IRELAND'S ECONOMIC OUTLOOK
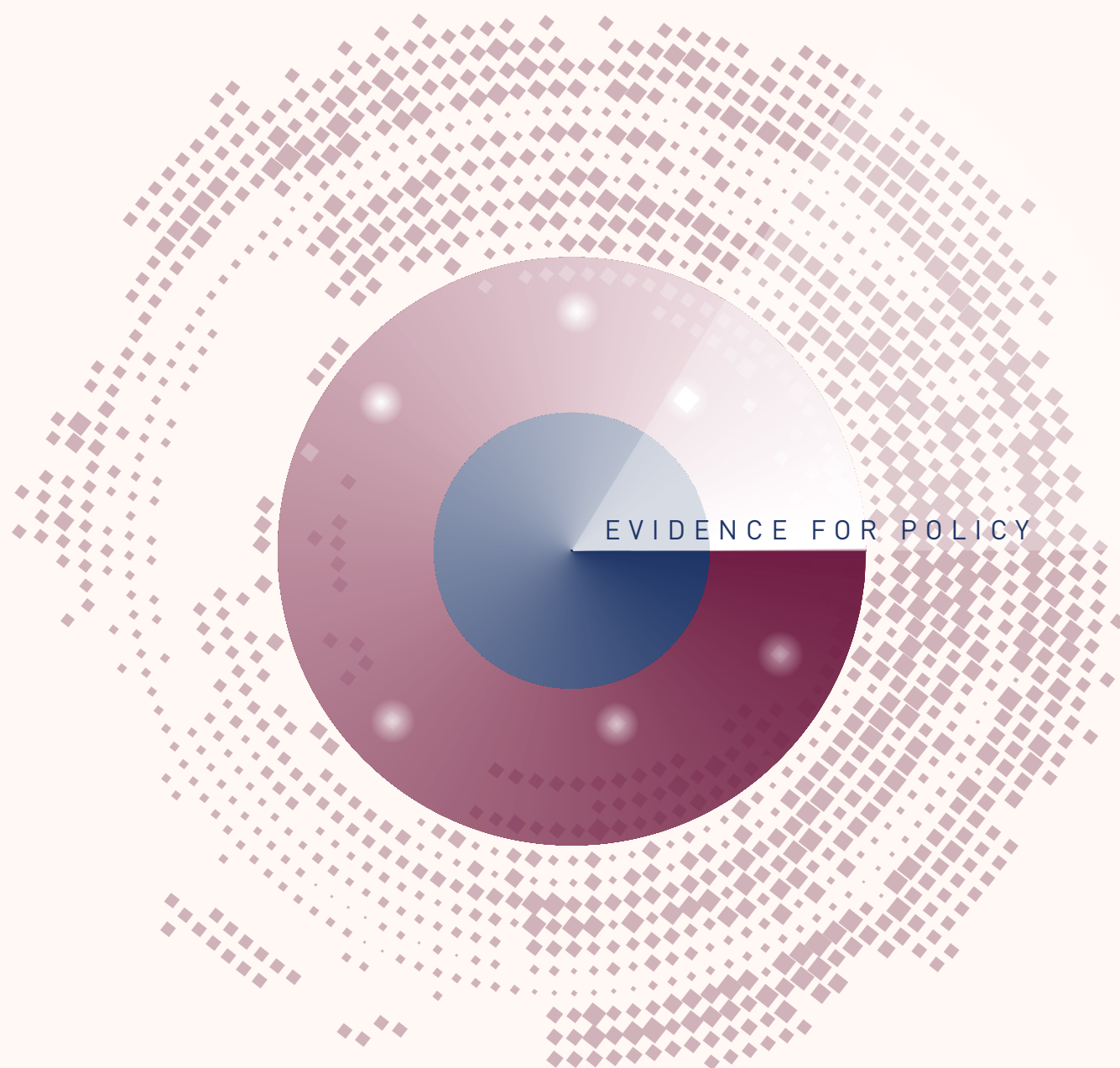
PERSPECTIVES AND POLICY CHALLENGES

Edited by Adele Bergin, Edgar Morgenroth, Kieran McQuinn

EVIDENCE FOR POLICY

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

Ireland's Economic Outlook: Perspectives and Policy Challenges

Editors

Adele Bergin, Edgar Morgenroth and Kieran McQuinn

Authors

Adele Bergin, David Duffy, Daniel Foley, Abian Garcia-Rodriguez, Martina Lawless, Niall McInerney and Edgar Morgenroth, and Kieran McQuinn

December 2016

Authors

Adele Bergin is a Senior Research Officer, Edgar Morgenroth is an Associate Research Professor and Kieran McQuinn is a Research Professor and Head of the Economic Analysis Division at the ESRI.

Martina Lawless is an Associate Research Professor, Daniel Foley is a Research Assistant and Niall McInerney and Abian Garcia-Rodriguez are Post-doctoral Research Fellows. David Duffy was a Senior Research Officer at the ESRI and is now a Director at Property Industry Ireland.

Acknowledgements

Table of Contents

List of Tables

List of Figures

Introduction

The highly open nature of the domestic economy ensures that Ireland is always going to be particularly vulnerable to international shocks. This was evident from the recent international financial crisis where difficulties across the banking sector internationally had especially adverse implications domestically. Lessons from the crisis, along with general developments in economic modelling, indicate that any accurate assessment of the Irish economy requires a framework which both captures international developments and which also captures the intricate interaction between the real and financial economies. In keeping with its well established traditions in this area, the Economic and Social Research Institute has, over the past five years, embarked on a highly ambitious project seeking to update its overall suite of macro-econometric models. Two significant contributions have been made; a dynamic structural general equilibrium (DSGE) model and a new structural econometric model (COre Structural MOdel (COSMO)).

Similar to existing models for Ireland, COSMO models the behaviour of the economy in a small open economy framework and has a theoretically-founded structure and specification. The short-run dynamics of the model are Keynesian while the long-run dynamics are driven by a fully specified neoclassical supply side. The model comprises three sectors: the internationally traded sector, the non-traded sector and the government sector. The disaggregation reflects the significant differences between firms/actors operating within the three sectors; the traded sector has a high content of multinational firms operating within it, but is not exclusively multinational.

Crucially, unlike other models of the Irish economy, COSMO incorporates the interaction between credit markets, macro-prudential policy and the property market, thereby linking the real and financial dimensions of economic activity. For example, the price and quantity of mortgage and consumer credit may have important implications for the consumption decisions of households. This consumption (or savings) behaviour has important implications for the trade balance, current account and net foreign asset position. Thus, COSMO facilitates the analysis of how macro-prudential policy can influence the interaction between real and financial shocks.

An important aspect of a small open economy is the impact of external factors, which means that projections of key external variables are required. Modelling all major economies in a consistent manner and projecting their growth paths is a substantial task. COSMO links with the National Institute of Economic and Social

Research (NIESR) in the UK and their global macro-econometric model, NiGEM. We use their projections of key external variables and also use the NiGEM model in creating international shocks, the outputs from which are then incorporated into COSMO to examine the impacts on Ireland.

This report sees the publication of the Irish Economic Outlook using COSMO. Compared with previous exercises, the focus in this report is on policy modelling. We use the model to assess the implications of different possible policy shocks. However, in order to assess these simulations, they need to be compared to a baseline outcome. The baseline provides a plausible profile of the economy over the medium to long term and is generated using a set of assumptions.

While much commentary in the Irish housing market has centred on the relatively slow supply response post-2013, hardly any attention has focussed on the challenges confronting the Irish financial sector of meeting the credit requirements necessary to fund the anticipated changes in the Irish housing stock. Chapter 3 examines two related issues in the Irish mortgage market. First we specify and estimate a new model of long-run housing demand which focuses on the role played by demographics and rate of household formation. Second, this model is then used to generate future levels of housing activity and the required financing from the Irish banking system is assessed.

The other set of policy shocks that are considered are those that might influence Foreign Direct Investment (FDI) in Ireland. FDI plays a considerable role in the country's overall economic performance, particularly in its export performance. It is therefore important to assess the impacts of potential changes in the attractiveness of Ireland to FDI, both positive and negative, and to use the estimated impacts to inform policy initiatives to maximise the benefits of any positive changes and minimise those of negative shocks. Chapter 2 considers two shocks. The first is a positive shock due to the potential FDI relocation from the UK to Ireland due to Brexit. The second potential shock to FDI that we analyse is a negative effect in the light of a change in the tax regime from the implementation of the proposed Common Consolidated Corporate Tax Base (CCCTB) across Europe. This initiative to simplify and harmonise corporate taxes may reduce some administrative burden on firms. However, if the corporate income on which taxes are levied is shared amongst countries for firms operating in multiple locations, then the risk for a small country such as Ireland is that the tax base here is reduced.

Chapter 1: Baseline: Methodology, Assumptions and Projections

Adele Bergin, Abian Garcia-Rodriguez, Niall McInerney and Edgar Morgenroth

This chapter presents a macroeconomic model-based medium-term projection for the Irish economy using the newly developed COSMO model (COre Structural MOdel of the Irish economy). The Irish economy has experienced significant volatility and structural change in recent years which has been incorporated into the estimation of the model. Perhaps the best example of this has been the evolution of the construction sector which was a key driver of growth before the financial and housing crisis, while in recent years the traded sector has supported growth. The model is estimated using the most up to date macroeconomic data and it is therefore opportune to use this platform to examine the future growth prospects of the economy.

A particular challenge in developing a baseline projection has been the reported outsized performance of the economy in 2015. The considerable revisions contained in the 2015 National Income and Expenditure Accounts were discussed in the Autumn *Quarterly Economic Commentary* and are treated as level shifts in the data. This is broadly reflective of the change in the system of national accounts which have moved from an ESA95 to ESA2010 basis and, in particular, the treatment of intangible investment. For example, investment equations estimated prior to 2015 have difficulty accommodating the recorded change in the capital stock and also the implied rate of depreciation.

These issues largely reflect Ireland as the prototypical small open economy, very sensitive to the international economy and therefore to changes in trade and financial flows. As a result, constructing any baseline scenario for the Irish economy is accompanied by a considerable amount of uncertainty given our sensitivity to the international economy, developments in which are relatively outside of our control.

Despite these issues, COSMO incorporates many of these structural changes in the economy such as the increasing importance of real financial linkages and, as such, provides a useful platform to assess the medium-term outlook for the

economy. The aim is to create a baseline projection to act as a benchmark against which scenarios can be examined.

This chapter is structured as follows: Section 1.1 discusses the methodology employed and assumptions adopted in developing the baseline scenario, Section 1.2 describes the projections for potential output and the production side of the economy and Section 1.3 focuses on the expenditure side. There is considerable uncertainty inherent in any projection exercise and, arguably, the main advantage of a macroeconomic model is its use in examining the impact of shocks and policy changes. This is largely done in subsequent chapters although in Section 1.4, we focus on one aspect of uncertainty for the Irish economy, namely the long-term implications for Ireland of the UK leaving the EU. Brexit merits a more comprehensive treatment as it represents a significant known challenge for Ireland.

1.1   Methodology and Assumptions

The projections and scenarios in this report have been generated using the COSMO model. To develop a baseline scenario, a series of additional assumptions are input into COSMO regarding projections around the population structure, the public finances and developments in the world economy. Throughout the chapter, we emphasise the annual average changes in key variables over three-, four- or five-year periods as there are much wider margins of error attached to projections for individual years than for medium-term trend growth rates. While in some tables and graphs year-by-year projections are presented, more weight should be applied to the average growth rates. This section provides a brief sketch of the COSMO model and outlines the external assumptions that have been made in developing the baseline scenario.

1.1.1 COSMO Model

COSMO is a new structural econometric model of the Irish economy, with a theoretically founded structure and specification. It is designed to be used for medium-term economic projections and policy analysis.[1] On the production side, COSMO distinguishes between the traded sector, the non-traded sector and the government sector.[2] The disaggregation reflects the significant differences between firms/actors operating within the three sectors.[3] The traded sector has a

---

[1]   See Bergin et al. (2016), 'COSMO: A new COre Structural MOdel for Ireland', ESRI Working Paper (forthcoming) for a full description of the mechanisms and behaviour of the model.

[2]   Sectors are defined based on the Supply and Use Input-Output Tables from the Central Statistics Office. A sector is defined as traded if at least 50 per cent of total final uses (excluding change in stocks) are exported. The aggregate government sector comprises those sectors in which at least 50 per cent of total final uses (excluding changes in stocks) are used by the government as consumption. The non-traded sector comprises the remaining sectors.

[3]   See Bradley and FitzGerald (1988) and Bradley et al. (1993).

high content of multinational firms operating within it, but is not exclusively multinational. It is constrained by global demand, a global user cost of capital and the state of technology in the traded sector. The non-traded sector, by contrast, primarily contains firms operating in the national economy for which domestic conditions are of primary importance. Each production sector is governed by an underlying three-factor (labour, capital and energy) CES production function. Tensions between supply and demand feed back into the economy through the price system. In the short run, rigidities and shocks can cause a divergence between actual and potential supply but prices and/or wages adjust over time to guide the economy towards capacity.

Demand is disaggregated along standard national accounts lines in terms of household consumption, public consumption, investment (housing, public sector, traded sector and non-traded sector), exports and imports. The key economic actors include households, which consume subject to disposable (after-tax) income and (financial and non-financial) wealth. They also supply labour, which is determined by demographics, the participation rate and migration. The supply of labour consists of a series of relationships determining the population of working age, participation in the labour force and migration. Because of the different pattern of labour market participation for males and females, the supplies of female and male labour are modelled separately. The participation rates are modelled as a function of real after-tax wages and the unemployment rate. A key factor affecting labour supply in Ireland over the last century has been migration. Because of the changing nature of migration over the past decade or so, we model gross flows. In COSMO, emigration is determined by the relative attractiveness of alternative labour markets. For example, if the returns to working in Ireland disimprove relative to the UK, measured in terms of real after-tax earnings, there will be a tendency for outward migration to resume or accelerate. Immigration is partly exogenous in the model but does react to changes in domestic economic conditions. Firms produce output, employ labour and invest, with their factor demands derived from the underlying CES production functions. The government sector raises taxes, transfers income to households, employs labour and invests in capital. Any deficit accumulates onto the government debt stock, and interest must be paid on this debt. Three tax transmission channels are distinguished: direct taxes on household income and wealth, direct taxes on firms, and indirect taxes.

The key policy channels in the model include fiscal policy through taxation and government spending, with the model distinguishing three types of taxes and current and capital expenditure. While monetary policy is exogenously set by an external ECB, borrowing rates include an endogenous margin, which depend on the state of the economy and the health of the banking system. Macro-prudential policy can be analysed through the model of the housing sector. Loan-to-value

and loan-to-income ratio instruments affect the level of mortgage lending and house prices, which feed into the real economy through consumption wealth effects and housing investment.

The COSMO model is estimated on data up to 2014. The figures for 2015 to 2017 are calibrated to the Autumn *Quarterly Economic Commentary*.

1.1.2 Public Finances

In preparing our baseline scenario we have assumed a broadly passive fiscal policy on the revenue side of the government accounts to keep the tax share broadly stable. This is not intended to be prescriptive, rather to produce a trajectory for the public finances that is consistent with fiscal rules. In COSMO, government revenue has three components; taxes on personal income and wealth, corporation tax and taxes on products. The revenue from each of these taxes is the product of the average effective tax rate and the appropriate tax base in each case. Each of the average effective tax rates is held constant over the projection horizon, with the exception of the average income tax rate which rises by 1 percentage point in 2022 and is held constant thereafter. This ensures that the maximum deficit on the general government balance is below 1 per cent in any year over the projection horizon.

On the expenditure side the government's spending is divided into investment, consumption, transfers and debt interest payments. In COSMO, as a behavioural rule, government consumption and investment are modelled as rising in line with the economy's potential output. Rates of transfers are assumed to be fully indexed to prices with adjustments made for the changing demographic balance and for the projected change in unemployment. The final component of expenditure – the interest payments on the national debt – is modelled as a function of interest rates and the national debt.

1.1.3 World Economy

In developing the baseline scenario, we need projections of the external environment for the Irish economy. The projections from the November 2016 NIESR (National Institute of Economic and Social Research) *Economic Review* are used as the basis for the medium-term projections for the major economies. Table 1.1 outlines projections of some key international variables for Ireland.

TABLE 1.1   PROJECTIONS FOR THE INTERNATIONAL ENVIRONMENT

	2006-2010	2011-2015	2016-2020	2021-2025
World GDP, %Δ	3.9	3.5	3.3	3.4
US GDP, %Δ	0.8	2.1	2.0	1.9
UK GDP, %Δ	0.4	2.0	2.0	2.0
Euro Area, GDP %Δ	0.8	0.7	1.5	1.1
	2010	**2015**	**2020**	**2025**
ECB Intervention rate, %	1	0.05	0.7	3.1
Oil Price, US $ per barrel	79	51	59	65
US $ per € exchange rate	1.32	1.1	1.15	1.22
GB £ per € exchange rate	0.84	0.73	0.91	0.92

Sources: NIESR Economic Review No. 238, November 2016.

These forecasts incorporate the likely impact of the UK's vote to leave the EU. In particular, NIESR model the decision to leave as a rise in risk premia on Sterling and other financial variables that affect households and corporate spending. The central medium-term assumption concerning the impact of Brexit centres on the exact nature of the agreement reached between the EU and UK. The National Institute assumes that the likely outcome of these negotiations is an EFTA-style agreement that is achieved within the designated two-year period.

Real global output growth in the near term is projected to be approximately 3.3 per cent annually, over the duration of the projection horizon. However, there is considerable heterogeneity in the projected growth performance across countries. From an Irish perspective, growth in the most important trading partners, the Euro Area, United Kingdom and United States provides the international demand channel which boosts output in the Irish traded sector. Annual growth in the United Kingdom is projected be approximately 2 per cent each year on average while that in the Eurozone is projected to grow at about half of this rate over the medium and longer term.

GDP growth in the United States is expected to average 2 per cent over the projection horizon. This represents a significantly lower average US growth rate when compared to the period 1980-2015.

The short-term impact of the UK decision to leave the EU has manifested mainly in terms of currency volatility and higher levels of uncertainty. The projected decline in the value of Sterling vis-à-vis the Euro represents a shock absorber for the UK economy, so that higher levels of exports cushion the economy against lower levels of domestic demand. Uncertainty affects households' decisions to

spend and firms' decisions to invest by increasing the relative benefit of a 'wait-and-see' approach.[4] Measures of economic uncertainty as constructed by the National Institute suggest that the immediate spike that followed the referendum result has dissipated. However, these measures tend to be volatile and may spike again once the UK-EU negotiations begin and Article 50 is closer to being triggered.

In terms of the Euro Area, high levels of debt in some countries depress consumption and investment as households and corporations repair balance sheets. In addition continuing high levels of unemployment raise the prospect of a persistent erosion of skills of the long-term unemployed through hysteresis effects. This, together with the demographic profile of the labour force, the resulting decline in labour force participation and weak total factor productivity growth, act to reduce the trend growth rate in the longer term.

Table 1.1 also outlines the projections for ECB policy rate. The slow pace and the trajectory of the tightening cycle indicates lack of traction for conventional monetary policy tools in the near to medium term. This raises concerns about the ability of the ECB, and other advanced country central banks, to provide economic stimulus using conventional tools in the event of adverse shocks. This suggests that unconventional monetary policy instruments may need to be a permanent part of the toolkit of central banks in advanced economies.

Moreover, these challenges may have a longer horizon as the estimated equilibrium real interest rate has fallen across many advanced economies, and may actually be negative in some economies in the medium term (Holston et al., 2016). This concept of 'secular stagnation' suggests that negative real rates are necessary to equate investment with saving at full employment (Summers, 2014). This decline may be attributable to both supply and demand factors. On the supply side, higher levels of inequality and reserve accumulation expand the supply of savings, while lower relative prices for capital goods and slower growth in the labour force constrain investment demand (Rachel and Smith, 2015). In addition, financial regulation requires institutional investors to hold particular types of safe assets which, given post-crisis decline in the supply of these assets, has exerted downward pressure on real long-term interest rates (Caballero et al., 2016). Lower interest rates may undermine financial stability as investors take on more risk in a search for yield.

While monetary policy frameworks could be modified to accommodate this low interest rate environment (for example by raising or overshooting existing

---

[4]   In the case of investment with high sunk costs, uncertainty raises the real option value of waiting.

inflation targets), fiscal policy could also play a stimulatory role via public investment in those economies with the requisite fiscal space. The latter has both positive demand and supply effects, as it boosts current levels of demand but also raises the productive capacity of the economy. In addition, these economies could benefit from policies that boost productivity growth and raise labour force participation to generate a higher level of investment demand.

Table 1.1 also presents the forecasts for oil prices in terms of the Dollar price per barrel. In the medium term, oil prices are projected to begin a gradual recovery on current levels rising to USD$72 per barrel by the end of the next decade. The decline in oil prices and the prices of other commodities since 2011 represents a positive terms of trade shock for many advanced countries including Ireland, and tends to support consumption by raising real incomes. In addition, lower oil prices can act to boost global growth due to the higher marginal propensity to consume of net importers of oil (IMF, 2015). As discussed in the next section, oil is one of the energy inputs in the sectoral production functions in COSMO, which generate Ireland's level of potential output.

A recent trend that is of concern from the perspective of a small open economy such as Ireland is the reduction in world trade since the onset of the financial crisis. In the 1990-2007 period global trade as a share of global GDP rose from 14 per cent to 24 per cent. This share fell sharply during the financial crisis. However, despite recovering to close to its pre-crisis level, this share has broadly remained constant since the beginning of the decade. Recent political events and the rise of economic populism in some countries indicate potential future resistance to deeper integration of labour and product markets. In addition, there has been a retrenchment in capital flows, mainly in advanced economies, in the post-crisis period with gross financial flows having fallen from approximately 15 per cent of global GDP in the pre-crisis period to a current level of approximately 5 per cent (Bussiere et al., 2016). Although some of the factors driving this reduction in capital flows are likely to be temporary and indicative of weak economic growth, other factors such as new banking regulations which limit the leverage of financial institutions are more structural in nature. Importantly from an Irish context, FDI flows have remained relatively robust in the aftermath of the financial crisis. However, as the impact of corporate taxation on direct investment has recently received considerable political attention, any policy changes in this area at the international level would have important implications for Ireland (Lawless et al., 2015).

