Institution: University of Strathclyde

Unit of Assessment: 19 Business and Management Studies

Title of case study: Enhancing the Scottish Government's policy evaluation capacity

1. Summary of the impact

Research at the University of Strathclyde has increased the economic and policy modelling capacity of the Scottish Government. This has been affected through collaboration between researchers at Strathclyde and the Office of the Chief Economic Advisor (OCEA) and the Scottish Government-funded Centre of Expertise in Climate Change, ClimateXChange. The improvement in modelling capability and scope has enhanced the process of policy formation and evaluation, as well as the outcomes from it. This has allowed for improved decision making in the Scottish Government, allowed significant budget savings, improved advice to Scottish Ministers, improved interaction with the Westminster Government and resulted in a more informed public debate on policy decisions.

2. Underpinning research

Context: This impact is based on extensions to Computable General Equilibrium (CGE) methods incorporated into AMOS, A macro-micro Model Of Scotland. The research programme was initiated in the 1990s with an ESRC grant to Dr. Frank Harrigan (now Director at the General Secretariat for Development Planning, Qatar) and Peter McGregor (University of Strathclyde). The Strathclyde academic contribution was to incorporate institutional, macroeconomic and market conditions that characterise regional economies in developed countries. Examples are imperfectly competitive labour markets, complex public sector budget constraints and high levels of capital and labour mobility.

Main research contributions: AMOS was one of the first regional CGE models and it has been continuously developed and extended over the last two decades. From the outset, applications were theory-informed and policy-relevant, an early example being analysis of a regional wage subsidy by Harrigan et al. in 1996 [1]. While the research has primarily focussed on applications to the Scottish economy, variants of the model have also been developed for other small, open regional and national economies and for inter-related systems of regions (e.g. Gilmartin et al., 2013 [2]). The ability to model economic activity has also been extended to incorporate environmental and energy issues (e.g. Hanley et al., 2009 [3]). The flexible structure of the model facilitates extensive sensitivity analysis with respect to key parameter values and behavioural relationships which may be uncertain at the regional level. Further, the model's set of multi-period options enables the tracking of impacts over time (Lecca et al., 2013 [5]). This makes the AMOS modelling framework particularly useful for policy analysis, and distinguishes it from many other CGE models.

A key strength of the model is the ability to incorporate both demand- and supply-side policy changes and other exogenous shocks in a unified framework. This is in contrast to the majority of regional models which are strongly demand-determined. However, most government policy, especially for a devolved region such as Scotland, involves supply-side initiatives. Over the REF period, applications of the model have included the measurement of the regional impacts of: Higher Education Institutions; demographic change (Lisenkova et al., 2010 [6]); and the likely economic and environmental impact of improvements in energy efficiency and the introduction of renewable technologies (Lecca et al., 2011 [4]). The work generates many non-technical papers directed at the wider business and policy communities, typically published in the Department's *Fraser Economic Commentary*, regarded as the leading source of independent commentary on the Scottish economy, and the focus of regular, extensive media coverage.

Key researchers. Beside Professors McGregor and Swales, over the REF period key researchers were: Grant Allan (Research Associate and Lecturer), Dr. Patrizio Lecca (PhD. Student and Research Associate), Dr. Karen Turner (Senior Lecturer at Strathclyde and now Professor at Heriot Watt University). A number of other research staff contributed to particular projects and membership of the modelling team has typically provided the basis of a successful subsequent

career as academic and professional economists.

The main conceptual, policy and methodological insights from the research are contained in the sample of relevant publications below. All of the references had significant impact prior to publication since they appeared initially as online Discussion Papers; for example, the forward looking version of the model was available to the Scottish Government well before the publication of Lecca et al. in 2013 [5].

3. References to the research

1. Harrigan, F., McGregor, P. G. and J. K.Swales (1996). "The System-Wide Impact on the Recipient Region of a Regional Wage Subsidy", Oxford Economic Papers, vol.48 (1), pp 105-133.

2. Gilmartin, M. , Learmonth, D. , McGregor, P. G. , Swales, J. K. & Turner, K., (2013), "The National Impact of Regional Policy: Demand-side Policy Simulation with Labour Market Constraints in a Two-region Computable General Equilibrium Model", Environment and Planning A, vol. 45, pp 814-834.

3. Hanley, N., McGregor, P.G., Swales, J.K. and Turner, K. (2009), Do Increases in Energy EfficiencyImprove Environmental Quality and Sustainability?", Ecological Economics, vol.68, pp. 692-709.

