

Impact case study (REF3b)

Institution: Durham University
Unit of Assessment: 19
Title of case study: North East Economic Model (NEEM)
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>The North East Economic Model (NEEM) was designed and developed at Durham University Business School (DUBS) from 2003. Customized to the regional economy, the aim of the research was for NEEM to model intra- and extra-regional economic relationships to provide quantitative estimates/projections of the impact of both long-term economic trends and shorter-term economic ‘shocks’. Its application has had significant impacts on policy practitioners in the region by: (1) facilitating more robust evidence-based policy analysis; (2) giving rise to knowledge transfer to policy-makers regarding the structure and workings of the regional economy; and (3) acting as a catalyst for an extended regional policy-modeling capacity. By influencing professional practice, it has had demonstrable impacts on regional economic policy, regional economic restructuring and local planning.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>NEEM (Reference 1) grew out of a substantial body of research that analyzed various aspects of structural change in the North East economy, based upon the development of comprehensive longitudinal databases of establishments (including one on all firms in Sunderland, and another covering all foreign-owned establishments in the North East region) - both databases reaching back to 1973. Through extensive establishment surveys and interviews (c2000 firms) over the years, the databases, importantly, incorporated micro data on inter-firm supply relationships both within and outside the region. This data (also used in other, related research on the regional economy (e.g. Reference 2)) were vital to improving the accuracy of the resulting model; given that a full primary survey was prohibitively expensive. Professor Stone initiated work on NEEM in 2003, convincing regional stakeholders of the practical need for such a tool and then obtaining development funding from (mainly) the Regional Development Agency (ONE) totaling £515,000 over 2003-11. NEEM is based on an input-output methodology, which captures key internal and external economic flows, and is customized to the regional context. It can be used for analyzing the impact on the region of both long-term economic trends (e.g. in the exchange rate or household saving behaviour) and short-term shocks (e.g. cutbacks in government spending). Results are fed into the policy process to inform regional policy-makers of the quantitative economic consequences of different policy responses and so lead to improved policy.</p> <p>While input-output analysis is a well-established technique, the construction of robust models for relatively small areas continues to present significant methodological hurdles. The well-known RAS procedure is widely used in the estimation of regional Input-Output tables based upon a historic regional table, or current national table, assuming that current regional row and column totals are known. However, these methods remain unreliable in situations, such as UK regions, where there is no reliable comparable table(s) that can be used as a basis for modified RAS procedures. Recent developments to the RAS procedure allow the possibility of improved accuracy in the presence of some structural differences between the structures of the parent and child tables. However, until recently, the last full national IO tables related to 1995, effectively preventing the consideration of such techniques. The methodology used to construct the NEEM is innovative in that it operates, as far as possible, by building analysis from record level data from government surveys (Labour Force Survey, Family Resources Survey) and using bespoke extracts only where necessary (e.g. Annual Business Surveys). These estimations use a combination of multi-region panel datasets, built to allow the use of econometric techniques to generate estimates of missing or uncertain data (e.g. 3 digit Standardized Industrial Classification level Gross Value Added estimates), and insertion of known superior data from the project team’s datasets regional plants and firms. This focus upon the creation of a primary data set has the effect of removing some of the (by definition unknown) errors that would result from using some kind of scaling technique based upon a outdated national table (for almost all of the project period the last national tables related to 1995) at the cost of significantly increasing the labour input required to produce the final table. NEEM’s development involved reviewing modeling techniques elsewhere (including overseas) and developing a state-of-the-art application appropriate to the North East context. The development phases involved testing of approaches and presentations/exchange of knowledge via</p>

academic networks and conferences (e.g. EcoMod International Conference on Regional Modeling (Brussels, 2006), British Urban & Regional Information Systems Conference (Royal Statistical Society, 2007), and Direct & Inverse Modelling in End-to-End Environmental Prediction (DIME) International Workshop (Newcastle, 2008)).

A substantial effort was required to collect, clean and convert a very large body of dispersed official data and information into a single, consistent and 'joined-up' resource using internationally recognized economic accounting/input-output methods. Over a million items of data, drawn from the best available data sources, are combined in NEEM's purpose-built software platform, complete with detailed Help files and instructions, and annually updated to reflect newly published official data and changes in the regional economic structure.

While scaled down versions of national models are commonly used in regional analysis, NEEM is distinctive in being a 'bottom-up' model specifically designed to use local data sources – including that directly collected through periodic large scale business surveys undertaken by the Durham team. For example, the unique data collected for other work on the region (e.g. Reference 2 on new firm survival in the north east) were directly incorporated into NEEM (there being no equivalent government data source available for use) – the 2001 data underpinning Reference 2 matched the latest available official data when NEEM was developed from 2003. This local data constituted critical information within the 110 industry sector groupings in NEEM. NEEM also has matrices relating to household, trading and government sectors, and incorporates output, employment, occupations, skills levels etc. These features make NEEM more reliable for analyzing regional issues than other models (e.g. Cambridge Econometrics). NEEM also evolved to include environmental dimensions (i.e. coefficients in the sectoral matrix structure linking industrial production with emissions) and also capability to interact with other models (e.g. to assess impact of demographic change via a demographic model developed by ONE).