1.1.4 Demographics

To analyse changes in the population structure, the ESRI maintains a demographic model for Ireland. The cohort component methodology is used to

generate population projections. This method projects the population by gender and single year of age for each year according to the components of population change (fertility, mortality, and net migration). The baseline scenario incorporates a continued improvement in mortality rates that slowly converges to a standard rate of improvement,[5] an unchanged (from 2015) total fertility rate of 1.94 and a projection for net inward migration of around 13,000 per annum over the longer term.

Migration flows are particularly sensitive to economic conditions, both domestically and in the source countries for immigrants or the destination countries for emigrants. The issue of the volatility of these flows is more pertinent for Ireland than for many other European countries. The approach taken in developing the scenarios is to first determine migration within COSMO and then to impose that result in the demographic model and use it to determine an initial labour force. A short iteration between the two models can be used to reach a solution that incorporates some of the additional insights available from the demographic model.

The demographic profile has significant ramifications for many aspects of the economy both now and in the future. It is thus pertinent for policymakers to incorporate such effects into medium-and long-term plans. Changes in the demographic profile can have important effects on the potential growth rate of the economy, mainly through the effect on labour supply and dependency ratios. The demographic and labour force projections are discussed in more detail in Section 1.2.

1.2   Baseline Projection: Potential Output and Output

1.2.1 Potential Output

Potential output growth indicates the level of growth that is sustainable for an economy in the medium and long term and reflects the rate at which the productive capacity of the economy is expanding.

Figure 1.1 illustrates the projected path of potential output growth up until the end of the next decade. The solid line indicates that the potential growth rate of the aggregate economy is approximately 3 per cent. This aggregate growth rate is a weighted average of the potential growth rates of each of the sectors in COSMO. The pattern of projected potential output growth indicates a continuation of the reorientation of the economy that we have witnessed in the post-crisis period away from construction and related activity towards high-

---

[5]   On the future prospects for life expectancy we follow the assumptions of the CSO (CSO, 2013).

productivity growth traded sectors. As a small open economy, growth in the traded sector is crucial to driving sustainable growth in the rest of the economy.

FIGURE 1.1   POTENTIAL OUTPUT GROWTH 2018-2025 (%)
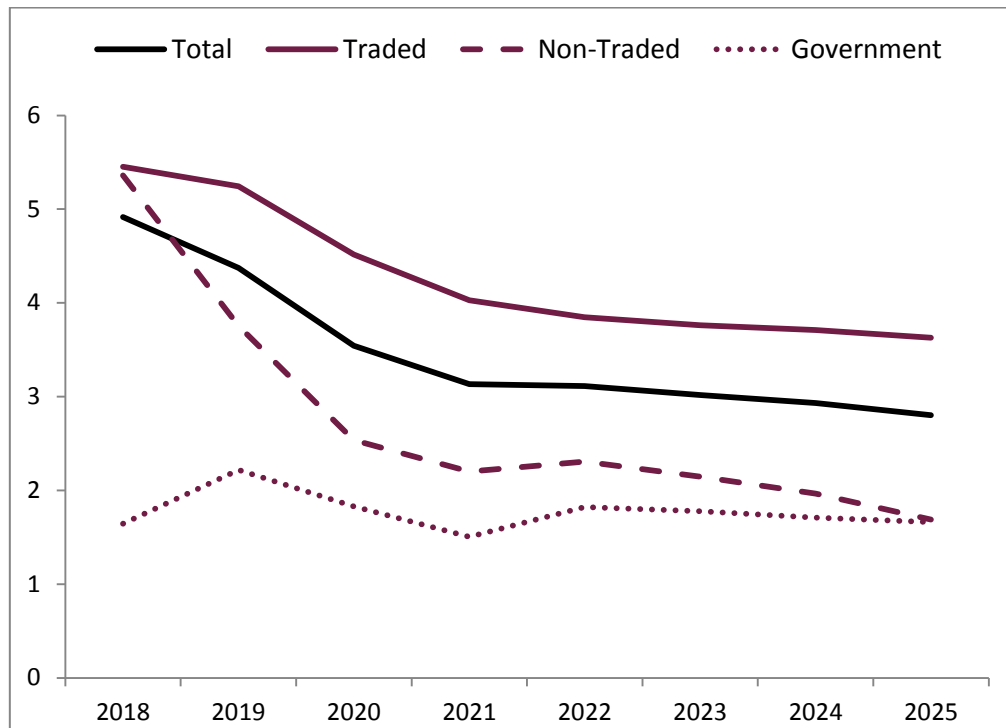
Source: Authors' own calculations.

The growth rate of potential output in the non-traded sector is projected to decline slightly from 2.5 per cent in the near term to approximately 2 per cent in the medium term. Potential output in the government sector is difficult to conceptualise but it is necessary to include a public sector component in a model for the whole economy; it broadly tracks the overall evolution of the rest of the economy.

In terms of labour supply, the overall labour input to producing goods and services comprises the number of people employed and the number of hours that those people work. As the latter has remained relatively static over time, growth in labour supplied is primarily due to an increase in the number of workers. The growth in the labour force itself depends on demographics, migration and labour force participation. Table 1.2 illustrates the breakdown of demographic and labour force projections that underpin the growth in potential output.

TABLE 1.2   **DEMOGRAPHIC AND LABOUR FORCE PROJECTIONS**

	2006-2010	2011-2015	2016-2020	2021-2025
Population 15+, %Δ	1.9	0.05	1.0	1.3
Labour Force, %Δ	1.3	-0.2	1.7	2.0
Immigration, '000s	97.6	58.4	59.5	47.2
Emigration, '000s	54.5	83.9	52.3	34.8
Female Participation 15+, %	54.0	52.8	54.6	58.2
Male Participation 15+, %	72.9	67.8	68.5	70.5

Source: Authors' own calculations.

Growth in the active population reflects the demographic trends which govern the size of the potential labour force of people aged over 15 years. The population aged over 15 years remained static over the period 2011-2015. This was mainly a result of average net emigration of over 25,000 people per annum during the same period. Similarly, these levels of emigration had by 2015 reduced the size of the labour force relative to its 2008 peak by 5 per cent. Table 1.2 shows that the population aged over 15 is projected to grow on average by 1 per cent per annum in the near term and close to 1.3 per cent per annum in the medium to longer term.

The financial crisis and ensuing recession resulted in decline in labour force participation rates. Participation rates are calculated as the ratio of the female (male) labour force to the population of females (males) aged 15 plus. In COSMO, these participation rates are a function of wage rates net of taxes and the unemployment rate.

In the 2006-2007 period, male participation reached a peak of 74 per cent before declining sharply in the recession, while female participation reached a peak of 55 per cent. By 2015, male participation rate had fallen to a historically low level of just under 68 per cent. Female participation has remained relatively robust during the recession, falling by just over one percentage point in the 2011-2015 period compared to the 2006-2010 period. The baseline projections from the COSMO model are for participation rates to rise over the coming years. In particular, the female participation rate is projected to continue on the upward trend that was interrupted by the crisis and rise to over 58 per cent over the next ten years. The rate of male participation is also projected to gradually recover from the losses of the recession, rising to just under 69 per cent by the end of this decade and just under 71 per cent by 2025.

Although the age profile of the domestic population is an important driver of this growth, it is also significantly affected by net migration. Table 1.2 indicates the

extent of the reversal in net migration in the 2011-2015 period relative to the 2006-2010 period, which partly includes the pre-crisis period. Although net migration was large in both periods, the gross flows of inward and outward migrants are particularly striking. The baseline indicates size of these flows will be lower in the medium to longer term and that net immigration is projected to be over 12,000 people per annum during that period.

Growth in the population aged over 15, together with positive net migration and rising labour force participation, indicate that the recent increase in labour force growth is expected to continue and strengthen. This is particularly evident in the projections for the medium to long term with the labour force growing by close to 2 per cent per annum on average.

Although not specifically a component of labour supply, the specification of the production function in COSMO treats technological progress as 'labour-augmenting' which means that it enhances the productivity of labour. Technological progress is itself difficult to model and even more difficult to project and is therefore often treated as a random walk in many macroeconomic models. COSMO assumes technological progress in the most productive sector, the traded sector, is trending over time and that technological progress in the other sectors is correlated with that in the traded sectors. Technological progress in the traded sector is projected to grow by over 2 per cent over the projection horizon. Table 1.3 outlines the drivers of potential growth in each sector up to the end of the next decade. As shown in Figure 1.1, growth in aggregate potential output is mainly driven by growth in the traded sector up to the end of the next decade.

TABLE 1.3   DRIVERS OF SECTORAL POTENTIAL OUTPUT GROWTH

	2016-2020			2021-2025		
	TR	NT	GV	TR	NT	GV
Potential Output Δ%	5.6	6.0	1.8	3.8	2.1	1.7
of which						
Labour Contribution	2.3	3.2	1.5	1.6	1.1	1.4
Capital-Energy Contribution	3.2	2.7	0.3	2.2	1.0	0.3

Source: Authors' own calculations.

Table 1.3 also clearly illustrates the heterogeneous growth in the demand for factor inputs that underlies the growth in potential output. While investment is projected to remain quite strong across all sectors over the projection horizon, it is particularly so in the traded sector over the medium to long term. This is due to

production being more capital intensive in the traded sector and to the higher rate of expansion of the sector itself.

COSMO assumes that technological progress is labour augmenting. Technological progress as a driver of potential growth is mainly a feature of the traded sector in the medium to long term. It is projected to be quite weak particularly in the case of the government sector, where output is highly labour-intensive but where productivity growth is difficult to measure. Similarly, one of the key components of the non-traded sector is construction, which is an activity that has, across countries and over time, been characterised by low productivity growth.

1.2.2 Output

As mentioned above, the medium- to long-run growth of the economy is governed by the potential growth rate of the economy. However, in the short- to medium-term, output depends on demand factors and thus can deviate from its potential level. Table 1.4 illustrates the growth rate of output for the aggregate economy, as well as the growth rate of output in each sector. A comparison of the growth rates illustrated in Figure 1.1 with those presented in Table 1.4 indicates the rate of convergence of output towards its potential growth rate so that the economy grows closely in line with potential after 2018.

TABLE 1.4   OUTPUT GROWTH (%)

	2006-2010	2011-2015	2016-2020	2021-2025
Total, Δ%	1.5	7.6	3.7	3.3
Traded, Δ%	2.8	10.1	4.3	3.9
Non-Traded, Δ%	-0.4	5.9	3.1	2.4
Government, Δ%	1.9	3.1	2.5	2.4

Source: Authors' own calculations.

Output in the traded sector is a function of external variables such as world demand and competitiveness vis-à-vis trading partners. One of the main determinants of competitiveness is relative wage rates. Wage rates in COSMO are determined in a bargaining framework in which workers negotiate wages relative to their productivity, personal tax rates, expected inflation and the unemployment rate. The latter is a proxy for the bargaining power of labour such that a falling unemployment rate indicates a tighter labour market and therefore strengthens workers' bargaining position.

Table 1.5 presents the projected (nominal) wage growth rates for the total economy and each sector. In COSMO, wage growth in each sector responds to

deviations of the product wage from labour productivity in that sector and to degree of tightness in the labour market, as approximated by the unemployment rate.

TABLE 1.5   WAGE GROWTH (%)

	2006-2010	2011-2015	2016-2020	2021-2025
Total, Δ%	1.5	0.9	3.7	2.5
Traded, Δ%	1.8	1.9	3.9	2.2
Non-Traded, Δ%	0.5	0.0	4.1	3.0
Government, Δ%	0.8	-0.1	3.5	2.8

Source: Authors' own calculations.

Wage growth is projected to be relatively strong across all sectors in the near term as the gap between actual and potential output narrows, but to moderate in the medium to longer term as output grows at potential.

In COSMO, government wages partly track wage formation in the traded and non-traded sector, with a slightly larger weight given to wage developments in the latter. Therefore, there is feedback from wage negotiations in the private sector to those in the public sector, although there is no direct feedback from government wages to wages in the rest of the economy.

Wage growth in excess of productivity can result in competitiveness issues for the economy. As discussed in the next section, output in the traded sector partly depends on wage rates relative to competitor prices. A loss in competitiveness that reduces output growth in the traded sector will affect wage rates in other sectors through lower aggregate labour demand. This rebalancing is an important mechanism though which output is brought back to potential in the medium term.

In the non-traded sector, output is driven by domestic demand factors primarily in the form of consumption, residential and non-residential investment, the projections for which are outlined in the next section. Finally, output in the government sector is a policy choice and mainly comprises government investment and consumption. In the absence of policy changes, these variables grow with the potential output of the aggregate economy.

1.3   Baseline Projection: Demand Side

The demand side in COSMO follows the traditional expenditure identity, where domestic product is simply the sum of consumption, investment, government expenditure and net exports. Figure 1.2 shows the projected path of the components of GDP for the medium term. Over the projection horizon, net exports are expected to make an increasingly larger contribution to GDP with respect to the other components. Currently, Ireland is already one of the most open economies of the world, measured by the sum of total trade (exports plus imports) as a percentage of GDP, and we expect this trend to continue in the future. Exports are projected to grow over time as world demand, one of the main determinants of exports in COSMO, expands. On the other hand, imports will also increase as the economy grows and pushes up the internal demand, as imports are used both as final consumption and intermediate inputs. The growth rate of both imports and exports will decelerate over time, returning to their historical averages. The trade balance surplus as a percentage of GDP will rise over the end of the current decade and stay at similar levels for the rest of the period. Similarly, the terms of trade, measured as the ratio between the exports deflator and the imports deflator, will return in the long term to their pre-crisis growth rate levels.

FIGURE 1.2   GDP COMPONENTS, € MILLION, 2017-2025
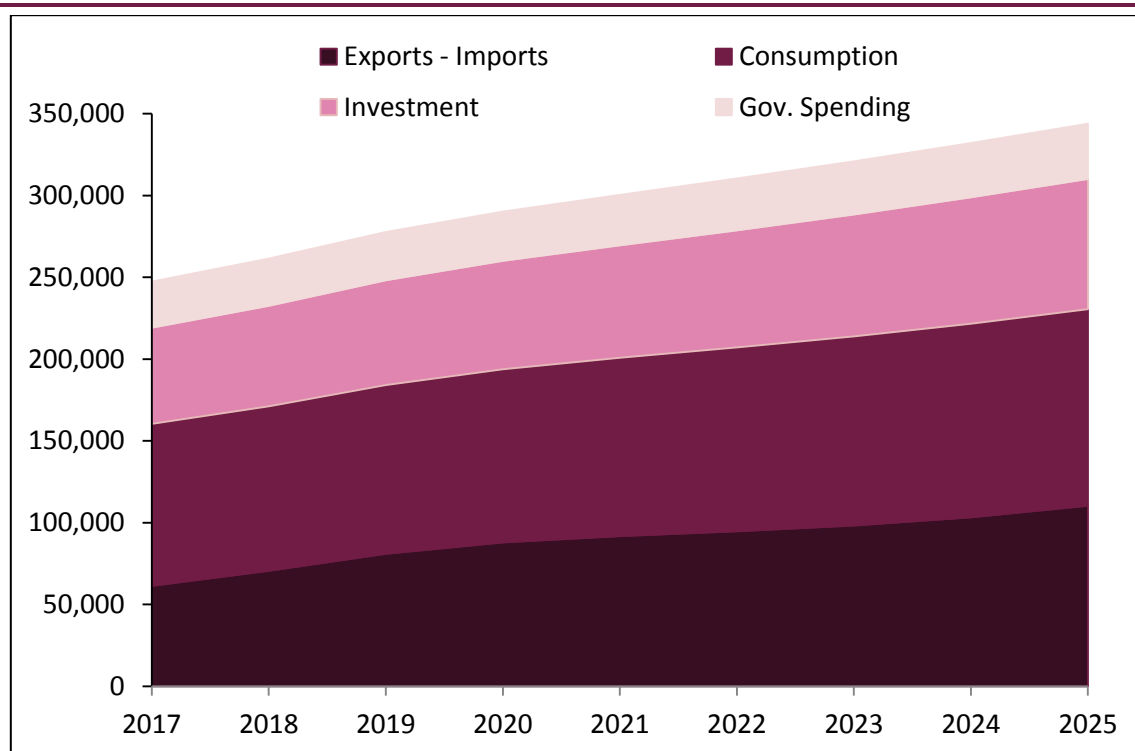
Source: Authors' own calculations.

Consumption is projected to grow at a rate below GDP but following a similar path. The evolution of consumption is linked to movements in real personal

disposable income and assets, both financial and housing. Real personal disposable income will grow over the next decade as total wages grow. Assets, on the other hand, should increase over time as the overall health of the financial sector improves, led by the increasing housing prices discussed below.

TABLE 1.6   GDP COMPONENTS AND DETERMINANTS, 2006-2025

	2006-2010	2011-2015	2016-2020	2021-2025
Gross domestic product, Δ%	0.9	7.1	3.7	3.2
Gross national product, Δ%	0.7	6.2	3.4	3.3
External sector:				
Exports, Δ%	4.4	10.6	6.0	4.4
Imports, Δ%	3.1	7.6	6.5	4.4
Trade balance, % of GDP	10.9	21.0	32.2	31.5
Terms of trade, Δ%	-0.8	0.0	-0.3	-0.9
Consumption:				
Personal consumption, Δ%	1.9	0.9	3.0	2.6
Real personal disposable income, Δ%	2.3	-0.1	3.2	2.5
HH assets (financial and housing), Δ%	0.2	2.3	4.2	6.8
Investment:				
Tradable sector, Δ%	-4.0	20.3	5.1	4.2
Non-tradable sector, Δ%	-3.2	15.2	3.3	2.7
Government, Δ%	-2.6	-0.2	7.2	3.1
Housing, Δ%	-17.3	-4.7	10.0	5.7

Source: Authors' own calculations.

Total investment will also follow a growth path similar to GDP, but with differences across sectors. Investment in the tradable sector is expected to register the largest growth rate by the end of the period. In the non-tradable sector, investment growth rates will keep a decelerating trajectory, as investment usually tracks overall activity, whereas government investment growth will also decelerate while maintaining relatively high levels.

TABLE 1.7   BALANCES, 2006-2025

	2006-2010	2011-2015	2016-2020	2021-2025
Unemployment rate, %	8.3	12.6	7.3	6.4
Savings rate, %	4.1	1.3	-0.3	1.9
Government deficit, % of GDP	-10.1	-6.3	0.1	-0.7
Government debt, % of GDP	47.7	107.9	67.7	60.8
Net migration, 000s	43.0	-25.5	7.1	12.5

Source: Authors' own calculations.

The assumptions on the public finances were outlined in Section 1.1. The impact of these assumptions combined with the macroeconomic projections result in the government deficit remaining below 1 per cent through the period of analysis and, as a consequence, public debt levels decrease progressively, as shown in Table 1.7.

In terms of employment, as mentioned above, the labour force is expected to grow over the next decade. Table 1.8 shows employment by sector. The table shows that the non-traded sector will remain the largest in terms of workers employed. However, the sector with the largest increase in employment for the rest of the current decade is expected to be the traded sector. This result is in line with the aforementioned projections of higher production and productivity for the sector, which should lead to higher wages, making the sector more attractive for workers. This tendency would be reduced during the next decade. In the government sector, the proportion of public workers in employment is projected to decline moderately over the period, with the share falling to around 25 per cent of the total. This figure is close to the average for the Euro Area.

TABLE 1.8   EMPLOYMENT BY SECTORS AND GROWTH RATES, 2006-2025

	2006-2010	2011-2015	2016-2020	2021-2025
Employment, 000s				
Total	2,034	1,889	2,097	2,362
Traded sector	592	561	629	715
Non-traded sector	975	841	954	1,084
Government sector	467	487	515	563
Growth rate, Δ%				
Total	-0.7	0.9	2.3	2.1
Traded sector	-1.2	1.1	3.1	1.6
Non-traded sector	-2.4	1.1	2.3	2.6
Government sector	3.5	0.3	1.5	1.8

Source: Authors' own calculations.

The robust growth in employment, together with the expected demographic and migratory trends, will have a knock-on effect on the unemployment rate over the medium term. Given the projected growth of the Irish economy, net inward migration is also expected to increase, and is expect to average around 13,000 per annum over the longer term.

FIGURE 1.3   INFLATION RATE AND AVERAGE WAGES BY SECTOR; YEAR-ON-YEAR GROWTH RATE, 2020-2025
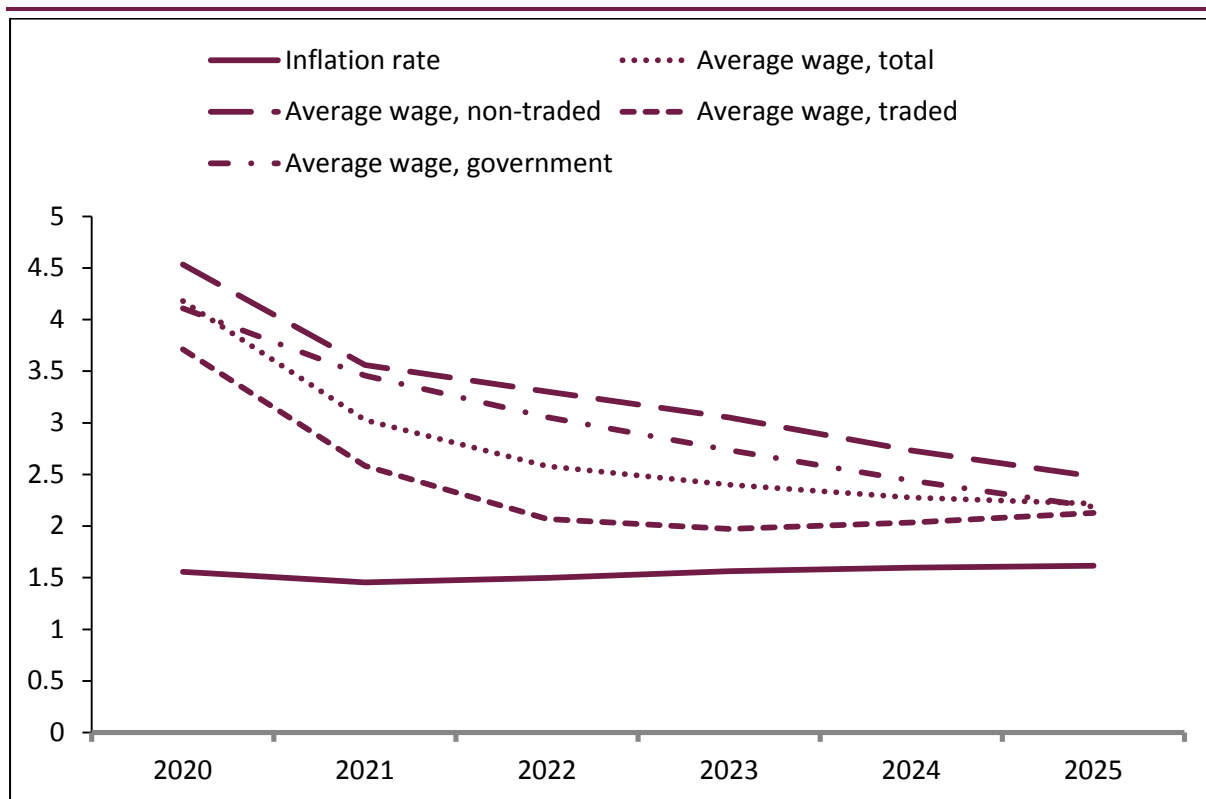
Source: Authors' own calculations.

