017.

**Chart 4.2:** Simulated change in disposable income net of mortgage repayment for borrowers with tracker mortgages, by age (per cent)



Source: Authors' calculations and HFCS.

0.90 to 0.97,<sup>11</sup> indicating limited scope for reduced savings in response to an interest rate shock. The economics literature suggests a marginal propensity to consume out of income for indebted borrowers of between 0.5 and 0.9 (Bunn et al, 2015). This implies that for each €1 fall in disposable income net of mortgage repayments, household spending falls by between €0.50 and €0.90. Second, and related to the first point, these borrowers hold relatively low savings stocks which could be drawn on in the case of a positive interest rate shock. Median savings (net liquid assets) range from just €2,000 to €5,500 for tracker borrowers aged between 35 and 49, and €1,000 to €1,600 for SVR borrowers.

Whilst the effects of an interest rate rise for high debt borrowers could be quite large *at the household level*, the aggregate effects will be smaller. This is because tracker borrowers as a group represent only a fraction of households – 12% in 2013 – although their consumption share is marginally higher, at 16%. Including *all variable loans* (i.e. trackers and SVRs)

increases the household and consumption shares to 29 and 36% respectively. However, as we discuss above, it is difficult to know in advance how lenders might adjust SVRs in response to a rate rise, given that the current margin on SVRs is already around 3%. In addition, savers will gain from higher rates. This is not trivial as aggregate household interest receipts are now close to interest payments (CSO, 2017).

The key to determining how an interest rise might affect households' ability to repay debt is to estimate the likely change in the debt service to income ratio (DSI), and specifically, how many households get pushed into higher, potentially unsustainable DSI territory (Fasianos and Bunn, 2017).<sup>12</sup> Recent Central Bank analysis of 'forward-looking vulnerabilities' also estimated the three-year probability of default (at end-2014) for different household types, controlling for, amongst other things, the path for interest-rates through to end-2017 (Central Bank of Ireland, 2016).

<sup>12</sup> The literature on the determination of mortgage arrears is rich and includes Deng et al (2000) and Gerardi et al (2015).

**Table 4.2:** Distribution of debt service burden in base case (actual 2013) and simulated 2% interest rate rise

	Trackers only Base case	Simulation	Trackers and SVRs Base case	Simulation
Mean	25.4	30.7	29.2	31.4
Median	18.5	22.2	19.2	22.8
% >=30	17.7%	27.8%	21.8%	31.1%
% >=40	7.5%	12.8%	9.8%	15.6%

Source: Authors' calculations and HFCS (2016). Note: Debt-service ratio, or burden, is the ratio of HMR (i.e. owner-occupier) mortgage repayments to gross income.

We simulate the DSI distribution for a 2% interest rate rise, holding incomes constant and assuming the rate rise is passed through fully. Table 4.2 summarises the results. For both tracker and all variable rate mortgage holders the interest rate increase scenario (an assumed 2% rise) results in a substantial shift to the right in the debt service burden distribution, although the picture is more stark for tracker borrowers alone where the average debt service burden increases by fully one-fifth. The share of households with tracker rate mortgages whose debt service burdens are considered high – over 30% – increases from 17.7 to 27.8%. When we include *both* trackers and SVR loans, the share rises to 31.1%. Looking even further along the high-DSR distribution, one-in-six variable rate borrowers (15.6%) would be spending 40% or more of their net disposable income on mortgage repayments were rates to rise by 2%. We emphasise once again, that these simulations *hold disposable income levels constant*.

Whilst these results are something to be aware from both a financial stability and real economy perspective, there are some important mitigating factors. First, the simulated 2% interest rate rise is highly unlikely to occur overnight. If it were to materialise, it would likely be only gradual over an extended period time, giving both borrowers and lenders time to adjust. Second, rising asset prices domestically, which is likely to occur simultaneously with interest rate rises, will go some way to mitigating both financial stability and real economy effects, particularly as more

households emerge from negative equity.<sup>13</sup> Third, as we have repeatedly emphasised, these simulations hold nominal gross incomes constant. If interest rates rise as a result of increases in the ECB policy rate, this will coincide with *sustained* nominal income and output growth in the Euro area, with some positive spill overs to Irish households' incomes also likely.<sup>14</sup>

## 5. Conclusion

Irish households, especially those where the head of household was born from the mid-1960s through to the early-1980s, hold a large quantity of debt. Even accounting for their higher incomes, the levels of this debt are higher than for comparator households in Europe or the US. When accounting for debt repayments and income however, the Irish experience is very much in line with that of the UK, US and Euro Area, due in the main to the (currently) low interest rates on tracker loans in Ireland.

Debt in Ireland is more concentrated in property, particularly for those whose debts outweigh their assets, than for comparator households in the US, UK or EA. This means that the majority of debt held in Ireland is secured, on assets whose prices are rising; unlike the most vulnerable households in the US and the UK who hold a variety of unsecured debt including loans related to medical and education borrowing.

<sup>13</sup> In fact, we estimate that the recent rise in house prices has already significantly reduced the proportion of households in negative equity, from 11% in 2013 to just under 7% by end-2016.

<sup>14</sup> ECB policy rate changes do not always occur simultaneously and in the same direction as income changes in Ireland. As we note above for example, ECB policy rates were low in the early part of the 2000s – a time of relative income *growth* in Ireland.

It is likely that, in the absence of much room to save, for the most indebted households in Ireland substantial debt reduction will continue for some time yet. The low interest rate environment that has prevailed since 2008 has been particularly beneficial to highly indebted Irish households. However, in relative terms, a far greater proportion of Irish borrowers are also exposed to potential interest rate rises in the future. Holding income constant, we show that a 1 to 2% interest rate rise reduces the disposable income after debt repayments of a typical borrower by between 2 and 4%, with larger impacts for younger borrowers. As well as the impact on household spending from lower disposable incomes, there could also be financial stability implications, depending on how increases in the debt service burden affect households' ability to repay debt. Finally, and on a more positive note, we highlight a number of mitigating factors, including: nominal income increases, asset price increases – both of which are also likely to occur with interest rate rises in the future – and the fact that a return to a more normalised interest rate environment is something that is only like to occur over a gradual timeframe, giving all stakeholders time to adjust.

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# The Role of Macroprudential Indicators in Monitoring Systemic Risk and Setting Policy

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## Abstract

The financial crisis demonstrated the damaging effects that the build-up of systemic risk in the financial system can have. However, due to the complex and constantly evolving nature of the modern financial system, monitoring systemic risk is not a straightforward task. As part of its systemic risk monitoring framework, the Central Bank maintains over 80 macroprudential indicators which reflect the multifaceted nature of systemic risk. The effectiveness of these indicators can be further enhanced by establishing indicator values associated with elevated risk levels and through the use of visualisation methods, such as heatmaps. While these indicators are used throughout the policy making process, they are not mechanically tied to policy decisions and policy maker judgement also plays a central role. This paper discusses the Central Bank's approach to the use of macroprudential indicators in policy setting and provides an overview of a number of key indicators.

<sup>1</sup> The author is an Associate Economist in the Financial Stability Division of the Bank. The views expressed in this article are those of the author and are not necessarily those held by the Central Bank of Ireland or the ESCB. Comments on previous drafts were kindly provided by Martin O'Brien, Yvonne McCarthy, Niamh Hallissey and Mark Cassidy.



## 1. Introduction

The financial crisis demonstrated the damaging effects that the build-up of systemic risk in the financial system can have and has led to the development of a range of macroprudential policies to mitigate this type of risk. Systemic risk is defined by the Central Bank of Ireland as the risk of a disruption to the provision of financial services, caused by an impairment of all or parts of the financial system, with serious negative consequences for the real economy (CBI, 2014). Systemic risk can take many forms and has both time and structural dimensions. Due to the dynamic nature of the financial system, it is also likely to evolve over time. This contrasts with monetary policy which generally addresses one or two specific objectives, which are directly measurable and defined. As a result, the monitoring of systemic risk requires a multifaceted approach and a wide range of indicators.

As Ireland's macroprudential authority the Central Bank is responsible for monitoring systemic risk in the Irish financial system and implementing policies to limit its impact on both the financial system and the real economy.<sup>2</sup> The Central Bank employs a broad suite of analytical tools and methodological approaches to monitor systemic risk. These include monitoring macroprudential indicators, conducting on-going conjunctural analysis, which is published on a bi-annual basis in the Macro-Financial Review, and employing advanced quantitative techniques.<sup>3</sup>

In this Article we focus on the role of macroprudential indicators. The Central Bank has constructed over 80 indicators required to monitor systemic risk. These are centrally stored in a database and are mapped onto types of risk through its structure, which categorises indicators in line with the Central Bank's intermediate objectives of

macroprudential policy. These objectives reflect the Central Bank's initial focus on the banking sector, given its prominent role in the intermediation process in Ireland.<sup>4</sup> The intermediate objectives are as follows;

1. to mitigate and prevent excessive credit growth and leverage;
2. to prevent excessive maturity mismatch and market illiquidity;
3. to limit direct and indirect exposure concentrations and;
4. to reduce the potential for systemically important banks to adopt destabilising strategies and to mitigate the impact of such actions.

The Article builds upon previous publications by the Central Bank outlining the overall framework for macroprudential policy (CBI, 2014) and available instruments of macroprudential policy (Grace, Hallissey and Woods, 2015). It is intended to further expand the information and knowledge in the public domain regarding the macroprudential policy framework, by providing an overview of the indicators of systemic risk used by the Bank and their role in assessing risk and implementing policies. Section 2 outlines the role of indicators in setting macroprudential policy, alongside the additional role of expert judgement. Section 3 discusses several key indicators in the context of intermediate objectives of macroprudential policy, the existing literature and their behaviour in the Irish and European financial systems. Section 4 gives an overview of approaches to linking indicator values with risk levels and to synthesising information contained in the indicators. Section 5 concludes.

<sup>2</sup> The Central Bank is Ireland's national macroprudential authority for the purposes of the European Systemic Risk Board's (ESRB) 2011 Recommendation and is the designated national authority responsible for certain macroprudential powers in the Capital Requirements Regulation and Directive ('CRR/CRD IV'). For further information see the Central Bank's framework for macroprudential policy (CBI, 2014).

<sup>3</sup> Examples of the latter include macro-financial modelling (Clancy and Merola, 2014; Lozej, Onorante and Rannenberg, 2017), micro-level loan loss forecasting models (Gaffney et al., 2014; Gaffney, Kelly and McCann, 2014; Kelly and O'Malley, 2014), price misalignment models for the real estate sector (Kennedy, O'Brien and Woods, 2016; Kennedy and McQuinn, 2012) and network models of interconnectedness between banks (Hallissey, 2016; Downey, Lyons and O'Malley, 2017).

<sup>4</sup> The intermediate objectives are laid out in the Central Bank's framework for macroprudential policy (CBI, 2014) and are influenced by those set out by the European Systemic Risk Board (ESRB) in ESRB Recommendation 2013/1.

## 2. The role of indicators in policy setting

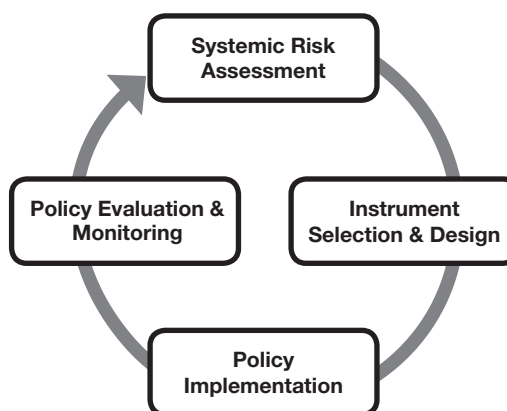
### 2.1 Macroprudential policy cycle

The process for setting macroprudential policy is a continuous cycle with four key stages, as shown in Figure 1. The first stage is systemic risk assessment, followed by instrument selection and calibration. Policies must then be implemented, followed by evaluation and monitoring. After this fourth stage the process begins again with systemic risk assessment.<sup>5</sup> Macroprudential indicators are key to each of these four stages.

During the first stage of the policy cycle, effective and well-constructed indicators are required to identify existing or emerging risks. While all policy relies on good data, access to a broad range of high quality indicators is particularly important in macroprudential policy due to the multifaceted nature of systemic risk in a modern financial system. The indicator database's structure is particularly useful during the second stage. Indicators are categorised by intermediate objectives, which in turn can be mapped onto different macroprudential risks and instruments (see Grace, Hallissey and Woods (2015) and ESRB (2014) for further discussion). As a result, discussion regarding instrument selection can be more focussed, although policy maker judgement will also play a central role (this is addressed in further depth in Section 2.2).

During the third stage, policy implementation, availability of high quality indicators is crucial to both timing and communication. As many macroprudential instruments aim to prevent the build-up of systemic risk, implementation at a point when imbalances have already accumulated may severely limit effectiveness (Drehmann and Juselius, 2013; Caruana, 2010). Clear communication of policy goals should further enhance the effectiveness of

Figure 1: Macroprudential policy cycle



Source: CBI (2014)

measures through a signalling effect and by providing market participants and the general public with insight into the Central Bank's decision making process (Caruana, 2010; BIS, 2016).<sup>6</sup>

The final stage of the macroprudential policy process is policy evaluation. The Central Bank reviews all of its macroprudential policies on a regular basis to determine whether changing risk levels may require re-calibration. The indicators are a key resource in this regard and allow for continuous monitoring of relevant risks. This is particularly important for cyclical instruments where risks are likely to fluctuate and the necessity to "release" an instrument may arise very rapidly.<sup>7</sup>

### 2.2 Role of judgement

Despite the central importance of indicators throughout the macroprudential policy cycle their application is not mechanical and judgement also plays a crucial role. The need for policy maker discretion in setting macroprudential policy arises from both the nature of systemic risk and current limitations in its measurement and detection.

<sup>5</sup> These stages are discussed in further detail in the Central Bank's framework for macroprudential policy (CBI, 2014).

