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Developing a Multi-Regional Input Output Model for Ireland



Key external stakeholders: DAFM

Practical implications for stakeholders:

This project developed a novel economic modelling framework to assess the regional impact of rural public policy reform in Ireland, improving the national toolkit for rural economic development analysis.

The Regional Input-Output tables are used to generate an estimate of the regional economic impact of Ireland's Rural Development Programme 2014-2020.

Main results:

This research develops Regional Input-Output Tables for ten regions - two NUTS II regions and the corresponding eight NUTS III regions.

The Regional Input-Output tables are used to derive direct and indirect output multipliers, allowing a comparative statistical analysis to be undertaken for the NUTS II and NUTS III regions.

The Regional Input-Output tables are used to generate an estimate of the regional economic impact of Ireland's Rural Development Programme 2014-2020. The highest direct impact is estimated to have occurred in the Border, Midland and West regions.

The direct plus indirect impact on the rural economy is estimated to be €3,334 million at the end of the programming period 2014-2020 if the entire RDP budget is spent.

It is interesting to see the highest RDP multipliers occur in the Border, Midland and Mid-West regions meaning that spill-over effects of RDP expenditure are greatest in these regions.

Opportunity / Benefit:

This modelling infrastructure allows for the first time, multipliers of rural economic development to be modelled at the NUT3 level. This builds capacity for improved rural and regional economic planning.

Collaborating Institutions:

UCD, DAFM

Teagasc project team: Prof Cathal O'Donoghue (Teagasc)

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1. Project background:

Regional policies, such as the National Spatial Strategy 2002-2020 and the most recent Project Ireland 2040, aim to maximise the potential of all regions and to increase their contribution to the national economy. However, the Dublin region has continued to be the most prosperous region and continually outperforms the Border, Midland, and West regions, in particular.

Understanding the interdependencies and disparities of Ireland's regions is of critical importance if the strategic outcomes of the most recent regional policy in Ireland, Project Ireland 2040, are to be achieved. However, the lack of a regional economic model will limit the ability of evaluators and policy-makers to assess the impact of Project Ireland 2040, the associated Rural Regeneration and Development Fund, and the Rural Development Programme, in achieving the regional development objective.

The absence of Regional Input-Output Tables in Ireland has reduced the capacity for evaluators and policy-makers to construct regional economic models and thereby to provide a robust and sound evidence base to formulate and assess regional and rural policy.

MacFeely (2011) made the first step towards addressing this gap by preparing the first set of fully integrated, symmetric, Input-Output Tables for the administrative NUTS II regions in Ireland: the Border, Midland and Western region and the Southern & Eastern region. However, the level of spatial disaggregation – two regions - failed to truly capture the complexity and diversity of Ireland's regional economies.

2. Questions addressed by the project:

This research aims to address the lack of regional economic models available in Ireland. A set of spatially disaggregated Regional I-O tables are compiled for the two NUTS II regions and the eight NUTS III regions of Ireland using a hybrid approach. The hybrid approach combines a “top-down” mechanical approach with a survey based “bottom-up” approach. The hybrid approach is the most common approach to constructing Regional I-O tables and is generally favoured due to the significant level of accuracy retained and the reduced survey data required.

3. The experimental studies:

The project developed a Chenery-Moses Multiregional Input-Output (MRIO) model for 2 NUTS II and 8 NUTS III regions in Ireland. The modelling approach the economic relationships within each region and the feedback affects from other regions. It extends the earlier work of MacFeely for NUTS II regions.

A hybrid (survey and non-survey) approach was used. In particular, the Generating Regional Input-Output Tables (GRIT) procedure, which applies Location Quotients (LQs) to the national Input-Output technical coefficients table to derive regional input-output coefficients is utilised. (Augmented) Flegg Location Quotient (AFLQ or FLQ) estimates are applied to the national Input-Output technical coefficients table to derive regional input-output coefficients and estimates for a “top-down”. These “Top-down” estimates are considered mechanical and the internal components of the Regional I-O tables, such as intermediate consumption and domestic imports, are identified for adjustment.

