# Overview of some alternative methodologies for economic impact analysis

## Aim

Economic impact analysis using inter-industry models provides a method to evaluate the effects of a project or proposed policy change. This paper briefly summarises the applicability, structure and limitations of three techniques frequently used in economic impact analysis:

- using simple Input-Output analysis (I-O);
- Input-Output Econometric modelling (IOE); and
- Computable General Equilibrium modelling (CGE).

While these methodologies are not the only tools available for economic impact analysis they represent the type of tools that are most frequently used within the Queensland public sector or by consultants on behalf of the Queensland public sector. Furthermore, it should be noted that economic impact analysis should also focus on the direct effects of the project, ie the project's investment and operational direct impacts in terms of number of persons directly employed and contribution to gross state product. This can be complemented by economic impact analysis that estimates, in addition to the direct impacts, the broader economic effects.

## Why conduct economic impact analysis

Economic impact analysis is conducted to quantify the economic effects of a proposed project or policy. Economic impact analysis is a methodology by which the economic implications of a potential action, such as the undertaking of a large infrastructure type investment, or the implementation of a policy or regulation, can be evaluated prior to taking that action.

## Outline of Methodologies

### 1. The input-output framework

In economic impact analysis the I-O technique can be considered a limiting case of its more complicated relatives the IOE and CGE models. In the I-O technique, the I-O table is converted into a model of inter-industry response through the manipulation of the I-O database. Specifically, the values in the I-O table are converted to fixed shares which through the process of matrix manipulation can be used to derive estimates of the total response of the economy as a result of some specified event or policy action.

I-O analysis involves the use of multipliers to calculate the overall economic impact of a project or policy change. Two types of multipliers are commonly used. Type I multipliers measure the industrial response to the change while Type II multipliers measure in addition to the industrial response the consumption-induced response.

The advantage of the I-O technique is its ease of use and transparency. However, as a methodology for undertaking economic impact analysis the ease of use comes at a cost. In particular, the I-O model is easy to use because of a number of limiting and unrealistic assumptions.

One major limitation of the I-O model when used to conduct impact analysis is the use of fixed coefficients implying that an industrial structure remains unchanged by the economic event. In addition, these fixed coefficients imply that the marginal response of industries as a result of some policy action is equivalent to the average relationships observed in the base year for which the tables are compiled.

Another major limitation of the I-O model is its lack of supply side constraints. The implications of this are frequently overlooked in economic impact analysis. Constraints on the availability of inputs, such as skilled labour, requires some means, for example prices, to act as a rationing device. Therefore, prices act as a signal that induces changes in the consumption patterns of producers and consumers. In I-O analysis, where all adjustments take place in changes in the quantities produced, this type of rationing response is assumed not to occur. Consequently, the technique often results in a significant overstatement of the impacts on employment and Gross State Product.

The lack of supply side constraints also becomes a problem in studies evaluating the impact of government expenditure programs. If the government expands the funding of one portfolio it is faced with the choice of reducing the funding of other portfolios, raising taxes or undertaking additional borrowing. Either of the last two options would result in reduced expenditure in future periods. Any of these compensating adjustments will act to offset the impact of the initial expansion of government expenditure. These compensating adjustments are not usually accounted for in I-O analysis but need to be included to make these types of evaluations realistic.

For these reasons, it is recommended that caution be used in interpreting the results of an economic impact statement using simple I-O analysis. If the flow-on effects are to be incorporated in the impact analysis only the Type I multipliers should be used. It should also be noted that these estimated effects are likely to overstate the benefits of the project to the State economy.

## 2. Input-output econometric (IOE) modelling

IOE modelling extends the I-O framework by integrating econometric relationships, estimated from time series or panel data, into the I-O framework. By incorporating econometric relationships IOE addresses the shortcoming of average relationships in simple I-O analysis and provides the adjustment path of the economy to an economic impact.

Additionally, the technique allows the incorporation of supply side constraints. Thus the IOE technique overcomes one of the major limiting assumptions of the I-O model. These constraints are incorporated via econometric relationships that provide an estimate of the price responsiveness of goods as a result of changes in demand and

supply. Consumer and producer behaviour is affected by these price changes, resulting in changes in the consumption and production patterns.

## 3. Computable general equilibrium (CGE) modelling

The empirical component of the CGE model is an I-O table. Each transaction flow in the I-O table is disaggregated into two components, price and quantity. Both the price and quantity components are allowed to adjust, with both components driven by different factors, in response to the economic event being analysed.

In the majority of CGE models used in Australia, firms or producers are assumed to maximise profits. In addition, product and factor markets are assumed to be competitive. Profit maximisation dictates that firms act so as to minimise costs and factors are generally responsive to price changes. Households are assumed to maximise utility in their consumption decisions, responding to price differences across goods and services. Finally, prices adjust in goods, services, and factor markets to equate demand and supply.

The majority of CGE models used in Australia can be separated into two broad categories, comparative static and recursive-dynamic. Like the I-O model, the comparative static CGE model does not contain any explicit time dimension. A recursive-dynamic CGE model can be linked to a macro-econometric model to produce a 'business-as-usual' forecast. The CGE model can then be used to trace out a specific time path of the economy following the change in the policy or introduction of the project. The economic adjustment can then be determined by the difference between the two alternative time paths.

### Summary

The previous discussion suggests that the three related techniques frequently employed in economic impact analysis will produce markedly different results. The estimated economic benefits derived from an I-O analysis will usually be the most generous. A result attributed to the techniques' use of average rather than marginal responses, lack of supply side constraints and inability to take account of any price responses. In favour of this technique is the transparent nature of the model making it easy to see how the results were derived and the fact that in a limiting number of situations more complex models may produce similar results.

It is difficult to compare the estimated impacts of the IOE or CGE modelling techniques since the estimates derived vary from model to model. More importantly, significant variation in estimates can be produced using the same CGE model. This is because the flexibility of these models allows the analyst to incorporate their own professional judgement in determining the appropriate economic environment and initial project or policy specification.

In the case of the IOE model, the results will depend very much on the extent to which the supply side of the model is specified and incorporated into the system in addition to the estimated parameters of the model. This will depend on the availability of data and

to some extent the preferences of the modeller in the specification of the model. To date, the supply side constraints incorporated in IOE models have not been as complete as those specified in CGE models.

For the CGE model the estimated response will depend partially on the coefficients used to drive the behavioural relationships specified in the theoretical structure of the model, but more importantly the economic environment of the model specified in the particular economic impact analysis.

For these reasons, the choice of an appropriate methodology for economic impact analysis must be undertaken on a case by case basis. Additionally, it is important that the analysis is presented in a manner in which the assumptions underpinning the results are clear. A rigorous assessment should include sensitivity analysis providing information on how changes in the models' specification, reflecting alternate assumptions, would effect the results. The inclusion of such documentation may be taken as a sign of a considered analysis.