



An Roinn Airgeadais
Department of Finance

Joint Research Programme on The Macroeconomy, Taxation and Banking

Annual Report for 2019

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 2019.

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 2019. 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 2020, subject to the approval of the Steering Committee.

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1. Description and Progress of Research Topics

Modelling the effect of Brexit on the Irish economy

Since the publication of the previous analysis of Brexit on Ireland in 2016, considerable further developments have occurred leading to a decision that it would be opportune to undertake a new analysis using new micro-founded Brexit scenarios and to incorporate updated assumptions and new information. The project focussed on the most well understood channels through which Brexit will affect Ireland, namely through lower trade incorporating the impact of tariff and non-tariff measures and the potentially positive impact of FDI diversion to Ireland, which are formally modelled using the COSMO macro-model.

Three scenarios were considered: In the *Deal* scenario, the UK makes an orderly agreed exit from the EU. This involves a transition period covering the years 2019 and 2020, and a free trade agreement between the UK and the EU27 thereafter. In the *No-Deal* scenario, the UK exits the EU without a deal but there is an orderly period of adjustment for trade. Ultimately, WTO tariff arrangements will apply to goods trade, there will be non-tariff barriers and services trade will also be negatively impacted. In the *Disorderly No-Deal* scenario, the UK exits the EU without a deal and there is an additional disruption to trade in the short-run, above that considered in the *No-Deal* scenario. In each scenario, some of the negative trade impact is partially offset by FDI being diverted to Ireland.

The paper was published in the Spring Quarterly Economic Commentary in March. The publication of the paper was extensively covered in the Irish and international media (including New York Times, Guardian and BBC). It was also presented at the EUROFRAME conference hosted by the ESRI on 7 June and summarised in the Department of Finance's Stability Programme Update of April 2019.

Modelling the effect of Carbon Taxes with revenue recycling options

This project extended the previous work on the impact of carbon taxes by exploring the distributional effects and the extent to which potential regressivity of the tax could be offset by revenue recycling options. This was done by introducing 10 household types and 3 labour types to the Ireland, Environment, Energy and Economy (I3E) model. These were made up of five urban and five rural household types, defined on the basis of income levels. The paper examines the impacts of an increase in the carbon tax of €10 in 2020 with further increases of €5 a year after that reaching a carbon tax of €80 in 2030, as proposed by the all Government Climate Action Plan.

The research finds that an incremental increase in the carbon tax reaching €80 per tonne in 2030 will help reduce economy-wide emissions by approximately 15% in 2030. However, it will lead to increased prices and a small reduction in real values of gross domestic product (GDP) and household disposable income. Recycling the carbon tax revenue to decrease other taxes can reduce these impacts and result in increases in household disposable income in real terms.

An increase in carbon tax will increase both the prices of energy and non-energy goods. The results indicate that by 2030, an €80 carbon tax will increase energy prices by approximately 10% and the overall consumer price level (CPI) will increase by, on average, 2%.

Without a recycling scheme, the results show that the carbon tax increase is regressive with greater impacts for poorer households, rural household and low skilled labour. The paper then investigates different revenue recycling schemes to understand how carbon tax revenue can be used to limit the economic and distributional impacts of the carbon tax increase. Options examined included a lump-sum transfer, a social welfare based transfer, a wage tax reductions, a sales tax reduction, a corporate tax reduction and a reduction in production taxes for the haulage sector.

The results show that a lump sum transfer can be used to transform the regressive carbon tax into a progressive tax. Using carbon tax revenue to reduce other taxes leads to a double dividend where emissions are reduced and economic growth increases. A production tax decrease for the haulage sector results in increased value added in that sector as well as emissions reductions. Combinations of different revenue recycling can ensure multiple goals are achieved, such as economic growth and progressiveness. This report was published as part of the Budget 2020 documentation in October.

Fiscal multipliers in a small open economy

This research stream aims to develop the capability of fiscal policy modelling. In 2018 this stream progressed by building a fiscal satellite to the COSMO macroeconomic model and providing robust estimates of fiscal multipliers by estimating and comparing different methodologies. The COSMO satellite was completed in the first quarter of 2019 and the alternative methodology using a new DSGE model (FIR-GEM) of the Irish economy was published in summer 2019. A technical paper on the model framework for FIR-GEM was also published.

The DSGE model approach added several novel elements to the estimation. First, it added heterogeneous agents in the model, distinguishing between Ricardian households (or savers), non-Ricardian households (or non-savers) and public employees. The introduction of non-Ricardian households and public employees can 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, state firms are introduced, allowing 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, a detailed fiscal sector is modelled meaning government can set its fiscal policy instruments subject to the government budget constraint. This allows for the possibility that government can set its instruments following fiscal rules; that is, by reacting to fiscal and macroeconomic indicators (e.g., debt, output or investment targets).