In terms of prices, Figure 1.3 shows the inflation rate which is expected to remain relatively low over the period at around 1.5 per cent per annum. The growth in average wages will tend to converge towards the inflation level, but will remain higher for most of the period. The behaviour of average wages by sector is heterogeneous, as can be expected given the differences in expected productivity that we have mentioned before.

TABLE 1.9   HOUSING AND FINANCIAL VARIABLES

	2006-2010	2011-2015	2016-2020	2021-2025
House Prices, %Δ	-2.9	-0.6	5.4	5.6
Housing Stock, %Δ	3.7	0.0	0.8	0.9
Mortgage Stock, %Δ	5.0	-5.5	6.7	7.1
Corporate Credit, %Δ	10.1	-12.4	7.3	8.1

Source: Authors' own calculations.

Table 1.9 presents the baseline projections for variables related to the housing and financial sector.[6] The boom and bust cycle in the Irish housing market in

---

[6]   Note all variables apart from the housing stock are in nominal terms.

recent years has generated significant financial and macroeconomic instability. House prices in COSMO are modelled in a standard inverted demand framework that is augmented with a measure of credit conditions. The projections indicate a path for nominal house prices that implies real house price appreciation of approximately 3.5 per cent per annum.

On the supply side, housing investment in COSMO mainly depends on the profitability of investment, as approximated by the ratio of house prices to building costs, and on the supply of credit to the construction sector. The expansion of the housing stock in the pre-crisis period exceeded long-term housing demand resulting in considerable overhang. However, Table 1.9 also shows that the net increase in the housing stock in the post-crisis period has been negligible so that the gap between housing demand and the existing stock is likely to have narrowed considerably. Recent levels of house price appreciation also indicate that supply issues are becoming more acute, particularly as net migration has turned positive. Table 1.9 shows that the projection for the growth in the housing stock from COSMO is close to 1 per cent per year.

Table 1.9 also indicates how the banking sector responds to the level of housing demand. On the household side, the stock of mortgage credit held on banks' balance sheets grows by 6.7 per cent per year in the near term, rising to over 7 per cent in the medium term, before falling to under 6 per cent in the longer term. Corporate credit is also projected to grow strongly over the projection horizon, driven both by the financing requirements of the construction sector and the investment needs of the rest of the corporate sector.

1.4   Long-Term Implications for Ireland of Brexit

The UK vote to leave the EU is likely to have a significant negative impact on the UK and wider world economies, and thus on the Irish economy. While the direction of the impact of Brexit can be determined at this point, it is difficult to assess the size and nature of the impacts until the final arrangement for the future relationship between the UK and the EU is known. Therefore, previous analysis on the impact of Brexit has considered a range of possible outcomes covering the most likely scenarios. These scenarios range from a relatively benign scenario where the relationship between the UK and the EU follows that between Norway and the EU, which is usually referred to as the EEA scenario and the more severe scenario where the future relationship between the UK and the EU where trade is governed by World Trade Organisation (WTO) Most Favoured Nation tariffs.

A distinction has also been made between the short-term and longer-term impacts. In the short term the main effect of the UK vote on Brexit is to increase uncertainty as well as the immediate effect on the value of Sterling. These effects arise regardless of the nature of the future relationship between the UK and the EU but their nature makes them difficult to model. In the longer term the impacts will come from the changed trading relationship between the UK and the EU and its impact on investment decisions, as well as the impact from a potentially changed migration regime in the UK.

The projected short-term impacts on the level of UK GDP range from a contraction by 0.9 per cent relative to a no-Brexit base to a reduction of 3.6 per cent relative to base, and averages 2.3 per cent. The estimated long-run impacts range between -0.1 per cent and -7.9 per cent and average -4.15 per cent relative to base, reflecting the wider set of scenarios considered in the long-run analysis compared to the short-run analysis (see Bergin et al., 2016, for a summary of the international modelling results).

The medium- to long-term impact of Brexit on the Irish economy was examined using COSMO in Bergin et al. (2016) which considered the impact of Brexit against a no-Brexit baseline. Following the approach used in the wider literature, that analysis considered the impact of Brexit on Ireland under the standard scenarios used in the literature by applying the impacts of Brexit on the UK and world economy as identified in Ebell and Warren (2016). As the analysis focused on the more permanent impacts of Brexit it did not consider the impact of short-term uncertainties.

Overall the analysis in Bergin et al. (2016) shows that output would be reduced under all scenarios but that the size of the permanent reduction in output differs according to the severity of the scenario considered. Thus, while the relatively benign EEA scenario would reduce output by 2.3 per cent below what it otherwise would have been over the longer term, a harder Brexit where trade between the UK and the EU is subject to the WTO tariffs would result in a permanent reduction of output by 3.8 per cent in the long run. In COSMO the impact of Brexit is transmitted via the traded sector, where demand for Irish output falls and this has related impacts on employment and the government finances. Thus, unemployment increases while the general government balance deteriorates unless corrective policy interventions are introduced (see Table 1.10).

TABLE 1.10   IMPACT OF BREXIT ON IRELAND AFTER TEN YEARS, CHANGE FROM BASELINE

	EEA	FTA	WTO
Percent deviation from Baseline Level:			
Gross value added at basic prices	-2.3	-2.7	-3.8
Gross value added at basic prices, Traded sector	-2.6	-3.0	-4.3
Gross value added at basic prices, Non-traded sector	-2.3	-2.7	-3.6
Exports of goods and services	-3.0	-3.5	-4.9
Personal consumption of goods and services	-2.2	-2.5	-3.4
Employed persons	-1.2	-1.4	-2.0
Average wage €	-2.2	-2.5	-3.6
Deviation from Baseline:			
Personal Consumption Deflator, %	-0.2	-0.2	-0.3
GDP Deflator, %	-0.2	-0.2	-0.3
Personal savings rate, %	-0.3	-0.3	-0.5
Unemployment rate, %	1.2	1.4	1.9
General Government Balance, % GDP	-0.6	-0.8	-1.0

Source: Authors' own calculations.

While the assessment of the impacts of Brexit on Ireland highlights the range of possible total impacts compared to a no-Brexit baseline, the vote in the UK to leave the EU and the decision of the Conservative government in the UK to trigger the process to leave the EU mean that a no-Brexit baseline would not reflect reality. Therefore, in the baseline presented here, a scenario of the impact of Brexit is incorporated. Specifically we use the latest projections (November 2016) for the UK and world economy from the UK National Institute of Economic and Social Research (NIESR). This incorporates the NIESR's latest thinking on the impact of Brexit, which encompasses both the short-term uncertainty effects as well as longer-term trade effects. The shorter-term effects include a significant increase in the risk premium for the UK economy and significantly reduced value of Sterling relative to what it might have been without Brexit. This is expected to result in increased inflation over the next five years. Importantly over the longer term the NIESR projections expect Brexit to permanently reduce UK GDP by around 2 per cent. The reduced level of output also reduces consumption, investment, wages and employment in the UK. For Ireland the implications are to reduce world demand which, along with competitiveness, is the key driver of traded sector output. The weakening of Sterling also impacts on exchange rates.

1.5   Conclusions

The baseline projection presented in this chapter provides an overview of the potential evolution of the economy over the medium to longer term. It is based on a set of assumptions around demographic trends, the world economy and the public finances. It provides an anchor to explore alternative policy scenarios.

The sustainable long-term real growth rate of the Irish economy is approximately 3 per cent, driven mainly by growth in the traded sector. A key driver of this growth is the expected continued expansion of the labour force through the natural increase in the working age population together with increases in female participation and a return to net immigration. Our baseline projections include relatively strong labour demand over the medium term which will help to reduce the unemployment rate to just over 6 per cent.

These projections rely on a series of assumptions, particularly around the likely path of the international economy. Unanticipated macroeconomic shocks and surprises can alter the growth path of the economy. In the following chapters, we address a series of relevant potential issues around the housing market and associated funding issues and opportunities and risks for FDI.

Chapter 2: Opportunities and Risks for Foreign Direct Investment

Martina Lawless, Edgar Morgenroth

2.1   Context

A key feature of Ireland's economic development has been the significant role of foreign owned enterprises. According to the United Nations Conference on Trade and Development (UNCTAD) statistics, Ireland's share in world FDI stocks was 1.7 per cent in 2015, which makes Ireland the 16th most important destination for FDI in the world, and ranks Ireland ahead of countries such as Italy and India. In per capita stock of FDI terms Ireland ranks tenth in the world.[7]

Among manufacturing firms, foreign owned units account for almost 15 per cent of enterprises, 58 per cent of employment, 83 per cent of output and 90 per cent of exports.[8] For firms that responded to the employment survey conducted by the Department of Jobs, Enterprise and Innovation[9] just over 50 per cent of employment was in foreign owned enterprises in 2015. However in sectors such as Computer Facilities Management Activities, Computer Programming Activities, Financial Services, Chemicals, Computer, Electronic and Optical Equipment, foreign owned firms account for 99.3 per cent, 96.3 per cent, 81.6 per cent, 88 per cent and 81.5 per cent of employment respectively (see Figure 2.1).

For most multinational corporations (MNCs) with subsidiaries in Ireland, the country serves as an export platform (Barry and Bergin, 2013). It is thus not surprising to find that the output of MNCs is largely exported. For example foreign owned manufacturing enterprises located in Ireland export almost 95 per cent of their output while Irish owned enterprises export just under 44 per cent of their output.[10] Of course this is related to the small size of the Irish market relative to the EU market which is almost 58 times larger in terms of GDP and almost 110 times larger in terms of population.[11] Given the fact that MNCs tend to use Ireland as an export base, they operate in sectors that are internationally traded and account for a significant proportion of traded sector activity. For

---

7   Excluding the British Virgin Islands, the Cayman Islands and Gibraltar, Ireland would rank seventh in the world after Malta, Luxembourg, Hong Kong, Singapore, Cyprus and Switzerland. The data are from the UNCTAD World Investment Report.
8   Based on CSO Census of Industrial Production 2012 data.
9   The survey was formerly known as the Forfás Employment Survey.
10   Based on CSO Census of Industrial Production 2012 data.
11   Based on Eurostat statistics.

example, the end of year stock of FDI in 2014 was 41 per cent of the total capital stock.[12]

FIGURE 2.1   SHARE OF EMPLOYMENT BY SECTOR ACCOUNTED FOR BY FOREIGN OWNED ENTERPRISES, 2015
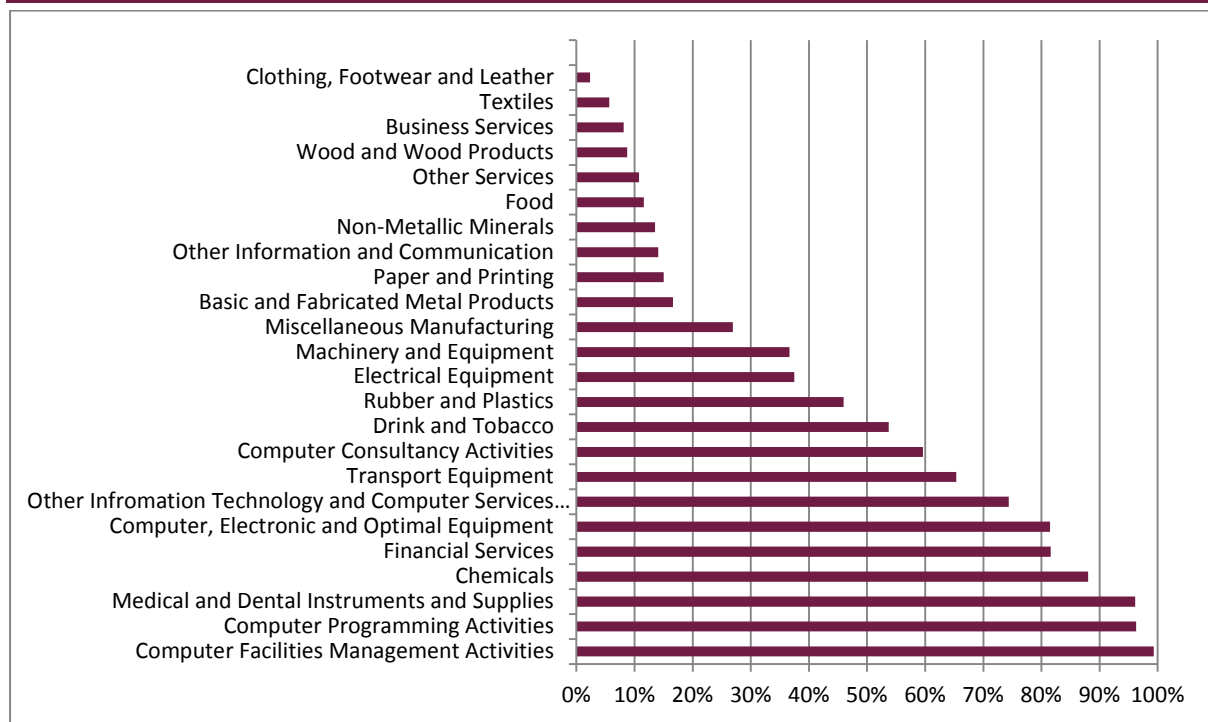
Source: Department of Jobs, Enterprise and Innovation, Employment Survey 2015.

A range of factors has been identified as important in attracting FDI to particular locations, including home country factors as well as destination country factors and geographical factors such as proximity (see Blonigen and Piger, 2014). The success of Ireland in attracting this disproportionate share of FDI is attributed to the presence of a highly educated English speaking labour force, EU membership, trade agreements with a range of non-EU countries, a business friendly regulatory environment, a simple corporate tax system with relatively low tax rates, good business environment and historical and cultural links with countries such as the US.

Given the significance of MNCs to the Irish economy, it is important to consider the impact of potential threats or opportunities affecting MNCs. To date, the country has established a strong record in attracting high technology firms. Long-term changes in sectoral demand may change the areas in which Ireland has a comparative advantage in the attraction of FDI, either positively or negatively, and maintenance of the factors that attract a disproportionate amount of FDI

---

12   Based on CSO FDI and Capital Assets statistics.

would have to be maintained to ensure the strength of Ireland's FDI pull. There are therefore some unforeseeable developments that could change the volume or type of FDI that locates in Ireland. In this chapter's examination of potential opportunities and risks, we focus on two more immediate issues and how they would affect the overall economic picture. The first change to Irish FDI we model is a diversion of investment from the UK to Ireland in the wake of EU exit. The second issue that could present a structural change to the levels of FDI is a major alteration of tax rules across Europe.

The exit of the UK from the EU (Brexit) might present a potential opportunity for Ireland to attract additional FDI, either by attracting new investment that might otherwise have been destined for the UK or by attracting some of the FDI that is currently in the UK but that might relocate to remain within the EU. Already there are signs that the FDI flow into the UK is declining. Quarterly statistics on FDI into the UK from the UK Office of National Statistics were already down 6 per cent and 3 per cent in the first and second quarters of 2016 when compared to the same quarters in 2015.

However, there are also potential threats to the underlying factors that make Ireland attractive to FDI. In particular, moves by the European Commission (EC) to introduce a Common Consolidated Corporate Tax Base (CCCTB), by the OECD to reduce base erosion and profit shifting (BEPS), as well as recent rulings by the EC Competition Directorate in relation to tax treatment of individual firms in a number of Member States, could indicate that changes in the Irish corporation tax regime might be possible. Previous research has shown that FDI is sensitive to the corporation tax regime and, in particular, investment in sectors such as financial services seeks locations with the lowest taxes (see Lawless et al., 2014).

In this chapter, we examine the potential macroeconomic implications of these opportunities and threats to FDI flows and their associated tax revenues. To undertake this assessment, we use the ESRI COSMO model to estimate the final effect on a number of economic variables. To assess the size of the potential relocation of FDI from the UK to Ireland the method previously applied by Morgenroth (2015) is utilised. Section 2.2 focuses on the effect of Brexit on FDI into Ireland, discussing previous estimates of the potential effects and how they can be incorporated into the macro model. Section 2.3 then presents results on two possible Brexit scenarios, depending on the extent of FDI diversion. Section 2.4 discusses the background to the CCCTB and why it might affect Irish FDI. The size of the initial 'shocks' due to the introduction of the CCCTB is informed by work by Cline et al. (2011). Section 2.5 presents the simulation results of a reduction in FDI coming from changes in the tax environment from the introduction of a CCCTB. Section 2.6 concludes.

2.2   Modelling the Impact of Brexit on FDI

While the impact of Brexit on the Irish economy has been analysed in a number of papers and reports, only two pieces of research have involved macroeconomic modelling. In Barrett et al. (2015) the impact of a 1 per cent reduction in UK GDP was considered. In a macroeconomic model system this constitutes a reduction in world demand for Irish goods and services and thus reduces Irish GDP. More recently, the wider implications of Brexit have been analysed by incorporating the simulations of the impact of Brexit on the UK and world economy produced by the UK National Institute of Economic and Social Research (NIESR) into COSMO and comparing these to a no-Brexit baseline (Bergin et al., 2016b). While that work, which is summarised in the Baseline chapter, shows the potential significant negative impact of Brexit on Irish GDP, mainly through a reduction in world demand, it did not consider the potential positive effect of Brexit on FDI and thus the wider economy.

Previous analysis has shown that reductions in market access of UK based MNCs to the EU market due to Brexit is likely to reduce the flow of green field FDI into the UK *ceteris paribus* (see Barrett et al., 2015). As mentioned above, access to the EU market is an important location determinant for MNCs. While the UK market is considerably larger than the Irish market, the EU market even without the UK would still be 4.7 times and 6.8 times larger than the UK in terms of GDP and population respectively.[13]

The annual FDI flows tend to be a fraction of the total accumulated stock of FDI. For example in 2015 the stock of FDI in the EU was almost 18 times larger than the flow of new FDI.[14] The UK has the second largest stock of FDI in the world and the largest stock within the EU, accounting for 5.8 per cent of world FDI stocks and 18.7 per cent of EU FDI, which is identical to the FDI stock in Germany and Italy combined. Ireland accounts for 5.6 per cent of the EU FDI stock. Thus any significant relocation of existing stocks of FDI from the UK to other EU countries is likely to have a substantial impact on the UK and the recipients of the diverted investment.

The potential for FDI diversion from the UK to the EU will depend on the nature of the future relationship between the UK and the EU, which at this point is unknown. However, recent statements by the UK Prime Minister seem to indicate that this relationship will be fundamentally changed as she ruled out either a

---

[13]   Based on Eurostat statistics.
[14]   Based on UNTAD data.

Norway-EU style EEA agreement or a Switzerland-EU style EFTA agreement. This would suggest that the relationship between the UK and the EU is more likely to encompass a bilateral trade agreement between the UK and the EU or a situation where trade between the UK and the EU is governed by World Trade Organisation (WTO) rules.[15]

To assess the impact of such a situation the methodology used in Morgenroth (2015) is followed here. However, rather than considering the relocation of FDI from outside the EU as in Morgenroth (2015), here the potential relocation of the entire stock of FDI that is currently in the UK is considered. The method used in Morgenroth (2015) utilises estimates from the literature on the effect of EU membership on the attractiveness to FDI compared to having a bilateral trade agreement with the EU. Assuming that the effect of losing the benefits of EU membership is symmetric to the gains from EU membership, it is possible to quantify the effect of Brexit.

The estimates contained in Hufbauer and Schott (2009) suggest that that EU membership increases FDI from outside the EU by 27 per cent and also substantially increases FDI stocks between EU Member States by 62 per cent, but EU members also invest more in non-EU members (21 per cent). This would suggest that the UK might lose 27 per cent of its FDI from outside the EU and might also lose 41 per cent (62 per cent minus 21 per cent) of its intra-EU FDI. This latter impact would seem rather large, especially as the size of the UK economy would suggest that MNCs also locate in the UK to service this large market and would thus be less likely to relocate. Therefore it is assumed that the effect of Brexit is the same for FDI from outside the EU and inside the EU, and reduces the stock of FDI in the UK by 27 per cent.[16] The assumption behind this effect is that the UK would not be part of the EEA or EFTA and that the type of Brexit scenario considered here is a hard Brexit.

The OECD International Direct Investment Statistics contain detailed information on the country of origin for FDI stocks across the OECD. These show that about half of the FDI stock in the UK is from outside the EU and the other half from within the EU, and in 2014 the UK FDI stock accounted for 21.2 per cent of the stock of FDI in the EU. The diverted stock might reasonably be expected to be distributed across EU members according to current shares in FDI stocks which reflect the relative attractiveness of each country to FDI. As Ireland's share in

---

[15] A more extreme outcome where the UK lowers tariff with third countries to below WTO levels i.e. breaks the customs union with the EU is also possible. This has the potential to alter trade and investment patterns in a more extreme way.

[16] The 27 per cent impact found by Hufbauer and Schott (2009) is very similar to that found in the more recent study by Dhingra et al. (2016) on UK FDI and Brexit which found that EU membership had increased the FDI in the UK by 28 per cent.

non-UK EU foreign direct investment stock is 6.9 per cent one can expect Ireland to capture 6.9 per cent of the diverted stock. Reducing the UK FDI stock by 27 per cent and attributing 6.9 per cent of this to Ireland implies that the stock of Irish FDI would increase by 7.3 per cent.

