Institution: University of Aberdeen

Unit of Assessment: UoA18 Economics and Econometrics

Title of case study: North Sea Oil and Gas Taxation and Activity Levels.

1. Summary of the impact

Research at the University of Aberdeen on the economics of North Sea oil and gas activity levels and the potential effects of tax changes on exploration and development decisions - and thus on total investment - have informed government and the oil industry of the virtues of ensuring that the tax system produces the appropriate balance between investment incentives and tax revenues.

In particular this work demonstrated the need to accommodate the differential impact of the tax system across offshore fields located in different geographic regions of the UK Continental Shelf (UKCS) which have varying cost characteristics, and the consequent need for tax allowances to avoid investment disincentives and to promote maximum economic recovery.

2. Underpinning research

The relevant research was undertaken at Aberdeen by Alex Kemp (Professor), Sola Kasim (Research Fellow), and Linda Stephen (Research Fellow) over the period since 2000.

The research involved the development of complex econometric models of the UK Continental Shelf (UKCS). The paper by Kemp and Kasim (2003a) produced insights into the factors (including taxation) which determine the pace of exploration, development, and production. A further study (Kemp and Kasim 2003b) used econometric techniques to forecast activity levels in the UKCS. Learning from the results in these papers, financial simulation models were modified and employed (Kemp and Stephen 2005 and 2011) to enhance understanding of the factors determining likely future activity levels, including the role of the tax arrangements.

Altogether the research identified and quantified the effects on investment and production likely to emanate from the changing UK tax system. The studies were conducted in a period when three large tax increases were introduced on North Sea oil and gas production. The research highlighted the consequences of what was basically a flat rate (proportional) tax system across fields personified by highly differentiated profitability. Investment and operating costs vary substantially across the UK Continental Shelf depending on the reservoir and oil characteristics, water depth, and distance from infrastructure. The paper by Kemp and Kasim (2006) clearly demonstrated the importance of these features and indicated the need for incentives to be differentiated according to geographic areas and cost characteristics, if economic rents were to be efficiently collected by the state without causing deadweight losses and investment disincentives.

A further strand of research on rates of decline in production (Kemp and Kasim 2005) demonstrated the need to incentivise incremental investments in mature fields to moderate decline rates and enhance economic recovery.

3. References to the research

- Kemp A G and Kasim A S (2003a). *An Econometric Model of Oil and Gas Exploration Development and Production in the UK Continental Shelf: A Systems Approach*. The Energy Journal, 24, 2, 113-141. http://search.proquest.com/docview/222022055?accountid=8155

- Kemp A G and Kasim A S (2003b). *Forecasting Activity Levels in the United Kingdom Continental Shelf: The Role of Perceptions*. Energy Economics, 25, 6, 713-839, DOI: 10.1016/S0140-9883(03)00045-8

- Kemp A G and Kasim A S (2005). *Are Production Decline Rates really Exponential? Evidence from the UKCS*. The Energy Journal, 26, 1, 27-50. http://search.proquest.com/docview/222022363?accountid=8155

- Kemp A G and Kasim A S (2006). *A Regional Model of Oil and Gas Exploration in the UKCS*. Scottish Journal of Political Economy, 53, 2, 198-221, DOI: 10.1111/J.1467-9485.2006.00376.X

- Kemp A G and Stephen L (2005). Optimising Oil and Gas Depletion in the Maturing North Sea with Growing Import Dependence. Oxford Review of Economic Policy, 21, 1, 43-66, DOI: 10.1093/oxrep/gri003

- Kemp A G and Stephen L (2011). *The Effects of Budget 2011 on Activity in the UK Continental Shelf*. University of Aberdeen, Department of Economics, North Sea Study Occasional Paper, No.120, 1- 50, http://hdl.handle.net/2164/2080

Grant awards

The research was conducted with the aid of grants awarded to Professor Alex Kemp over the period. They were awarded on a yearly basis all under the heading North Sea Oil and Gas Economics. The sponsors have been a (varying) group of oil companies plus Scottish Enterprise. The values of the grants have exceeded £100,000 per year. The total for the current REF period 2008-2013 alone is £706,700.