This research computed estimates for fiscal multipliers, using the benchmark calibration for the Irish economy and an 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.

Growth enhancing fiscal policy

This project compares the Irish fiscal mix, trends in economic growth and their historical relationship with the associated EU averages. The research is motivated by arguments that the overall fiscal policy mix can prove to be a major factor in determining rates of economic growth; for example, the European Commission (2016) has called for a re-orientation of the budget toward a more growth-friendly approach, even for countries that do not have the available fiscal space.

Given that the tax structures across member states largely differ, the construction of suitable aggregate tax indicators that will allow cross-country comparisons was needed. The first stage of this project was therefore to estimate Effective Tax Rates (ETRs) based on harmonized and comparable data from the National Accounts, thus fulfilling the comparability requirement. The project estimated ETRs for the factors of production (namely, labour and capital), consumption and corporate tax, as well as indicators for the non-wage cost of labour for Ireland and the rest of the EU countries following the approach of Mendoza et al. (1994) and Carey and Rabesona (2002). An extensive database of ETRs for Ireland along with the rest of EU countries that allows international comparisons has been constructed which can be used for other analysis. The database is ready in Excel format with a user manual in the form of slides.

The second stage of the project was to use these ETRs along with various spending categories for an assessment of the effects of the fiscal policy mix on GDP growth for the EU. This was estimated for a panel of 27 EU countries over the 1995-2017 period with results on the effects on long-run growth of changes in:

- Productive vs unproductive government spending
- Distortionary vs non-distortionary taxes (using the tax revenues or the estimates for ETRs).

Overall, this paper focuses on the historical relationship between government size (Total Expenditures/GDP, Total Tax Revenue/GDP) and the disaggregated categories with GDP growth, focusing on the time series properties of the data, including unit roots and cointegration and estimation techniques accounting for reverse causality. Additional Irish-specific estimates of the effects of fiscal policy changes were also produced, subject to some limitations in data availability.

Two papers are in progress. A paper to describe the estimation process in more detail is under internal review and will be circulated shortly. A non-technical paper that presents Irish tax indicators and conducts comparative analysis with the rest of the EU countries is in progress.

The results of the cross-country paper have been presented at the following conferences: International Conference on Public Economic Theory (Strasbourg, July 2019), ASSET 2019 (Athens, October 2019) and the Spanish Economic Association Conference (Alicante, December 2019). A draft paper is being prepared for circulation to the Steering Committee along with a separate note on the Irish specific modelling.

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 1970s. 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. Since beginning in January 2019, this project has pursued two parallel strands of investigation, one using national accounts data and the other using more disaggregated sectoral data.

At a macroeconomic level, the project examined the extent to which the increase in the capital share of income across countries can be attributed to the increase in the returns to housing over the period. The aim of this section was to explore whether this increase in housing returns is caused by increases in the economic profits of housing, and then use these profits as a determinant of the overall evolution of the labour/capital shares. Newly constructed data on house price level estimates across countries was received from the European Commission. This novel dataset has only been used in a working paper by the Commission, which examines house price developments in the EU. Applying a user cost of capital approach to this dataset, a time series for the economic profits of housing has been generated. The compilation of a database containing all estimates of housing profits and housing income shares is complete and different sets of regressions are now being run.

At a sectoral level, analysis of EU KLEMS and ESCB CompNet data show evidence that increased dispersion of productivity and concentration of activity in a smaller number of firms within sectors are key contributors to the reduction in the labour share. This is consistent with the work on US firms by Autor et al (2018) who argued that the emergence of “superstar firms” due to technological changes were allowing higher profits to be concentrated in a relatively small number of firms, thereby reducing the share of value added accruing to workers. The work has examined several different measures of productivity using pooled country-sector data across Europe as well as testing the approach on individual countries and groups of sectors. The results are broadly consistent across all estimation approaches and measures. Countries with higher levels of globalisation are also found to have lower average labour shares with changes in the cost of capital relative to labour also playing a role.

The initial findings from this sectoral analysis were presented at the Department’s Annual Policy Conference in April, at the Economist Group of the IIEA in September, the CompNet Data Users conference in Paris in October and at an OECD Workshop on “Trends in business dynamism, productivity growth and productivity dispersion” in Brussels in November. A draft paper has been circulated to the Steering Committee for comments and completion in the new year.

Corporation Tax Elasticities

This project was proposed to complete the suite of micro-founded revenue elasticities papers produced under the auspices of earlier Joint Research Programme commitments to now include an analysis of corporate income tax elasticities. The objective of the project is 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 Commissioners Corporation Tax Panel.

Whilst the primary focus of this research will be the estimation of elasticities, it is anticipated the findings will shed light on the area of tax base stability and address concerns around flight risk related

to concentration. Furthermore, this estimation will also help inform more dynamic tax revenue forecasting.