<sup>6</sup> Examples of this communication approach include the Central Bank's announcements regarding the Countercyclical Capital Buffer (CCyB) (see CBI, 2016).

<sup>7</sup> For example, the CCyB requires banks to build up capital buffers during periods where aggregate lending growth in an economy is accelerating. The buffer can then be released during periods of systemic stress, allowing banks to maintain credit supply to a greater extent than would otherwise be the case. While the build-up phase often takes place over a number of years, reductions in credit supply can materialize very quickly and as such it is crucial that policy makers have access to timely measures of systemic stress (Drehmann, Borio and Tsatsaronis, 2011).

Firstly, due to the dynamic nature of the financial system it is likely that future systemic risk will arise in ways not captured by existing measurements. This could take the form of new risks arising from financial innovation or the financial system's responses to macroprudential policies. Due to the evolution of the financial system in terms of contracts, institutions, technology and operations, previously observed systemic risks may also present themselves in new ways. As a result, establishing a mechanical link between a fixed set of indicators and policy setting based on historical experience could lull policy makers into a false sense of security (Agur and Sharma, 2013).

Second, mechanical interpretation of individual indicators faces difficulty in tying specific indicator values to systemic risk levels. As financial crises are infrequent events it is difficult to construct statistically sound associations between indicator values and risk levels (see Section 4.1). Furthermore, given the complexity of modern economies, the effects of systemic risk are often non-linear and assuming that the future path of systemic risk can be quantitatively inferred from a given indicator is unrealistic. For example, the impact of a particular form of systemic risk may be state dependent and its ultimate effect on the real economy may differ dramatically across different economic environments (Chiu and Hacıoglu Hoke, 2016; Haldane, 2012).

Finally, due to the multifaceted nature of systemic risk, there is not yet a single model or single metric by which systemic risk can be measured. Transmission mechanisms of macroprudential tools are also not yet fully understood.<sup>8</sup> In this context it is useful to again compare macroprudential policy with monetary policy. Inflation targeting monetary policy has a far longer track record than is available for most macroprudential instruments, allowing

for the development of an extensive toolkit and literature. Despite this, much of the existing literature concludes that monetary policy still remains both "art" and "science" and that judgement should continue to play a role in decision making (Blinder, 1998; Svensson, 2003; Blanchard, 2006; Mishkin, 2007). Similarly, and in most cases to a greater extent, the use of both quantitative assessment of macroprudential indicators and policy maker judgement is recommended in setting macroprudential policy.<sup>9</sup>

### **3. Intermediate objectives of macroprudential policy**

To provide an overview of the macroprudential indicators used by the Central Bank, this section examines a number of key indicators and the ways in which they relate to each of the intermediate objectives. It should be noted that this discussion focuses on a selection of indicators and is in no way reflective of the entire range of indicators monitored by the Central Bank.

#### **3.1 Intermediate objective 1**

The first intermediate objective of macroprudential policy is to prevent excessive credit growth and leverage. The role of excess credit growth in causing financial crises has been well documented in the academic literature (Minsky, 1972; Barajas, Dell'Araccia and Levchenko, 2007; Claessens, Kose and Terrones, 2008; Mendoza and Terrones, 2012). Its effects can be further amplified by excess leverage, which both facilitates credit growth and makes individuals and institutions less resilient to its reversal. A wide range of indicators have been constructed to monitor these risks, such as measures of aggregate and sectoral credit dynamics, bank leverage, real estate price-based indicators, measures of real estate price

<sup>8</sup> The development of comprehensive systemic risk models, composite indicators, calibration tools and impact assessment methods are all areas of intensive research in both academia and policy making institutions with notable recent contributions in these areas including Gambacorta and Karmakar (2016), Schuler, Hiebert and Peltonen (2015) and Baptista et al. (2016).

<sup>9</sup> A concrete example of this approach can be found in CCyB setting. Both the Basel Committee on Banking Supervision (BCBS) (BCBS, 2010) and the EU's Capital Requirements Directive IV (CRD IV) recommend the use of a "buffer guide" whereby the value of a country's credit-to-GDP gap is mapped directly onto a potential CCyB rate. This mapped value, combined with the judgement of policy makers, is used to set the ultimate rate. Such an approach has been implemented across EU member states, including Ireland. Credit-to-GDP gap values, buffer guide values, rationale for policy setting and resulting CCyB rates can be found on the ESRB website.

misalignment, aggregate loan to value (LTV) and loan to income (LTI) ratios and measures of investment in real estate.

Following the financial crisis, the use of the credit aggregates as indicators of systemic risk has gained traction in both the academic literature and in policy making. In particular, the deviation of the credit-to-GDP ratio from its long term trend (referred to as the credit-to-GDP “gap”) is put forward by Drehmann, Borio and Tsatsaronis (2011) as the preferred indicator of a build-up of cyclical systemic risk and is recommended by both the BCBS (BCBS, 2010) and the ESRB (ESRB, 2014b) as a core indicator in CCyB setting. The buffer guide (see footnote 9) also puts forward lower and upper thresholds, for the introduction of a positive CCyB and the use of a maximum CCyB of 2.5 per cent respectively, which are taken into consideration in the interpretation of these indicators.

However, the credit-to-GDP gap is not without its limitations. For example, the gap is calculated as deviation from long term trend, which in turn is calculated using a purely statistical technique.<sup>10</sup> As a result the trend is not economically founded and will not account for structural changes to the economy which could alter equilibrium or sustainable credit levels (Czech National Bank, 2014; Buncic and Melecky, 2014). A number of macroprudential authorities have also found that prolonged periods of excess credit expansion or contraction can feed through to the trend calculation leading to over or underestimations of sustainable credit levels (Bank of England, 2015). These issues again highlight the importance of judgement in policy setting and have led to the development of a number of alternate versions of the measure by European authorities (Pekanov and Dierick, 2016).

In an Irish context the indicator faces further complications due to difficulties arising from both aggregate credit and GDP measurements. In the case of the former, large intra-group positions held by multinational corporations (MNC) resident in Ireland result in inflated aggregate credit measurements which may not reflect developments in the domestic economy

(Creedon and O’Brien, 2016). Similarly, the influence of MNCs on headline Irish GDP figures has led to much debate as to whether or not the statistic represents a meaningful measure of domestic economic activity. This issue has become more pronounced over recent years due to corporate restructuring and methodological changes to GDP calculation (see Walsh, 2016).

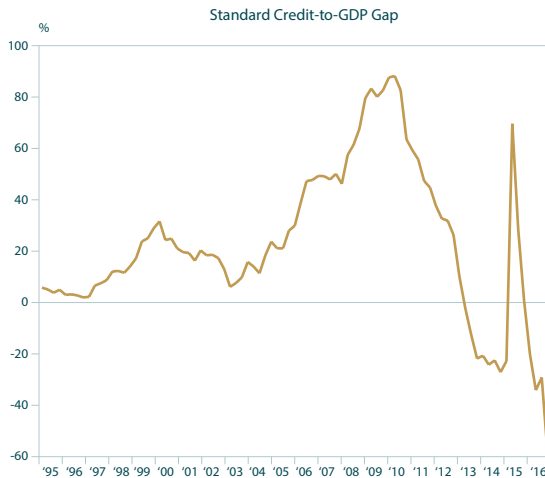
To reflect this a number of credit-to-GDP gap measures are constructed. The first is the standard credit-to-GDP gap, constructed in line with ESRB Recommendation 2014/1, which reflects all credit in the Irish economy and uses a standard GDP measure. The second, referred to as the national specific credit-to-GDP gap, uses a credit aggregate which has been adjusted to remove the effect of Ireland’s MNC sector and a standard GDP measure (for further discussion of this indicator see Creedon and O’Brien (2016)). The third is a credit to underlying domestic demand gap. This uses the national specific credit aggregate and a measure of domestic demand excluding investment in aircraft and intangible assets such as intellectual property.

As shown in Figure 2 all variations on this indicator rose substantially in the years leading up to the financial crisis, with both non-standard measures passing the lower threshold for CCyB setting in 1998 and reaching the upper threshold by between 1999 and 2003. The impact of changes to the 2015 national accounts data from mid-2016, which included substantial changes to both aggregate credit and GDP measures, resulted in a temporary but dramatic spike in the standard measure. This was primarily driven by the immediate impact of the change on aggregate credit combined with a more gradual impact to GDP, which is measured as a four quarter rolling sum.

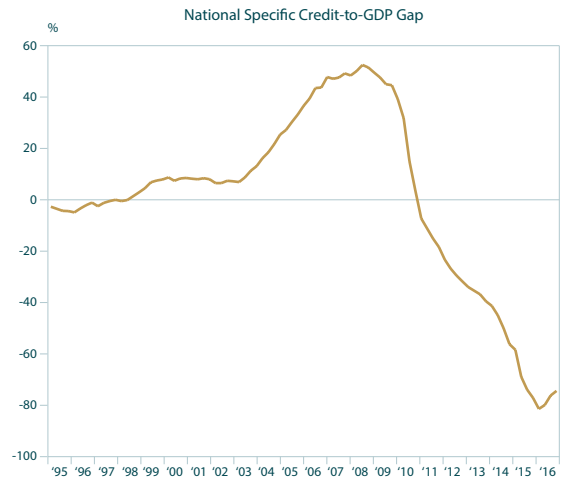
In addition to these credit stock measures, a number of credit flow measures have been proposed by the literature. For example, Schularick and Taylor (2009) find credit growth to be a strong predictor of financial crises. As such year on year aggregate growth is calculated for each credit measure.

<sup>10</sup> The trend level of the credit-to-GDP ratio is calculated using a recursive Hodrick-Prescott (HP) filter. This decomposes a time series into trend and cyclical components, dependent on a variable smoothing parameter. In this case a smoothing parameter of 400,000 is prescribed. A recursive, or one-sided, filter means only information available at each point in time is used for the calculation of the trend

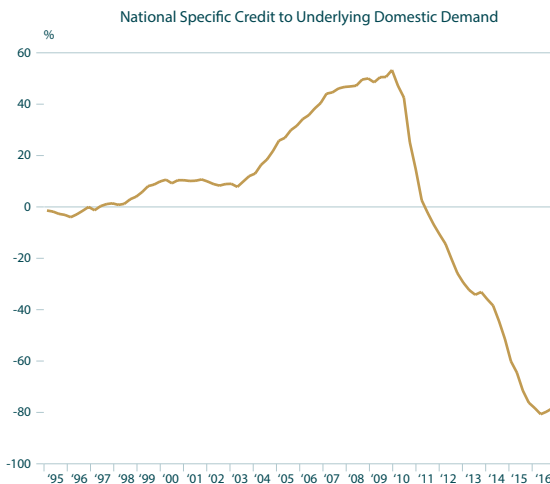
Figure 2: Credit Aggregate Indicators



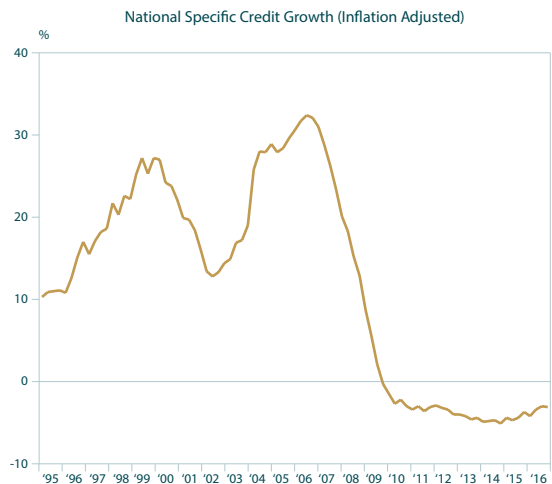
Source: QFA and CSO.



Source: QFA, CSO, Credit Money and Banking.



Source: QFA and CSO.



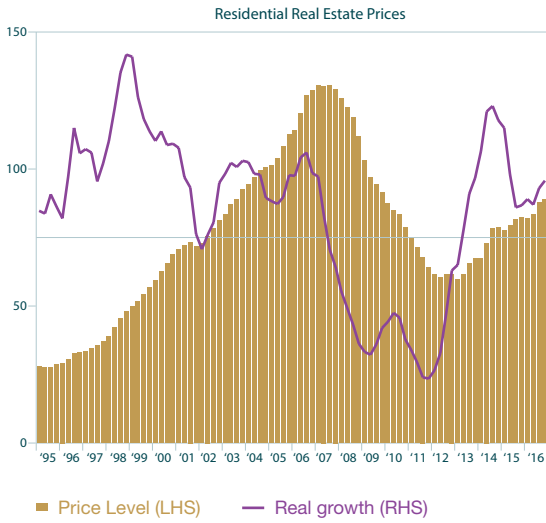
Source: QFA, CSO, Credit Money and Banking.

Given the interaction between credit dynamics, leverage and real estate prices, real estate indicators form another important component of the Objective 1 indicators. These include direct measures of real estate prices, simple ratios aiming to capture price misalignment and the output of a number of advanced models aiming to do the same. A common ratio examined in this context is the price-to-rent ratio, where a high value implies prices may be in excess of fundamental returns on property investment,

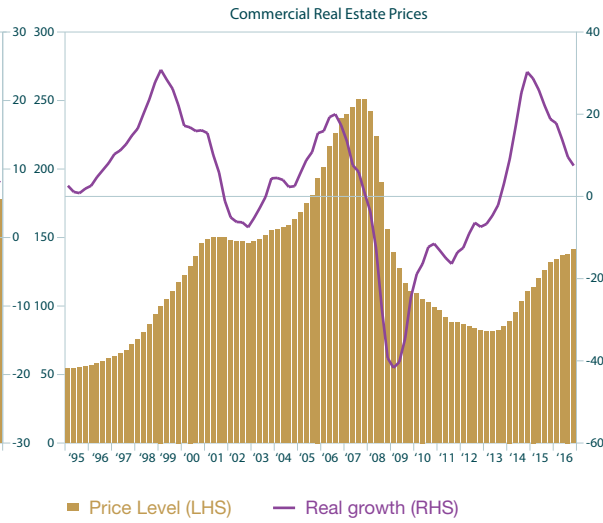
thus suggesting the asset is overvalued. A more advanced approach to estimating overvaluation is laid out in Kennedy, O'Brien and Woods (2016). The authors use a number of reduced form models, based on developments in supply and demand factors such as income and housing supply, to estimate a time series for sustainable house prices.