In the Hybrid approach, the mechanically generated “top-down” regional IO tables are supplemented with superior data, such as official published regional data and supplementary survey data. Supplementary survey data was collected on the transactions of goods and services by firms and consumers in Ireland to further improve the accuracy of the estimates. Regional Purchase Coefficients are derived from the survey data and used to revise the “top-down” regional intermediate consumption estimates and the household component of final demand. The resulting unbalanced matrices are balanced using a simplified Three-stage RAS technique.

4. Main results:

This research develops Regional Input-Output Tables for ten regions - two NUTS II regions and the corresponding eight NUTS III regions. The Regional Input-Output Tables are compiled using a hybrid approach, which combines a “top-down” mechanical approach with a survey based “bottom-up” approach. The Hybrid approach is extended by incorporating a simplified three-stage RAS approach to balance the

eight NUTSIII matrices and the two NUTSII matrices, while maintaining consistency with the National I-O table and official national and regional data sources.

The Regional Input-Output tables are used to derive direct and indirect output multipliers, allowing a comparative statistical analysis to be undertaken for the NUTS II and NUTS III regions. The Regional Input-Output tables are used to generate an estimate of the regional economic impact of Ireland's Rural Development Programme 2014-2020. The highest direct impact is estimated to have occurred in the Border, Midland and West regions. The direct plus indirect impacts are estimated by adjusting the final demand vector by the amount of the direct impact and multiplying the revised final demand vector by the Leontief inverse. The direct plus indirect impact on the rural economy is estimated to be €3,334 million at the end of the programming period 2014-2020 if the entire RDP budget is spent. It is interesting to see the highest RDP multipliers occur in the Border, Midland and Mid-West regions meaning that spill-over effects of RDP expenditure are greatest in these regions. Utilising the 8 region Regional I-O tables provides a truer reflection of the economic impact of RDP expenditures (€3,334 million) on rural areas than the original INDECON analysis undertaken for DAFM..

Future research is suggested in a number of areas, including to extend the number of sectors, to update the tables to 2015 for the revised NUTS regional configuration, to develop a gravity model to analyse inter-regional trade flows, to endogenise households to allow the induced effects to be calculated, and finally to develop a set of Regional Input-Output Tables for the island of Ireland, i.e. to include Northern Island as another region.

5. Opportunity/Benefit:

The main contribution of this research relates to overcoming the lack of regional data and considering the methodological framework to suit the Irish situation. This research provides an overview of the methodological approaches, including the different types of Regional I-O tables and examines the options to regionalised I-O models in an Irish context. In particular, the single regional model, inter-regional input-output model (IRIO), the balanced regional model, the multiregional input-output model (MRIO) and the gravity-model approach are considered as possible modelling frameworks. The three main groups of approaches to generating Regional I-O models – survey based, non-survey based, and a hybrid approach – are examined taking account of the numerous data sources available at regional level in Ireland. The project extended the hybrid modelling technique and simplifying the three-stage RAS matrix balancing technique

The Regional Input-Output model developed provides a new policy toolkit for regional, sectoral and rural policy makers in Ireland. The model is the first comprehensive set of spatially disaggregated I-O Tables for Ireland at NUTSIII level (eight regions). MacFeely (2011) produced regional tables at NUTSII level, however the two region tables have been underutilised in terms of regional economic analysis. The eight region Regional I-O tables contribute to the understanding of the economic relationships between the eight regions in Ireland and can be utilised to analyse the economic impact of changes of different events, such as sector expansion, firm closure and regulatory changes, on the regional economies. These tables also provide an enhanced platform for regional economic models, to analyse the impact of regional, sectoral and/or rural policy interventions, such as the Project Ireland 2040 funds, the Regional Operation Programmes or the Rural Development Programme.

6. Dissemination:

The model developed in conjunction with a senior official in the Department of Agriculture Food and the Marine. Drawing upon the lessons learnt from the project, an additional model was developed to facilitate the Implementation of Limerick 2030 Economic Plan

Main publications:

Carey, M. (2019) A Multi-Regional Input-Output Model for Ireland. PhD Dissertation, University College Dublin.

7. Compiled by: Cathal O'Donoghue and Mary Carey