Following some initial estimates and the results from work on other projects using the same panel, time was spent over the summer to expand the coverage of the data and undertake checks to maximise data quality. In particular, a range of additional variables that contribute to differences between 'gross tax due' (which is essentially the statutory rate applied to taxable income) and 'tax payable' were added to the panel. Work is ongoing on the estimation of tax buoyancies using both econometric and analytical approaches. Completion of this project is expected early in the new year.

SME Investment Report and Modelling SME Investment

The slow response of the investment behaviour of domestic SMEs to the economic upturn has been highlighted in a number of publications as a key concern for growth and resilience of the sector. To examine the determinants of SME investment, a module was added to the Department of Finance Credit Demand Survey to explore in more detail the patterns of investment, its barriers, and its financing across Irish SMEs. The first results of this survey module were published in Gargan et al. (2018). The first part of this research topic uses the template of the previous investment report to explore trends over the three years 2016-2018 in investment by asset class, firm type, sector and region. The analysis then presents trends in firms' views on financing and their preference for different financing types.

A draft report was circulated to the Steering Committee for comments. The report shows that around 80 per cent of SMEs invested in some form of asset or in their staff in each year from 2016 to 2018. Considerable variation across investment type was found with over 65% of SMEs investing in staff and 20% investing in buildings. Just 7% of SMEs invested in intangibles, with a median investment value of €10,000. While most patterns were stable across years, reductions in the percentages of investing by UK exporting firms were observed in 2018 suggesting some Brexit uncertainty impacting on firm investment decisions. However, 80% of Irish SMEs reported satisfaction either with the level of investment undertaken or the capacity they currently have (if they did not invest). The data indicated that roughly 16% of firms faced a capital gap in 2018, a reduction since 2016. However, the capital gap continues to be highest for micro and younger firms. In terms of barriers to investment, uncertainty and insufficient internal funds were identified as two most important factors. Uncertainty was of particular importance in 2018 for firms which invested less than they would like.

This report also contains some cross-country evidence provided by the European Investment Bank from data collected in their EIBIS survey. This report will be launched at a conference on "Trends in SME investment and financing" organised by the ESRI and Department of Finance.

The second strand of the SME research topic is to 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. This is similar in methodology to that used in earlier work to identify gaps for overall investment (Lawless et al., 2018) which found that Irish SMEs were underinvesting by approximately 30 per cent. The new more

disaggregated data now available allows an examination of whether this investment gap is concentrated in certain asset classes or more broadly based. The approach links investment to the marginal product of capital using a GMM approach to deal with endogeneity and a stochastic frontier model to measure the investment gap. The research tests whether liquid assets, indebtedness and uncertainty impact SME investment as well as the empirical investment gap. A clear link between investment and its marginal product is found with an elasticity of approximately 0.5; a unit per cent increase in marginal product leads to a 0.5% increase in investment. A clear investment gap is also found. A draft of this paper has been circulated to the Steering Committee for comments.

Mortgage arrears stress-testing

This topic aimed 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. Within the context of modelling the drivers of arrears in the Irish mortgage market, this project built a micro-econometric stress-testing model that links mortgage arrears at the household level to the equity and affordability channels which drive arrears. This allows 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.

Two outputs from this project were published in March. The first was a policy related Special Article in the Quarterly Economic Commentary and the second is a more technical working paper documenting the model structure. Another output, a QEC Research Note examining the socio-economic characteristics of borrowers in mortgage arrears in Ireland was published in December.

2. Outputs in 2019

Research Papers and Publications published in 2019

- “Exploring the implications of monetary policy normalisation for Irish mortgage arrears” by Mike Fahy, Kieran McQuinn, Conor O’Toole and Rachel Slaymaker, Special Article in *ESRI Quarterly Economic Commentary*, Spring 2019.
- “Monetary policy normalisation and mortgage arrears in a recovering economy: The case of the Irish residential market” by Mike Fahy, Kieran McQuinn, Conor O’Toole and Rachel Slaymaker, ESRI Working Paper No.613 (March 2019).
- “Modelling the Economic Impact of Brexit on Ireland” by Adele Bergin, Philip Economides, Abian Garcia-Rodriguez and Gavin Murphy, Special Article in *ESRI Quarterly Economic Commentary*, Spring 2019.

- The Economic and Distributional Impacts of an Increased Carbon Tax with Different Revenue Recycling Schemes by Kelly de Bruin, Eoin Monaghan and Aykut Mert Yakut, ESRI Research Series No.95.
- “FIR-GEM: A SOE-DSGE Model for fiscal policy analysis in Ireland” by Petros Varthalitis, ESRI working paper No. 620 (March 2019).
- “Fiscal multipliers in Ireland using FIR-GEM model” by Petros Varthalitis, ESRI working paper No. 636 (September 2019).

