

Teresa Chance
Central Policy - Freedom of Information
1C/25
100 Parliament Street
London SW1A 2BQ

By email to:
Lisa Evans
[request-29xxxxxxxxxxxxx@xxxxxxxxxxxxxxxxxxx.xxx]

Tel

Fax 020 7147 0666

Email

Date 6 April 2010
Our Ref FOI 1200/10
Your Ref

www.hmrc.gov.uk

Dear Ms Evans,

Freedom of Information Act 2000

I am writing to confirm that HMRC has now completed its search for the information you requested on 17 February 2010. I apologise for the delay in responding. You asked:

I would like to request the schema for the HMRC computable general equilibrium (CGE) model

A copy of the information is enclosed.

The information supplied to you continues to be protected by the Copyright, Designs and Patents Act 1988. You are free to use it for your own purposes, including any non-commercial research you are doing and for the purposes of news reporting. Any other re-use, for example commercial publication, would require the permission of the copyright holder. Most documents supplied by HMRC will have been produced by government officials and will be Crown Copyright. You can find details on the arrangements for re-using Crown Copyright on HMSOnline (internet access required) at:

<http://www.hmso.gov.uk/copyright/licences/click-use-home.htm>

Information you receive which is not subject to Crown Copyright continues to be protected by the copyright of the person, or organisation, from which the information

Information is available in large print, audio tape and Braille formats.
Type Talk service prefix number – 18001



INVESTOR IN PEOPLE



originated. You must ensure that you gain their permission before reproducing any third party (non Crown Copyright) information.

If you have any queries about this letter, please contact me. Please remember to quote the reference number above in any future communications.

If you are not happy with this reply you may request a review by writing to HMRC FOI Team, Room 1C/25, 100 Parliament Street London SW1A 2BQ. You must request a review within 2 months of the date of this letter. It would assist our review if you set out which aspects of the reply concern you and why you are dissatisfied.

If you are not content with the outcome of an internal review, you may apply directly to the Information Commissioner for a decision. The Information Commissioner will not usually consider a case unless you have exhausted the internal review procedure provided by HMRC. He can be contacted at The Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

Yours sincerely

Teresa Chance

HM Revenue and Customs

Computable General Equilibrium Model Specification and Applications

The HMRC CGE model is a large scale, multi-sectoral, dynamic model calibrated to the UK economy. It uses the software package GAMS/MPSGE to evaluate the economic and distributional effects of policy decisions. It is based on National Accounts data and aims to simulate the structural relationships of the economy. It provides results for 45 household types, split by income quintile and 9 types of household composition. It incorporates an 11-sector split of the economy, which can be aggregated from a choice of 123 sectors for more detailed results. The CGE model is being continually updated to meet UK developments, and has been used in HMRC for 7-8 years.

What is the CGE model typically used for in HMRC?

- See the impact of a policy change on the economy as a whole, including the impact on the tax base and tax yield
- Economic and distributional impacts of tax policy.
- Impact of a change in one tax on revenue from other taxes
- Evaluating the incidence and excess burden of taxation.
- We are generally asked to provide economic analysis of the wider impacts of tax policy on different variables including: welfare & efficiency, GDP and sectoral output, prices and employment, household income by cohort, government revenue, production and consumption.

Applications

The CGE model can be applied to a wide range of tax and non-tax policy changes, including non-marginal changes and those with no historical precedent. The model is continually being developed, and supplementary modules are added to enable the modelling of specific policy changes.

Non-Tax policy

Recently we have developed an environmental sub-module to analyse the economic implications of environmental policies for the Department of Energy and Climate Change (DECC). Specifically we have fed into the analysis of the Renewable Energy Strategy and Emissions Trading Scheme, looking at the long term Marco-economic costs (in particular the GDP impact) of both policies.

Tax Policy

The model incorporates around 95 per cent of tax revenues, and therefore is ideally suited to the economic analysis of tax policy changes. The CGE model is typically used for the analysis of Budget and PBR measures – and as such we will often be working to tight deadlines. The outputs provided by the model are used by policy customers and are used in the policy making process. We will generally provide analysis of the long term impact on GDP (by component), welfare and household income of different tax policy changes.

What are the key assumptions?

- A1. A fundamental underlying assumption is that markets are in equilibrium, which means that the amount of a good supplied equals the amount that is demanded, with prices adjusting to ensure this remains so. This holds for all goods and services, as well as labour and capital.
- A2. The model assumes that government expenditure is fixed. In other words, no prior assumption is made about how revenue changes affect spending decisions, which is thought to make the model more transparent.
- A3. Households and firms are assumed to be rational and forward-looking, i.e., taking decisions based on information they have now and what they expect to happen in the future.
- A4. The CGE model is an open economy model that accounts for flows of foreign direct investment (FDI) and international trade. The flows of imports and exports and the level of FDI adjust in the model in response to policy changes.
- A5. An element of market power is introduced to the model, which varies by sector, according to a standard index of concentrations. This means that firms in the same sector are able to differentiate their goods from the competition, which allows them some control over the prices they charge and can explain why imports are preferred over domestically produced goods from the same sector. This can be switched off to analyse classical “perfect competition” scenarios, if desired.
- A6. Labour and capital (factors of production) can be substituted in the production process depending on the effect the policy change has and the supply and demand for these factors in each sector. Factors are assumed to incur costs when they move from one industry to another, which means it can take longer for these resources to be put to the most efficient use following a shock to the economy. Some capital stock is assumed to be specialised for the industry it is in and can't be used elsewhere, and workers experience a temporary loss in productivity when they move to a new sector as it takes time for them to retrain.
- A7. The CGE model is set-up so that the output grows at 2.75% per annum in-line with HMT assumptions of the long-run underlying rate of economic growth. What the CGE model does not assume is any policy response to a given change in the economy. So for instance, if demand in the economy rose

significantly in response to a policy change and caused prices to rise, no inflation adjusting response from the Bank of England is specified. However, such effects can be built in and compared if desired.

- A8. Capital Adjustment Costs: Following Uzawa (1969) capital installation costs depend on the gross rate of investment relative to the existing capital stock.

Given the level of investment, the cost of new capital decreases when the capital stock increases and vice versa.

The installation cost function is given by:

$$I_t = J_t \left(1 + \phi \frac{J_t}{2K_t} \right)$$

Rapid changes in the capital stock are costly and the speed of adjustment is reduced when installation costs increase.

- A9. Imperfect Competition:

The model applies the Lerner Index of market power to set endogenously the price mark-up over marginal cost. This is then set equal to the perceived elasticity of demand.

$$\frac{P - MC}{P} = \frac{1}{\varepsilon}$$

As firms are trying to protect mark-ups, a firm's behaviour will be determined by the preservation of its mark-up, and rival firms' actions or the behaviour of new entrants will be implicit in this decision making process.

Each sector has a fixed conjectural variation parameter which determines within-sector responses to the leading firm's behaviour.