4. Details of the impact

The research described above has been found valuable and employed by investors, policy-makers within the UK Government, and also by House of Commons Committees who influence policies. Often acknowledgement of the value of the research has been made privately but sometimes publicly. In June 2009 the House of Commons Select Committee on Energy and Climate Change published a report entitled *UK Offshore Oil and Gas* (Vol.1, HC 341-1) in which the Memorandum and Oral Evidence given by Professor Kemp was cited several times and his recommendations on the fiscal regime and related issues were incorporated in the conclusions of the Committee's report.

The study by Kemp and Kasim (2006) highlighted the particular economic problem of securing stranded gas developments in the West of Shetland region where there was little infrastructure and the investment costs correspondingly high. This had some influence on the introduction in 2010 of tax allowances for stranded gas fields. A later paper (Kemp and Stephen 2011) identified the problems of developing fields generally in the UKCS, but particularly oil fields in the West of Shetland region. This informed policy regarding the introduction of the special allowance for large, deepwater fields in Budget 2012 as outlined below.

The results of the research paper produced after Budget 2011 (Kemp and Stephen 2011) were quoted in support of her views by Justine Greening, Economic Secretary to the Treasury, in her evidence to the House of Commons Energy and Climate Change Select Committee on 4th May 2011 in support of the Government's position (see House of Commons Energy and Climate Change Committee, HC108-*i*, January 2012). The study by Kemp and Stephen (2011) produced evidence of the need for further field tax allowances to mitigate the effects of the tax rate hike in Budget 2011.

In Kemp and Kasim (2005) the research paper on production decline rates in the UKCS found that the generally assumed exponential production decline rates did not correspond with the realities of the UKCS. Detailed econometric modelling demonstrated that production decline rates were more likely to be logistic rather than exponential. It was also found that decline rates were very sensitive to the presence or otherwise of incremental investments during the mature phase of a field's life. At this time there were no tax incentives for such investments. This study and that by Kemp and Stephen (2011) provided independent evidence of the need to incentivise investments in mature

fields. In Budget 2012 provision was made to introduce the brownfield allowance to apply to incremental investments. In the Green Budget published by the influential Institute for Fiscal Studies in February 2013 there is a section on North Sea oil taxation in which the paper by Kemp and Stephen (2011) is cited approvingly.

The various oil company and Scottish Enterprise sponsors have been sufficiently impressed with the research work that they have continuously renewed their sponsorship throughout the REF period (and for many earlier years). Their sponsorship is on a one-year basis only, and no promises are made about any further funding. They have clearly revealed their satisfaction by continually agreeing to fund further research studies on this important, ongoing subject. They see the benefit of independent research which models the entire North Sea oil sector and measures the aggregate effect of tax changes on the sector. The impact of the research on the private sector has been generated by providing a public analytical service to individual oil companies, who generally lack industry-wide knowledge of the impact of tax measures. In turn this has enabled the companies to make better-informed decisions. This private sector impact further augments the impact on the UK Government.

Based on his research papers on North Sea oil, in the REF period, Professor Kemp has given many television interviews to the BBC, STV, Channel Four, Al Jazeera, and Bloomberg, radio interviews to Radio 4, Radio 5, BBC Radio Scotland, and North Sound, and press interviews to The Financial Times, Times, Guardian, Scotsman, Herald, Aberdeen Press and Journal, and Le Monde. These indicate the wider impact effect of the research.

5. Sources to corroborate the impact

a) House of Commons Select Committee on Energy and Climate Change, UK Offshore Oil and Gas, Vol.1, HC341-1, June 2009, http://www.publications.parliament.uk/pa/cm200809/cmselect/cmenergy/cmenergy.htm

b) House of Commons Energy and Climate Change Committee, Implications for the North Sea Oil and Gas Industry of Budget 2011, HC1018-I, January 2012. See oral evidence of Justine Greening, Economic Secretary to the Treasury. http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/c1018-i/c101801.htm

c) Director, Licensing, Exploration and Development, Department of Energy and Climate. To corroborate Professor Kemp's research work on the relationship between petroleum taxation and activity in the UKCS.

d) Vice President Tax Americas, Shell Oil Company. To corroborate Professor Kemp's research work on the relationship between petroleum taxation and activity in the UKCS.