Research Papers and Publications forthcoming

- “Effective tax rates in the EU: An updated database over 1995-2017” by Ilias Kostarakos and P. Varthalitis
- “Effective tax rates in Ireland” by Ilias Kostarakos and P. Varthalitis
- “Productivity dispersion and sectoral labour shares in Europe” by Martina Lawless and Luke Rehill.
- “Do housing returns affect the labour share of income?” by Ilias Kostarakos, Kieran McQuinn and Luke Rehill.
- *Responsiveness of corporate taxes to profits and taxable income* by Jean Acheson, Martina Lawless, Donough Lawlor and Laura Weymes.
- *SME Investment Report 2019: Trends and developments* by Maria Martinez-Cillero, Martina Lawless, Conor O’Toole, Eric Gargan, Leona Cantillion and Peter McGoldrick
- “A granular analysis of the SME investment gap and its determinants” by Maria Martinez-Cillero, Martina Lawless and Conor O’Toole

3. Proposed Research Topics for 2020

A range of new topics have been proposed for the 2020 work plan, described briefly below. Detailed terms of reference will be prepared for these and any new proposed topics for discussion and approval by the Steering Committee throughout the year.

Macroeconomic effects of alternative capital buffer rules

This research project proposes to develop the COSMO banking sector model and enable an assessment of macroprudential capital buffers on the Irish economy. The research would allow the

Department and ESRI to explore how changes to capital buffers (such as the countercyclical capital buffer) would impact Irish GDP, employment, fiscal policy and the broader mortgage market.

Measuring the macroeconomic effects of MNEs in Ireland

By international standards, multinational enterprises (MNEs) play a particularly important role in the Irish economy. The production structure of foreign-owned MNEs is very different from the traditional structure of domestic firms. MNEs' complex structure and operations have a significant impact on the Irish national accounts. The aim of this project is to follow a model-based approach to measure the effect of MNEs on the welfare of the Irish residents using the newly developed FIR-GEM model to incorporate a multinational production sector separate from the tradable sector.

The role of firm dynamism in aggregate productivity growth

The establishment and growth of new businesses are key ingredients for economic growth and job creation. Across the OECD, however, the share of start-ups had been steadily decreasing and evidence from the US that finds a significant decline in business dynamism in the US over the last 30 years. For Ireland, the OECD has expressed concern that the rate of business entry-exit dynamism is particularly low. Extensive work on estimating firm productivity distributions using CSO micro-data has been undertaken by the Department and used in a previous project on productivity spillovers for this programme. This project proposes to utilise these data further and build on the previous analysis by focusing on the contributions to overall productivity levels and distributions of firm turnover.

Assessing the potential impact of population ageing on the public finances

Population ageing and long-run demographic changes are widely considered to have important implications for future economic growth and fiscal sustainability. The ageing process will put considerable upward pressure on public spending. The ESRI published a paper on this topic in 2005 (Barrett et al., 2005) but there is a need to revisit the issue and to produce up-dated projections of the public finances out to 2050. The long-term demographic projections will be generated using the ESRI's demographic model. Using COSMO (and the fiscal satellite) and the demographic model, it would be possible to generate alternative macro scenarios from which the implications of ageing for the evolution of the public finances could be analysed. The fiscal satellite allows for a richer interaction between COSMO and the demographic model, with a more comprehensive view of public spending and how ageing could affect its different components.

Exposure of Ireland to potential increased protectionism in the United States

Ireland is one of the most open countries to international trade in the world and this openness brings some vulnerability. Increases in trade tensions, most particularly between the US and Europe, but also more generally could exert downward pressure on Irish growth. This project proposes to examine the

potential direct exposure to Ireland and other countries across the EU of increases in US import tariffs. This will be done at the most granular level possible, using the product level trade flows compiled by the United Nations and matching them to current tariff levels. This will allow for a description of current trade flows, highlighting where products are particularly dependant on the US market and categorising them by current tariff level. This data structure can then be used to generate a broad counterfactual scenario of exposure to increases in tariffs across the entire product range.

Different trajectories for the carbon tax

The government increased the carbon tax from €20 to €26 in the Budget 2020 and €6 annual increases are expected until the carbon tax reaches €80. The end target of €80 can be reached by various paths and each trajectory would have different results on both macro- and micro-level economic figures. The existing modelling assumes a basically linear set of increases over time. However, several scenarios with more or less ambitious trajectories rather than such a linear trajectory could be considered and their overall impacts on environmental and economic factors estimated using the I3E model applied to the carbon tax analysis of the programme in 2019.

4. Budget 2019

Allocation of cost by research project	
Project	Cost
Brexit modelling	€ 58,962
Carbon tax	€ 37,010
Corporate tax	€ 11,196
Fiscal policy & growth	€ 56,708
Fiscal multipliers	€ 11,135
Labour share	€ 38,260
SME investment	€ 46,874
Total	€ 260,144