



An Roinn Airgeadais
Department of Finance

Joint Research Programme on The Macroeconomy, Taxation and Banking

Annual Report for 2018

The joint research programme between the Department of Finance, the Revenue Commissioners and the ESRI on *The Macroeconomy and Taxation* began in January 2015 with the objective of undertaking research on a range of macroeconomic and taxation issues in Ireland. In the course of 2017, an additional strand was added to the programme to undertake research on issues related to banking and financial stability in Ireland. The expanded programme was then extended to continue through 2018.

This report has been prepared on behalf of the Steering Committee for submission to the Secretary General of the Department of Finance and the Director of the ESRI to describe the work undertaken in 2018. It includes an overview of the completed projects and presentations along with associated costs. It also includes a brief overview of the proposed research for the programme's extension into 2019, subject to the approval of the steering committee.

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1. Description and Progress of Research Topics on the Macroeconomy and Taxation

Research topic 1: Modelling the impact of a carbon tax increase

The focus of this research project was to create a better understanding of how different carbon tax rates can be expected to impact both the economy and the level of CO₂ emissions. For this analysis an Energy Social Accounting Matrix (SAM) has been developed and applied in a multiplier analysis setting. The Energy SAM reproduces the structure of the economy in its entirety, including productive sectors, households and the government, among others, quantifying the nature of all existing economic transactions among diverse economic agents. An Energy SAM also includes energy flows and emissions in addition to the standard monetary flows. The explicit inclusion of emissions makes it possible to evaluate the emission reduction associated with specific carbon tax policies.

The research estimated that an increase in the carbon tax of €5 per tonne of CO₂ will on average increase consumer prices (measured by CPI) by 0.13% and producer prices by 0.08%. Even quite large increases in the carbon tax are found to have limited impacts, where a doubling of the carbon tax (to €40) is estimated to increase consumer prices by 0.53% and producer prices by 0.37%. At the same time, the study estimates small impacts on emission reductions of 1.2% for a €5 increase and 4.7% for a €20 increase.

Households at all income levels will face similar percentage increases in consumer prices. In the case of a €5 increase in carbon tax, costs would increase by €0.45 per week for the poorest households and by €2.30 a week for the richest. However, in terms of shares of income, the impacts on poorer households will be more than double that of richer households. The production sectors most impacted by a carbon tax increase are the energy and transportation sectors. However, the impacts are estimated to be small, with an increase of less than 0.3% increase in the production costs of the transport sectors.

This analysis was published as an ESRI research report in “The economic and environmental impacts of increasing the Irish carbon tax” in October 2018.

Research topic 2: Tax modelling and fiscal multipliers

This research stream aims to develop the capability of fiscal policy modelling by building a fiscal satellite to the COSMO macroeconomic model and providing robust estimates of fiscal multipliers by estimating and comparing different methodologies.

COSMO fiscal satellite

This part of the project involves expanding COSMO to include a detailed fiscal satellite model. The aims of building such a model are: to produce more detailed and robust fiscal projections based on a richer set of determinants, to run fiscal simulations showing the macro impact of changes to the various instruments, and to produce estimates of fiscal multipliers.

In comparison with the existing fiscal policy block in COSMO, the fiscal satellite adds a significant number of fiscal instruments. In summary, government spending now comprises:

- (a) Current spending, broken down into education, health and a residual current spending category (largely pay and pensions),
- (b) Transfers, split into payments related to older-age, unemployment, family and children, and a residual transfers category,
- (c) Investment broken down by five categories (infrastructure, housing, health, education and the rest) and
- (d) Debt interest.

Taxation includes:

- (a) Direct taxes on income with contributions distinguished from other direct taxes,
- (b) Corporate taxes and
- (c) Indirect taxes broken down in to VAT and a residual indirect tax category.

At present, the satellite has been fully integrated into COSMO. We are able to run standard economic shocks and can compare results between the two versions of COSMO (with and without the satellite). We found similar responses in both models, but with some interesting differences in the fiscal block. Furthermore, we are able to produce estimates of fiscal multipliers using the new version of COSMO with the fiscal satellite, including multipliers for fiscal instruments not present in the previous version of COSMO. The results can be compared with the multipliers produced by the previous version of COSMO and with the multipliers estimated in the HERMES model for the Medium Term Review 2013. We again observe results which are consistent with the older models but with some differences.

Fiscal multipliers in a small open economy

For additional robustness in the estimation of fiscal multipliers, taking account of the specific features of a small open economy, we have developed an extended version existing EIRE model (see Clancy and Merola 2016) by adding several new building blocks that allow us to conduct fiscal policy analysis. First, we have added heterogeneous agents in the model, i.e. we now distinguish between Ricardian households (or savers), non-Ricardian households (or non-savers) and public employees. The introduction of non-Ricardian households and public employees will result in non-trivial effects for fiscal policy analysis (e.g., the size of fiscal multipliers, distribution effects of fiscal changes etc.).