As shown in Figure 3, all of these indicators rose dramatically over the years preceding the

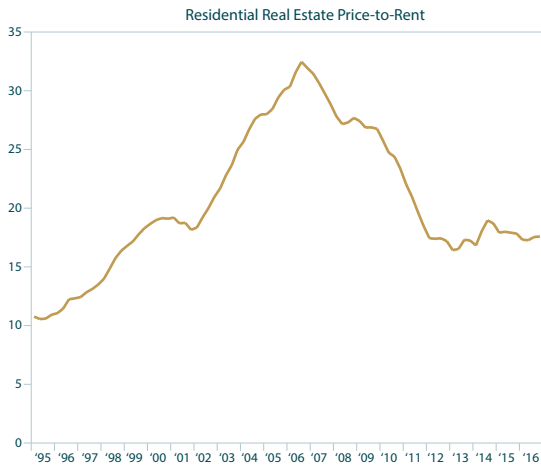
Figure 3: Real Estate Price and Price Misalignment Indicators



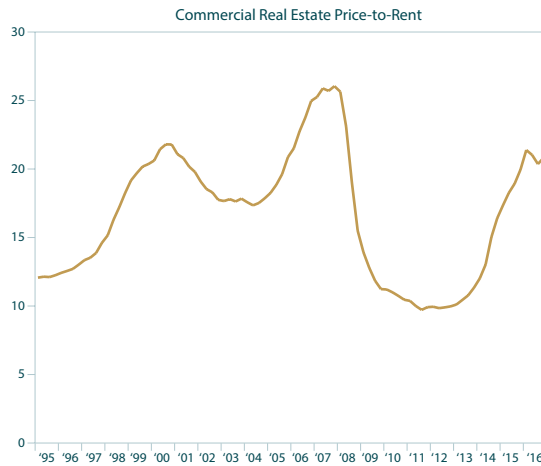
Source: CSO.



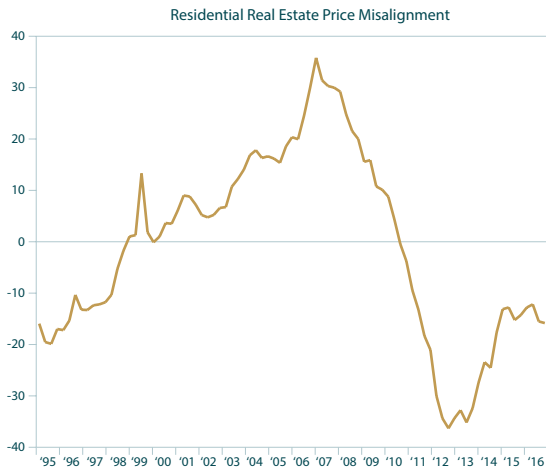
Source: IPD.



Source: CSO.



Source: IPD.



Source: Central Bank calculations.

financial crisis and began falling between late 2006 and 2008. While price growth shows marked increases over the past two years, price levels and misalignment measures do not yet point to overvaluation in either residential or commercial markets.

### 3.2 Intermediate objective 2

The second intermediate objective of macroprudential policy is to mitigate and prevent excessive maturity mismatch and market illiquidity. This objective targets systemic risk arising from financial institutions relying excessively on short-term and unstable funding. Unstable sources include funding provided “wholesale” by other financial institutions, capital markets or sourced abroad and contrast with more stable funding from retail deposits. An increased reliance on unstable sources of funding can increase banks’ vulnerabilities to system-wide runs, particularly when it is used to fund lending at long maturities. Risks arising from this type of activity often move in tandem with those covered by Objective 1 as non-deposit funding facilitates the rapid expansion of balance sheets (Hahm et al., 2013). A range of indicators have been constructed to capture these risks, including bank funding ratios, aggregate measures of bank maturity structures, liquid asset ratios, asset encumbrance ratios and market liquidity indicators.

The non-core funding ratio (NCFR) aims to capture risk arising from reliance on wholesale funding, using the ratio of funding sourced through security issuance to funding through deposits. The indicator features prominently in the literature on financial crisis early warning indicators where it is found to be a particularly effective leading indicator (Hahm et al., 2013). As shown in Figure 4 the behaviour of this indicator for domestic Irish banks mirrors that of the credit-to-GDP gap in the years leading up to the financial crisis.<sup>11</sup> This reflects the increased reliance of Irish banks on non-deposit funding to increase lending. In recent years the behaviour is also similar across the two indicators and they

Figure 4: NCFR for Domestic Irish Banks



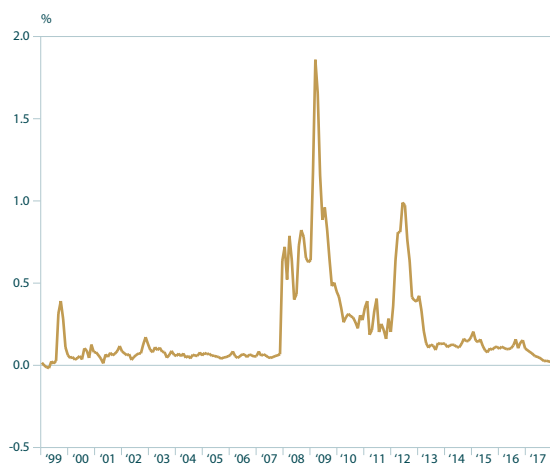
Source: Money and Banking Statistics.

show how post-crisis deleveraging has been accompanied by a return to a more deposit funded model.

Risks associated with reliance on wholesale funding often build-up slowly and materialise rapidly. Banks which have become reliant on short term wholesale funding can suddenly face significant liquidity and funding challenges following increased risk aversion in wholesale funding markets. This realisation is captured by the difference between the rate at which European banks lend to one another (the Euro Interbank Offered Rate (EURIBOR)) and the overnight interest rate swap rate (Overnight Indexed Swap (OIS)) over the same period. This indicator spiked dramatically following the bankruptcy of Lehman Brothers and during the European sovereign debt crisis. This was driven by increased credit risk in the banking system leading to wholesale lenders requiring higher compensation for short term unsecured lending. In addition to providing a useful measure of banks’ wholesale funding costs this indicator is available on a daily basis, making it a preferred option to indicators which are released at a lower frequency or with a lag.

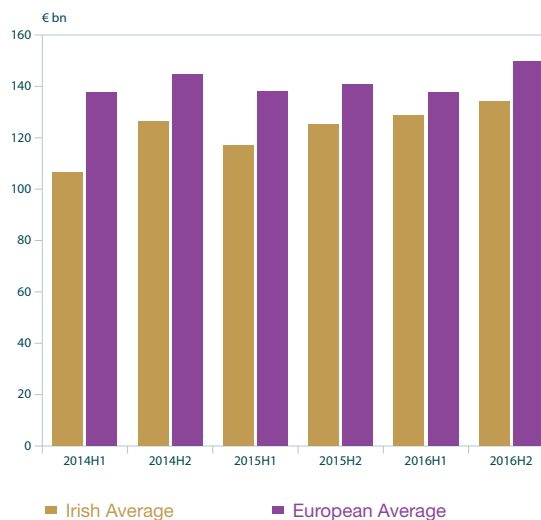
<sup>11</sup> Domestic Irish banks refers to institutions included in the Domestic Market Group category used in the Central Bank’s Money and Banking statistics; a comprehensive list of these institutions is available [here](#) on the Central Bank website. It should also be noted that these statistics are calculated on a residency basis, meaning that data are compiled on a locational basis so, for example, branches of foreign authorised entities located in Ireland are included in aggregate statistics and branches of Irish authorised entities located outside of Ireland are not. For a detailed explanation of residency based statistics and how this differs from the supervisory approach see O’Brien and Reen (2012).

Figure 5: 3 Month EURIBOR OIS Spread



Source: Bloomberg.

Figure 6: Average LCR for Irish Headquartered and European Institutions



Source: SNL.

Note: European average reflects average value for banks included in EBA stress test.

However, not all banks will be equally affected by negative funding shocks. For example, banks with a higher share of liquid and unencumbered assets on their balance sheet will be better able to manage such scenarios. The Liquidity Coverage Ratio (LCR), put forward by the Bank of International Settlements (BIS), aims to directly measure banks' ability to withstand market stress. It is constructed using the ratio of High Quality Liquid Assets (HQLA) to total cash outflows over a 30 day market stress scenario.<sup>12</sup> Under Basel III requirements this measure should not fall below 100 except during periods of financial stress, where banks may draw on their stock of HQLA (BCBS, 2013). Figure 6 shows the unweighted average LCR across Irish headquartered retail banks alongside the European average for comparative purposes.<sup>13</sup> While the LCR of Irish banks are all in excess of the BIS requirement, they do lag behind their European counterparts.

### 3.3 Intermediate objective 3

The third objective of macroprudential policy is to limit direct and indirect exposure concentration. As the financial sector's exposures become more

concentrated, risks related to these exposures may begin to pose systemic threat to the financial system. For example, if the banking system is heavily involved in funding a given sector, the risk of a downturn in that sector may become a systemic risk for the financial system. Realisation of this type of risk will often take the form of contagion, where negative developments in one sector spread through the wider financial system. Exposure concentration is seen as "direct" when financial institutions' balance sheets are directly and excessively exposed to a common risk. However, exposures can also be "indirect", as fragility in one part of the financial sector may lead to fire sales and reduce the prices of assets held by other institutions (ESRB, 2014).

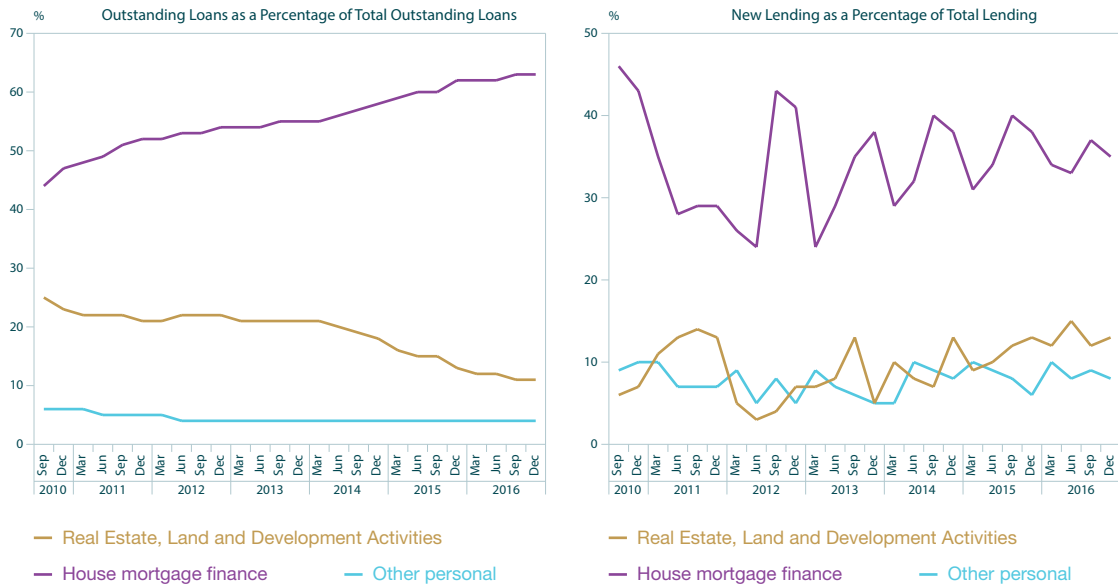
While objectives one and two focus primarily on cyclical systemic risk, objectives three and four focus more on the cross-sectional, or structural, dimension of systemic risk. Structural systemic risks make the financial system more vulnerable to negative shocks and may interact with cyclical systemic risks by propagating or amplifying cyclical shocks. In most cases structural risks, and as an extension indicators used to measure them, are more slow-moving than cyclical risks.

<sup>12</sup> BIS defines HQLA as cash or unencumbered assets which can be converted into cash at little or no loss (BCBS, 2013)

<sup>13</sup> This data is compiled on a supervisory basis and as such focuses on developments in the individual credit institutions or banking groups on a consolidated basis, taking into account all operations regardless of whether they are undertaken by offices located in Ireland. For a detailed explanation of supervisory based statistics and how this differs from the residency approach see O'Brien and Reen (2012).



Figure 7: Direct Sectoral Exposures of Domestic Banks



Source: Central Bank of Ireland.

Furthermore, while there is an extensive literature on cyclical forms of systemic risk, such as credit and real estate bubbles, many of the risks in this category have been less studied and data sources tend to have shorter time series.

However, a wide range of more recent datasets are available. In compiling the indicators, a range of these sources have been drawn upon to examine concentration in banks' new lending and outstanding loans, concentration in bank security holdings to sectors, countries and individual counterparties, the magnitude of concentrated exposures relative to institutions' capital base, the magnitude of exposures between Irish banks and the distributions of total assets and leverage ratios across Irish authorised banks. Many of these measures are constructed at both institution and system-wide levels.

For example, high level regulatory returns can be used to assess concentration in sectoral exposures of Irish financial institutions in terms of total outstanding exposures and new lending.

As can be seen in Figure 7, Irish retail banks are heavily exposed to the real estate sector, particularly in terms of household mortgage finance.<sup>14</sup> While the concentration of new lending in household mortgage finance has decreased since 2010, it remains the largest single component of domestic bank new lending.

Since the financial crisis, a number of more granular data sources have also become available to the Central Bank, such as the large exposures dataset. This is collected by the Central Bank in its supervisory capacity and provides extensive exposure-level information on all large exposures held by Irish authorised banks.<sup>15</sup> Hallissey (2016) uses this dataset to map exposures across the Irish financial system and the dataset is also extensively drawn up to monitor risk arising from exposure concentration. For example, total large exposures relative to an institution's capital base can be used to monitor the overall concentration of its exposures or exposures held by the system as a whole.