The underpinning research, led by Professor Stone, consists of: (a) analytical papers on industrial change in the north-east necessitating the building of large datasets (illustrated by Reference 2); and (b) the design, initial building and then further development of the NEEM model (Reference 1). This model was applied from 2005 onwards, through analysis of a variety of specific policy-related issues, by the Durham team, in collaboration with regional policy-making bodies. In addition, a substantial dissemination, knowledge transfer and training programme was delivered, to inform regional practitioners of NEEM's insights into the nature and functioning of the local economy and to facilitate direct use of NEEM by key regional officers (e.g. for supporting EU funding bids).

Staff involved: *Ian Stone* – Professorial Fellow, DUBS 2003–date; *Andrew Hunt* – Researcher in Policy Research Group, DUBS, 10/2003 to 2007; part-time Teaching Fellow 2007-08; business-funded PhD student, DUBS 2008–date; P Holmes was at DUBS, 1984-2008, Professor of Finance; P Braidford was a researcher at DUBS 2003-07.

3. References to the research (indicative maximum of six references)

- 1) NEEM is research in itself: Hunt A. & Stone, I. (2005, and updated versions annually) North East Economic Model; available for inspection on disk.
- 2) Holmes, P., Stone, I. and Braidford P. (2003) '*An analysis of new firm survival using a hazard function*'. Entrepreneurship Research Series: Durham University Business School (see <https://www.dur.ac.uk/resources/dbs/businessschool/researchpaper003.pdf>). A revised version was published as: Holmes P., Hunt, A. and Stone, I. (2010). '*An analysis of new firm survival using a hazard function*' *Applied Economics* **42**(2): 185-95. (ABS 2*) <http://dx.doi.org/10.1080/00036840701579234>

4. Details of the impact (indicative maximum 750 words)

NEEM led to major improvements in quantitative policy analysis in the North East of England, taking the region to the forefront of regional economic planning within the country from 2008.

Knowledge transfer to policy practitioners

NEEM constitutes a tool that played a pivotal role in moving regional policy-makers towards a more coherent, systematic and information-based analytical framework. Its knowledge transfer role was in part delivered through a series of research seminars at ONE, the formation of a modeling discussion forum (below) and by training programmes for ONE staff and other practitioners on using NEEM and interpreting its results. The analytical work undertaken using the model (including that embodied in numerous reports and briefings) and the embedding of knowledge through formal

knowledge transfer related to NEEM, gave practitioners a more realistic and otherwise unobtainable understanding of how the regional economy works and led to markedly improved policy analysis and design. Former Head of Regional Strategy at ONE suggests that ‘the model was critical to the RDA and partners (including local authorities) as a means of ensuring shared assumptions in planning and economic development policy across the local authority areas in the North East. It made a significant impact on regional development activity, and this was further enhanced when we began to understand interfaces with other models, including around carbon emissions and transport.’ (Testimonial 1). The former Corporate Research Manager at Northumberland County Council (NCC), considered that the model’s ‘greatest merit was probably... in its educational impact on researchers and policy-makers’ (Testimonial 2).

Catalyst for developing extended regional modelling capacity

The model played a key role in NE policy circles in fostering a culture (ongoing and intensifying throughout the REF period) where policy modelling became accepted and even routinized. Based initially around meetings and discussions relating to NEEM itself, region-wide planning practitioners began meeting formally (from 2005 to 2010) as the NE Economic Modelling User Group. This group gave rise to further initiatives that permitted integrated modeling across diverse aspects of the economy, including demography, housing and the environment. Of the various policy reports produced using the NEEM, 17 (of 20) were produced from 2008 or after – or relate directly to the REF period. (See full list of relevant policy reports in Evidence 1). Thus, from 2008, the NEEM was central to achieving a clear process of advancement in the use of scientific tools to analyse regional issues in an integrated manner. As the former Modelling Manager of the North East Regional Information Partnership (NERIP), states in testimonial 3: ‘NEEM provides a highly detailed source of data about the regional economy. For regional partners, this provided a much richer picture than was available from standard sources... NEEM saw considerable use and, in my view, was of immense value in educating people both inside and outside ONE, about some of the myths and realities of the regional economy. As well as the obvious uses for producing numbers on Output, GVA, Productivity and so on, the data was also used to identify multiplier effects in different sectors and saw its way into many internal reports’. (Evidence 1).

Stronger evidence-base in regional policy-making

A further NEEM impact was to ensure that regional policy was founded upon a much stronger evidential basis. Regional economic planning was underpinned by local capacity to make a systematic quantitative assessment of the various policy choices. The following cases have been selected to demonstrate NEEM’s impact in this respect.