Second, on the production side, we have introduced state firms. This means we allow for a productive role of the various public spending instruments (e.g., public wages, public investment, and government purchases of goods from the private sector). Similarly, this addition will result in non-trivial effects for fiscal policy analysis.

Third, we have added a detailed fiscal sector meaning government can set its fiscal policy instruments subject to the government budget constraint. Also, we allow for the possibility that government can set its instruments following fiscal rules, i.e. by reacting to fiscal and macroeconomic indicators (e.g., debt, output or investment targets).

Following the September Steering Committee Meeting, we amended the model to address comments raised by the Steering Committee (such as the degree of openness of the Irish economy and debt-elasticity of interest rates):

- a. We have computed estimates for fiscal multipliers, using the benchmark calibration for the Irish economy,
- b. We have conducted extensive sensitivity analysis to provide a range of estimates of fiscal multipliers by varying most of the parameters of the model that affect significantly the size of fiscal multipliers.

The next steps remaining in this project are to finesse the calibration of the model so as to provide the final range of the Irish fiscal multipliers and to submit the working paper to the steering committee.

Research topic 3: Knowledge spillovers from multinationals to domestic firms

As well as their direct effects on output and employment, it is sometimes argued that inward foreign direct investment provides further economic benefits through spillover effects that potentially increase the productivity performance of domestic firms. Empirical evidence on these effects has however tended to be mixed. This research examines whether, and to what extent, the productivity performance of indigenous firms is linked to spillovers from foreign affiliates operating in Ireland, using firm-level data from the Census of Industrial Production (CIP) and the Annual Services Inquiry (ASI). The research was carried out in co-operation with the Economic Research Unit of the Department of Finance and the OECD team that prepared the *Economic Survey on Ireland* (published in March 2018).

This paper updates previous work on intra-industry spillovers and then extends the research by examining if spillovers are more likely to occur through supply chain linkages in line with more recent developments in this literature. It further tests for the sensitivity of these vertical spillover effects to alternative supply chain measures. Overall, limited evidence of a link between the presence of foreign-owned firms is found although important variation across sectors is identified. Examining linkages through supply chains indicates some negative impacts from obtaining supplies from foreign-owned firms although this is mitigated for domestic firms in manufacturing which invest in R&D, which appears to increase the absorptive capacity of the firms to internalise spillovers.

Preliminary results were presented to the OECD country mission in November 2017, following which some further tests of absorptive capacity were undertaken. A draft version of a Technical Paper was circulated for review by the Steering Committee and OECD and published together with the OECD Economic Survey on Ireland in March 2018.

2. Description and Progress of Research Topics on Banking

Research topic 1: Is there an investment gap in Irish small and medium enterprises?

Despite the general economic recovery and pickup in overall aggregate investment, concerns have been raised that investment rates in Irish small and medium enterprises (SMEs) have not kept pace with these broader indicators. This paper uses firm-level data for Irish SMEs from the Department to investigate the existence of an investment gap by modelling fundamental investment based on firm performance characteristics and measures of local demand developments. We find evidence that actual investment is below what would be expected given how companies are currently performing. The magnitude of this “investment gap” is economically meaningful and is estimated to be just over 30 per cent in 2016.

Having established that an investment gap exists, we further examine the extent to which there is a role for frictions in the availability of financing to firms that affects investment decisions. To ensure robustness, we use three methods to ascertain the contribution of financial market failures to the investment gap. First, we use a model-based approach which appends proxy variables for credit access to the investment specification. Second, we follow the EIF guidelines for the ex-ante assessment of financial market instruments and third, we use a simple empirical estimate based on external financing usage in other EU countries. Across the three different methodologies, we estimate that financial factors explain between 12 per cent and 18 per cent of the investment gap.

Following comments from the steering committee and a presentation at the Department of Finance-OECD conference, this paper was published as an ESRI working paper in March. The conference presentation of the paper was covered by a number of media outlets including the Irish Independent, RTE.ie and NewsTalk.

Research topic 2: Profiling the investment patterns of Irish small and medium enterprises

Research on this topic, carried out jointly by ESRI and Department researchers, uses new questions added to the Department’s SME Credit Demand Survey to profile for the first time the types of assets SMEs are investing in, how firms are financing these investments and what barriers firms face to investment. The work provides a detailed exploration of the trends across firms looking at different size classes, age groups exporting status and sectors. The key findings of the paper are that two in every three SMEs invested in their staff, one-in-two invested in fixed assets and less than one-in-ten invested in intangible assets in 2016. SMEs were in general satisfied with their investment levels or their current capacity with only one-in-five facing a capital gap. For those with perceived insufficient investment, a lack of internal funds, rather than access to external finance, was identified as the main reason. SMEs also reported having significant liquidity levels in 2016. These findings suggest that any perceived sluggishness in borrowing or investment appetite could potentially be demand-side in orientation.