<sup>14</sup> This classification of Irish retail banks is in line with the classification used in the Central Bank's Macro-Financial Review. This data is compiled on a supervisory basis and as such focuses on developments in the individual credit institutions or banking groups on a consolidated basis, taking into account all operations regardless of whether they are undertaken by offices located in Ireland. For a detailed explanation of supervisory based statistics and how this differs from the residency approach see O'Brien and Reen (2012).

<sup>15</sup> A large exposure is defined as an exposure that is 10 per cent or more of a bank's eligible capital base and each bank authorised in Ireland must report these on a quarterly basis. Banks whose parent institution is authorised in Ireland (Irish headquartered banks) also report any exposures which are greater than €300 million. These exposures consist largely of loans but also include derivatives, guarantees and debt or equity holdings (Hallissey, 2016).

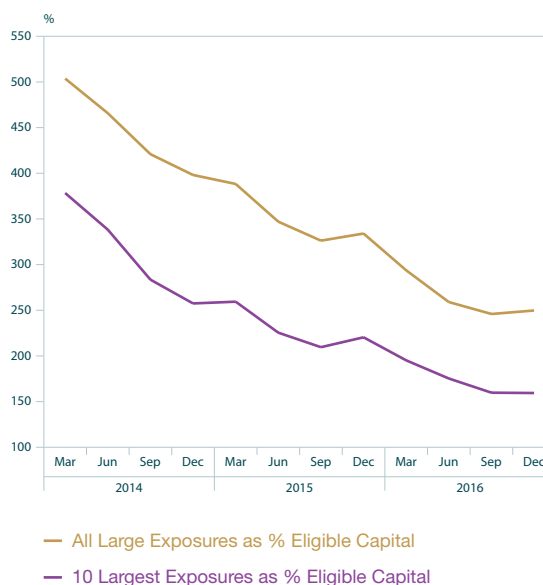
Figure 8 shows the evolution of this measure for Irish retail banks, where the indicator shows substantial but decreasing exposure concentration. The magnitude of this exposure is primarily driven by institutions' large sovereign bond holdings and by substantial parent company exposures (see Figure 10 for a full sectoral breakdown). It should also be noted that "eligible capital", which consists of an institution's tier one capital and a limited share of its tier two capital (see European Commission, 2016), is a fairly narrow capital measure which, as the measure's denominator, will further increase its value. The large exposures dataset also provides exposure values net of collateralisation and exemptions, where exemptions include sovereign bond holdings and exposures with certain type of parent company guarantees (Hallssey, 2016). These values are much smaller, ranging between 58 and 42 per cent over the period shown.

Figure 8 also highlights concentration within the banks' large exposures, as the ten largest exposures make up between 75 and 64 per cent of the total value over the course of the period shown. As a result, details of these exposures are also monitored including degree of collateralisation, total size and counterparty name, sector and country. Throughout the period shown these ten largest exposures are almost entirely made up of Irish sovereign bond holdings and exposures to parent companies. Their decreasing size, alongside rising eligible capital levels, drive the aggregate indicator's downward trend over the period.

Counterparty information is also used to assess concentration in exposures to specific counterparties, sectors and countries. Figure 9 provides a geographic breakdown of large exposures for the first quarter of 2014 and the final quarter of 2015. The charts show a strong but decreasing home bias among large exposures, along with substantial exposure to the UK.

Figure 10 provides a sectoral breakdown for the same two periods where government and credit institutions dominate; this is in line with

**Figure 8: Domestic Institution Large Exposures as a Percentage of Eligible Capital**



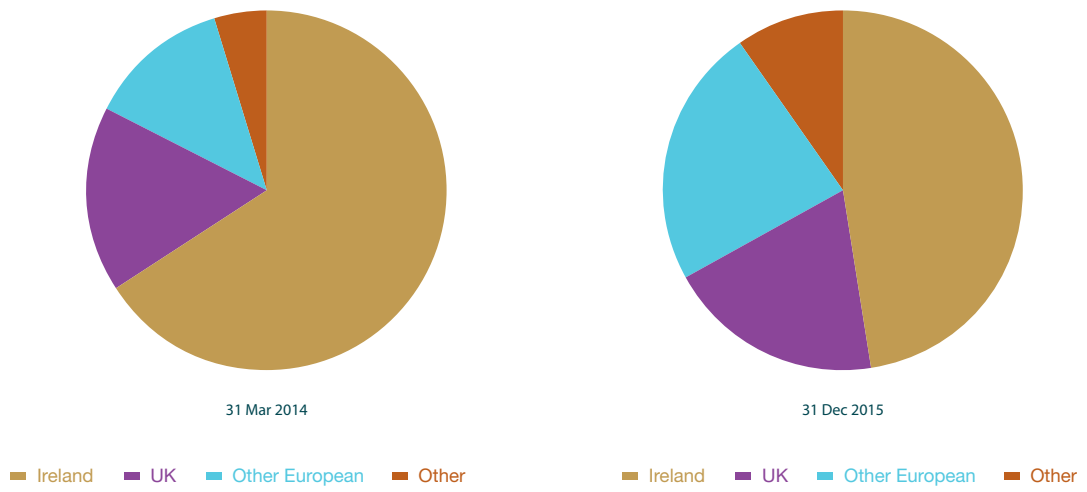
Source: Central Bank of Ireland.

the sectoral breakdown of the banks' ten largest exposures discussed above. Furthermore, the similarity in sectoral exposures across the two periods reflects the slow-moving nature of structural risks.

### 3.4 Intermediate objective 4

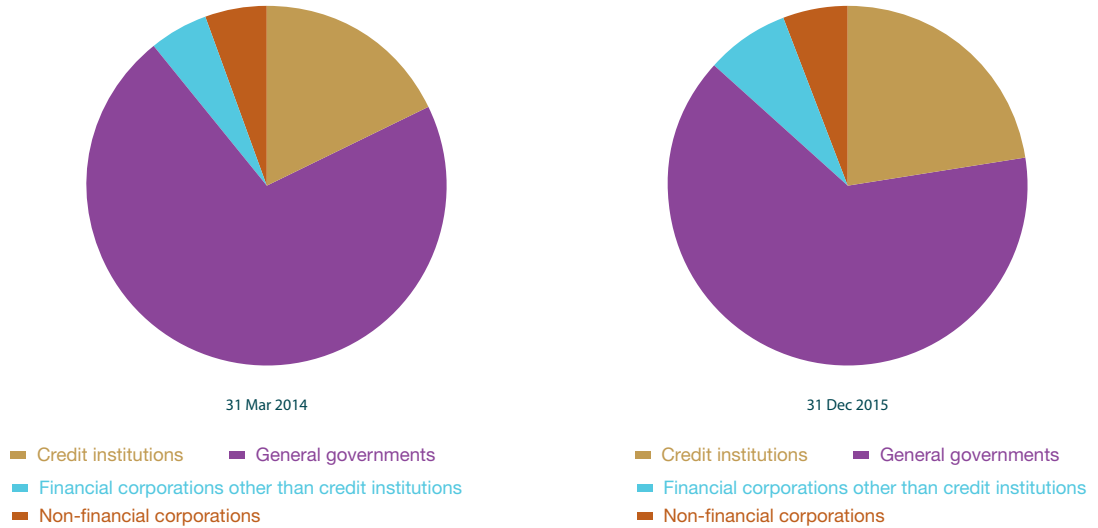
The fourth intermediate objective is to reduce the potential for systemically important banks to adopt destabilising strategies and to mitigate the impact of such actions. The financial crisis demonstrated that in many cases the cost of failure of systemically important, or too-big-to-fail (TbTF), institutions for the rest of the financial system and the real economy is high enough to result in government intervention (Siegert and Willison, 2015). While this may be an optimal solution on a case by case basis it also creates a moral hazard problem, whereby institutions who believe they will be bailed out in the case of bankruptcy have less incentive to prevent their bankruptcy from occurring. This may result in increased risk taking by systemically important

Figure 9: Domestic Institution Large Exposures by Country



Source: Central Bank of Ireland.

Figure 10: Domestic Institution Large Exposures by Sector



Source: Central Bank of Ireland.

institutions, which both increases the likelihood of their failure and overall risk taking in the financial system (Afonso, Santos and Traina, 2014).

A range of indicators have been constructed which both assess incentives for systemically important banks to adopt destabilising strategies and the impact this could have on the real economy. These include indicators covering the size of individual institutions relative to GDP, the size of the system as a whole relative to GDP, measures of concentration across a number of key markets, measures of interconnectedness between Irish banks and the wider financial system, each other and the Irish state, measures of lending and funding concentration, measures of bank and system complexity, and measures of cross border activities.

While systemically important banks are often the largest banks in a financial system there are a number of attributes which, in addition to size, contribute to systemic importance. For example, if financial agents, such as borrowers or depositors, can substitute one institution for another without substantial market disruption, this could limit the impact on the system of an institution's failure. A number of measures of market share concentration are constructed and these are summarised in Figure 11. This chart shows the market share held by the three largest institutions in the markets for Irish private sector deposits, private sector loans, household loans and NFC loans. In all cases the three largest institutions command most of the market share, suggesting the failure of one would cause large scale disruption to the system and the real economy.

The Central Bank has also used a wide range of datasets and methodologies to conduct analysis of interconnectedness in the Irish financial system. The failure of an institution to which others are highly exposed can have a detrimental effect on the entire system; Brunnermeier et al. (2009) refer to this phenomenon as “too interconnected to fail”. In addition to transmitting shocks, a high degree of interconnectedness can also contribute to the complexity of the

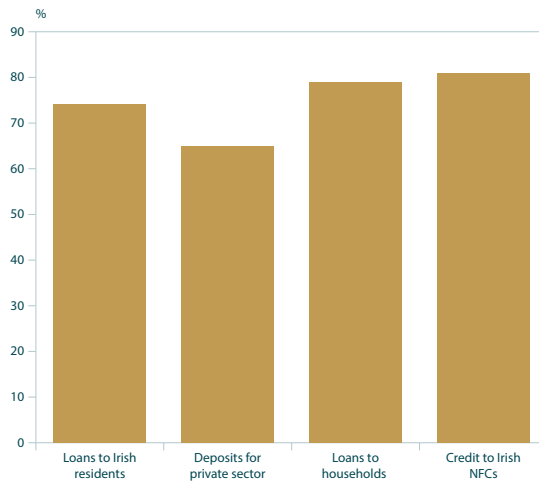
financial system and increase the cost of allowing individual institutions to fail. In a complex or opaque financial system, where it is difficult to understand how and to what extent institutions are exposed to one another, the failure of one institution may give rise to adverse selection effects as investors are unable to distinguish between institutions which are and are not exposed to related losses. During the financial crisis this resulted in the freezing up of the interbank markets and forced asset sales (Claessens et al., 2010).

Examples include Downey, Lyons and O'Malley (2017) who use data from TARGET2-IE, Ireland's component of the Eurosystem's large value payment system (TARGET2). The authors examine connections between Irish banks arising from payment transactions, both customer and interbank. By mapping these two separate networks at a specific point in time, they find that interbank payment flows were mainly between a relatively small number of Irish banks and with a select number of international banks. They also find that three banks have many connections with each other and with other banks in the Irish customer network, while many banks in this network have very few connections. The authors draw upon literature from network analysis to construct a number of indicators identifying banks which are most important in the Irish interbank and customer payment networks. Their work also proposes a way of monitoring Irish payments data from a financial stability viewpoint and why this is important.

Hallissey (2016), on the other hand, uses large exposures data to map interbank exposures of all Irish authorised banks. This is shown in Figure 12 where circles (nodes) represent banks, lines connecting them represent credit exposures and circle size represents the sum of all exposures to that bank. The results of this analysis highlight that the network of bilateral interbank credit exposures held by Irish authorised banks is relatively sparse. There are a just a few key hubs in this network, all of which had been identified as systemically important at a global level (Global Systemically Important Institutions) at the time

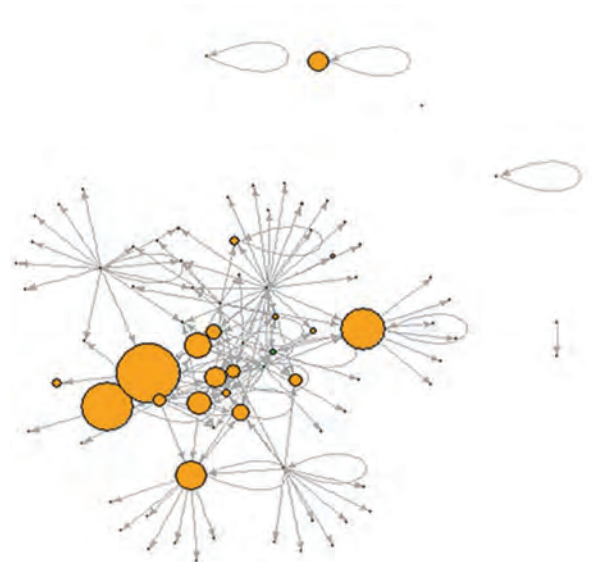
**16** It should be noted that this network shows only asset exposures held by Irish authorised institutions and as such does not provide a full picture of interconnectedness for the Irish banking system.

**Figure 11:** Market Share Held by the Three Largest Institutions (December 2016)



Source: Central Bank of Ireland.

**Figure 12:** Gross bilateral interbank exposures of Irish authorised banks



Source: Hallissey (2016)

of writing.<sup>16</sup> The large exposures dataset is also used to monitor interconnectedness between Irish retail banks at a granular level.