Applying this shock to the FDI stock in Ireland as published by the CSO implies an increase in the stock of FDI by €22.43 billion. Of course the impact will not occur in one year. Analysis has shown that the trade effects of Brexit are likely to take ten years to be fully realised (see Morgenroth, 2016), and it is thus assumed that the relocation will be shared out equally over a period of ten years.[17]

The FDI that is currently located in the UK serves both the domestic UK and international markets. Previous research has shown that MNCs located in the UK, like their counterparts in Ireland, export a greater share of their output (Kneller and Pisu, 2004). Office of National Statistics data show that while just over 10 per cent of indigenous businesses in non-financial sectors export, almost 60 per cent of MNCs are exporters.

A relocation of FDI thus also implies changes in trade volumes, as the relocated FDI will serve existing customers both in the UK and internationally. Thus UK exports would be expected to decline while countries that receive the relocated FDI would experience an increase in exports. Unfortunately official UK statistics do not show the share of UK exports accounted for by MNCs. However, Girma et al. (2008), using the Bureau van Dijk FAME database found that MNCs account for 57 per cent of UK exports. Lawless and Morgenroth (2016) estimate the reduction of exports from the UK under a WTO scenario to be just under 10 per cent, excluding FDI relocation effect. Under the same scenario Ebel and Warren (2016) estimate the trade impact with FDI relocation effect to range between 20 per cent and 30 per cent. This would suggest that the FDI share of reduced exports ranges between 50 per cent and 66 per cent.

On the assumption that 50 per cent of UK exports are due to MNCs, and if the reduction of the UK FDI stocks is 27 per cent as outlined above, then UK non-oil exports would decline by 13.5 per cent. If Ireland were to benefit from a shift in exports commensurate with its share in the relocation of FDI (6.9 per cent) then Irish exports would increase by 2.8 per cent. This is the total effect at the end of the period of FDI relocation. The shock is implemented by increasing traded sector production commensurately with the increase in export. For the purposes

---

[17]   While there is analysis to indicate the time period over which the impacts of Brexit might emerge, it is not clear what profile the impacts will follow. For example there could be a big surge of relocations soon after Brexit or there might be a more gradual pattern where most of the relocation takes place towards the end of the ten-year period.

of the simulations it is assumed that the benefits accrue in line with the shift in FDI i.e. the full increase in exports is only realised after ten years.

2.3   The Effect of FDI Diversion from the UK due to Brexit

The shock is implemented in COSMO over the period from the first quarter of 2018 over a ten-year period. With FDI assumed to go exclusively into the traded sector, the FDI diversion from the UK would result in a significant increase in traded sector investment, which initially amounts to 7.8 per cent of traded sector investment and declines to 5.2 per cent of traded sector investment by the end of the period, thereby increasing the traded sector capital stock. This is expected to increase the productive capacity of Ireland. This increases the potential output of the traded sector. The increase in exports also lifts the actual output of the traded sector.

Figure 2.2 shows the response of real GDP and employment relative to the COSMO baseline to the very sizable positive investment shock. This shows that under the scenario described above, where FDI that is currently located in the UK significantly relocates to other EU countries including Ireland, real GDP will be raised by 3 per cent compared to the baseline. The figure also shows that employment will rise by 1.8 per cent. This increase is smaller than the increase in GDP as wages rise, and with the traded sector which is less labour intensive, the average labour intensity decreases. Interestingly, non-traded sector output initially increases more than that of the traded sector as the significant investment shock means that the construction sector which is part of the non-traded sector has to ramp up its capacity. Once this has occurred and with a declining growth in the traded sector investment shock, the growth in the non-traded sector flattens off to peak at 2.4 per cent. While government consumption expands by 1.5 per cent by the end of the period, there is also an improvement in the debt-to-GDP ratio and the general government balance.

The COSMO simulations indicate that potential output in the traded sector grows by more than output, suggesting that an improved external environment would result in an even more positive impact on actual output. Of course this also points to an important caveat of the simulation presented here, that the shift in FDI from the UK would simultaneously also shift demand for the output from the UK to Ireland. Simulations, where the investment is not accompanied by a shift in demand to Ireland, show that under such a scenario the effect on output and employment would be negligible, while potential output would be significantly expanded. Furthermore, it is implicitly assumed in this simulation that Ireland could absorb such a sizable investment shock. This implies that if such a scenario were possible, actions might be required to ensure that there is sufficient absorptive capacity to accommodate the investment.

FIGURE 2.2   SIMULATED IMPACT ON REAL GDP AND EMPLOYMENT
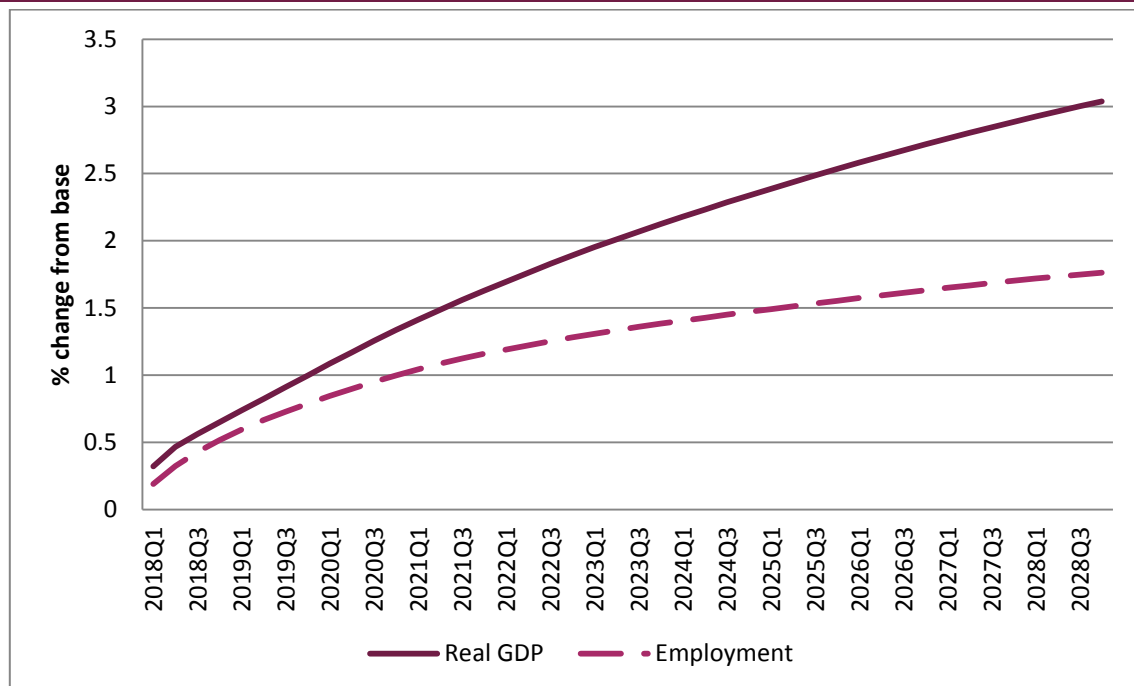
Source: Author's own calculations.

2.4   Modelling the Potential Impact of CCCTB and Irish FDI

This section deals with the possible implications of the introduction of the Common Consolidated Corporate Tax Base (CCCTB), the impact of which has not previously been analysed in a macroeconomic model. However, previous analysis by Conefrey and FitzGerald (2011) on the effect of the reduction in corporation tax for services in the 1990s identified a number of macroeconomic effects. These included increases in services exports and output but also a reduction in corporation tax revenue. It is therefore likely that the introduction of a CCCTB will also have wider macroeconomic effects.

The Common Consolidated Corporate Tax Base is a proposed initiative by the European Commission to harmonise the base on which corporation taxes across the EU are levied. This does not include any direct changes to the tax rate applied by any Member State but the proposal does include mechanisms to change where taxes are collected in some circumstances. The primary objective is to simplify tax payments for companies operating across a number of countries. As the complexity of tax systems has been shown to have a negative effect on FDI (Lawless, 2013), a harmonised set of rules and procedures should reduce administrative burdens for firms operating across borders and thus promote investment (European Commission, 2016). A further objective of the CCCTB is to limit the ability of firms to shift profits across locations to avoid taxes, thus

working to support the wider international Base Erosion and Profit Shifting (BEPS) initiatives of the OECD. However, Davies (2013) casts doubts on the ability of a factor apportionment approach to allocating tax revenues to reduce transfer pricing and suggests that, under some circumstances, the overall effect could be to reduce tax revenues.

The CCCTB would mean that multinational companies would have to comply with a single set of rules on how to calculate the amount of income that would be liable for taxation. The taxable income would then be apportioned across the countries that the firm operates in and be taxed at the prevailing rate in each country. The precise mechanism for this apportionment is possibly the most contentious of the elements of the CCCTB proposal as it has the potential to shift tax revenues considerably across countries. The current proposal for how the company income would be divided across countries for tax purposes is based on a formula that takes into account the locations of the company assets, employment and sales. For small countries, such as Ireland, where considerable multinational production takes place for export, the use of sales location as part of the basis for sharing the tax base would reduce the amount of multinational income available for taxation. Largely for this reason, the Department of Finance stated during the initial phase of discussions on the proposal that 'Ireland's position on the CCCTB is one of scepticism' (Department of Finance, 2012).

The CCCTB was initially proposed in 2011 but agreement was not reached on how it should be implemented and progress effectively stalled. The proposal was re-launched in October 2016 with a number of new elements. The new version of the proposal divides the implementation of the CCCTB into two distinct stages with work on defining a common base (specifically agreeing rules on allowances and exemptions) to proceed first before negotiating the consolidation element (how the tax base is allocated across countries) (European Commission, 2016).

To examine the impact of the proposed changes, Ernst and Young were commissioned to carry out a wide-ranging analysis of the CCCTB and how it would impact firms in different countries and sectors under a variety of possible scenarios (Cline et al., 2011). They build a tax model based on an extensive database of firm-level accounting and ownership information, the *Amadeus* data collected by Bureau Van Dijk. This includes the financial statements of almost four million companies, with ownership structure information that allows 50,000 firm groups to be identified amongst the firms. As the CCCTB would only affect firms operating across multiple countries, they separate out the 200,000 companies that would have their tax treatment changed by the imposition of the CCCTB. They can then compare the current tax payments of these companies in each of their locations and how this would potentially change if the CCCTB apportionment rules were applied to the companies.

The over-riding finding of the Cline et al., research was that the impact of a mandatory application of the CCCTB would be very unevenly spread across Member States. We use these estimates to inform the size of the shock to Irish FDI flows and corporation tax revenues. There is the double effect of a reduction in overall FDI flows to Ireland in the order of -4.6 per cent (as our low corporation tax rate would be applied to a smaller share of the company's income and would therefore be a reduced attraction to location here) and a reduction in revenues from corporation tax receipts of -5.7 per cent.

Figures 2.3 and 2.4 show how Ireland is affected in terms of FDI and corporation tax revenues respectively compared to other countries in the EU. These figures show a small fall in total EU FDI (-1.1 per cent) and a modest overall increase in tax revenues across the EU27 (+0.2 per cent). The uneven spread of the effects is quite striking with Ireland one of the most negatively affected, particularly in terms of tax revenues. A number of other countries would also stand to lose significantly, with Bulgaria, Romania and Poland being the most likely to lose in terms of FDI flows, and with France and Spain the main positive recipients. Apart from Germany, most of the countries that would expect a reduction in tax revenues are small open economies reflecting the redistribution of some revenues to their sales location rather than production centre or headquarters.

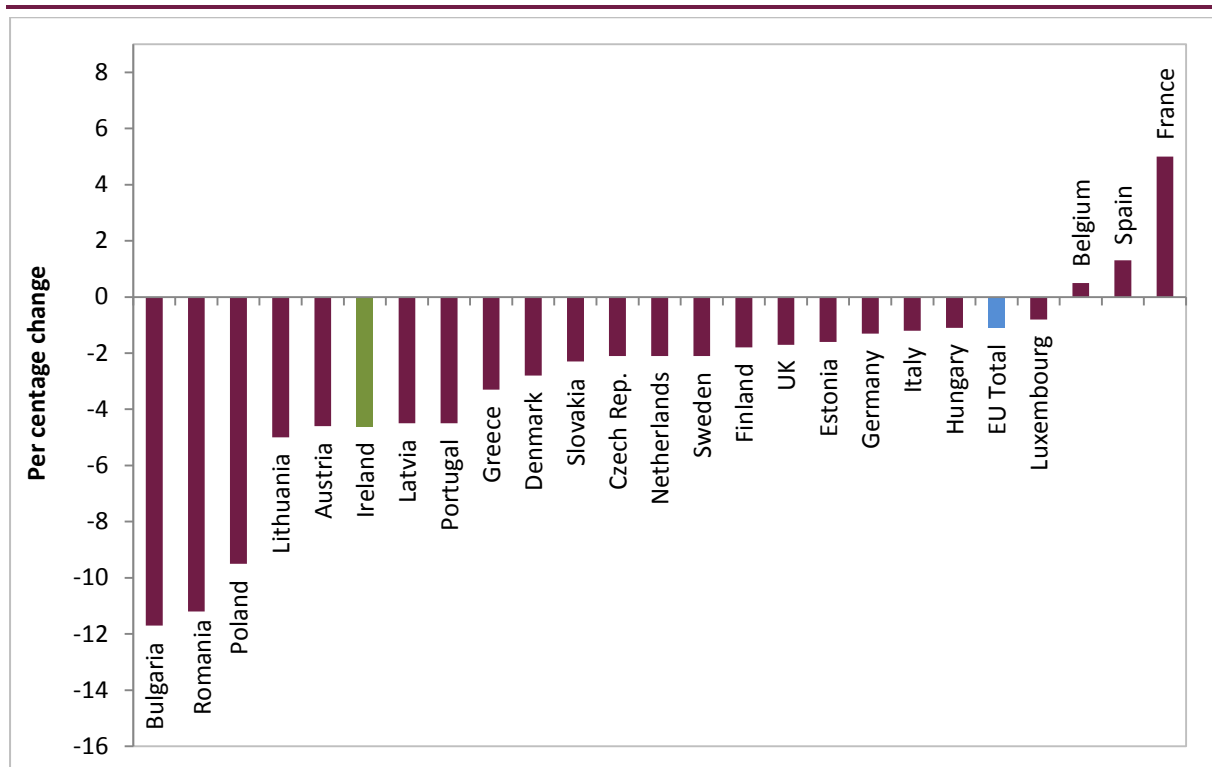**FIGURE 2.3   ESTIMATED IMPACT OF MANDATORY CCCTB ON FDI FLOWS**

Source: Cline et al., 2011.

FIGURE 2.4   IMPACT OF MANDATORY CCCTB ON CORPORATION TAX REVENUES
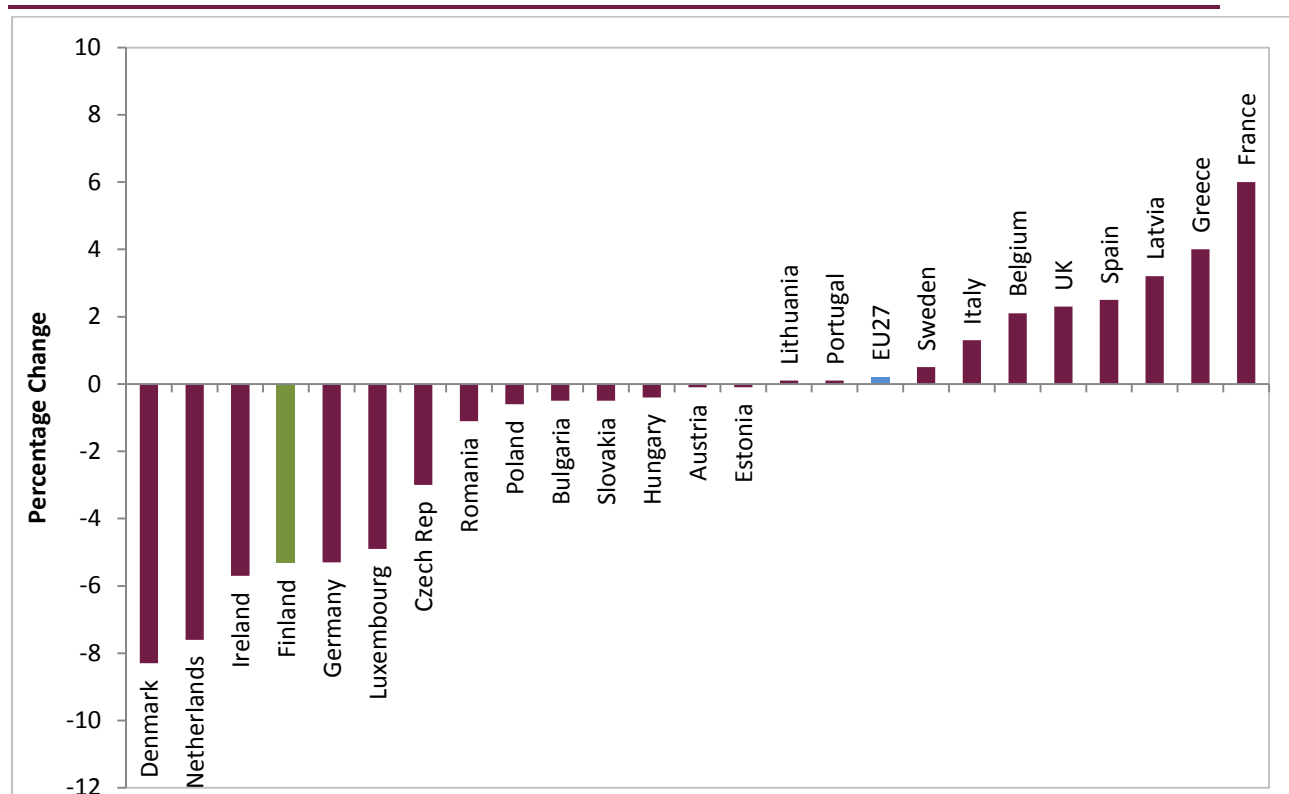
Source: Cline et al., 2011.

2.5   Simulation Results for the Impact of the Introduction of the CCCTB

In Figure 2.5, we show the effects on potential output of the combined FDI investment and corporation tax revenue shock coming from the implementation of the CCCTB across Europe, as simulated by COSMO. As the investment reduction is concentrated in the traded sector, this shows the largest decline in output. The total impact at the end of the time horizon is that traded sector output is 3 per cent lower than in the baseline scenario (assuming the CCCTB impact begins in 2018, although this is highly unlikely given that the proposals are not yet finalised). Along with the direct negative effect on traded sector output, there is also a negative spill-over effect on output in the non-traded sector, although this is considerably more modest at -0.7 per cent. Combined, these effects reduce overall potential output for the economy by 2 per cent relative to baseline estimates.

FIGURE 2.5   CCCTB EFFECT ON POTENTIAL OUTPUT
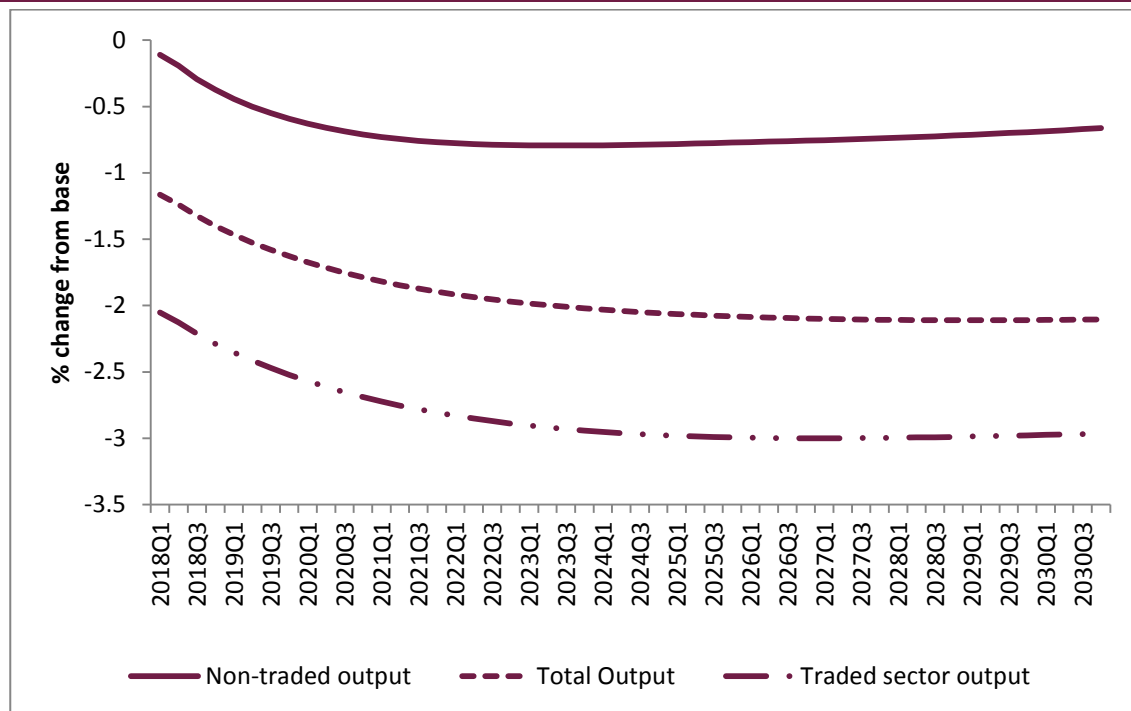
Source: Author's own calculations.

We also present the effects of the negative investment and revenue shock on the labour market. In line with the reduction in investment, employment falls quite sharply although the magnitude of the effect is relatively small, reaching a trough of -0.6 per cent after three years. Thereafter, the employment picture begins to improve and returns to the same level as in the baseline scenario by the end of the simulation period. This appears to be linked to a pro-competitive effect of a reduction in wages in the wake of the investment shock and accompanying output fall. The wage effect is however very small and occurs more gradually than the employment effect, stabilising after approximately eight years at a level 0.8 per cent down on the baseline scenario.