4. Lecca, P., Turner, K. and Swales, J.K. (2011), "An investigation of issues relating to where energy should enter the production function", Economic Modelling, vol. 28, pp. 2832-2841.

5. Lecca, P., McGregor, P.G. and Swales, J. K. (2013) "Forward Looking versus Myopic Regional Computable General Equilibrium Models: How Significant is the Distinction?" Economic Modelling, vol 31 (C), pp160-176.

6. Lisenkova, K., McGregor, P.G., Pappas, N., Swales, J.K., Turner, K. and Wright, R.E., (2010), "Scotland the Grey: A Linked Demographic-Computable General Equilibrium (CGE) Analysis of the Impact of Population Ageing and Decline", Regional Studies, vol. 44, pp. 1351-1368.

Over the current REF period the team attracted: five awards from ESRC (including the most recent, which will start in October 2013); six from EPSRC; two from the EU; three from the Scottish Government and one from the private sector (SSE). McGregor and Swales have been PI or CI on all of these grants, which have exceeded £3 million over the REF period. The outputs include: well over 30 papers in leading international refereed journals (15 in the current REF period); numerous presentations at major international conferences around the world (many of these invited). In 2010 McGregor co-edited, with Professors Mark Partridge (Ohio State) and Dan Rickman (Oklahoma State), a special issue of Regional Studies on *Innovations in Regional CGE Modelling*.

4. Details of the impact

Process leading to impact:

The modelling team has enjoyed a long-term relationship with the economists in the Scottish Government through e.g. the provision of short courses; periodic seminars; membership of advisory groups. However, there has been a step-change impact during the current REF period that it is not "one-off" in nature - linked to a particular policy initiative - but rather continuing through the policy development and evaluation process itself. As a direct consequence of our research, OCEA has become committed to routine use of CGE models to analyse policy options for Scotland under alternative constitutional arrangements. The Scottish Government have established a CGE modelling team with a commitment to further developing this activity, in part through pro-active engagement with Strathclyde. There are a number of dimensions to this engagement.

Nature of the Impact:

Impact on Office of the Chief Economic Advisor (OCEA). The process began in the summer of 2011 when the Economics Department ran a short CGE modelling course for members of OCEA. This course was to familiarise members of the Government Economic Service working for OCEA

on the operation of CGE models in general. The aim of the Scottish Government was to build modelling capacity in order to evaluate more effectively the impact of policy initiatives and possible external shocks to the economy. The motivation was to improve decision making over key economic policies and increase the quality of policy discussion in Scotland, thereby benefitting the performance of the devolved government in Scotland. Specifically, the Scottish Government wanted to operate a CGE model as part of a suite of modelling techniques, including forecasting and tax modelling, to improve the advice it gives to Scottish Ministers.

The Department subsequently worked with OCEA, on modelling the impact of a differential reduction in Corporation Tax in Scotland on the Scottish economy. This work is explicitly cited in the Scottish Government's submission to the Scotland Bill (Scottish Government, 2011) and is the subject of a report from the Scottish Parliament Information Centre (Marsh and Nicol, 2013). The research has subsequently been presented at a Scottish Institute for Research in Economics (SIRE) Conference on International Business Taxation, July 2012, and the Urban and Regional Economics Seminar Group, January 2012. Further collaboration on developing a CGE modelling capacity within OCEA involved the Scottish Government purchasing a version of the Strathclyde model and establishing a formal contract for Strathclyde to provide on-going technical support to help them further customise the model and run model simulations. Two members of the OCEA staff, Leila Akhoundova and Angela Nolte, have been assigned to develop the CGE modelling and Kim Swales has been a visiting advisor to OCEA.

Model simulations by the Scottish Government have been used to identify the impact of the present fiscal consolidation experienced by the Scottish Government. Simulation results are also currently a key input into internal evaluation within the Scottish Government on the impact of changes in current and capital expenditure on the Scottish economy and variations in employers' national insurance contributions. This research has also been used to inform the Council of Economic Advisers. OCEA reports (Source 2) that the relationship with the University of Strathclyde has led to significant increases to the quality advice provided to the Scottish Government.

"As a result of our relationship with the team at the University of Strathclyde, the breadth and quality of analytical advice that we have been able to provide has increased significantly." (Source 2)

In particular, the modelling frameworks designed by Strathclyde are shaping policy development at the highest levels within government.