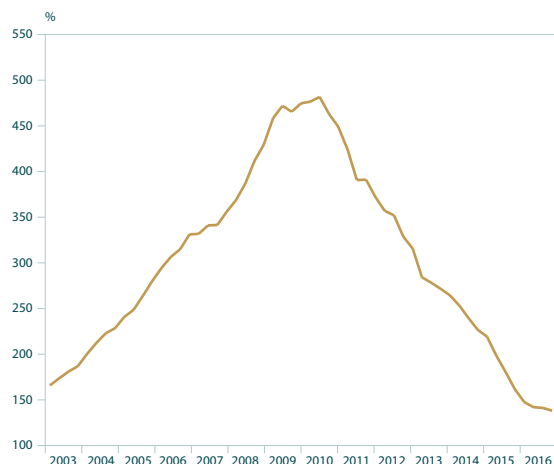
Of course size is also a key determinant of an institution’s systemic importance and as such a number of indicators focussing on financial institutions’ size have been constructed. Moreover, there is a direct link between the size of an institution, or the size of the financial system as a whole, and the impact the materialisation of TBTF risk will have on the real economy. Figure 13 shows the size of Ireland’s domestic banking sector relative to Irish GDP where the rapid expansion of the financial sector, even relative to the size of the rapidly growing Irish economy, prior to the financial crisis is clear. Following the financial crisis substantial deleveraging has taken place and as such the measure has fallen to below its 2003 level.

## 4. Thresholds and visualisation

Having compiled an initial set of indicators and categorised them by intermediate objective, a number of further steps can be taken to maximise their effectiveness. This section discusses work regarding indicator thresholds and visualisation methods, which aim to highlight risks as they are captured by indicators.

### 4.1 Thresholds

As touched upon in Section 2.1, the usefulness of an indicator can be enhanced by establishing levels of systemic risk associated with a given indicator value. This is often done by establishing threshold values. Ideally, a threshold should form a dividing line between indicator values associated with a stable financial system and those associated with excessive systemic risk. However, financial crises are infrequent or “tail” events resulting in a limited number of historical

**Figure 13: Irish Domestic Bank Assets to GDP**

Source: Money and Banking, CSO.

observations. This makes it difficult to construct statistically sound thresholds. As such there is no universally agreed upon approach to threshold calculation and a number of approaches have been taken internationally.

The literature on early warning indicators for financial crisis provides a number of models for threshold calculation, such as the signal extraction method laid out in Drehmann, Borio and Tsatsaronis (2011) and Borio and Drehmann (2009). This method examines the behaviour of indicators in the period preceding past financial crises and an indicator is considered to be “signalling” if it is above a given threshold. An indicator’s performance is then assessed by examining the ratio between correct predictions and false warnings across a range of thresholds. Thresholds can then be chosen at levels which maximise an indicator’s performance in both areas.<sup>17</sup> The effectiveness of this method can be undermined by the infrequent nature of financial crises which makes it difficult to establish statistically sound thresholds on an individual country basis.

Thresholds can also be established by examining an indicator’s historical or cross country distribution and identifying points which may reflect normal or stable conditions, such as average values. As discussed in relation to the credit-to-GDP trend in Section 3.1, this method is purely statistical and average values will not always coincide with sustainable indicator levels. This may be caused by structural change in the economy over time or the effect of consistently extreme values both before and after financial crises. Similarly, cross country comparisons may not take into account structural difference across countries.

A third approach is to refer to both the early warning indicator literature and thresholds put forward by international policy setting groups. While much of the existing literature examines the effectiveness of indicators without establishing optimal thresholds, work by Lo Duca and Peltonen (2011), Drehmann, Borio and Tsatsaronis (2011) and Hermanson and Rohn (2015) does highlight specific thresholds at which indicators are particularly effective. A number of policy making bodies have also proposed indicator thresholds such as credit aggregate thresholds put forward by the Basel Committee on Banking Supervision (2010) and ESRB (2014b) for use in CCyB setting.

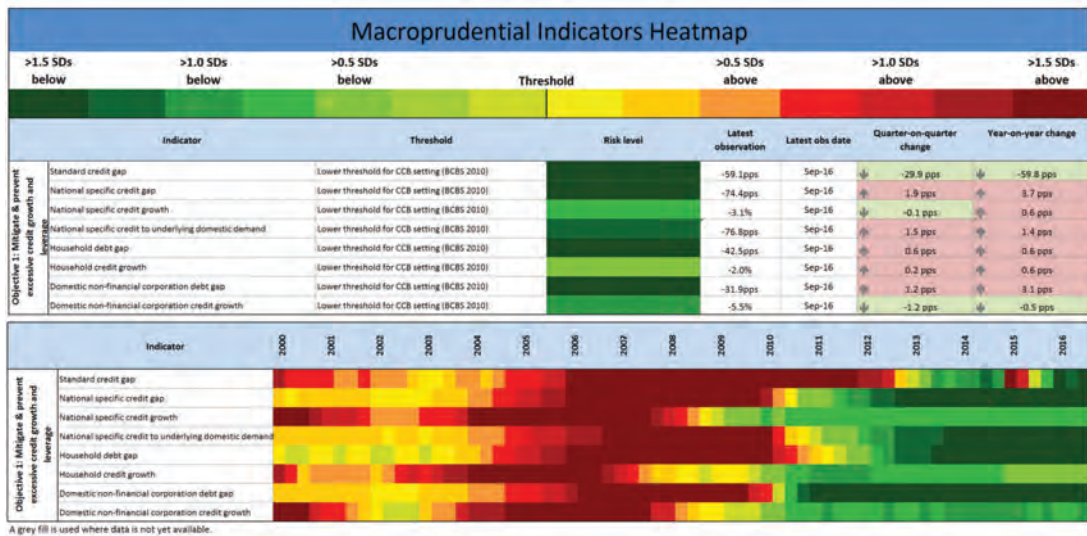
While the results of these methods should be interpreted with caution, they are still informative. As a result, all of the above approaches have been applied to as many macroprudential indicators as available data will allow. Work in this area will continue as new data sources become available and methodologies advance.

#### 4.2 Visualisation

Once thresholds have been established, a wide range of visualisation techniques can be employed to provide a clear overview of information contained in the indicators. Visualisation techniques are particularly important in this context, given the large number of indicators required to monitor systemic risk

<sup>17</sup> Borio and Drehmann (2009) suggest minimising the noise-to-signal ratio subject to at least two-thirds of the crises being correctly predicted. This is due to the ratio’s tendency to reach its minimum at quite a high threshold where both noise and signal ratios are very low. Other literature such as Demirgüç-Kunt and Detragiache (1999) has focussed on deriving an optimal trade-off between missing crises and incorrectly predicting crises by minimising a policy maker loss function.

Figure 14: Point in time and time series heatmapping approaches



Source: Central Bank of Ireland. Note: The above provides a non-exhaustive sample of indicators and time periods covered by the macroprudential heatmaps.

in a modern financial system. As the number of indicators employed by the Central Bank increases, so does the need to synthesise the information they contain.

A popular approach to this type of risk visualisation is heatmapping, which aims to highlight elevated or increasing areas of risk and allow for comparison of risk levels across time periods. The approach has been put forward by both the Banco de España and the Federal Reserve Bank of New York to monitor systemic risk (see Mencía and Saurina (2015) and Adrian, Covitz and Liang (2014)).

The Central Bank has developed a two-part heatmap which provides both a point-in-time and a time series overview of systemic risk in the Irish financial system, as captured by the indicators. These maps assign a risk level to each indicator based on its number of standard deviations from its threshold; a heatmap is then formed by assigning graduated colours to each risk level.<sup>18</sup> For example, an indicator which is more than 1.5 standard deviations above its threshold is assigned dark red and an indicator which is at or just below (0.25 standard deviations) its threshold

is assigned light green. This aims to give an immediate overview of the macroprudential risk landscape and to highlight areas of possible concern to policy makers.

The point-in-time map (Figure 14) provides heatmap colour coding for the most recent observation of each indicator along with the value of the observation, its quarter-on-quarter change and its year-on-year change. This provides policy makers with a one-page summary of the indicators, the risks levels these imply and the direction of their movement. The time series map, also shown in Figure 14, uses colour coding only and shows indicator risk levels from 1995 to the most recent period, where data is available. This provides historical context for the risk levels conveyed by indicators and a dynamic picture of the risk landscape. Both heatmap approaches can also be seen in the Central Bank’s most recent CCyB rate announcement, where the methodology has been applied to key indicators used in CCyB setting.

While these techniques provide a useful overview of a large number of indicators they have some limitations. They rely on thresholds which, as

<sup>18</sup> Again it should be noted that number of standard deviations from threshold is a purely statistical measure. While assigned colours are based on the general association of above-threshold indicator levels with elevated levels of systemic risk, these colours are not directly linked to a fixed probability of financial crisis occurrence.

discussed earlier, should be interpreted with caution. Moreover, a number of the indicators are simply not suited to being represented by a single number or colour, such as cross-bank exposure matrices. Due to the complexity of systemic risk and of the financial system, as discussed in Section 2.2, visualisation methods should be considered as a starting point of macroprudential analysis and a means of focusing policy maker discussion. They should not be seen as policy setting tools in and of themselves.

## 5. Conclusion

Monitoring systemic risk is at the core of the Central Bank's responsibilities as a macroprudential authority. However, due to the multifaceted and dynamic nature of systemic risk, this is not a straightforward process and requires a broad range of indicators and methodologies. As part of its systemic risk monitoring framework, the Central Bank has leveraged data available to it as a macroprudential, monetary and supervisory authority and has compiled over 80 macroprudential indicators which are centrally stored in a purposefully structured database. In addition to mapping indicators onto intermediate policy objectives through this database's structure, visualisation methods have been employed to allow the indicators to effectively support focussed policy discussion and decision making. While the indicators are used throughout the policy making cycle, it is important to note that they are not tied mechanically to instrument selection or calibration and that policy maker judgement also plays a central role. The suite of indicators will evolve over time, as new data sources become available, new risks are identified and threshold calculation methods are further developed.



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# Monitoring Ireland's Payments using TARGET2

Claire Downey, Paul Lyons and Terry O'Malley<sup>1</sup>

## Abstract

With the aim to develop indicators to better understand the interconnectedness of the Irish banking system and to identify the build-up of potential systemic risks, this article describes TARGET2-IE, Ireland's component of the Eurosystem's large value payment system (TARGET2). In doing so, we seek to highlight how close monitoring of payments data can confer a deeper understanding of the components that contribute to the smooth functioning of the Irish economy and a stable financial system. Following a description of TARGET2-IE, we highlight the underlying topology (map) of Ireland's interbank and customer payment networks. We identify key bank connections arising from payment flows between banks and introduce indicators for systemic risk monitoring. The indicators provide information on the relative importance of banks in the networks, liquidity conditions, key connections and payment inflows and outflows.

<sup>1</sup> The views expressed in this article are those of the authors and are not necessarily those held by the Central Bank of Ireland or the ESCB.

## 1. Introduction

Significant amounts of economic transactions are ultimately settled via money transfers between banks taking place on large-value payment systems. In this manner, payments data reflect economic activity and the health of a financial system. A necessary condition for the functioning of the economy is that payment transactions are settled smoothly and securely. TARGET2<sup>2</sup> fulfils this role for euro denominated payments. Given its importance to the smooth functioning of the economy, a key priority of the Eurosystem – including the Central Bank of Ireland – is ensuring that the infrastructures for payments and securities settlement are safe, resilient and efficient and that participants can readily access such systems. It is through this close monitoring and oversight that payment system infrastructures proved resilient even during the most recent financial crisis.

Payment systems can also be beneficial in identifying the ‘too-interconnected-to-fail’ institutions, i.e. the ‘systemically important’ institutions that have become an increasing focus of regulators and policy-makers alike following the Global Financial Crisis (GFC).<sup>3</sup> The GFC highlighted that regulators had limited information about the direct and indirect connections between financial institutions. Furthermore, little was understood on how these connections affected financial stability. Encouragingly, there have been considerable empirical and theoretical contributions since the GFC aiding a better understanding of these issues (see Section 2).

In this article, we introduce TARGET2-IE, the Irish component of TARGET2. We highlight how analysis of payment flows to and from Irish banks can be utilised for financial stability purposes, by enabling a deeper understanding of credit institutions’ behaviour and their key connections. Specifically, data from TARGET2-IE are used to present, for the first time, a network topology of both customer payment flows and interbank payment flows involving Irish banks.

We consider how this analysis can feed into the identification of idiosyncratic or system-wide risks and to illustrate, we introduce some indicators that aid in this task. This is especially important in an Irish context, given that liquidity concerns during the GFC resulted in substantial Central Bank liquidity provision to banks (both through regular operations and by way of Emergency Liquidity Assistance) and ultimately public interventions via capital injections.

The article is structured as follows: Section 2 discusses relevant literature; Section 3 introduces TARGET2; Section 4 describes TARGET2-IE and presents some summary statistics; Section 5 presents the network for TARGET2-IE, highlighting the key connections between institutions, while Section 6 discusses indicators for systemic risk monitoring. Section 7 concludes.

## 2. Related Literature

Relevant literature in the context of this article is vast and growing but can be broadly summarised as focusing on the following areas: systemic risk; financial crisis; contagion; interbank markets and payments network theory. This article builds on earlier work in an Irish context by Hallissey (2016) who examined Irish banking sector interlinkages using a number of regulatory data sources. The author finds that banks with a domestic retail focus have much lower levels of interconnectedness with the global financial sector than the internationally-focussed foreign-owned banks, in part driven by the intragroup exposures of the foreign-owned banks. The author also noted the need for improvements in data availability to better capture all exposures and connections. Payments data can aid in this regard.

A related strand of literature examines the major role of interconnectedness among banks in the propagation of financial distress. Seminal contributions by Allen and Gale (2000) and Freixas et al. (2000) suggest that

<sup>2</sup> TARGET stands for Trans-European Automated Real-time Gross settlement Express Transfer system

<sup>3</sup> EBA Guidelines on the criteria for the assessment of Other Systemically Important Institutions (O-SIIs) pursuant to Article 131 (3) of Directive 2013/36/EU require, for example, the use of payments data as a mandatory indicator.

a more interconnected architecture enhances the resilience of the system to the insolvency of any individual bank. Allen and Gale, for example, argue that, in a 'complete' structure, which they describe as one in which every bank has symmetric links with all other banks – contagion is less likely to occur. If every bank lends to every other bank, the impact of one bank defaulting is diluted among other banks – making the network more resilient. In contrast, they find that a ring network, in which each bank borrows from exactly one other bank and 'incomplete' structures, where banks have links only with a few neighbouring banks, are particularly fragile. The findings of Freixas et al. are similar. They note that interbank connections generally enhance the resilience of the financial system as interbank credit lines provide an implicit subsidy to an insolvent bank, allowing it to share losses with other banks.