FIGURE 2.6   CCCTB EFFECT ON EMPLOYMENT AND WAGES
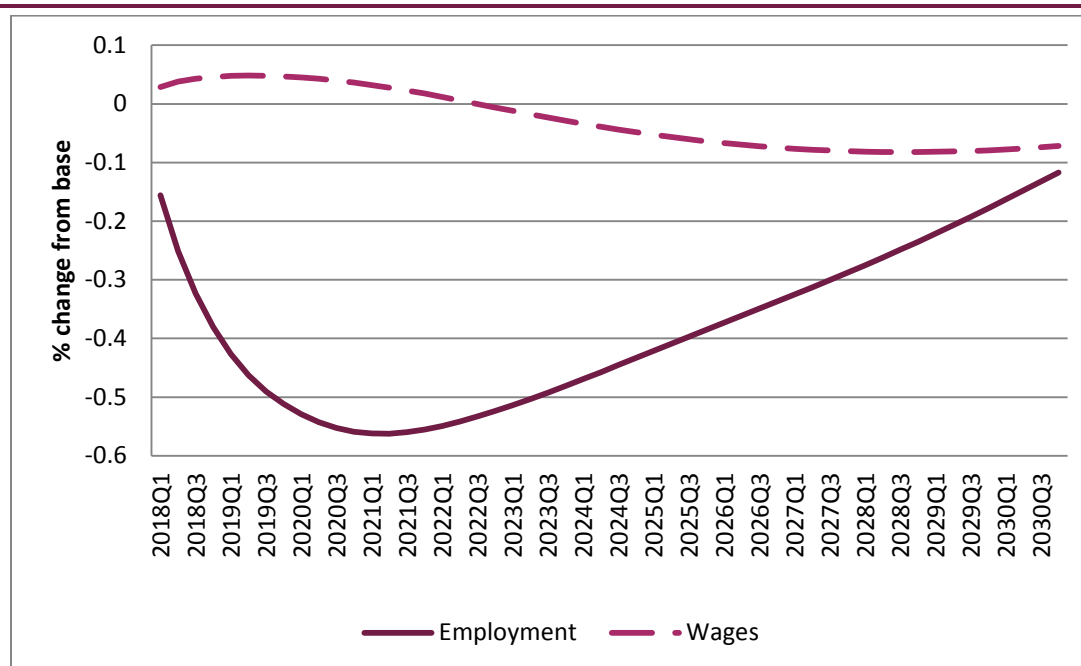
Source: Author's own calculations.

2.6   Summary and Conclusion

The location of foreign multinationals in Ireland plays a considerable role in the country's overall economic output, and most particularly in its export performance. It is therefore important to incorporate potential changes in the attractiveness of Ireland to FDI, both positive and negative, in scenarios of the future path of the economy and to use these to inform policy initiatives to maximise the benefits of any positive changes and minimise those of negative shocks.

This chapter looks at two different potential shocks that could impact the flow of FDI to the Irish economy going forward. The first is the diversion of FDI from the UK following its exit from the EU, where it is assumed that the UK would be outside the EEA and EFTA. Assuming that a considerable proportion of multinational activity in the UK values access to the EU market, some of this may move to maintain such access, presenting an opportunity for Ireland to obtain a share of this diverted activity. Our simulations show that the positive effect of the increased investment flow this brings to Ireland is significantly dependent on the broader path of global demand. A negative Brexit effect on global demand may mitigate the size of the increase in Irish output generated from the higher FDI inflow although the direction of the effect remains positive.

The second potential shock to FDI we analyse is a negative effect in the light of a change in the tax regime from the implementation of the proposed CCCTB across

Europe. This initiative to simplify and harmonise corporation taxes may reduce some administrative burden on firms. However, if the corporate income on which taxes are levied is shared amongst countries for firms operating in multiple locations, then the risk for a small country such as Ireland is that the tax base here is reduced. This has an obvious direct effect on revenue but also an effect of reducing the attractiveness of our low corporation tax rate as it would apply to a smaller share of a multinational enterprise's income. The combination of these effects is estimated to result in a 1.5 per cent lower potential output relative to the baseline scenario.

Chapter 3: Demographic Change, Long-Run Housing Demand and the Related Challenges for the Irish Banking Sector

David Duffy, Daniel Foley, Niall McInerney and Kieran McQuinn

3.1 Introduction

In this chapter we examine two related issues in the Irish mortgage market; first we specify and estimate a new model of long-run housing demand which focuses particularly on the role played by demographics and rates of household formation. This model is then used to project future levels of housing activity. Second, we examine the financing requirements for the Irish banking system which will arise as a result of these projections. While much commentary in the Irish housing market has centred on the relatively slow supply response post-2013, hardly any attention has focussed on the challenges confronting the Irish financial sector in funding the anticipated changes in the Irish housing stock.

The housing demand model we posit is relatively unique in that it examines the relationship between actual activity in the housing market and the structural demand for housing. The model builds on existing research on household formation rates and tenure choice (see Byrne et al., 2014). Note household formation in the Byrne et al. (2014) model is determined in part by the cost of accommodation. It is therefore a measure of *realised* demand. Thus, the present model is ideally placed to examine the implications for the housing market of changes in Irish population levels which might arise over the medium-term. Over the period 1982 to the present, we find a close relationship between actual housing activity and structural demand. Therefore, by forecasting both demographic changes and household formation rates, we can quantify the likely future level of housing activity.

As a next step, we input the projections of housing activity in to the banking sector model in COSMO to derive the associated levels of credit which would be required to meet the increased future level of activity. Importantly, the banking model generates estimates of both mortgage credit required to purchase the housing and construction credit required to build it. Therefore, a comprehensive

assessment of the likely implications for banks' balance sheets of future housing trends is provided.

The Irish financial sector is still struggling to come to terms with the global financial crisis of 2007/08. The substantial increase in housing supply up to 2007, coupled with unsustainable increases in house prices, saw the emergence of a substantial property credit bubble. The significant correction which occurred in Irish house prices post-2008 had profound consequences for the domestic financial sector. One policy consequence of the difficulties experienced was the requirement that Irish institutions deleverage their balance sheets; this saw an explicit target being set across the sector for the credit to deposit level or 'funding gap'. This ratio which stood at approximately 170 per cent in 2010 was required to reduce to 122 per cent over a period of just three years. The sharp reduction in the size of Irish institutions' balance sheets since 2010 has led to a number of studies querying whether the domestic financial sector is capable of meeting the requirements of an expanding economy.[18] In this paper we explicitly quantify the future credit levels necessary to meet key housing market requirements.

3.2   Background

Figure 3.1 shows the historical level of structural demand and actual housing activity in Ireland over the period 1982 to 2015. It is clear from the graph that while a relationship exists between these two concepts over time, at certain intervals there have been some divergences. From the late 1990s a clear oversupply of housing relative to the underlying demand emerged; this reached a peak in 2006 when over 90,000 housing units were constructed, whereas underlying demand in the economy at that stage would suggest that 50,000 units was a more sustainable level. Following the crisis period, housing activity dropped somewhat below the structural demand. More recently, as the demand for housing has exceeded the supply, an increasing amount of attention has focussed on stimulating the level of housing supply in the Irish economy. Reflecting the present imbalance between supply and demand, house prices and rental rates have experienced persistent increases since 2013.

---

[18]   See Lawless et al. (2015) and Lawless et al. (2014) for example.

FIGURE 3.1   STRUCTURAL DEMAND AND ACTUAL HOUSING ACTIVITY IRELAND 1982-2015
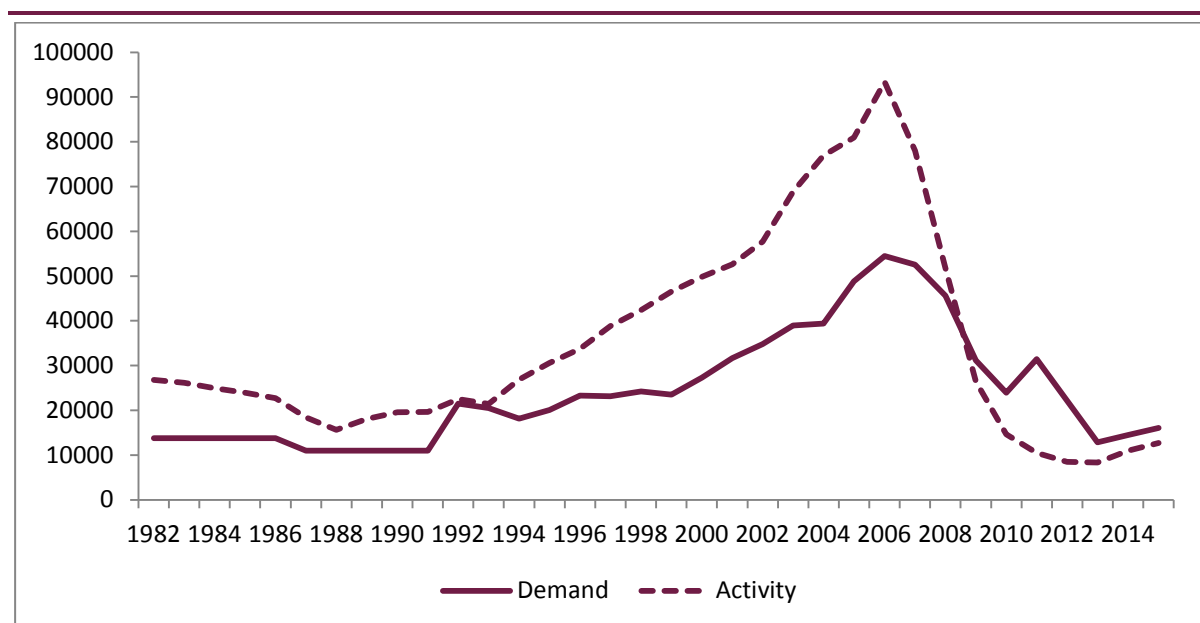
*Source:*   Own calculations and Department of Housing

Explicitly linking housing demand to population trends is particularly important given the demographic pressures which Ireland is likely to face over the next ten years. It also enables an evaluation of the sustainability or otherwise of housing activity levels; an assessment which is particularly critical in an Irish context given the impact that the oversupply of housing and the related financial stability imbalances have had on the real economy in the past.

The funding profile of the Irish financial sector has witnessed substantial change over the past 20 years. Figure 3.2 shows the historic level of total credit in the economy against the level of total deposits. Up to the early 2000s lending in the Irish economy was closely correlated with deposit levels; in many respects this close link acted as a constraint on the total level of credit in the domestic economy. However, as noted in McCarthy and McQuinn (2016) amongst others, post-2003, Irish financial institutions were able to access international wholesale markets. The perceived ability of European credit institutions to better control certain risks, through more use of derivatives and repurchase (repo) agreements, enabled greater cross-country borrowing amongst financial institutions. Ultimately, the presence of a deeper and more integrated bond market following the introduction of the Euro facilitated the greater use of more market-based capital structures and thereby enhancing the funding choices of European financial institutions.

From an Irish perspective this resulted in a substantial break in the relationship between traditional deposits and credit extension as can be seen in Figure 3.2. As

the Irish property market looks set for a period of significant expansion, the pertinent question from a banking perspective is; what are the lending and funding implications which will arise. If a significant expansion of credit is required, how will this be funded and what can be done to ensure that significant increases in lending do not lead to financial stability concerns for the Irish financial sector and economy overall?

FIGURE 3.2   TOTAL CREDIT AND TOTAL DEPOSITS 1982-2015
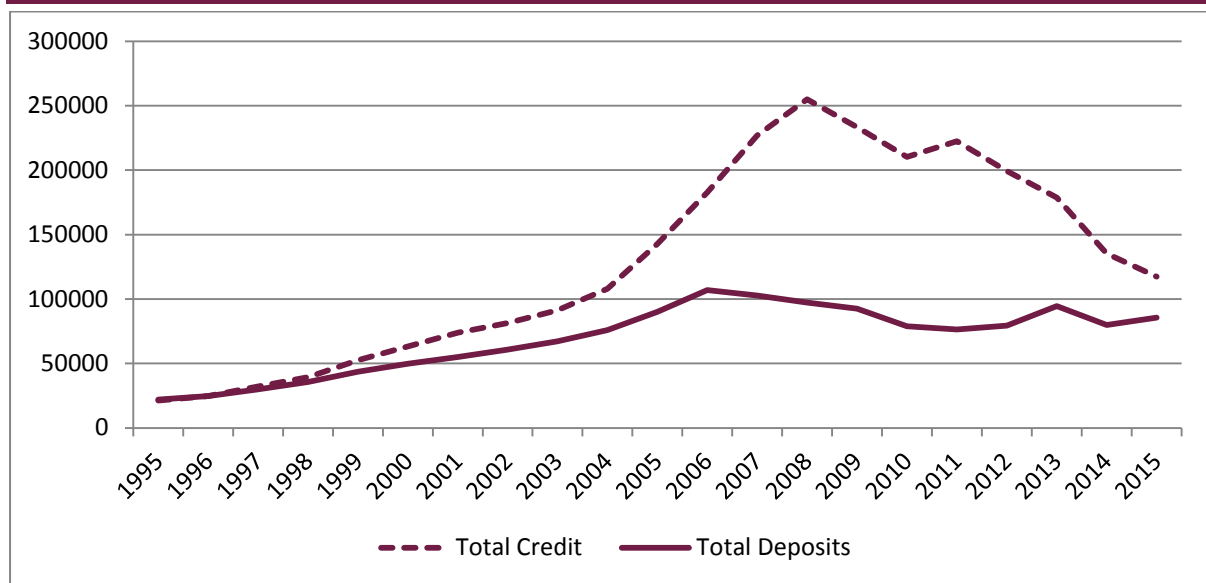
Source: Central Bank of Ireland.
Note: Estimated over the period 1982-2015.

Population movements are set to be highly influential in an Irish context over the medium term. Figure 3.3 shows annual net migration in Ireland from 1987 to 2016. In the run-up to 2007 an increasing flow of migrants into the country was observed reaching a peak of 104,800 in 2007. Following the economic downturn, inward migration declined precipitously and Ireland had negative net migration until 2015. In 2016 net migration became positive for the first time since 2009. Given the recent strong performance of the Irish economy as well as potential tighter migration control in the UK following Brexit, inward migration could be quite substantial into the Irish economy. This will have clear implications for the housing market as migrants typically have a higher elasticity of demand for housing than other members of the population. Thus, it is important to have a model of long-run housing demand which explicitly incorporates demographic and household formation trends.

FIGURE 3.3   ANNUAL NET MIGRATION IRELAND (000S) 1987-2016
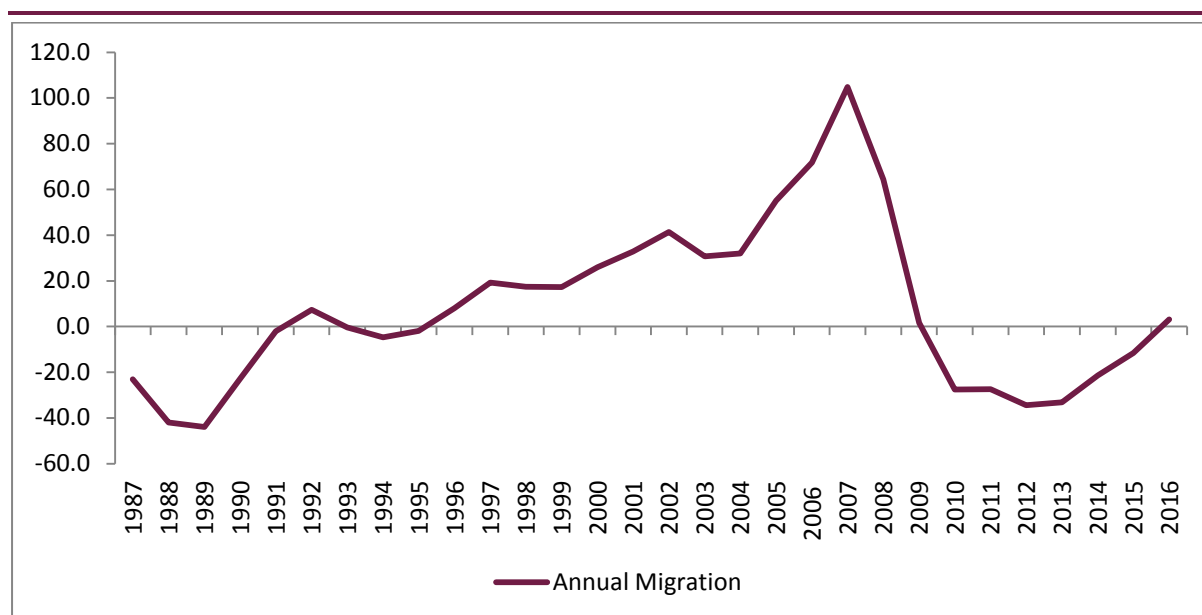
Source: Authors' own calculations.

The rest of this Chapter is structured as follows: In the next section, Section 3.3, we provide an overview of the relevant literature and the theoretical concepts underpinning our methodology. We also discuss, in Section 3.4, our model and the results in both the long and short run. We follow this in Section 3.5 with our forecasts for the structural demand and supply of housing over the medium term based on our demographic scenarios. In the following section, Section 3.6, we look at the implications of our results for the financial sector. In particular, we project the level of mortgage and construction credit that is consistent with the housing supply generated by our model. We then conclude with a discussion of some of the policy implications motivated by our results.

3.3   Housing Supply Theory and Literature

Despite the significance of the supply side of the housing market, the majority of the housing literature tends to focus on modelling the demand side of the market. What empirical approaches do exist for the supply-side primarily rely on a set of variables believed to determine the fundamental level of supply over the long run. In an Irish context Addison-Smyth et al. (2009) use an existing demand-side model of the housing sector to gauge what the structural level of demand is for Irish housing; they estimate the implicit supply function and use this to examine what the likely implications are for housing supply of alternative paths of two of the most significant determinants of housing demand; income and interest rates. On the basis of this model, Addison-Smyth et al. (2009) conclude that, by 2007, the level of structural demand for housing units in the Irish economy was some way below the actual supply levels.

In examining the evolution of real home prices in the United States, Klyuev (2008) estimates both the long and short run relationship of house prices to demand and supply fundamentals. The model is used to quantify the level of overvaluation in house prices. On the demand side, Klyuev (2008) includes variables such as real disposable income per capita, the real interest rate and the unemployment rate. On the supply side, average household size and construction costs are included. Theoretically, increased construction costs should decrease supply as it can become prohibitively expensive for developers to build if costs get too high. Overall, Klyuev (2008) concludes that there was significant overvaluation in home prices across the United States in the lead up to 2008 based on fundamentals and that prices had risen to unsustainable levels.

Other studies in this area have included similar variables based on the same theoretical observations. Such studies include Arestis and González-Martínez, (2015) who model housing markets in the OECD using variables such as real disposable income, the mortgage rate, unemployment and population. In addition, they also include a variable measuring the ratio of taxation to property/house prices. Recent research[19] discusses the role that taxation has played in influencing housing supply across countries and its effectiveness as a policy tool.

Another study which makes use of an alternative but widely used theoretical framework is Grimes and Hyland (2013). They model housing dynamics in New Zealand and assess the effects of exogenous shocks to the system. In particular, they look at the effects of population and credit shocks to the long run supply of housing. They model the supply equation based on a Tobin's Q approach to investment. This model implies that

> *new housing construction responds positively to a deviation between house prices and the full cost of producing a new house, where the cost includes both construction and land costs.* (Grimes and Hyland 2013).

In particular, it is the ratio of the value of an asset to its replacement value or cost of the asset. The theory states that new housing stock will be supplied only if it is profitable for builders to do so. Thus, one would expect new construction to respond positively to increased house prices and negatively to increased construction costs. Similarly, any constraints on credit would also limit the availability of new supply as it becomes more difficult for developers to secure lending.

---

[19] See Morley et al. (2015) for example.

The Grimes and Hyland (2013) model is relevant in the present case as it examines the effects of both a shock to migration and a shock to credit on activity in the housing market. For the former, they apply an exogenous shock in the form of an increase in migration. As the ratio of population to housing stock rises there is upward pressure on house prices. Since the supply of housing will be inelastic in the short run, increasing demand fuels house price increases.

> *The sustained increase in house prices becomes embedded in expectations of further capital gains in housing which contributes to a reduction in the (perceived) user cost of capital.* (Grimes and Hyland 2013).

This increase in house prices drives up Tobin's Q causing housing investment to increase and therefore housing supply to increase. This result could have important ramifications for the housing supply issue in Ireland given the increase in migration inflows that are expected to occur over the next number of years. With respect to a credit shock, Grimes and Hyland (2013) find that credit restrictions reduce new housing investment and places limitations on housing stock. The end result is that there is a supply shortfall for up to five years with upward pressure placed on house prices.

It is evident from Figure 3.1 above that while there is a close relationship through time between housing market activity and structural demand, there are periods when a significant divergence appears, in particular over the period 2000 to 2007. Therefore, similar to both Grimes and Hyland (2013) and Arestis and González-Martínez (2015), we allow for changes in credit provision in our own model of long-run housing demand. In that regard, we closely follow the approach of Duca et al. (2011) and Kelly and McQuinn (2014) who incorporate a measure of credit conditions into models of house prices. We assume that significant changes in credit standards in the Irish market are the main reasons for substantial deviations between actual activity and the structural demand for housing.

3.4   Models and Results

In modelling the long-run demand for housing[20] we undertake a number of steps; we first present the initial long-run model of housing demand, we then augment the model to allow for variations in credit standards and finally we present the equivalent short-run model.

---

[20]   Because of the focus on household formation rates, the long-run model is principally concerned with owner-occupier homes and does not, for example, examine the role played by second (holiday) homes.

To investigate the long run relationship between the level of housing demand and household formation we specify the following:

$$f_t = a_0 + a_1 hh_t - a_2 s_t + \epsilon_t \tag{1}$$

where f_t is actual housing activity, hh_t is the household formation level (based on updated demographic estimates from Duffy et al., 2014) and s_t is the stock of housing[21] – lower case denotes that all variables are in logs. We expect a negative coefficient on the stock of housing variable denoting the fact that, *ceteris paribas*, long-run demand will decline given an increase in the stock. We expect the coefficient on hh_t to be positive reflecting the fact that higher levels of household formation rates will lead to increasing demand for housing which in turn increases the level of activity.

The results from our long run model (Table 3.1) are as we expect with household formation having a positive and significant coefficient, suggesting an increase in household formation in the long run will have a positive impact on housing activity. We also find that the stock of housing has a significantly negative relationship with housing activity in the long run.