1. Regional Economic Strategy

NEEM was a key driver in the evolution of the Regional Economic Strategy (RES) from the participatory (but largely unscientific) process to a more quantitative-based approach, as reflected in the Integrated Regional Strategy (IRS), developed to cover the period 2006-2016. The RES document, *Leading the Way* (Evidence 2) embodies extensive NEEM analysis, which provided the basis for the *RES Action Plan* (Evidence 3). For example, it allowed ONE to improve its inter-sectoral growth targets for 2006-16. NEEM projections showed that the initial growth targets were simply not feasible; the credibility of the NEEM helped ONE to achieve consensus among regional stakeholder groups in support of a more feasible growth strategy that was implemented after 2008. The Corporate Research Manager of NCC said that the model ‘brought into focus the reality of the economy and its interdependencies. It debunked growth targets that were not possible; that had initially formed part of policy at county and regional level’ (Testimonial 2). (This testimonial relates to Evidence 3.) The (then) Chief Economist at ONE states that the NEEM ‘played a major role in shaping the work of a number of public agencies... [and by 2011] has left the region in a much stronger position to develop its economic priorities and to engage in informed discussions over public and private investment’ (Testimonial 4).

2. Economic restructuring

One of NEEM’s strengths is in analysing economic restructuring following ‘shocks’ to the economy. The fact that the model is primarily a *regional* one, built from the ‘bottom up’, makes it superior for this purpose than top-down national models that are only superficially modified for regional analysis. An example is the response to the Corus steel closure on Teesside in January 2010 (Evidence 4). In this case, an over assessment of multiplier effects was made public by Teesside-based stakeholders, to justify a significant diversion of regional resources to that locality. However, Durham’s NEEM-based analysis for ONE demonstrated these estimates to be substantially

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exaggerated, enabling regional partners to design a more appropriate regional policy response. (As testimonial 4 puts it: "I drew on the model many times to understand the impact of major redundancies on the region's growth and employment. That included working through the effects of some of very high profile shocks to the region e.g. Northern Rock, Corus and Nissan. The model gave myself, and the senior leadership team, confidence to enter into robust debates on the state of the region and its investment needs with central government (Ministers and senior officials)". NEEM's role in facilitating the shift towards greater evidence-based decision-making thus helped reduce the power of regional actors to press unrealistic claims to advance their own area's interests at the expense of others. NEEM was also similarly applied to the analysis of other closures during the REF period (e.g. Alcan's aluminium plant – report published 2012 – evidence 5), organisational downsizing (Northern Rock – report published 2010 – Testimonial 4), impact of reduced government spending (Evidence 6) and major infrastructure investments (Hitachi train factory (report published 2012), High Speed Broadband network (report published 2012) – both listed in Evidence 1). In these cases, NEEM enabled policymakers to achieve better-informed estimates of impact, giving greater credibility to their bids to central government/the Treasury for support or special initiatives, and improving efficiency and equity with respect to public spending.

3. Local planning: the cases of Durham and Northumberland County Councils

NEEM has also had impacts on more localized (sub-regional) economic planning processes. This application provided transparent results based on clear underlying assumptions and helped planners fine-tune their plans around their own local knowledge. Again, using scaled-down national models was regarded as unsatisfactory because of their opaque ('black box') nature and the limited scope they offered for bringing local knowledge to bear on the issue. Thus, NEEM was recognized as providing the basis for a demonstrably superior planning process. The former manager at NCC states: 'NEEM was used to understand the national recession's knock-on effects to Northumberland; the likely effects of the closure of Alcan...; the real significance of Agriculture (huge) and Tourism's impact (frequently exaggerated)' (see Testimonial 2).

4. Renewal of NEEM support funding:

Funding for NEEM was renewed twice, in 2005 and 2009. Former Modelling Manager at NERIP, points out that 'the second renewal only took place because the model had clearly demonstrated its worth' (Testimonial 3). Although funding for NEEM was terminated when ONE was abolished by the Coalition government in 2010, the model's importance for local and regional planning is confirmed by the 'Updating the North East Economic Model' contract awarded by Newcastle City Council (Evidence 7) in order to facilitate the preparation of a 'Skills Action Plan'. This collaborative initiative by NE Local Economic Partnerships recognises NEEM's previous contribution to labour market planning. As, Head of Regional Strategy Manager at ONE NE, notes: 'It has... become very apparent over the past two years that there is a significant gap in the field of strategic economic activity around developing shared underpinning assumptions to make investment decisions. For this reason, a decision has been taken at the regional level to redevelop NEEM and use it for skills investment and a variety of other purposes going forward' (Testimonial 1).

5. Sources to corroborate the impact (indicative maximum of 10 references)

Evidence

1. List of Policy Reports applying NEEM
2. [Leading the Way. Regional Economic Strategy 2006-2016](#)
3. [Regional Economic Strategy Action Plan](#)
4. [CORUS steel closure](#)- BBC News Channel, 4th December 2009,
5. [Rio Tinto Alcan Lynemouth Closure: Evidence of Likely Economic Impact](#), Report for NCC, 2012.
6. *Mind the Gap- Assessing the impact of reduced government spending on the NE Economy*, Report for ONE NE, 2010
7. 'Updating the North East Economic Model' contract (Newcastle City Council no.003018, dated 07.03.13, £48K.

Testimonials

1. Head of Regional Strategy at ONE
2. Former Corporate Research Manager, Northumberland CC
3. Former Modelling Manager of NERIP
4. Former Chief Economist at ONE