A further strand of literature (Gai and Kapadia, 2010) finds that modern financial networks display 'robust-yet-fragile'<sup>4</sup> features. Higher interconnectedness allows for innocuous absorption of most shocks, reducing the overall probability of systemic failure. However, when extreme, high impact events occur, such as during a crisis, the shocks are more amplified than in less connected networks. Acemoglu et al. (2015) also support this view and find that the same factors that contribute to resilience under certain conditions may function as significant sources of systemic risk under others.

In this article we explore the topological features of the Irish payment networks over time. We follow the approach of Bech and Rørdam (2008), who use Danish payments data, by focusing on two distinct network topologies – one for customer payments and another for interbank payments. Other topological studies have been completed for large value payment systems in other jurisdictions: Japan (Inaoka et al., 2004); US Fedwire (Soramäki et al., 2007); UK CHAPS (Becher et al., 2008); Hungary (Lubloy, 2006) and Austria (Boss et al., 2004). Iori et al. (2008) analyse the network topology of the Italian

money market and investigate the evolution of the network over time while Martinez-Jaramillo et al. (2014) present topological measures to monitor systemic risk for the Mexican payment system.

Further, this article is related to elements of research completed by other European Central Banks using TARGET2. Heijmans et al. (2011) using data from the Dutch portion of TARGET2 (TARGET2-NL) have developed indicators for signs of liquidity shortages and potential financial problems of banks in the Netherlands. Pröpper et al. (2008) use network theory to examine the Dutch payment system with special focus on systemic stability issues. Network measures proposed in the comprehensive study on contagion in financial networks presented by Glasserman and Young (2016) provided inspiration for some of the indicators we examine.

Finally, the latter part of this article relates to the literature on extracting indicators from payments data. Gaffney (forthcoming) highlights how payments data can be useful in tracking price and quantity effects in the Irish interbank market. The author applies an algorithm developed by Furfine (1999) to identify interbank payments between Irish banks. Given that prices and counterparties to money market transactions are generally unobservable, this approach provides a novel means of identifying salient trends in Irish interbank lending – thus providing indicators on liquidity and changing perceptions of counterparty risk over time. Related studies using the Furfine algorithm to identify interbank loans have been widely used in other euro area countries (Frutos et al. (2016); Bräuning and Fecht 2012; Heijmans et al. (2011); Saldanha and Soares (2015)) as well as for other countries (Demiralp et al. (2006); Armantier and Copeland (2012)). Furthermore, by comparing the algorithm's outcomes with observable interbank loans from the Italian e-MID platform, Arciero et al. (2014) were able to verify that the matching was reliable in identifying unsecured interbank loans of up to three-month maturities.

4 Speech given in April 2009 by Andrew Haldane, Executive Director for Financial Stability at the Bank of England.

### 3. TARGET

TARGET2 is the large value payment system of the Eurosystem. It is used to settle almost all euro denominated payment transactions.<sup>5</sup> By providing the technical infrastructure for the safe and reliable settlement of euro denominated payments on a real-time basis TARGET2 facilitates efficient inter-country payments; it plays a pivotal role in ensuring the smooth conduct of Eurosystem monetary policy operations and in ensuring financial stability in euro area countries.

As all settlements are conducted in real time and with immediate finality<sup>6</sup>, a receiving institution to a payment transaction in TARGET2 has full certainty with regard to the receipt of funds. This feature of TARGET2 allows the receiving institution to immediately reuse the funds received for its own purposes. In value terms, the largest payment types settled in TARGET2 relate to monetary policy operations. The next largest payment type by value in TARGET2 is interbank transactions – defined as those exclusively involving credit institutions – and the settlement of transactions relating to other payment and securities settlement systems (known as ancillary systems). In volume terms, customer payments – defined as those processed on behalf of a non-bank party, either individual or corporate – represent the largest type of payments settled.

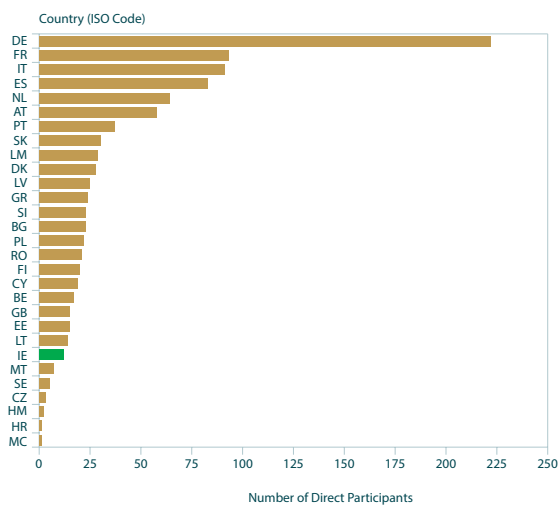
In 2015, the latest year for which full data is available, TARGET2 processed a daily average of around 345,000 payments, representing a daily average value of €1.8 trillion.<sup>7</sup> The average transaction value in TARGET2 in 2015 was €5.3 million, although most payments (two-thirds) settled via TARGET2 had a value less than €50,000 each.

Types of participation in TARGET2 vary depending on the institutions' needs but can be broadly categorised as either direct or indirect. A direct participant can initiate payments on their own or on their customers' behalf. Indirect participants, on the other hand

must operate through a direct participant to make payments. In total, there were 1,004 direct participants in TARGET2 at end 2015 (Chart 1).

The TARGET2 system is based on a single shared platform. Three eurosystem central banks – the Banca d'Italia; the Banque de France and the Deutsche Bundesbank jointly operate this single shared platform (the technical infrastructure behind TARGET2) on behalf of the Eurosystem. However, in a business sense, TARGET2 operates in a decentralised manner and each connected central bank is responsible for the operation of its system component and maintains the business relationships with its local counterparties.

**Chart 1: Number of TARGET2 Direct Participants by Country**



Source: ECB ([www.ecb.europa.eu](http://www.ecb.europa.eu)). ECB Target 2 directory January 2016.

### 4. TARGET2 – IE

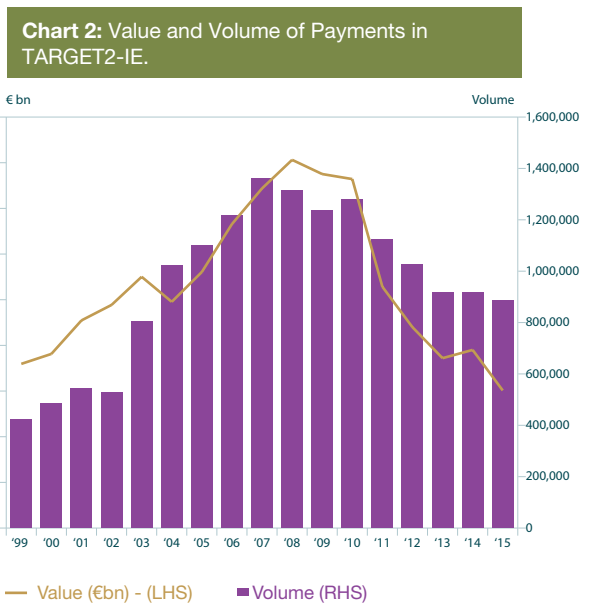
The Irish component of TARGET2, referred to in this article as TARGET2-IE had 12 direct participants and 10 indirect participants (Table 1) at end 2015. Of the 12 direct participants, 9 were credit institutions, with the remainder

<sup>5</sup> According to the ECB's annual report on TARGET2 for 2015, TARGET2 processed 91% of the value all euro payments in 2015.

<sup>6</sup> Settlement finality in payment and securities settlement systems, Directive 98/26/EC of the European Parliament.

<sup>7</sup> ECB TARGET2 annual report for 2015.

consisting of the Central Bank of Ireland, the National Treasury Management Agency (NTMA) and the Irish Paper Clearing Company.<sup>8</sup> TARGET2-IE accounted for just 1 per cent and 0.01 per cent respectively of the total value and volume of payments processed in all of TARGET2 in 2015. Chart 2 displays the evolution of payment values and volumes for TARGET2-IE since 1999. Both volume and value for TARGET2-IE peaked in 2007 and 2008 respectively. A contraction in the value of payments in TARGET2-IE is observable from 2010 onwards. This largely reflects a decrease in interbank activity. The volume of payments, which is dominated by customer activity, also declined since 2010, but has stabilised in more recent years. The trends in Ireland's payment system often mirror activity in the broader Irish economy and monitoring such activity can provide insights for financial stability and payment system oversight.



Source: ECB TARGET2 Annual Reports 2000-2015. Prior to February 2008, TARGET was in operation.

**Table 1: TARGET2-IE Listed Participant Names by Participation Type**

Direct	Indirect
<ul style="list-style-type: none"> <li>The Royal Bank of Scotland plc.</li> <li>Allied Irish Banks plc.</li> <li>Bank of Ireland Treasury</li> <li>Danske Bank</li> <li>Depfa Bank plc.</li> <li>EBS Limited</li> <li>Permanent TSB plc.</li> <li>Investec Bank plc.</li> <li>Ulster Bank Ireland Ltd.</li> <li>Central Bank of Ireland</li> <li>Irish Paper Clearing</li> <li>NTMA</li> </ul>	<ul style="list-style-type: none"> <li>Intesa Sampaolo</li> <li>Bank of America</li> <li>Merrill Lynch</li> <li>Citibank Europe plc.</li> <li>DZ Bank Ireland plc.</li> <li>KBC Bank Ireland plc.</li> <li>ING Bank NV Dublin Branch</li> <li>KBC Bank NV</li> <li>Scotiabank Ireland Ltd</li> <li>Rabobank Ireland plc.</li> <li>EAA Covered Bond Bank plc.</li> </ul>

Source: ECB ([www.ecb.europa.eu](http://www.ecb.europa.eu)). ECB TARGET2 Directory January 2016.

**4.1 TARGET2-IE Descriptive Statistics**

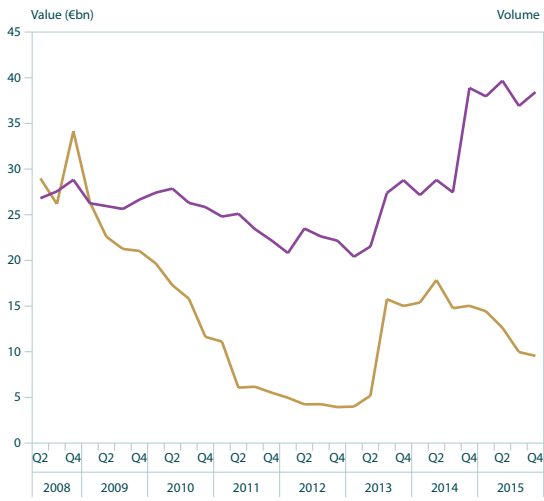
From Chart 2, we see that, in 2015 TARGET2-IE processed almost 880,000 transactions and this represented a total value of around €3 trillion.

The largest payment type by value in TARGET2-IE is interbank payments exclusively involving credit institutions, with €9.5bn per day on average in 2015 (Table 2). Customer payments processed on behalf of corporates and individuals account for the largest number of payments in TARGET2-IE, with almost seven thousand per day on average in 2015. The sharp fall in value of interbank payments from 2008 onwards is clear in Chart 3, reflecting well-known disruptions to wholesale funding markets access experienced by the Irish banks during the financial crisis. While access has improved in recent years, activity is still well below pre-crisis levels. This somewhat reflects the changing composition of domestic banks' funding – there is now a greater dependence on more stable retail deposits rather than on wholesale markets.<sup>9</sup>

<sup>8</sup> The Irish Paper Clearing Company maintain and operate a payment, clearing and settlement system for domestic paper debits and credits e.g. cheques.

<sup>9</sup> Deposits represented 79 per cent of Irish retail banks total funding (€177 billion) at end September 2016. (Central Bank of Ireland Macro Financial Review 2016.II).

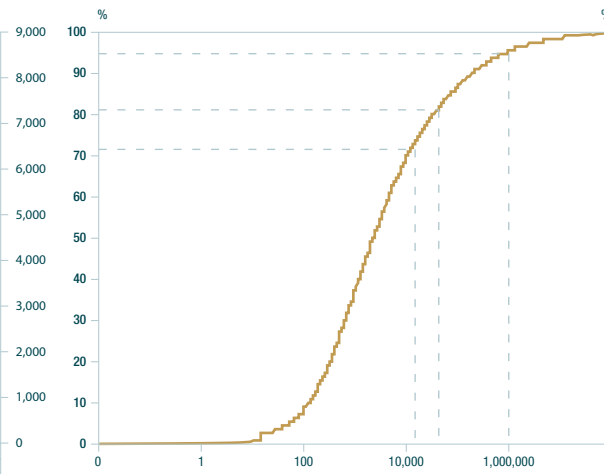
**Chart 3: Average Daily Payments per Quarter, Q2 2008 – Q4 2015 – Value (EUR billion)**



— Value EUR million (LHS) — Volume (RHS)

Source: Central Bank of Ireland – TARGET2-IE.

**Chart 4: Distribution of TARGET2-IE Transactions Across Value Bands in 2015**



Source: Central Bank of Ireland – TARGET2-IE.

Note: X-axis is plotted on the log10 scale. Dashed lines correspond to values of 15,000 (73rd percentile); 50,000 (83rd percentile); and 1,000,000 (95th percentile).