TABLE 3.1   LONG-RUN MODEL OF HOUSING DEMAND

Variable	Coeff	Std Error	T-Stat	Significance
Constant	27.257	3.140	8.680	0.000
hh_t	1.651	0.129	12.745	0.000
s_t	-2.382	0.272	-8.745	0.000
N				34
R2				0.829
F − Test				0.000

Source: Author's own calculations.
Note: Estimated over the period 1982-2015.

The fitted value from Equation (1) is now used to generate the long-run demand for housing i.e. the level of activity compatible with structural demand in the market. The results can be observed in Figure 3.4.

---

[21]   This is derived on a perpetual inventory basis: $s_t = s_{t-1}(1 - \Theta) + f_{t-1}$, where Θ is the rate of depreciation.

FIGURE 3.4   ACTUAL VS FUNDAMENTAL HOUSING ACTIVITY – IRELAND 1990-2015
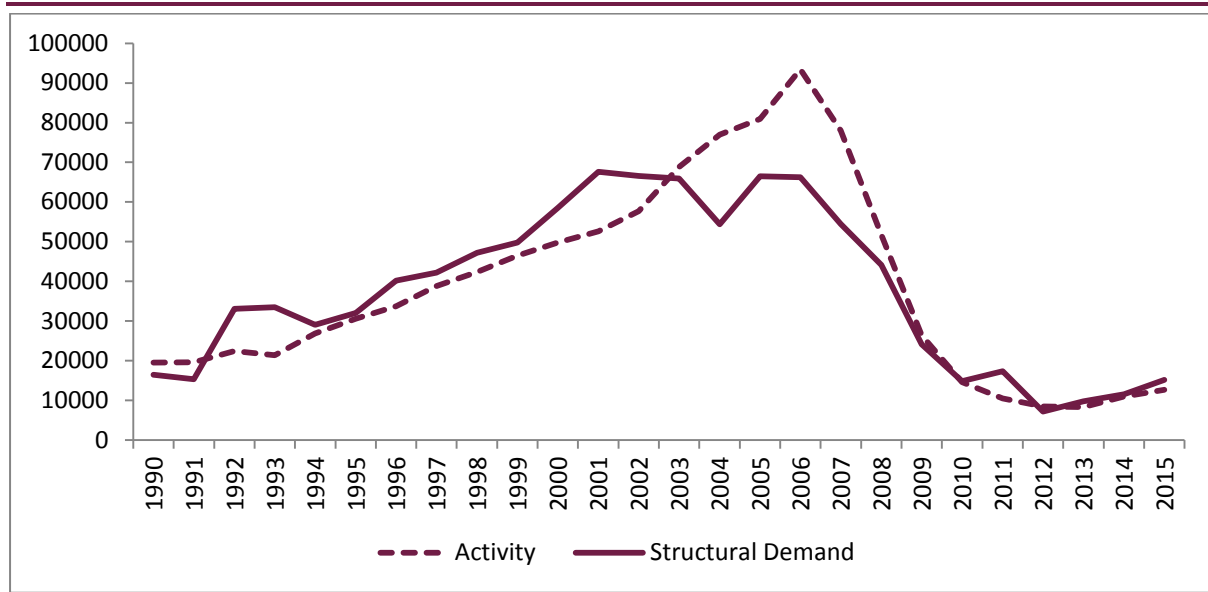
Source: Department of Housing and Author's own calculations..

From the figure, it is clear that the level of structural demand is closely correlated with actual housing activity apart from the period 2004-2007. This period, of course, is synonymous with the significant expansion in mortgage credit in the Irish market. A number of studies, such as Addison-Smyth et al. (2009), have examined the implications of this increase in credit up to 2007 on the Irish property market. In particular, Addison-Smyth et al. (2009) highlight the impact the increase in credit had on the divergence observed between actual and structural demand in the Irish market.

Therefore, we next extend the model (1) to incorporate changes in credit provision on housing activity. To do this we must decompose variation in the observed credit levels into changes due to varying lending conditions and changes attributable to demand-side pressures. The credit series we use is credit for real estate, land and development activities and is published by the Central Bank of Ireland. In particular, we follow Duca et al. (2011) and Kelly and McQuinn (2014) by isolating supply-side movements in credit using the following equation:

$$cred_t = \gamma_0 + \gamma_1 cred_{t-1} + \gamma_2 hpcred_t + \gamma_3 ypop_t + \omega_t \tag{2}$$

We regress the credit variable on its lagged value, its filtered value ($hpcred_t$) and the proportion of population between the ages of 25 and 39. The filtered value is used for example to control for trends in the credit series. Doing so allows us to capture any demand-side factors which affect the level of credit in the economy. We then extract the residuals from (2) which contain only supply-side factors

which shift the credit variable. The results are presented in Table 3.2. Using the residuals from this regression, which can be construed as the changes in the credit level due to supply-side effects, we then amend the original long-run regression to incorporate financial market dimension ($adjcred_t$) as in Equation (3).

$$f_t = a_0 + a_1 hh_t - a_2 s_t + a_3 adjcred_t + \epsilon_t \tag{3}$$

TABLE 3.2   ADJUSTED CREDIT MODEL

Variable	Coeff	Std Error	T-Stat	Significance
$Constant$	15.760	2.963	5.318	0.000
$cred_{t-1}$	0.831	0.069	11.921	0.000
$fcred_t$	-0.183	0.085	-2.151	0.039
$ypop_t$	2.248	0.429	5.234	0.000
N				33
$R2$				0.991
$F-Test$				0.000

Source: Author's own calculations.
Note: Estimated over the period 1982-2015.

Table 3.3 contains the results from the long-run regression with the adjusted credit variable. We again find that our results are consistent with *a priori* expectations with a statistically significant and positive relationship between the level of credit in the economy and the level of housing activity. The coefficient on the adjusted credit variable suggests that *ceteris paribus*, in the long run a 1 per cent increase in the level of credit in the economy increases housing activity by 1.32 per cent.

TABLE 3.3   LONG-RUN AUGMENTED DEMAND MODEL

Variable	Coeff	Std Error	T-Stat	Significance
$Constant$	40.319	4.122	9.781	0.000
hh_t	1.119	0.168	6.627	0.000
$adj\ cred_t$	1.322	0.326	4.049	0.000
s_t	-3.081	0.281	-10.937	0.000
N				34
$R2$				0.999
$F-Test$				0.000

Source: Author's own calculations.
Note: Estimated over the period 1982-2015.

Similarly, a 1 per cent increase in the level of household formation in the economy will increase structural demand by 1.19 per cent. For robustness we also perform Fully Modified OLS and Dynamic OLS (Appendix).[22] The results are very similar across the different methods suggesting that our results are not significantly biased.

We now examine the short run dynamics of the variables. Unit root tests suggest all variables are Integrated of Order 1 (Results in Appendix). To fully account for all dynamics we test for co-integration using the method of Engle and Granger. This involves estimating the long run equation and testing whether the lagged residuals are stationary. If the residuals do not contain a unit root then the variables have a long-run relationship which is stationary and are therefore co-integrated. We estimate the following short-run error correction version of (3):

$$\Delta f_t = B_0(f_{t-1} - a_0 - a_1 hh_{t-1} - a_2 s_{t-1} - a_3 adjcred_{t-1}) +$$

$$B_1 \Delta f_{t-1} + B_2 \Delta adjcred_t + B_3 \Delta p_t + B_4 \Delta R_t + \psi_t \quad\quad (4)$$

Where $f_{t-1} - a_0 - a_1 hh_{t-1} - a_2 s_{t-1} - a_3 adjcred_{t-1}$ is the error correction term (ϵ_{t-1}). The coefficient on the error correction term (B_0) gives us the direction and magnitude of the adjustment towards equilibrium following a shock. The equation also includes stationary variables such as the growth in the interest rate (ΔR_t), the growth in house prices (Δp_t), changes in credit provision ($\Delta adjcred_t$) to model the dynamics of adjustment and also the dependent variable (Δf_{t-1}). We expect the error correction term to have a negative coefficient reflecting the convergence between actual housing supply and the equilibrating value.

We can see from Table 3.4 that all variables are significant and have the correct signs suggesting they are all important factors affecting supply in the short run. We are particularly interested in the coefficient on the ϵ_{t-1} variable. Although only significant at the 10 per cent level, the sign is negative indicating that activity attempts to converge towards its equilibrium each quarter. In particular, the magnitude suggests that activity adjusts by approximately 17 per cent per year towards equilibrium, meaning *ceteris paribus*, it takes over five and a half years for activity to adjust to a level which equates with demand.

---

[22]   These estimators provide robust estimates for inference purposes in the presence of potential endogeneity. Examples of these applications in an Irish context can be observed in Fitzpatrick and McQuinn (2007).

TABLE 3.4   SHORT RUN ERROR CORRECTION MODEL

Variable	Coeff	Std Error	T-Stat	Significance
ϵ_{t-1}	-0.176	0.093	-1.887	0.070
Δf_{t-1}	0.622	0.115	5.374	0.000
$\Delta adjcred_t$	-7.360	0.362	-2.030	0.052
Δp_t	1.085	0.276	3.932	0.000
ΔR_t	-0.020	0.007	-2.885	0.007
N				31.000
$R2$				0.773

Source: Author's own calculations.
Note: Estimated over the period 1982-2015.

3.5   Forecasts of Structural Demand and Activity

To assess the likely level of structural demand for housing in the future we use updated household formation rates based on Duffy et al. (2014).[23] We forecast household formation rates based the demographic forecasts contained in Bergin et al., (2016). Figure 3.5 plots the forecasted household formation rates associated with these future population trends. The figure shows that household formation rates rise to approximately 32,000 by 2024 from a present level of approximately 16,000.

FIGURE 3.5   HOUSEHOLD FORMATION FORECASTS
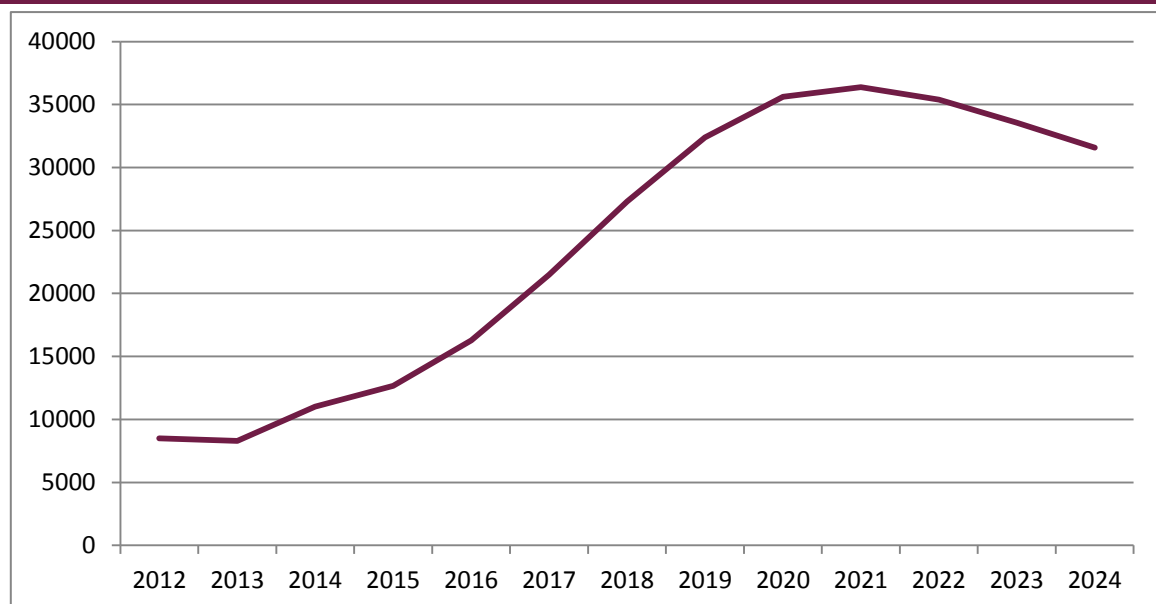
Source: Author's own calculations.

---

[23]   Duffy et al. (2014) use a probit model to estimate household formation pooled over 2001-2011, by age group. They separate the sample by age group to better identify behaviours specific to each age group. In the formation equation, the main focus is the relationship between affordability and the probability of household formation.

We next calculate forecasts for the level of housing activity based on our earlier models. This exercise allows us to quantify the disparity between the level of housing demanded and the level of housing supplied over the next eight years.

FIGURE 3.6   ACTIVITY VS STRUCTURAL DEMAND
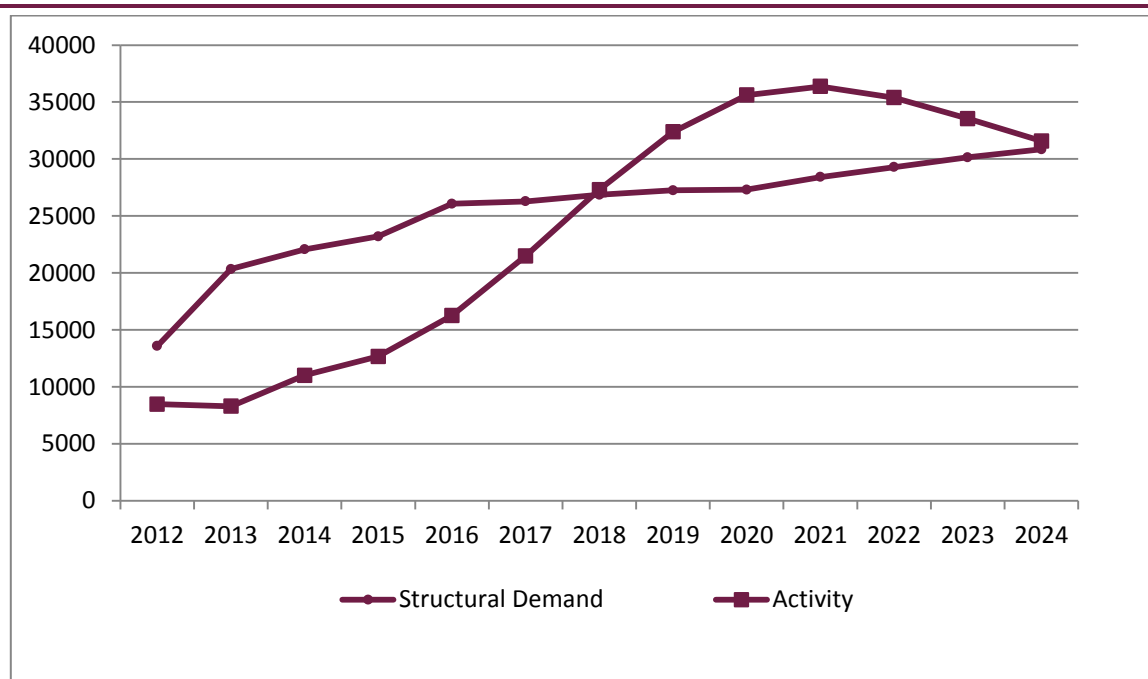
Source: Author's own calculations.

In 2015 housing activity was quite low historically with around 12,600 units being built. If we look at demand, we can see that the underlying requirement for housing in the economy is approximately 23,000 units. We can see that under this scenario the market reaches an equilibrium of about 27,000 units in 2018. From 2018 onwards our projections suggest that demand is likely to increase at a steady rate before reaching just over 30,000 units per annum by 2024.

3.6   Housing Supply and the Irish Financial Sector

Figure 3.7 below outlines the interaction between the housing supply model in the previous section and COSMO. We focus now on how the financial sector responds to the projected housing stock requirements. In the first stage, the required housing stock from the housing supply model is mapped into the level of residential investment that would be needed in each quarter to build these extra units. This would have implications for house price dynamics but in this scenario we treat house prices as exogenous and take the projected path of house prices from the model outlined in McQuinn (2014).

The model next projects the level of mortgage and construction credit that is consistent with the given level of residential investment and house prices. In COSMO, the key variable on the demand side is the demand for new mortgage lending, which takes the increase in house prices as an increase in collateral values which allows households access to higher levels of credit. Other variables in the mortgage demand equation that will subsequently change during the simulation are personal disposable income and the real mortgage rate. It is assumed that the borrower-based macro-prudential instruments, the loan-to-income and loan-to-value ratios, are unchanged in the simulation.

On the housing supply side, the higher level of required residential investment generates a demand for a greater volume of construction credit from banks. In this case, house prices act as a proxy for the collateral value of the property against which the loan is secured so that higher house prices allow construction firms to obtain a higher volume of credit.

FIGURE 3.7   THE FINANCIAL SECTOR IMPACT OF REQUIRED HOUSING SUPPLY IN COSMO
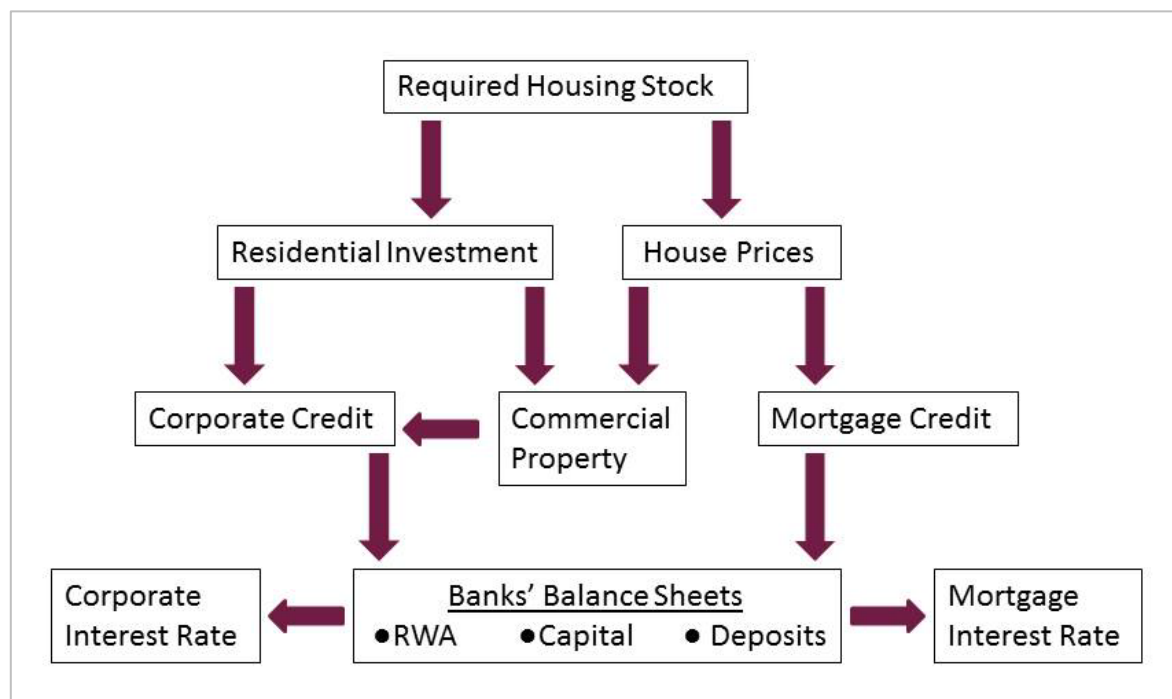
A secondary channel that is noted in Figure 3.7 is the impact of the change in house prices and residential investment on commercial property capital values. In COSMO, it assumed that the construction of residential and commercial buildings is undertaken by the same firms. Therefore, an increase in house prices generates a supply response from construction firms as residential investment rises as a result. However, as resources are diverted towards residential investment and

away from investment in commercial construction this generates an increase in commercial property capital values. The latter increases the collateral value of existing owners of commercial property allowing these owners to obtain higher levels of credit. The rise in the value of commercial property further generates an increase in real estate lending.

Figure 3.7 also illustrates the implications of this process for the balance sheet of the banking sector. First, the increase in corporate and mortgage lending increases the size of the aggregate balance sheet so that risk-weighted assets will also increase. The proportionate increase in the latter depends on how much mortgage credit responds relative to consumer credit, which carries a higher risk-weight. Focusing on micro-prudential capital requirements and abstracting from the counter-cyclical capital and the capital conservation buffers,[24] the level of capital in the banking sector must increase so that it does not fall below the regulatory minimum. Moreover, COSMO assumes that banks will actually increase the size of their capital buffers given their higher exposure to real estate, which is viewed as more volatile and is therefore associated with a higher level of risk.

A central question that we pose in this chapter is what are the funding requirements facing banks if they are to provide this level of credit? Given the liquidity problems which Irish banks faced during the financial crisis due to a heavy reliance on short-term money market funding, a funding base that is more deposit-based is a desirable feature of the Irish banking sector. A gradual lowering of loan-to-deposit ratios was, as noted earlier, introduced as part of CBI (2011) and a greater reliance on stable funding such as deposits is an important part of the Basel III accord. In COSMO, deposits are assumed to grow with GDP so that lending in excess of this growth rate must be funded from non-deposit sources.

Finally, the dynamics of the banking sector's balance sheet have implications for setting interest rates. Capital ratios and loan-to-deposit ratios are important drivers of how banks set interest rates. In particular, the main channel through which capital is assumed to be raised is retained earnings. Therefore, higher capital ratios mean that banks have to increase interest rates relative to wholesale and deposit funding rates in order to generate the required increase in retained earnings. The parameters of the model suggest that banks are more

---

[24] The Basel III framework introduces both a capital conservation and a counter-cyclical capital buffer. The aim of the capital conservation buffer to allow banks to absorb losses during periods of macroeconomic and financial stress. The counter-cyclical capital buffer address the procyclicality of credit growth and thus the build-up of systemic risk. Banks are required to raise capital buffers by up to 2.5 percentage points of risk-weighted assets depending on the deviation of the credit-to-GDP ratio from its underlying trend, as well as on the judgement of the macro-prudential authority.

likely to raise mortgage interest rates by more than corporate interest rates to achieve this.

3.7 Simulating the Impact of Required Housing Supply

In the previous section, we discussed the theoretical impact on the financial sector of a higher level of housing supply. We now use COSMO to quantify this impact.

We first map the required level of new housing units on to the level of the housing stock and real residential investment. Real house prices are taken from the housing model in McQuinn (2014).

Figure 3.8 shows the projected evolution of annual housing investment and the housing stock under this scenario up to the end 2024.