The initial results were presented to the steering committee at the March meeting and also to the Banking section of the Department. This work was published as a QEC special article in September.

Research topic 3: Arrears and stress-testing the Irish mortgage market

This topic aims to provide analysis of the Irish mortgage market and implications for financial stability by designing a model of the triggers of default that can be used as the basis of regular stress-tests to assess, for example, the impacts of interest rates on mortgage delinquencies. Internationally, standard models of mortgage default would stress the sensitivity of households to two main factors: equity shocks (changes in house prices relative to debt outstanding) and affordability shocks (through household income or interest rate changes). While a number of papers have documented the relative importance of equity versus affordability shocks on mortgage default, further work is required to disentangle income shocks from affordability through the interest rate channel.

Within the context of modelling the drivers of arrears in the Irish mortgage market, this work, being carried out jointly between the ESRI and Department, aims to build a micro-econometric stress-testing model which will link mortgage arrears at the household level to the equity and affordability channels which drive arrears. This will allow us to understand how shocks to income (through changes in net after tax income from unemployment or fiscal policies), interest rates (through changes in the ECB policy rate), and house prices impact arrears. These factors can then be linked to macro models to look at scenarios for arrears. The topic also explores the differences across households to see whether pockets of vulnerabilities are evident.

Two draft research papers were provided to the Department and Steering Committee in October 2018. The first was a policy related Special Article and the second a technical research paper. Final comments have been received from the Department to be addressed in early January 2019. The plan is to publish the research (as a QEC Special Article and ESRI Working Paper respectively) early in 2019 once the comments have been addressed. A QEC Research Note on “The Financial Crisis and the Changing Face of Mortgage Arrears” has been published with the December 2018 QEC as the first output from this project.

3. Outputs in 2018

Research Papers and Publications published in 2018

- “The Financial Crisis and the Changing Profile of Mortgage Arrears in Ireland” by Mike Fahy, Conor O’Toole and Rachel Slaymaker, ESRI Quarterly Economic Commentary Research Note, Winter 2018
- “The economic and environmental impacts of increasing the Irish carbon tax” by Kelly de Bruin and Aykut Mert Yakut, ESRI Research Series No. 79, October 2018
- “Exploring SME Investment Patterns in Ireland: New Survey Evidence” by Eric Gargan, Martina Lawless, Maria Martinez-Cillero and Conor O’Toole, ESRI Quarterly Economic Commentary Special Article, Autumn 2018
- “Dynamic tax revenue buoyancy estimates for a panel of OECD countries” by Yota Deli, Abian Garcia Rodriguez, Ilias Kostarakos and Petros Varthalitis, ESRI Working Paper No.592, March 2018

- “Productivity spillovers from multinational activity to indigenous firms in Ireland” by Mattia Di Ubaldo, Martina Lawless and Iulia Siedschlag, ESRI Working Paper No.587, March 2018 and OECD Productivity Working Paper No. 16, November 2018
- “Corporate taxation and the location choice of foreign direct investment in EU countries” by Ronald B. Davies, Iulia Siedschlag and Zuzanna Studnicka, ESRI Working Paper No.591, March 2018
- “Estimating an SME investment gap and the contribution of financing frictions” by Martina Lawless, Conor O’Toole and Rachel Slaymaker, ESRI Working Paper No.589, March 2018
- “Expenditure Tax Revenue Elasticities in Ireland: An Analytical Approach” by Jean Acheson, Yota Deli, Martin Murphy and Edgar Morgenroth, ESRI Working Paper No 596, September 2018
- “Elasticity of Taxable Income” by Jean Acheson, Sean Kennedy, Brian Stanley and Edgar Morgenroth, Department of Finance paper, December 2018

4. Proposed Research Topics for 2019

A range of new topics have been proposed for the 2019 work plan, described briefly below. Detailed terms of reference will be prepared for these and any new proposed topic for discussion and approval by the Steering Committee throughout the year.

Growth enhancing fiscal policy using effective tax rates

One major debate amongst policy-makers is whether fiscal policy is an effective tool for stimulating and maintaining economic growth, especially in cases where monetary policy is constrained and there is not enough fiscal space available for discretionary actions. Fiscal policy can enhance short- and long-run growth through several channels: for example, well designed tax policy can broaden the tax base and minimize distortions, while efficient and productive public investment (e.g. in infrastructure and human capital) can increase the economy’s productive capacity in the long run. This project aims to compare the Irish fiscal mix, trends in economic growth and their historical relationship with the associated EU averages. Given that the tax structures across member states largely differ, in order to perform any analysis we need to construct suitable aggregate tax indicators that will allow cross-country comparisons.