**Chart 5: Average Daily Payment Value and Volume per hour of day in 2015**



— Interbank (LHS) — Customer (RHS)

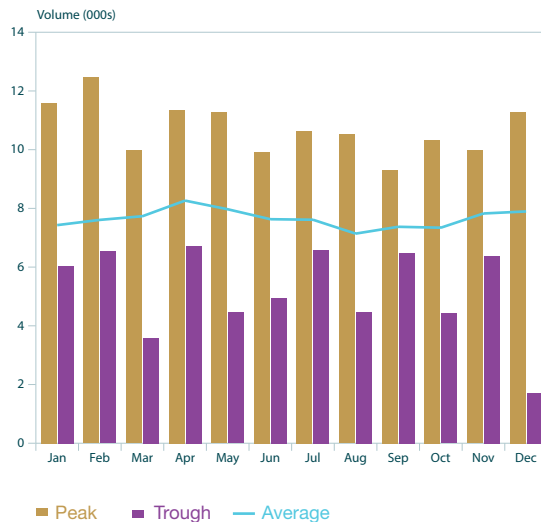
— Interbank (LHS) — Customer (RHS)

Source: Central Bank of Ireland – TARGET2-IE.

Note: Hour of day is recorded in Central European Time.



**Chart 6:** Seasonality of TARGET2-IE Transactions Across Months in 2015 (Combined Interbank and Customer)



Source: Central Bank of Ireland – TARGET2-IE.

**Table 2:** TARGET2 – IE Value and Volume of Payments 2015 by Payment Type.

		Average	Median	Min	Max
Daily Value (EUR million)	Interbank	9,527	8,805	397	28,004
	Customer	2,069	1,855	327	6,260
Daily Volume	Interbank	731	684	322	1,620
	Customer	6,912	6,736	1,384	11,398

Source: Central Bank of Ireland – TARGET2-IE

In 2015, the day with the largest value of interbank payments settling was 20 March 2015 when €28bn was settled (over three times the daily average for 2015). The peak interbank trading day in terms of volume was 13 May 2015 when 1,620 payment transactions took place. The 28 December 2015 was the day on which the minimum interbank and customer transactions took place.

An interesting feature noted by the ECB in its annual report on TARGET2 is that more than two thirds of all transactions in TARGET2 were for values lower than €50,000 and payments in excess of €1 million account for 12 per cent of traffic.<sup>10</sup> A similar feature is present in TARGET2-IE. We find that over four fifths of all payments settled in TARGET2-IE are for amounts less than €50,000 while less than 10 per cent of payments are for amounts in excess of €1 million (Chart 4). Furthermore, the scheme (Instant Credit Transfer scheme) to introduce instant payments in euro by November 2017<sup>11</sup> has set a maximum amount an originator can transfer via a single instruction as €15,000. Over 70 per cent of payments in TARGET2-IE in 2015 were for amounts below this threshold and would hence be potentially eligible for instant payments.

TARGET2-IE is open from 07.00 to 18.00 Central European Time (CET) on each of its working days, with a cut-off time of 17.00 CET for customer payments.<sup>12</sup> The first hour in the morning is the busiest in terms of settlement values for interbank transactions. After a peak at morning opening, the hourly average value of transactions fluctuates throughout the day and reaches a second peak between 11.00 and 12.00 CET for interbank transactions and a peak between 12.00 and 13.00 CET for customer transactions. In terms of volume of payments, early in the morning and late in the day, near 16.00 CET are the busiest times (Chart 5).

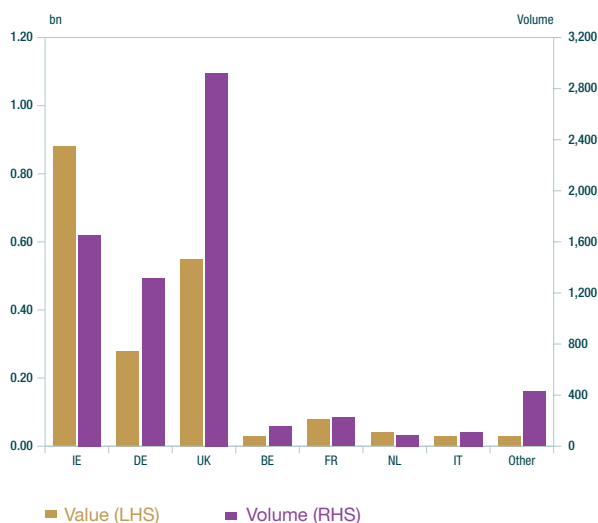
In terms of peak times in the year for payments, some seasonality patterns are observed (Chart 6). The months of April and December had peak average volumes in 2015. A fall in payments volumes is observed in the summer months before picking up again at end year. The month of December had some of the highest (peak) trading days of the year as well as the lowest (trough).

<sup>10</sup> ECB TARGET2 Annual Report, 2015.

<sup>11</sup> See speech "2017-a decisive year for innovative retail payment services" by Yves Mersch, ECB Executive Board member, 06 January 2017, for further details on euro instant payments introduction.

<sup>12</sup> TARGET 2 also has a night-time window facility available between the hours of 19.30 and 07.00 CET the next day to facilitate the settlement of different ancillary systems.

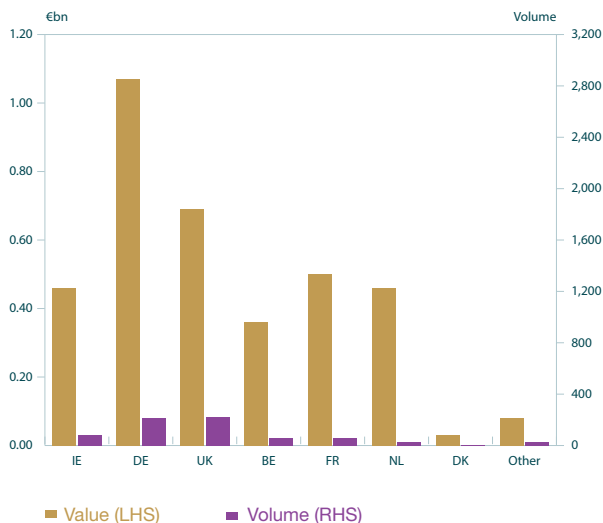
**Chart 7: Average Daily Customer Payment Activity Between Ireland Direct Participants and Participants in Other Countries in 2015**



Source: Central Bank of Ireland – TARGET2-IE.

Note: LHS = value (€ billion) and RHS = Volume (number of payments). Direct participants as listed in Table 1 but excludes Central Bank of Ireland, NTMA and IPCC. Participants country identified via two letter ISO code in their Bank Identifier Code (BIC).

**Chart 8: Average Daily Interbank Payment Activity Between Ireland Participants and Participants in Other Countries in 2015**



Source: Central Bank of Ireland – TARGET2-IE.

Note: LHS = value (€ billion) and RHS = Volume (number of payments)

Finally, we display the activity of the Irish direct participants with participants in other countries during 2015 (Chart 7 and Chart 8).

From Chart 7 we observe that, on average, there were 1,654 daily customer payment transfers between Irish banks and other Irish banks in 2015. This represented a daily average value of €0.9 billion. Meanwhile, the largest number of customer transfers took place between Irish banks and UK banks with a daily average number of 2,922. Payment volumes between Irish banks and German banks were the next highest with 1,313 payments on average each day during 2015.

Chart 8 displays similar connections for the interbank market, excluding activity with the Central Bank and NTMA. Both value and volume are lower than customer payments reflecting the aforementioned reduced composition of interbank funding in Irish banks total funding sources. In terms of value, interbank daily average activity in 2015 was largest between Irish banks and those in Germany (€1.1 billion daily average) and UK (€0.7 billion daily average).

## 5. Ireland's Payment Network

Payment systems have a structure that can be analysed and described using tools from graph theory or network analysis.<sup>13</sup> In recent years, graph theory has found favour in a diverse number of studies such as social networking in social sciences; transportation network studies; the spread of diseases in biological sciences and payment systems in finance.

For payment systems, banks can be considered the nodes of the graph while payments are the links between the nodes. Thinking about payment systems in this manner allows a framework for analysing the Irish payment system as a whole. The importance of such analysis is underscored by ESRB recommendations calling on macroprudential authorities such as the Central Bank of Ireland to develop tools for identifying the degree of connectivity between different sectors in the economy.<sup>14</sup> A topology of the Irish payment system allows for greater understanding of any weaknesses or dependences in the Irish system.

<sup>13</sup> Graph Theory has its origins in 1736, when the mathematician Euler first considered the problem of traversing the seven bridges in the city of Königsberg without going over any bridge more than once and ending back at the same start location.

<sup>14</sup> ESRB/2013/1 on intermediate objectives and instruments of macroprudential policy.

**Chart 9:** Ireland's Interbank Payment Network  
March 2015



Source: Central Bank of Ireland – TARGET2-IE

Note: Green nodes denote direct participants in TARGET2-IE. Node sizes correspond to the sum of the value all payments associated with that node (sent or received). Numbers are the ranks of the nodes according to an importance statistic (eigenvector centrality, discussed in Section 6). Transparency of links corresponds to the sum of the value of payments transferred between two nodes. The nodes associated with the bottom 20 percentile are removed to ease visualisation.

Firstly, in Chart 9, we display the TARGET2-IE interbank payment network for one representative month in 2015, March 2015.<sup>15</sup> In terms of importance, a relatively small number of Irish direct participants listed in Table 1 feature most predominantly in the network (e.g. numbers 1, 3, 7 and 10 in the visualisation). Further, a small number of non TARGET2-IE direct participants (i.e. international banks) also feature (e.g. numbers 2, 4 and 5). In this sense, interbank payment flows were mainly between these Irish banks and with a select few international banks. From a systemic risk viewpoint, monitoring this mapping and connections over time allows sight of the relative importance of any one bank in the system. Further, it facilitates monitoring of interbank market trends between Irish banks with both domestic and foreign banks. The importance of this is underscored by the well documented reduction in interbank lending by international banks to Irish banks during the GFC.

Likewise, Chart 10 displays the network for the TARGET2-IE customer network. There are

**Chart 10:** Ireland's Customer Payment Network  
March 2015



Source: Central Bank of Ireland – TARGET2-IE

Note: Green nodes denote direct participants in TARGET2-IE. Node sizes correspond to the sum of the value all payments associated with that node (sent or received). Numbers are the ranks of the nodes according to an importance statistic (eigenvector centrality, discussed in Section 6). Transparency of links corresponds to the sum of the value of payments transferred between two nodes. The nodes associated with the bottom 20 percentile are removed to ease visualisation.

observably more participants and links present in this network than in the interbank network displayed in Chart 9. A distinct triangle of TARGET2-IE direct participants dominates the network (numbered 1, 2 and 3 respectively). Payment flows are frequent between these three banks and from these three banks to other banks. The customer network is further characterised by these three banks having many connections with each other and with other banks, while there are numerous banks in the network that have very few connections.

While the interbank network provides information on the sources and needs of interbank borrowing of Irish banks, the customer network provides insights to the relative importance to economic activity of individual Irish banks (by virtue of reflecting payments with corporates and individuals).

In terms of network statistics (Table 3), the customer network is larger than the interbank in terms of number of nodes (banks) and edges (connections), while the interbank

<sup>15</sup> A similar network map is observable for other months in 2015, indicating that the topology for any one month is fairly representative, although the ranking of importance does change month-by-month in the interbank network. The customer network ranking of banks is observed to be more stable in terms of individual bank ranking over time.

network is larger in terms of the total value of payments. In March 2015, there were, on average, 598 edges in the customer network, composed of 200 banks. This is compared to a daily average of 212 edges and 73 banks in the interbank network. However, in total, approximately €126 billion was transferred in the interbank network compared with €33 billion in the customer network in March 2015.

**Table 3: Network Summary Statistics – March 2015**

		Average	SD	Min	Max
Edge count	Interbank	212.05	22.56	130	247
	Customer	597.86	70.02	302	654
Node count	Interbank	72.82	5.62	62	88
	Customer	199.64	17.72	128	222
Total Transferred	Value	Total(bn)			
	Interbank	126.131			
	Customer	33.205			

SD = standard deviation while Min and Max represent the minimum and maximum respectively over all days in March.

## 6. Systemic Risk Applications

Systemic financial risk can be defined as the risk of disruption to financial services that results from an impairment of the financial system, with the potential to harm the real economy. It can arise anywhere in the financial system and may be amplified as market participants overreact to incomplete or incorrect information. How this risk is distributed across entities and sectors depends on the structure of balance sheet linkages, which can be complex.

Policymakers who monitor systemic risk therefore need an analytical framework to capture this complexity. This requires multiple indicators, based on a range of data (Ryan, 2017). The indicators should provide a broad view of the financial system, ideally from several vantage points.

One promising source of these indicators comes from payments data. In the subsections that follow, we present three possible indicators that offer potential for systemic risk monitoring. The three indicators are chosen for illustration purposes and is not an exhaustive list of possible indicators available.

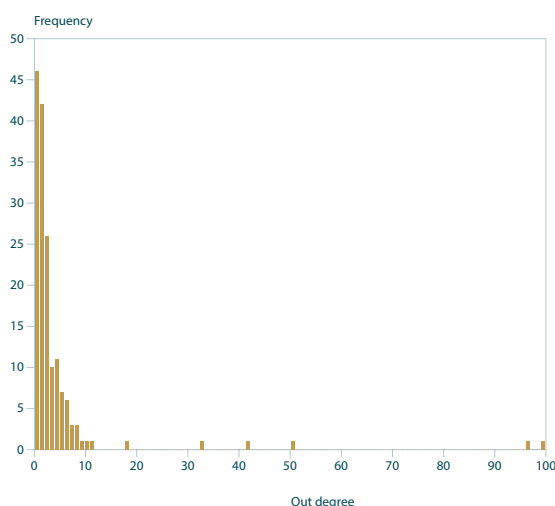
### 6.1 DEGREE CENTRALITY

In a payments network, one question of interest is how to identify 'important' banks in the network. In network theory, the concept of centrality is frequently used for this purpose. There are multiple centrality measures. We focus on two in this section.