FIGURE 3.8   REQUIRED HOUSING INVESTMENT AND HOUSING STOCK
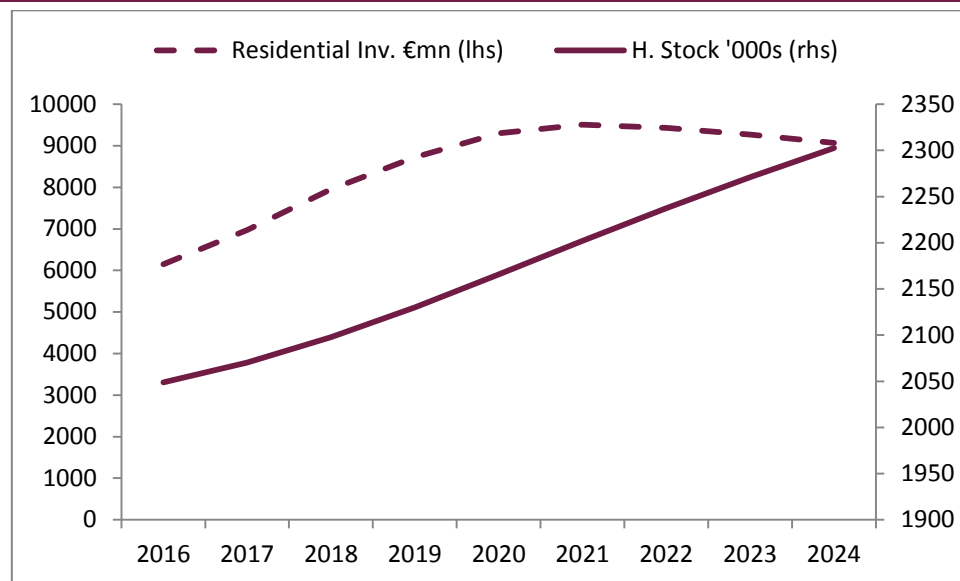
Source: Authors' own calculations.

As mentioned, the evolution of the net housing stock follows the required number of completions from the model of required housing supply discussed in the first half of the chapter. In level terms, the (net) housing stock would need to increase by approximately 250,000 units up until 2024. Figure 3.8 also illustrates the level of real residential investment that would be required to generate this number of completions. The model suggests that investment of approximately €6 billion (measured in 2013 Euro) would be needed in 2016, rising to over €9 billion over the first half of the next decade. To put these values in a historical context, the latter figure is approximately the level of real residential investment

observed over the 2000-2001 period. By contrast the peak of housing boom was in 2006 when the level of real residential investment was almost €15 billion in 2013 Euro.

As discussed above, the commercial property market is of significant importance to the broader corporate sector due to its role as collateral. In particular, lower levels of commercial property capital values tend to be associated with higher rates of corporate insolvency (Whitely and Windram, 2003). In COSMO, GDP is used to proxy for the demand for commercial property while the private sector capital stock is used to proxy the supply. House prices are used to proxy demand for resources from the commercial property sector, or alternatively the opportunity cost of investing in commercial property relative to other investments (Whitely and Windram, 2003). Similar to the inverted demand for housing equation, commercial property prices depend on a measure of user cost and credit availability. The former incorporates the real corporate lending rate and expectations of capital appreciation which, similar to the house price equation, are formed extrapolatively. Credit availability is also approximated by the corporate credit-to-GDP ratio.

Figure 3.9 illustrates the projected path of commercial property capital values, along with the path of house prices predicted by the model of McQuinn (2014). Both house prices and commercial property capital values are indexed to 100 at the beginning of 2016.

FIGURE 3.9   HOUSE PRICES AND COMMERCIAL PROPERTY CAPITAL VALUES
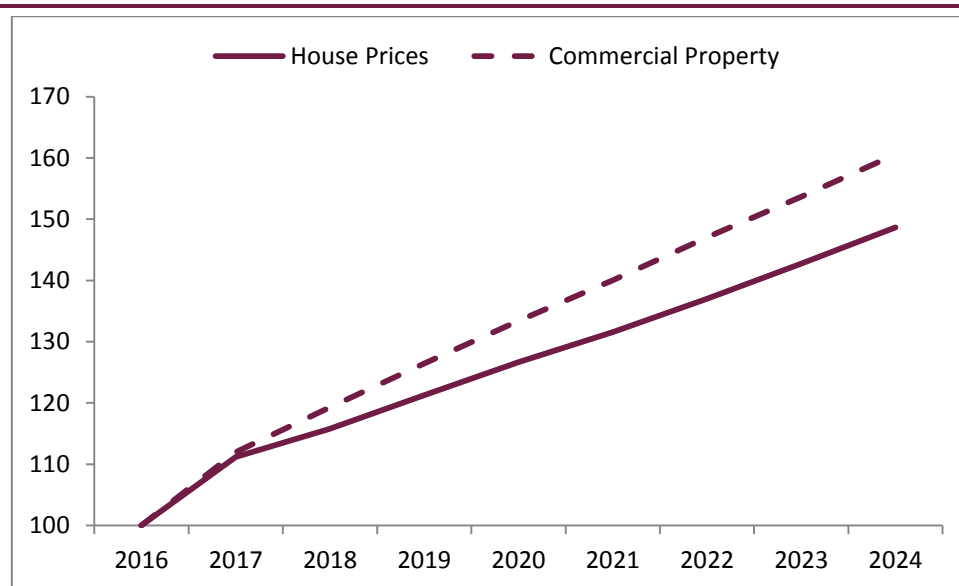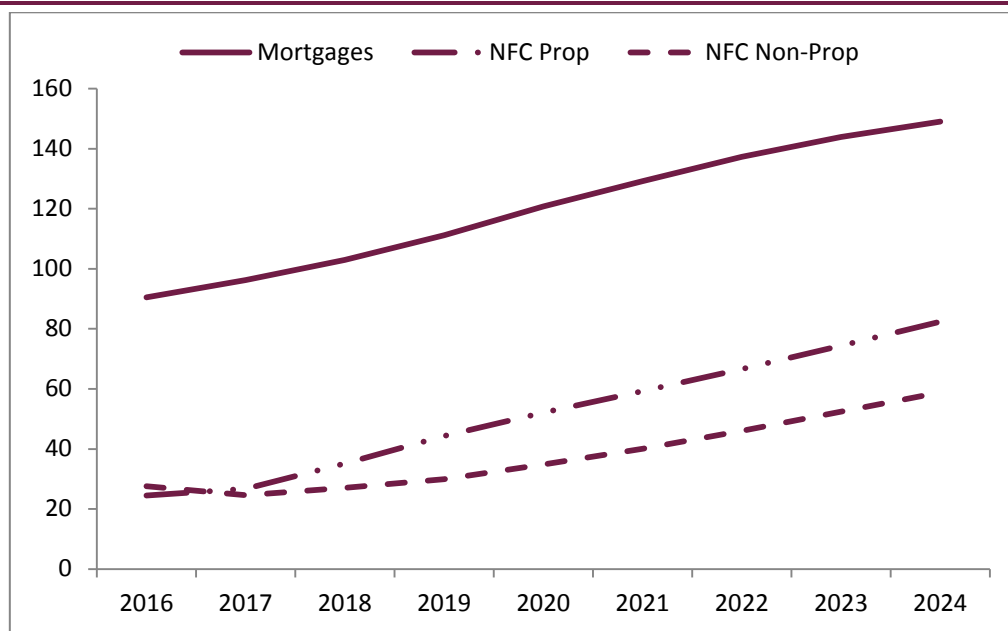

Source: Author's own calculations.

In COSMO, the short-run dynamics of commercial property are mainly determined by the changes in credit availability and house price inflation. Figure 3.9 shows that commercial property capital values are projected to track house prices up until 2018 before beginning to diverge as the long-term determinants of capital values become more important. The projected annual growth in both nominal commercial property values for 2016-2017 is approximately 7 per cent per annum in nominal terms and then just under 6 per cent until the end of this decade. This is mainly due to the rigidity of the supply of commercial property in the short run. In the medium term, commercial property price inflation moderates to just over 5 per cent as the private sector capital stock responds to demand.

In terms of house prices, the projected path sees nominal appreciation of 7 per cent over the next two years moderating to approximately 5 per cent towards the end of the next decade, and 4 per cent thereafter.

We next turn to required level of mortgage and corporate credit consistent with this level of housing supply. Figure 3.10 illustrates the projected evolution of the outstanding stock of mortgage lending, construction and real estate credit, and non-property related corporate credit.

FIGURE 3.10 PROJECTED MORTGAGE AND CORPORATE LENDING (€ BILLION)

Source: Author's own calculations.

The credit requirements implied by the level of housing supply are relatively high over the projection horizon. In terms of mortgage credit, domestic banks would

be expected to provide close to €50 billion in additional lending up to the end of 2024 when the mortgage stock is projected to reach €140 billion.[25]

In addition to mortgage credit, the provision of the required level of housing also necessitates an expansion of lending to finance this construction. In COSMO, lending to construction firms and real estate companies is aggregated into a single variable. While the demand for construction credit is mainly a result of the increase in housing demand, the demand for real estate credit is mainly a response to the concomitant increase in the value of commercial property. Figure 3.10 indicates that COSMO projects strong growth in construction and real estate credit (NFC Prop), rising by over €45 billion in current prices over the period up to 2024.

In addition to construction and mortgage credit, the projected growth in the economy necessitates funding for non-residential investment. In COSMO, non-property related corporate lending is mainly driven by derived demand from growth in the overall economy. From Figure 3.10, the stock of this type of lending grows from its current level of approximately €20 billion to €50 billion by 2024.

In terms of the aggregate balance of the banking sector, the required expansion in credit discussed above implies a similar expansion in funding liabilities. This may take the form of higher levels of retail deposits, short- and long-term debt securities, or levels of capital. In COSMO, retail deposits are assumed to grow in line with GDP while capital levels are determined by particular features of the banking sector such as its size, its exposure to the real estate sector and its profitability.[26] The remaining liabilities of the banking sector are treated as a residual.

Figure 3.11 shows the projected path for banks' retails deposits and equity, together with the implied loan-to-deposit (LTD) ratio.

---

[25] This scenario assumes that there are no changes to the borrower-based macro-prudential tools that the Central Bank of Ireland currently employs.
[26] See McInerney (2016) for details.

FIGURE 3.11 PROJECTED LEVELS OF DEPOSITS AND CAPITAL (€ BILLION), AND THE LOAN-TO-DEPOSIT RATIO
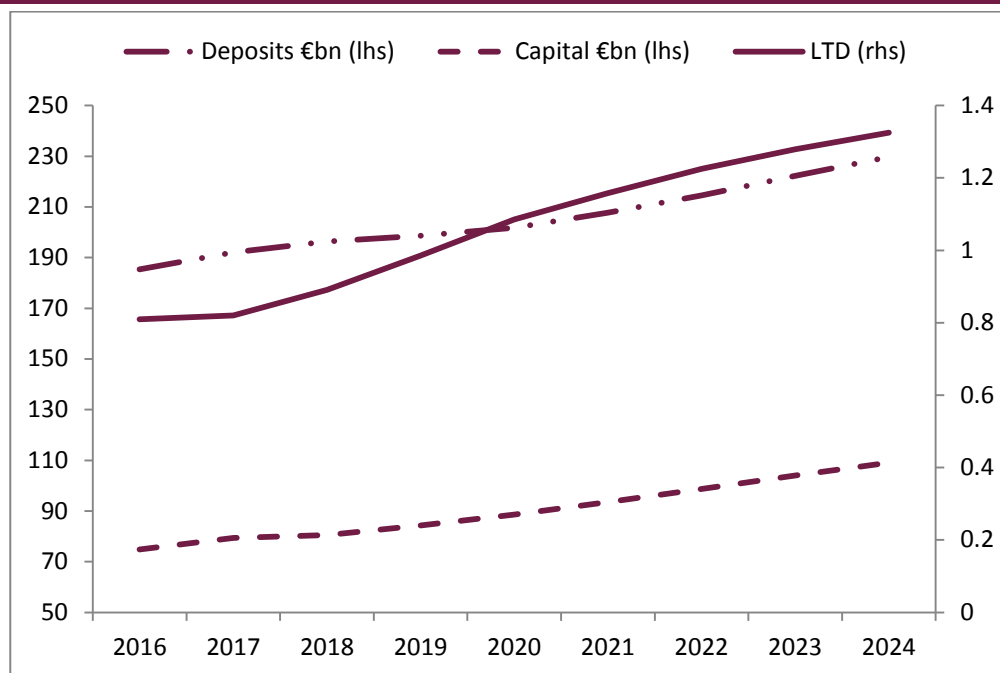
Source: Author's own calculations.

As discussed in the next section, the LTD has fallen considerably over the post-crisis period. This ratio reached a peak of 1.8 in 2008 and through deleveraging, securitisation and financial policy reached its current level of approximately 0.8.

As Figure 3.11 illustrates, the traditional source of banking sector as represented by deposits is projected to rise in line with the overall growth rate of the economy. This suggests an increase in retail deposits of approximately €55 billion between 2016 and 2024. In COSMO, capital holdings depend on a number of macroeconomic and financial factors. In the context of this discussion, they fall with the ratio of deposit to non-deposit funding and rise with the share of real estate lending in total lending. This is reflected in Figure 3.11 as the trajectory of growth in capital is slightly steeper than that of deposits.

A comparison of the growth in lending in Figure 3.10 with the growth in deposits in Figure 3.11 indicates a rising LTD ratio over time. This ratio is also plotted in Figure 3.11. It is projected that by 2024, the LTD will rise from its current value of 0.8 to approximately 1.3. This suggests a significant funding gap (between loans and deposits) will arise for Irish banks over time, which will need to be filled with alternative sources of finance.[27]

---

[27]   As we assume a relatively simple relationship between deposit and GDP growth, it could be argued that the projections for deposits represent a lower bound. Although we have considered alternative indicators such as personal disposable income and corporate profits, the results did not significantly increase the growth rate of deposits.

Before a further discussion of these funding challenges facing the banking sector in the next section, it should be noted that the higher level of residential investment explored in the scenario in this chapter implies a higher level of demand relative to the baseline. Figure 3.12 shows that the gap between actual and potential output is 0.3 percentage points higher in the near term relative to the baseline.

FIGURE 3.12   OUTPUT GAP RELATIVE TO BASELINE (PP)
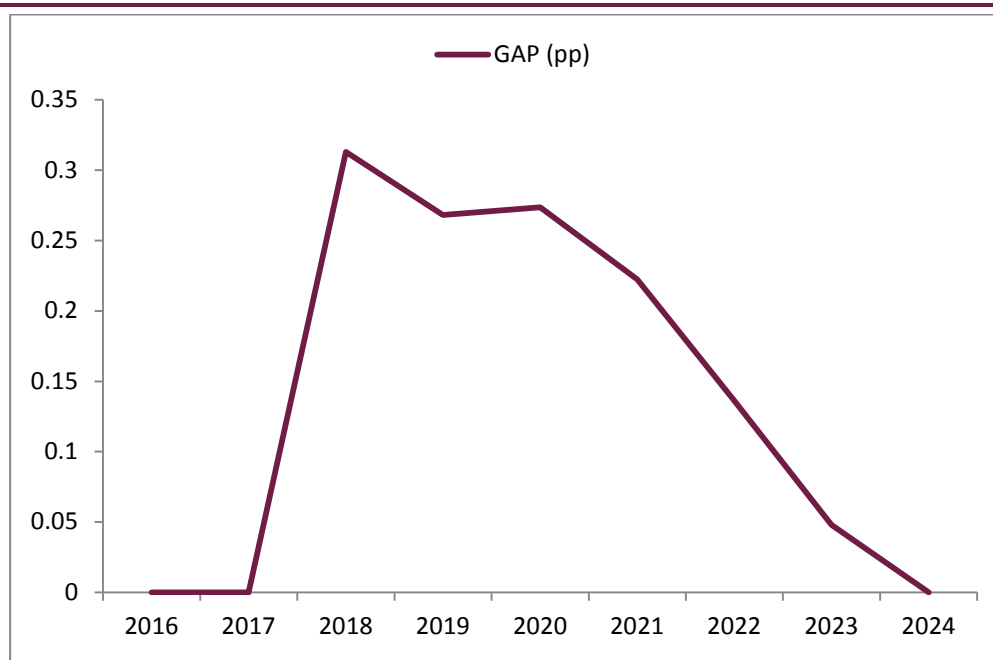
Source: Author's own calculations.

As the economy is growing at potential in the near-term and if fiscal authorities wish to prioritise housing construction, additional stimulus in the form of higher levels of residential investment could be offset by fiscal intervention in the form of higher personal or consumption taxes or reduced government spending.

3.8   Funding Challenges Confronting Irish Credit Institutions

The results of our simulations in the previous section highlight the funding challenges facing Irish banks if the required level of credit is to be provided. To place these challenges in context we can look at how Irish banks have funded balance sheet expansion in the past.

Figure 3.13 plots the evolution of the LTD ratio since the first quarter of 2003 for on-balance sheet lending (On_BS) and for both on- and off-balance sheet (On+Off_BS) lending. The figure is striking in two respects. The first is that the sharp rise in the LTD between 2003 and 2007 indicates that much of the increase

in lending was funded from non-deposit sources.[28] The second is that Irish banks have moved a significant share of their lending off-balance sheet, mainly through securitisation. This activity can mask the scale of lending which is not funded from retail deposits.

FIGURE 3.13 LOAN-TO-DEPOSIT RATIO OF IRISH BANKS
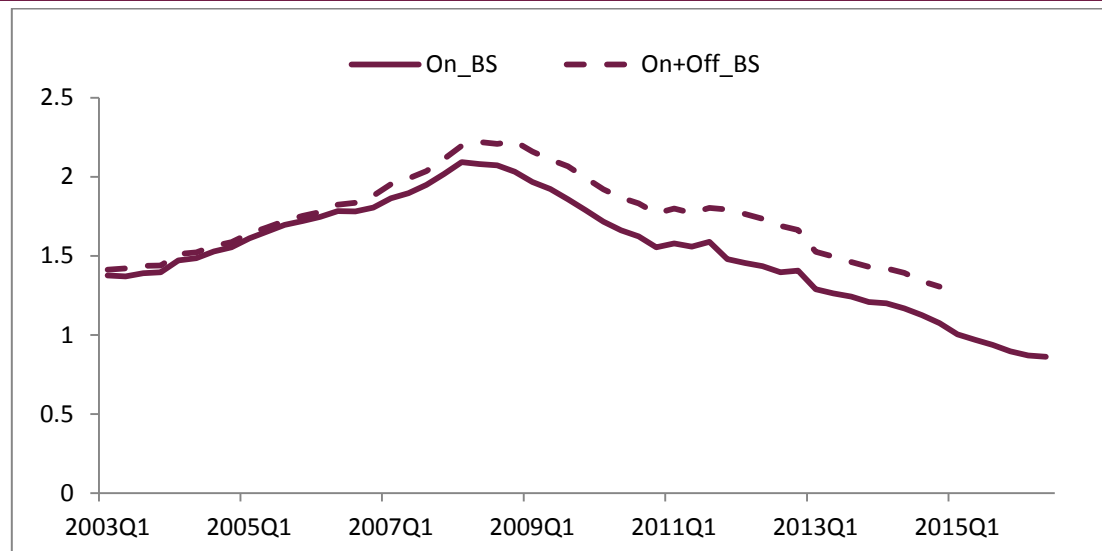
Source: Central Bank of Ireland.
Notes: On_BS refers to the loan-to-deposit ratio using only on-balance sheet loans. On+Off_BS refers to both on- and off-balance sheet loans. The deposit data refer to the deposits of Irish households and Irish resident private sector enterprises and excludes the deposits of non-Irish resident private sector enterprises. All data are taken from the Central Bank of Ireland's *Credit, Money and Banking Statistics.*

For example, by Q4 2014, the most recent period for which securitisation data are available, the on-balance sheet LTD had fallen from a peak of 2.1 in Q1 2008 to 1.06, while the LTD including off-balance sheet loans had fallen from a similar peak of 2.2 in Q4 2008 to 1.3. By Q2 2016, the on-balance sheet loan-to-deposit ratio had fallen further to 0.87.

Figure 3.14 illustrates that this securitisation has mainly been in the form of loans to households for house purchase.[29]

---

[28]   See Duffy et al. (2016) for a discussion of these issues.
[29]   The securitisation of loans to non-financial corporations appears to have been relatively negligible.

FIGURE 3.14 ON- AND OFF-BALANCE SHEET LOANS TO IRISH HOUSEHOLDS (€ MILLION)
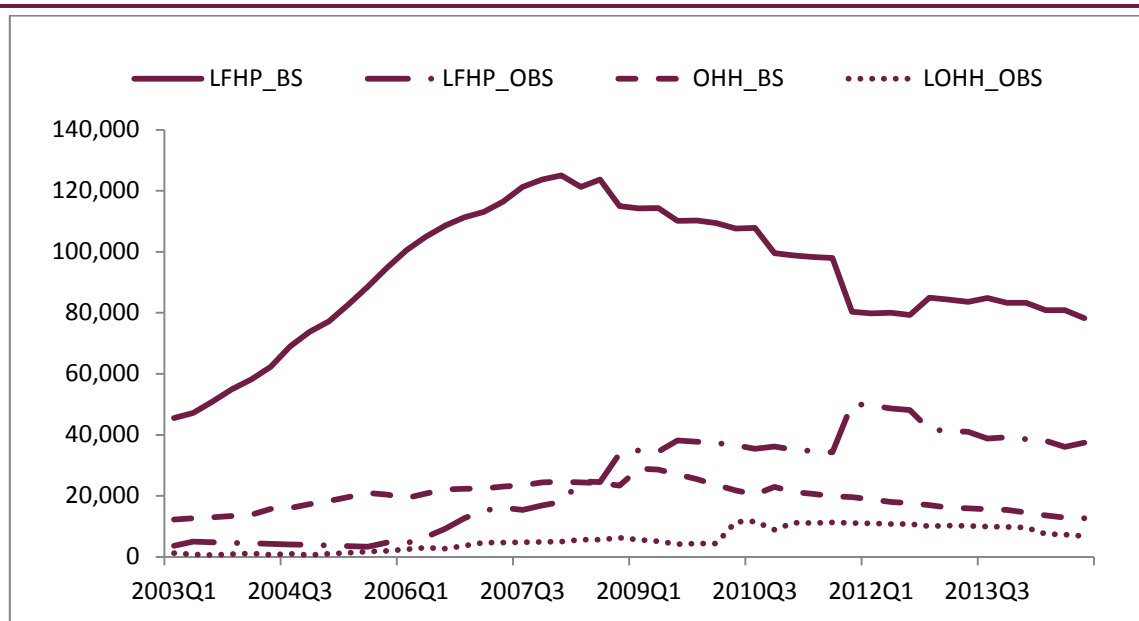
Source: Central Bank of Ireland.

