**Economic Modelling & Regional Analysis Note**

This note sets out available approaches available to assess the economic impact of spending in the economy. Specifically, how to attempt to quantify the potential economic impact of investment and development projects.

*Economic Modelling*

Whilst there are many approaches to quantifying economic impacts, of varying degrees of complexities, one founded approach is input-output modelling. Input-output modelling is a method used to analyse the interdependencies and relationships between different sectors of an economy. It quantifies the flows of goods, services, and money between various sectors, providing insights into the overall structure and functioning of the economy.

In input-output modelling, the economy is viewed as a collection of different sectors, such as agriculture, manufacturing, and services. Each sector's inputs and outputs are identified and represented in a matrix called the input-output table. The input-output table shows the purchases (inputs) and sales (outputs) of goods and services between sectors.

An input-output table captures the flow of goods, services, and money between sectors. It provides a quantitative representation of the interconnections between sectors and allows for the analysis of the ripple effects of changes in demand or production within the economy. By quantifying these interdependencies, input-output models can estimate the direct and indirect effects of changes in specific sectors on the overall economy. For more technical details, see [this](https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2019/08/input-output-latest/documents/sut-methodology-guide/sut-methodology-guide/govscot%3Adocument/SUT%2BMethodology%2BGuide%2Bv7.pdf) methodology note produced by the Scottish Government.

Input-output models are often used for policy analysis and impact assessments. For example, they can help policymakers understand the potential consequences of changes in government spending, changes in industry regulations, or the introduction of new technologies. Moreover, this approach is also used in the private sector to help understand the economic contribution of business activity on indicators such as GVA, jobs and investment in the economy.

An alternative approach is Computable General Equilibrium (CGE) modelling. This is a macroeconomic modelling approach that incorporates microeconomic principles and mathematical equations to simulate the behaviour of economic agents and the overall economy. In this, the economy is represented by a set of equations that capture the production, consumption, and distribution activities of different sectors and agents. These equations describe the relationships between factors of production (such as labour, capital, and natural resources), industries, households, government, and international trade. These models account for various economic variables, such as prices, quantities, wages, taxes, and savings.

The key difference between CGE and input-output models is that CGE models incorporate large amounts of economic theory, whereas input-output models are wholly data driven. CGE models require large amounts of time to set-up and build, compared to input-output models which are relatively quick to establish when the data is available.

*Data*

To undertake input-output modelling, quantitative information on the interactions between sectors in the economy of interest are required. Input-Output tables are readily available for the [UK](https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/ukinputoutputanalyticaltablesindustrybyindustry) and [Scottish](https://www.gov.scot/publications/input-output-latest/) economies. At more granular levels (For example at city levels), data is less readily available. Caution should also be made when undergoing such a granular approach given economies are usually highly interconnected. For example, an assessment of the Glaswegian economy in isolation of the rest of Scotland or the UK would likely underestimate impacts, given interactions between sectors within and outside of Glasgow would not be included.

*Regional Analysis*

Similar to economic modelling, regional analysis can be undertaken to various degrees of sophistication. The simplest approach is to apportion regional or UK-wide results by GVA shares across geographical areas. For example, the [Department of International Trade](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1073969/impact-assessment-of-the-free-trade-agreement-between-the-united-kingdom-of-great-britain-and-northern-ireland-and-australia.pdf) illustrate the potential regional impacts of Free Trade Agreements by apportioning results based on GVA shares. Whilst useful for illustrative purposes, this approach likely misses out the potential feedback loop of economic impacts between regions, such as how economic growth in one area can help stimulate further growth in interconnected areas. Moreover, a competitive element between regions may also exist, where the gains from economic shocks may be shared unevenly across regional areas based on differences in competitive advantage.

In reality, modelling regional effects with a high degree of sophistication is difficult. Not only does it require a large amount of economic theory, but it also relies on vast amounts of sub-regional data that is often not widely available. This results in most approaches using simple apportionment. Whilst there are caveats to this approach, it is usually the most transparent and provides a good indication of more granular economic impacts.

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