The first, and perhaps the simplest centrality measure in a payments network is the degree of a node (bank) which is defined as the number of edges (payments) connected to it. In payment networks, banks typically have both an in-degree and an out-degree where in-degree represents the number of incoming payments to the bank and out-degree represents the number of out-going payments from the bank. A strength of the in (out)-degree centrality measure is that it offers a simple, yet informative metric for ranking the relative importance of a bank in the network at any one point in time or over a period of time, based on its incoming (outgoing) payments.

For TARGET2-IE, we find that the distribution of both in and out degrees is highly skewed, with most banks having few connections and only a small number having many connections (Chart 11).

**Chart 11: Out-degree Distribution of TARGET2-IE Interbank Payment Banks for March 2015**



Source: Central Bank of Ireland – TARGET2-IE.

Note: Out-degree distribution shows the number of unique out-going interbank payments (aggregated per banking pair) emanating from each bank in March 2015.

**6.2 EIGENVECTOR CENTRALITY**

A more useful extension of degree centrality is the concept of eigenvector centrality. Pioneered by Katz (1953), Bonacich (1972) and Bonacich (1987), eigenvector centrality captures better the relative importance of banks in the TARGET2-IE payments networks. It does so by capturing risk by association, which the simple degree centrality measures do not capture. Chart 9 and Chart 10 use eigenvector centrality to rank each banks' importance in the interbank and customer networks respectively. The top-10 banks by eigenvector centrality are labelled 1 to 10.

A bank's importance in a network may be increased by virtue of the fact that it has connections with other banks which are themselves important. This is the concept behind eigenvector centrality. It assigns a large score to banks that are well connected (in this case by payment flows) or connected to banks that are well connected. In this manner, eigenvector centrality has the nice property that it can be large either because a bank has many neighbours or because it has important neighbours (or both).

Bonacich (1972) states that: eigenvector centrality takes into account direct connections as well as indirect ones, hence, this measure considers "the entire pattern of the network" in a weighted sum.

Mathematically, eigenvector centrality is defined as:

$$e_i = \frac{1}{\lambda} \sum_{j:j \neq i} A_{i,j} e_j$$

where  $e_i$  is the eigenvector centrality measure for node  $i$  (or bank  $i$  in this case) and  $A_{ij}$  is the associated adjacency matrix capturing the payments between bank  $i$  and all other banks in the network. The elements of the matrix,  $a_{ij}$ , equals 1 if there is a payment link between bank  $i$  and bank  $j$  and  $a_{ij}$  equals 0 otherwise.

The eigenvector centrality,  $e_i$ , is proportional to the sum of the centralities of  $i$ 's neighbours. In other words, the measure takes into consideration the centrality of the neighbours to compute the centrality of a node. The exact computation of eigenvectors for each bank is achieved by solving the above equation iteratively.

Similar to out- and in- degree centrality, in directed networks, there exists the concepts of both left and right eigenvector centrality respectively.

Right eigenvector centrality for a bank is larger if more banks are making payments to the bank, i.e. other banks in the network bestow importance on a bank by virtue of sending more payments to it. A useful analogy in thinking about right eigenvector centrality is from the World Wide Web. The number and importance of webpages that point to a page gives an indication of how important that page is. For payments networks, we could interpret this as borrowing centrality, in the sense that it could represent a bank's borrowings from numerous other banks. The failure of a node with high borrowing centrality would result in defaults on large obligations (failure to pay back borrowings) and could set off a default cascade.

Left eigenvector centrality, on the other hand, captures the importance that one bank bestows on others by sending payments. We may interpret this as funding centrality. The failure of a node with high funding centrality could create a liquidity shock at other nodes through the withdrawal of funding.

Table 4 displays the ranking of 15 banks in TARGET2-IE in March 2015 according to payment value weighted versions of the centrality measures introduced above. The lower the ranking score in the table, the relatively more important the bank is in the network according to the ranking. In many instances, both degree measures and eigenvector centrality rank similarly. However, there are some notable cases where the

metrics offer different ranking perspectives. For example, Bank C ranks higher according to degree centrality than its ranking under eigenvector centrality measures. Furthermore, rankings for some banks can vary considerably based on whether they are ranked relatively more important due to their role in sending payments to other banks or vice-versa due to their role in receiving payments. Bank K, for example, is a bank identified as having low importance ranking for in-coming payments yet higher importance ranking for out-going payments. Ranking banks in the network in this manner allows an intuitive and metric based approach for identifying banks that form key connections in the Irish payment network. In this manner, network based rankings facilitate a broad understanding of the importance of individual banks in the network.

### 6.3 TIME SERIES PROPERTIES

From a financial stability perspective, it is useful to monitor the trend of TARGET2 payments over periods of time. Large spikes in payment values or large falls may indicate stress in the payment system. The problem is how best to extract a signal from the data so analysis of TARGET2 would highlight abnormal values.

A simple method is to construct a time series of daily average values of payments settled in the TARGET2 system. Large deviations from a trend could constitute a warning signal that the payment system is behaving differently from its historical average. To achieve this, we consider a test statistic that closely resembles a standard t-statistic, which we call 'standard deviation distance (SDD)'. The formula is as follows:

$$SDD_t = \frac{P_t - \bar{P}}{\sigma_p}$$

where  $P_t$  is today's payment value,  $\bar{P}$  is the series average and  $\sigma_p$  is the series standard deviation. The statistic calculates the "distance" of today's value from the average

**Table 4:** Importance Ranking of Irish Banks in Interbank Network – March 2015

bank	Degree		Eigenvector centrality	
	Out	In	Left	Right
A	1	1	1	1
B	2	2	3	3
C	3	4	16	12
D	4	3	9	5
E	5	6	6	4
F	6	5	2	2
G	7	8	4	7
H	8	12	17	14
I	9	13	5	8
J	10	10	15	15
K	12	153	7	153
L	13	9	12	10
M	15	27	8	18
N	16	7	13	6
O	23	16	10	9

daily payment amount, taking into account volatility in the series.

For illustrative purposes, we choose a numerical value of 3 as the critical value that must be breached before a warning is issued by the test statistic.<sup>16</sup> Since this method may also produce negative values, we also allow -3 to be the lower bound of the acceptable range.

One issue is that the payment system is constantly changing, i.e. payments networks are dynamic over time. A daily value of €10 billion may look like an anomaly today but may not have been last year. Therefore we also construct measures of the mean and standard deviations of the series over a 90-day rolling window.<sup>17</sup>

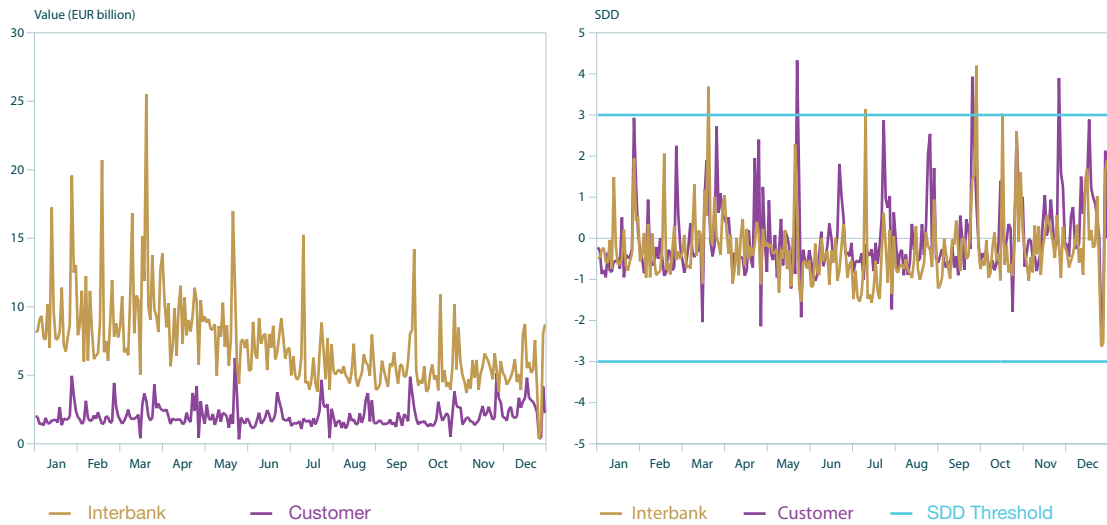
We examine payments for each payment type in 2015 and plot both the raw time series and the SDD metric below.

The [-3,3] interval which we set as the acceptable range is breached 7 times over the course of the year: three times for customer payments and four for the interbank series. There are, however, somewhat predictable spikes in the statistic as evidenced by equal

<sup>16</sup> While the threshold 3 is used for illustrative purposes in this article the choice of this threshold can be informed by historical trends.

<sup>17</sup> Including weekends and TARGET2 bank holidays.

Chart 12: Time Series Properties of 2015 TARGET2 Payments



Source: Central Bank of Ireland – TARGET2-IE.

Left panel shows raw data of TARGET2 payment amounts for 2015 customer and interbank transactions. Right panel shows results from the SDD test statistic procedure. Also shown is the  $[-3, 3]$  threshold interval.

distances between spikes in the line. A more involved analysis would be to use univariate time series methods to further extract signal from the noisy series. In this manner, extracting trends by smoothing the noise and fitting a statistical model would allow another means to look at payment behaviour. An autoregressive integrated moving-average (ARIMA) model<sup>18</sup> could be used to control for the predictable parts of the series, e.g. higher turnovers at month-end/maintenance period end or during certain days of the week. Deviations from the daily prediction would then become the time series we use to produce our test statistics. These time series indicators will be further developed but offer advantages for looking at salient trends in Irish payments over time.

## 7. Conclusion

A clear lesson from the GFC, is the need for central banks and other policy makers to have a suite of indicators to better understand the key connections within the financial system. This is underscored by ESRB recommendations to macroprudential authorities to develop indicators for systemic risk monitoring. In this article, we introduce

the Irish component of TARGET2. We show how visualisations of the data coupled with a number of carefully chosen indicators can offer benefits for monitoring the key features of both the network of Irish customer payments and the network of Irish interbank payments. The article presents, for the first time, a topological view of these payment networks. Additionally, the article introduces practical indicators for operationalising the close monitoring of payments data to extract salient features for financial stability and payment system oversight. These include network based measures based on degree and eigenvector centrality, as well as more novel time-series measures (SDD). Combined with previously developed indicators for Irish interbank lending (Gaffney, forthcoming), these indicators provide a means for intensive scrutiny of Irish payment connections – thus conferring a deeper understanding of the components that contribute to the smooth functioning of the Irish economy and a stable financial system.

<sup>18</sup> In statistics, ARIMA models are fitted to non-stationary time series data either to better understand the data or to predict future points in the series (forecasting).

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# Statistical Appendix

## Statistical Appendix

The publication of the Statistical Appendix of the Quarterly Bulletin was discontinued from Quarterly Bulletin 1 2014. Statistical data compiled by the Central Bank are accessible on the Statistics page of the Central Bank's website, <http://www.centralbank.ie/polstats/stats/Pages/default.aspx>. Some tables, previously published in the Statistical Appendix, have been expanded to provide more comprehensive data. A number of statistical tables, which were not published in earlier Bulletins, have also been added.

The list of statistical tables and links to access them on the website are given on the following page.

## STATISTICAL TABLES: CENTRAL BANK WEBSITE LINKS

### Money and Banking:

<http://www.centralbank.ie/polstats/stats/cmab/Pages/Money%20and%20Banking.aspx>

- Summary Irish Private Sector Credit and Deposits
- Financial Statement of the Central Bank of Ireland
- Credit Institutions – Aggregate Balance Sheet
- Credit Institutions (Domestic Market Group) – Aggregate Balance Sheet

### Business Credit and Deposits:

<http://www.centralbank.ie/polstats/stats/cmab/Pages/BusinessCredit.aspx>

- Credit Advanced to Irish Resident Private-Sector Enterprises
- Deposits from Irish Resident Private-Sector Enterprises

### Private Household Credit and Deposits:

<http://www.centralbank.ie/polstats/stats/cmab/Pages/HouseholdCredit.aspx>

- Credit Advanced to and Deposits from Irish Private Households

### Money Market Funds:

<http://www.centralbank.ie/polstats/stats/cmab/Pages/MoneyMarketFunds.aspx>

- Money Market Funds Aggregate Balance Sheet
- Money Market Funds Currency Breakdown of Assets

### Retail Interest Rates:

<http://www.centralbank.ie/POLSTATS/STATS/CMAB/Pages/Retail%20Interest%20Rate%20Statistics.aspx>

- Retail Interest Rates - Deposits, Outstanding Amounts
- Retail Interest Rates - Loans, Outstanding Amounts
- Retail Interest Rates and Volumes - Loans and Deposits, New Business
- Official and Selected Interest Rates

### Investment Funds:

<http://www.centralbank.ie/polstats/stats/investfunds/Pages/data.aspx>

- Ireland: Investment Funds Data

### Securities Issues:

<http://www.centralbank.ie/polstats/stats/sis/Pages/Issues.aspx>

- Securities Issues Statistics

### Financial Vehicle Corporations:

<http://www.centralbank.ie/polstats/stats/fvc/Pages/data.aspx>

- Irish Financial Vehicle Corporations

### Locational Banking Statistics:

<http://www.centralbank.ie/polstats/stats/locational/Pages/data.aspx>

- Total Positions of Banking Offices Resident in Ireland vis-a-vis Residents and Non-Residents

### Quarterly Financial Accounts:

<http://www.centralbank.ie/polstats/stats/qfaccounts/Pages/Data.aspx>

- Financial Accounts for Ireland: Q1 2012 to present – ESA 2010

### Public Finances and Competitiveness Indicators:

<http://www.centralbank.ie/polstats/stats/sis/Pages/SecuritiesHoldingsStatistics.aspx>

- Gross National Debt
- Holdings of Irish Government Long-term Bonds

<http://www.centralbank.ie/polstats/stats/Pages/hcis.aspx>

- Nominal and Real HCIs



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