"We have also been better able to inform the evaluation of past-policy initiatives. Recent examples of this work includes research to inform publication of major external consultation documents – e.g. on corporation tax – and internal policy advice to Ministers – e.g. capital investment, export promotion and labour market participation. The research has also been used to inform the deliberations of the Council of Economic Advisers…. Feedback from senior Ministers, include the First Minister and the Cabinet Secretary for Finance, Employment and Sustainable Growth, has been excellent." (Source 2)

The Strathclyde research has also yielded significant cost savings. According to OCEA, these are recurring and expected to save around 10% of OCEA's annual research budget (Source 2).

Impact on ClimateXChange. The Scottish Government initiated an interaction with academics in Scotland through a new body, ClimateXChange. Professors McGregor and Swales successfully competed for funding under this initiative and were founder members of the body, their inclusion depending primarily on their prior research in regional Environment–Energy-Economy CGE modelling. ClimateXChange is a unique collaboration in which research on areas of key policy interest to the Scottish Government are funded across academic groups in Scotland. The Strathclyde models developed and applied to policy issues in this context share the same basic multi-sectoral framework as those being developed by OCEA, though extended to include detailed links to energy demands and carbon emissions. It therefore becomes straightforward to track the

impact of any energy or economic policy on energy use and emissions. The support for this capacity building is motivated by a conviction of the value of CGE modelling of the type developed at Strathclyde as a tool for the policy formation process.

The way in which annual objectives are agreed and delivered ensures that priorities reflect the research needs of the Scottish Government. In April 2012, mid-way through the first year of the project, we reported to the ClimateXChange policy workshop on the changes in efficiency and/or subsidies for renewables required for the Scottish Government to meet its renewables targets. We also reported simulation results for the introduction of a carbon tax in Scotland, clearly a possibility under independence. We have also recently (Summer 2013) discussed with the Scottish Government on-going work on the wider economic and energy use impacts of improved energy efficiency in household consumption. In the second year of the project we are undertaking analysis of the potential economic impacts for Scotland of developments in "Community Renewables". We have also provided an analysis of the likely economic impact of the recent licensing for marine energy developments. This research will feed directly into the Scottish Government's deliberations on the current renewable energy targets in this area (Source 3 can corroborate).

Overall, increased capacity in economic modelling enhances the process of, and outcomes from, policy formation and evaluation. This allows for better decision making in the Scottish Government, improved advice to Scottish Ministers and a more informed public debate on policy decisions. These are central issues in the move towards greater devolved fiscal powers embodied in the Scotland Act (2012) and the discussions surrounding the independence referendum.

Continuing model innovation and sustainable impact. Furthermore, the Scottish Government is part-funding (with the ESRC) two PhD studentships within the Economics Department to expand the variant of the AMOS model that it has adopted, and continues to fund advice and technical assistance from the modelling team. The specific areas of improvement are the treatment of the Government sector, further labour market developments and greater household disaggregation. These are particular areas chosen by the Scottish Government where an enhanced understanding would improve their policy analysis. Continuing model innovation is also a feature of a very recent award to Strathclyde under the ESRC's *Future of the UK and Scotland pre and post referendum* initiative, which will explore alternative fiscal futures under a range of model developments, including: a separate North Sea Oil sector; the incorporation of public attitudes towards taxation and government expenditure (building on explicit monitoring of these attitudes in juries and panels run by multidisciplinary colleagues); and the completion of a "behavioural" single-region and a "New Economic Geography" inter-regional variant of the model. Sustained policy impact is virtually assured as a consequence of the current embeddedness of CGE modelling within the Scottish Government's policy formation and assessment process (Sources 1 and 2 can corroborate).

5. Sources to corroborate the impact

1. Chief Economic Adviser for the Scottish Government can be contacted to corroborate that sustained policy impact is virtually assured as a consequence of the current embeddedness of CGE modelling within the Scottish Government's policy formation and assessment process.
2. A letter from the Head of the Office of the Chief Economic Advisor (OCEA), Scottish Government, corroborating the Strathclyde modelling team's impact through OCEA.
3. Former Head of the Energy and Climate Change Directorate within the Scottish Government can be contacted to corroborate that the research and analysis provided of the likely economic impact of the recent licensing for marine energy developments, will feed directly into the Scottish Government's deliberations on the current renewable energy targets in this area.