Globalisation, productivity, and the decline in labour’s share of income

Although the idea of constant factor shares has commonly been suggested to be one of the stylized facts of long-run growth, a long-term decline in labour shares has been observed in many European countries since the late nineteen-seventies. The decline of the labour share in Ireland was particularly sharp, bringing it to the lowest in the European Union although recent work by the Department of Finance (2018) shows that some element of this is due to distortions in Irish national accounts. This shift in national income between capital and labour has raised questions on both the causes of the phenomenon and its implications. This topic proposes to investigate how globalisation and

technological developments have contributed to this decline in labour share and the extent to which it can provide an explanation for productivity developments across countries.

Extension of carbon taxes model

Under the 2018 Joint Research Programme an energy social accounting matrix (ESAM) model was produced by the ESRI and formed part of an ongoing modelling project funded by the Department of Communications, Climate Action, and Environment (DCCA). This research examined the within year effects of increasing carbon tax on producers and households, highlighting that both would face relatively small exposures in the event of a doubling in rate. It is proposed to extend the carbon taxes impact assessment work as part of the 2019 work programme. The envisaged research would be centred on the analysis of the impacts of increasing the tax on a stepped basis from its current €20 per tonne to €80 by 2030. This work would require a more dynamic suite of demand elasticities capable of capturing multiannual behavioural changes during the phased rate increases out to 2030.

Corporation tax (CT) elasticities

It is proposed to complete the suite of micro-founded revenue elasticities papers produced under the auspices of earlier Joint Research Programme commitments to include an analysis of corporate income tax elasticities. It is proposed to explore the use of microdata on profit distribution and a range of other candidate metrics to calculate marginal tax rates of representative business entities using the Revenue Commissioner's Corporation Tax (CT) Panel. This newly constructed data source captures the full firm-level CT-paying population and is unique in its coverage. It provides a rich resource amalgamating different sources across CT returns and a variety of employment-related tax revenue returns over the period 2004 to 2015. It also collates useful information on the investment patterns of the sample, which can be used to enhance our understanding of the stability of this tax base.

By calculating a measure of corporation tax buoyancy based on the elasticity of corporation tax yields to reported profit levels, this analysis will uncover the drivers of corporate tax volatility by firm level characteristic. These may include factors such as firm ownership structure (indigenous Irish owned versus foreign owned multinationals), size, age, trading position, as well as the degree of historical company losses, and factors such as access to tax reliefs and capital allowances.

Brexit impact modelling.

There is almost a complete consensus in the international literature that Brexit will have a negative effect on the UK economy both in the short and long-run. The UK is one of Ireland's closest economic partners and previous research conducted in 2016 as part of the Programme examined the medium to long-run impact of Brexit on the Irish economy under a series of alternative scenarios. Since this work was completed, more refined Brexit scenarios have been generated that reflect updated assumptions and new information. For example, the November 2018 *National Institute Economic Review* considered the impact on the UK of a 'no-deal' Brexit compared to a soft Brexit. The ESRI proposes to use these scenarios in COSMO to provide new estimates of the potential impact of Brexit on the Irish economy. Some additional shocks to the UK may be included to gauge the sensitivity of the Irish economy to UK shocks, such as an exchange rate shock.

Annual SME investment patterns report 2018 and granular investment gaps modelling

While a robust rebound in investment has been a core element of the recovery in the Irish economy, a large component of this investment has been accounted for by the multinational sector with Irish SMEs found to be on average underinvesting. To explore the issue of underinvestment in more detail, Gargan et al. (2018) includes a new investment and assets module into the Department of Finance Credit Demand Survey to explore in more detail the patterns of investment, its barriers, and its financing across Irish SMEs. To develop this research further, it is proposed that the ESRI team will work with the Department to push forward the research in two strands:

1. First, research will focus on making changes to the survey design following reflections on the first modules operations then run the module again in Q4 2018 to capture data for 2017, and potentially again in Q2 2019 to capture data for 2018. Analysis will then be undertaken on the data to develop an annual SME investment report which will be used to measure and capture trends across firms in the SME investment activity.
2. The team will estimate a model to determine whether investment gaps are evident for Irish SMEs across the different asset classes they are investing in and whether the level of investment is above or below that expected by economic fundamentals. The research will then focus on determining how other factors such as the cost of capital, availability of finance, uncertainty, indebtedness, and the development of the macroeconomy are affecting investment by Irish SMEs. Critically, this aspect of the analysis will determine whether any of these factors are leading to specific underinvestment in types of assets and this has not to date been completed by any research studies.

5. Budget 2018

<i>Project</i>	<i>Cost</i>
FDI Spillovers	€15,295
Tax modelling & multipliers	€126,477
Carbon tax	€37,400
Mortgage arrears	€30,596
SME profiling	€45,474
Total	€255,242