Notes: LFHP_BS and LFHP_OBS are loans to Irish house for house purchase that are kept on-balance sheet and off-balance sheet, respectively. OHH_BS and OHH_OBS are other loans to households that are kept on- and off-balance sheet, respectively. All data are taken from the Central Bank of Ireland's *Credit, Money and Banking Statistics*.

One of the most interesting aspects of Figure 3.14 is the sharp rise in securitisation activity after the crisis. One explanation for this may be the use of 'internal securitisations' aimed at creating eligible securities to avail of the ECB's refinancing operations.

Both Figure 3.13 and Figure 3.14 illustrate the deleveraging that Irish banks have undertaken since the crisis, leaving LTD ratios that should have enhanced the stability of the sector. As mentioned, the Financial Measures Programme (CBI, 2011) which was introduced during the re-capitalisation of the Irish banking sector outlined a required path for Irish banks' loan-to-deposit ratios. This requirement on the liability side of their balance sheets sought to address one of the key fragilities of Irish banks' balance sheets, which was the overreliance on short-term wholesale funding (Honohan, 2010). The issue is that banks face a maturity mismatch between their assets and liabilities which gives rise to liquidity risk. Retail deposits, particularly those of households, are viewed as less vulnerable to investor flight and thus not subject to the same roll-over risk that characterises short-term money market funding.[30]

---

[30]   Hahm et al. (2013) emphasise the increasing importance of non-core liabilities as a source of risk in the financial sector.

However, banks' use of securitisation to move loans off-balance also means that the improvement in the LTD ratio is not primarily a result of improved access to deposits. Therefore the ability of banks to bridge the loan-to-deposit funding gap that we projected in our simulations in the previous section is an important policy issue, which we now discuss in more detail.

3.9   Policy Implications

There are a number of policy implications which arise from the analysis. First, it can be concluded that the Irish household sector may not be able to fund the necessary housing investment which is required because of the implications for indebtedness of the sector and for the banking system. If the level of housing demand were sustainable, then there should be a rise in the rental sector with substantial equity injections, possibly from outside Ireland. Such a long-term funding of the investment would be sustainable.

Current and future developments in macro-prudential policy are likely to be very important in affecting the response of the domestic banking sector. The Central Bank of Ireland is the designated national macro-prudential authority responsible for certain macro-prudential powers under the Capital Requirements Directive IV and Capital Requirements Regulation (CRDIV/CRR).[31] This legislation has introduced measures that complement micro-prudential capital requirements, for example, in the form of counter-cyclical capital and conservation buffers that target systemic risk in the banking sector rather than the individual risk posed by a single bank.[32]

However, macro-prudential tools that target liquidity risk are likely to also be introduced in the near future. These tools would constrain banks in terms of the composition of their funding. The Basel III framework outlines two requirements in terms of liquidity which are also being introduced in the EU through the CRRIV/CRR. The first is the 'Liquidity Coverage Ratio' (LCR) which aims at reducing the liability share of short-term, 'flighty' sources of funding such as short-term unsecured inter-bank deposits. The LCR is calculated as the ratio of high quality assets to net cash outflows over a 30-day horizon and banks must keep this ratio above unity (BCBS, 2010).

The second is the Net Stable Funding Ratio (NSFR) which requires a certain share of liabilities to be of more medium- to long-term duration and focuses more on

---

[31]   With the introduction of the Single Supervisory Mechanism, the ECB has received supervisory powers over Euro Area banks and also macro-prudential supervisory mandate. Therefore, macro-prudential policy is a shared competency between the Central Bank of Ireland and the ECB (CBI, 2014).

[32]   See EU Directive 2013/36 and EU Regulation No. 575/2013.

overall maturity mismatch of the balance sheet.[33] It is defined as the ratio of 'available stable funding' to 'required stable funding' (BCBS, 2010). The former is the weighted sum of each type of liability with the weights reflecting the estimated stability of the funding over the following year. The latter is the weighted sum of on- and off-balance sheet exposures, with the weights representing the liquidity risk factors for each exposure over the following year.

One possible channel to generate this long-term funding is through the issuance of covered bonds, which are debt securities that are backed by cash flows from the issued loans.[34] This would circumvent the possibility of financial disintermediation in which assets would simply be moved off-balance sheet as the assets underlying the covered bonds remain on the balance sheet of the bank. Therefore, the credit risk associated with the mortgage stays with the bank, which has to hold capital against it, although with a lower risk weight attached. The advantage for the bank is that the funding of covered bonds is typically cheaper than other types of non-secured funding and these bonds are treated as high-quality collateral by the ECB.

A second channel through which the required level of credit and associated funding could be achieved is through the entry of foreign banks into the Irish retail banking sector. These banks generally have access to stable medium- to long-term funding through the parent bank and would therefore be less likely to engage in deposit competition with domestic banks.

3.10 Conclusion

Since 2013 demand-side indicators in the Irish housing market have witnessed a significant recovery after the post-2008 international, financial downturn. Both prices and rents have grown significantly over this period as confidence has returned to the market. However, housing supply has been slow to respond with actual supply levels falling well short of the estimated structural demand in the economy.

The long-run housing demand model specified and estimated in this chapter has explicitly posited household formation rates as a key determinant over the longer term. This, in turn, enables forecasts of housing activity based on likely future

---

[33] The Core Funding Ratio (CFR) is a simpler alternative to the NSFR which requires a certain share of funding to be in the form of retail deposits and medium- to long-term wholesale funding.

[34] Irish banks have recently been using this channel to obtain long-term funding. For example, in April 2015, Bank of Ireland raised €1 billion through the issuance of a seven-year covered bond backed by a pool of Irish residential mortgages.

changes in demographics. Given the important role population changes are set to play in Ireland's economic performance over the medium term, it is important that these trends are incorporated to expected activity levels in the property market. Under a likely population scenario, we estimate that housing supply could reach up to 30,000 units per annum by 2024.

In the second part of the paper we examine the financing implications for the domestic banking sector of such an outcome. In the mid-2000s heightened levels of activity in the Irish housing market were only facilitated by the Irish banking sector availing substantially of new developments in international wholesale funding. This funding development allowed a break to occur in the long-standing steady relationship between credit extension and the traditional deposit base of the banking sector.

The results of our analysis suggest that in the future the traditional deposit base will be unable to fund the level of credit required to meet the housing demands of the economy. This will require significant changes in the domestic financial sector; some of these potential developments are discussed in the paper.

Given the calamitous events of the past decade, a significant expansion in the lending capacity of the domestic banking sector will immediately give rise to concerns about the emergence of another credit fuelled bubble. In that regard the recently adopted macro-prudential policy will be particularly important. Previous contributions (Duffy and McQuinn, 2014 and Duffy et al., 2016) have called for the inclusion of a 'counter-cyclical' component in the policy framework. Under such a component certain key housing market variables would be examined on a routine basis and the measures, such as loan-to-value and debt-to-income ratios, would be then re-calibrated to reflect the changing circumstances in the market. It is clear that housing supply needs to be one such variable; if it is established that actual housing supply begins to significantly diverge from the structural demand within the housing market then it is imperative that the macro-prudential measures be adjusted accordingly to maintain financial stability within the Irish mortgage market.

Appendix

TABLE A.1   DYNAMIC OLS

Variable	Coeff	Std Error	T-Stat	Significance
hh_t	0.383	0.142	2.689	0.014
$adjcred_t$	0.279	0.183	1.521	0.145
s_t	-0.912	0.258	-3.527	0.002
Δhh_{t-1}	0.128	0.076	1.673	0.111
Δhh_t	-0.078	0.107	-0.729	0.475
Δhh_{t+1}	0.020	0.086	0.232	0.818
$\Delta adjcred_{t-1}$	0.295	0.291	1.013	0.324
$\Delta adjcred$	0.243	0.312	0.780	0.444
$\Delta adjcred_{t+1}$	0.259	0.278	0.929	0.365
Δs_{t-1}	18.687	4.661	4.008	0.000
Δs_t	5.464	7.267	0.751	0.461
Δs_{t+1}	11.650	5.201	2.239	0.037
$Constant$	18.098	3.019	5.994	0.000
N				31.000
R2				0.988
F-Test				0.000

Source: Authors' own calculations.
Note: Estimated over the period 1982-2015.

TABLE A.2   FULLY MODIFIED OLS

Variable	Coeff	Std Error	T-Stat	Significance
$Constant$	37.409	3.783	9.886	0
hh_t	1.19	0.153	7.756	0
$adjcred_t$	0.944	0.296	3.182	0.001
s_t	-2.882	0.258	-11.141	0
N				33

Source: Authors' own calculations.
Note: Estimated over the period 1982-2015.

TABLE A.3   UNIT ROOT TESTS

Variable	ADF	1 per cent	Phillips Perron	1 per cent
f_t	-2.89	-3.58	-1.39	-3.63
s_t	-0.47	-3.58	-0.367	-3.63
hh_t	-1.30	-3.58	-1.49	-3.63
$adjcred_t$	-1.07	-3.58	-1.02	-3.63
N				33

Source: Authors' own calculations.
Note: Estimated over the period 1982-2015.

TABLE A.4   CO-INTEGRATION TESTS

Test Type	ADF		Phillips Perron	
Variable	Statistic	1 per cent	Statistic	1 per cent
Res_{t-1}	-3.50	-3.58	-3.68	-3.63

Source: Authors' own calculations.
Note: Estimated over the period 1982-2015.

References

Addison-Smyth D., K. McQuinn and G. O'Reilly (2009). 'Modelling credit in the Irish mortgage market', *Economic and Social Review*, Vol. 40(4), pp.371-392.

Addison-Smyth D., K. McQuinn and G. O'Reilly (2009). 'Supply response in an uncertain market: Assessing future implications for activity levels in the Irish housing sector', *International Journal of Housing Policy*, Vol. 9(3), pp. 259-283.

Arestis P. and A. González-Martínez, (2015). 'Residential Construction Activity in OECD Economies,' *Manchester School*, University of Manchester, Vol.83(4), pp. 451-474, 07.

Barrett, A., A. Bergin, J. FitzGerald, D. Lambert, D. McCoy, E. Morgenroth, J. Siedschlag and Z. Studnicka (2015). 'Scoping the Possible Economic Implications of Brexit on Ireland', ESRI Research Series No. 48. Dublin.

Barrett, A. and A. Bergin (2006). *Assessing Age-Related Pressures on the Public Finances, 2005 to 2050*. In *Budget Perspectives 2006* (Callan, T., and Doris, A., eds.). The Economic and Social Research Institute.

Barry, F. and A. Bergin (2013). 'Offshoring, Inward Investment and Export Performance in Ireland' in Ashok Bardhan, A.,D.M. Jaffee and C.A. Kroll (eds.) *The Oxford Handbook of Offshoring and Global Employment*. Oxford; Oxford University Press.

Basel Committee on Banking Supervision (BCBS) (2010). 'Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring.'

Bergin, A., A. Garcia Rodriguez, N. McInerney, E. Morgenroth and D. Smith (2016). *Baseline: Methodology, Assumptions and Projections*. ESRI Ireland's Economic Outlook.

Bergin, A., N. Conroy, A. Garcia Rodriguez, D. Holland, N. McInerney, E. Morgenroth and D. Smith (2016). 'COSMO: A new COre Structural MOdel for Ireland', ESRI Working Paper (forthcoming).

Bergin, A., A. Garcia-Rodriguez, N. McInerney, E. Morgenroth and D. Smith (2016b). 'Modelling the Medium to Long Term Potential Macroeconomic Impact of Brexit on Ireland', *ESRI Working Paper No. 548.*

Blonigen, B., and J. Piger (2014). 'Determinants of foreign direct investment', *Canadian Journal of Economics*, Vol. 47(3), pp. 775-812.

Bradley, J. and J. FitzGerald (1988). 'Industrial output and factor input determination in an econometric model of a small open economy'. *European Economic Review*, Vol. 32, pp. 1227-1241.

Bradley, J., J. FitzGerald and I. Kearney (1993).'Modelling supply in an open economy using a restricted cost function', *Economic Modelling*, Vol. 10(1), pages 11-21, January.

Bradley, J., K. Whelan and J. Wright (1995). 'Hermin Ireland', *Economic Modelling*, Vol. 12, 323-334.

Busemeyer, M.R. (2007). *Determinants of public education spending in 21 OECD democracies, 1980-2001*. Journal of European Public Policy, 14(4), 582-610.

Bussiere, M., J. Schmidt and N. Valla. (2016). 'International Financial Flows in the New Normal: Key Patterns', Working paper 2016-02, European Investment Bank.

Byrne, D., D. Duffy and J. FitzGerald (2014). 'Household Formation and Tenure Choice: Did the great Irish housing bust alter consumer behaviour?'. Working Papers WP487, Economic and Social Research Institute (ESRI).

Caballero, R.J., E. Fahri and P.O. Gourinchas (2016). 'Safe Asset Scarcity and Aggregate Demand', *American Economic Review*, Vol. 106, No. 5, May. pp 513-518(6)

Castles, F.G. (1989). 'Explaining public education expenditure in OECD nations'. *European Journal of Political Research*, 17(4), pp. 431-448.

Central Bank of Ireland (2011). *Financial measures programme report*, Central Bank of Ireland, March.

Central Bank of Ireland (2014). *A Macro -Prudential Policy Framework for Ireland.*

Clancy, D. and R. Merola (2015). 'ÉIRE Mod: A DSGE Model for Ireland. *Economic and Social Review*, Vol. 47(1), pp. 1-31.

Cline, R., T. Neubig, A. Phillips, C. Sanger and A. Walsh (2011). *Study on the Economic and Budgetary Impact of the Introduction of a Common Consolidated Corporate Tax Base in the European Union,* Report by Ernst and Young Commissioned by the Irish Department of Finance.

Conefrey, T. and J. FitzGerald (2011). 'The Macro-economic Impact of Changing the Rate of Corporation Tax'. *Economic Modelling*, Vol. 28, No. 3, pp. 991-999.

CSO (2013). *Population and Labour Force Projections: 2016-2046*. Central Statistics Office.

Davies, R.B. (2013). 'Tariff-induced Transfer Pricing and the CCCTB', *UCD Working Paper Series WP13/14*.

Department of Finance (2012). 'Common Consolidated Corporate Tax Base: An Update', report available at www.finance.gov.ie/sites/default/files/Common-Consolidated-Corporate-Tax-Base-CCCTB-An-Update_0.pdf.

Department of Finance (2016). *Budget 2017: Expenditure report*. Dublin, Department of Finance.

Department of Social and Family Affairs (2002). *Study to Examine the Future Financing of Long-Term Care in Ireland*, Dublin: Stationery Office.

Dhingra, S., G. Ottaviano, T. Sampson and J. Van Reenen (2016). 'The impact of Brexit on foreign investment in the UK'. *Centre for Economic Performance*, LSE, Brexit Analysis No. 3.

Duca J., J. Muellbauer and A. Murphy (2011). 'House prices and credit constraints: Making sense of the U.S. experience', *Economic Journal*, Royal Economic Society, vol. 121(552), pgs. 533-551, 05.

Duffy, D., D. Byrne and J. FitzGerald (2014). 'Alternative scenarios for new household formation in Ireland', *Quarterly Economic Commentary* Special Article, Spring.

Duffy D. and K. McQuinn (2014). Assessment of proposed macro-prudential policy measures, Appendix, *Quarterly Economic Commentary*, Summer, Dublin: The Economic and Social Research Institute, October.

Duffy D., N. McInerney and K. McQuinn (2016). 'Macro-prudential policy in a recovering property market: Too much too soon?' *International Journal of Housing Policy*, Article first published online: August, 2016 www.tandfonline.com/doi/full/10.1080/14616718.2016.1210937.

Ebell, M. and J. Warren (2016). 'The long-run economic impact of Leaving the EU', *National Institute Economic Review*, Vol. 236, pp. 113-143.

Ebell, M. and J. Warren (2016). 'The long-run economic impact of Leaving the EU', *National Institute Economic Review*, Vol. 236, pp. 113-143.

European Commission (2016). 'Commission proposes major corporate tax reform for the EU', press release http://europa.eu/rapid/press-release_IP-16-3471_en.htm 25 October 2016.

FitzGerald, J. (2015). *Problems Interpreting National Accounts in a Globalised Economy – Ireland*. QEC Special Article, ESRI, Dublin.

FitzGerald, J. and I. Kearney (Eds.) (2013). *Medium-Term Review*. Dublin: The Economic and Social Research Institute.

Fitzpatrick T. and K. McQuinn (2007). House prices and mortgage credit: Empirical evidence for Ireland, *The Manchester School*, Vol. 75, Number 1, pp.82-103.

Girma, S., H. Görg and A. Hanley (2008). 'R&D and Exporting: A Comparison of British and Irish Firms'. *Review of World Economics*, Vol. 144(4), pp. 750-773.

Grimes, A. and S. Hyland (2013). 'Housing Market Dynamics and the GFC: The Complex Dynamics of a Credit Shock'. Motu Working Paper 13-12, *Motu Economic and Public Policy Research*.

Hahm, J-H., H.S. Shin and K. Shin (2013). 'Non-core bank liabilities and financial vulnerability', *Journal of Money, Credit and Banking*, Vol. 45, issue S1.

Hitiris, T. and J. Posnett (1992). 'The determinants and effects of health expenditure in developed countries'. *Journal of Health Economics*, 11(2), pp.173-181.

Holston, K., T. Laubach and J.C. Williams. (2016). 'Measuring the Natural Rate of Interest: International Trends and Determinants', Working paper 2016-11, Federal Reserve Bank of San Francisco.

Honohan P. (2010). 'The Irish banking crisis regulatory and financial stability policy 2003-2008: A report to the Minister for Finance by the Governor of the Central Bank'.

Hufbauer, G.C. and J.J. Schott (2009). 'Fitting Asia-Pacific Agreements into the WTO system' in Baldwin, R., and P. Low (eds.) *Multilateralizing Regionalism: Challenges for the Global Trading System*. Cambridge: Cambridge University Press.

IMF (2015). 'Where Are We Headed? Perspectives on Potential Output', *World Economic Outlook*, Chapter 3, April.

Irish Fiscal Advisory Council (2016). *Fiscal Assessment Report: June 2016*. IFAC.

Kelly R. and K. McQuinn (2014). 'On the hook for impaired bank lending: Do sovereign-bank inter-linkages affect the net cost of a fiscal stimulus?' *International Journal of Central Banking*, Volume 10, Number 2, pp. 95 - 128.

Klyuev, V. (2008). 'What Goes Up Must Come Down? House Price Dynamics in the United States', IMF Working Papers 08/187, International Monetary Fund.

Kneller, R. and M. Pisu (2004). 'Export-Orientated FDI in the UK', *Oxford Review of Economic Policy*, Vol. 20(3), pp 424-439.

Lawless, M. (2013). 'Do Complicated Tax Systems Prevent Foreign Direct Investment?', in *Economica*, Vol. 80(317), pages 1-22.

Lawless, M. and E. Morgenroth (2016). 'The Product and Sector Level impact of a hard Brexit across the EU', *ESRI Working Paper* No. 500.

Lawless, M., D. McCoy, E. Morgenroth and C. O'Toole (2015). 'Corporate Tax and Location Choice for Multinational Firms'. Working Paper 491, Economic and Social Research Institute.

Lawless, M., D. McCoy, E. Morgenroth and C. O'Toole (2014). *The Importance of Corporation Tax Policy in the Location Choices of Multinational Firms*. Dublin; Department of Finance.

Lawless, M., N. McInerney, K. McQuinn and C. O'Toole (2015). 'Credit Requirements for Irish Firms in the Economic Recovery,' *Quarterly Economic Commentary*: Special Articles, Economic and Social Research Institute (ESRI).

Lawless, M., B. O'Connell and C. O'Toole (2015). 'SME recovery following a financial crisis: Does debt overhang matter?' *Journal of Financial Stability*, Elsevier, vol. 19(C), pages 45-59.

McCarthy Y. and K. McQuinn (2016). 'Credit conditions in a boom and bust property market: Insights for macro-prudential policy' *The Quarterly Review of Economics and Finance*, Article first published online: September, 2016. www.sciencedirect.com/science/article/pii/S1062976916300655.

McInerney, N. (2016). 'A Structural Model of Macro-prudential Policy and the Banking Sector', mimeo.

McQuinn, K. (2014). 'Bubble, Bubble Toil and Trouble? An Assessment of the Current State of the Irish Housing Market', *QEC Special Article*, Summer. ESRI: Dublin.

Morgenroth, E. (2015). 'Economic Consequences for Ireland' in O'Ceallaigh, D. and P. Gillespie (eds.) *Britain and Europe: The Endgame*. Dublin; Institute for International and European Affairs.

Morgenroth, E. (2016). 'Examining Consequences for Trade: Integration and Disintegration Effects' in Bailey, D. and Budd, L., eds. *Political Economy of Brexit*. Newcastle upon Tyne: Agenda Publishing.

Morley, C. D. Duffy and K. McQuinn (2015). 'A Review of Housing Supply Policies,' *Quarterly Economic Commentary*: Special Articles, Economic and Social Research Institute (ESRI).

Murphy, A. (2006). 'An Assessment of the Implications of EU Enlargement for Foreign Direct Investment and Jobs in Ireland' in *Central Bank of Ireland Quarterly Bulletin* 1, 2006 pp. 105-118.

Rachel, L. and T.D. Smith (2015). 'Secular Drivers of the Global Real Interest Rate', Working paper No. 571. Bank of England.

Summers, L. (2014). 'Secular Stagnation? The Future Challenge for Economic Policy', Institute for New Economic Thinking, Toronto, April 12.

Whitley, J. and R. Windram (2003). 'A Quantitative Framework for Commercial Property and its Relationship to the Analysis of the Financial Stability of the Corporate Sector', Working Paper No. 207, Bank of England.

Wolswijk G. (2007). *Sort- and long- run tax elasticities: The case of Netherlands*. ECB working paper series, 763.

Xu, K., P. Saskena and A. Holly (2011). *The Determinants of Health Expenditure: A Country-Level Panel Data Analysis.* World Health Organization Working Paper, December 2011.

ECONOMIC & SOCIAL
RESEARCH INSTITUTE