Economic Impact Assessment (EIA) using Input-Output Multipliers

A manual for basic users

Hutt City Council

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Objectives

Making you familiar with:

- The Input Output (IO) model, concepts and terms

- Economic Impact Assessment (EIA) using IO multipliers

Content

- Input-output model
- What are multipliers
- Basic concepts of multipliers
- Calculation of impacts using multipliers
- Example
- Limitations and misuses

Why do we care?

In planning various projects and policies we need to know:

- If the benefits justify the costs

- Comparison purposes: which of the available options brings more impacts and other benefits to the local economy, and

- Understand wider impacts of specific event, activity, project or policy

What is an Input Output model?

- is a quantitative economic technique that represents the interdependencies between different branches of a national economy or different regional economies.

- is a matrix with column entries representing inputs to an industrial sector, while row entries represent outputs from a given sector

- presents a comprehensive picture of supply and use of all products and income generated from production. In plain words:

> **It shows how much the production of each sector is and how output from each sector may become an input to another sector.**

- IO uses values at Basic Prices (output minus any tax payable)

When you buy a loaf of bread for $40

Supply of Output

	Wheat	Wheat Flour	Bread	Con-sumption	Total Products
Wheat	0	**10**	0	0	10
Wheat Flour	0	0	**25**	0	25
Bread	0	0	0	**40**	40
Salary & Profit	10	15	15		
Total Products	10	25	40		

Input for a specific product

Source: neda.gov.ph

The story goes on…

	Agric.	Constr.	Mfg.	Trans.	Trade	Serv.	PCE	PFI	Net Exports	Govt.	Total
Agriculture											
Construction											
Manufacturing			Intermediate Inputs					Final Use			Total Gross Output
Transportation											
Trade											
Services											
Compensation											
Taxes			Value Added					GDP			
Gross surplus											
Total			Total Gross Output								

Regional multipliers arise naturally out of regional IO models. **Hutt City IO model that includes 106 industries has been updated** based on the national IO model published in April 2016. The model covers YE 03/2013 data.

What are multipliers?

- Derived from Input Output (IO) tables, they are summary measures used to estimate the total impact on all industries due to changes in the demand for the output of one industry

For example, the total impact on the whole economy of one additional dollar spent on food services (i.e. an increase in output of food services)

✓ Multipliers are designed to quantify the **direct, indirect and induced economic impacts** of policies and projects in an economy.

What are economic impacts?

- **Output**: the total value of production by all industries required to satisfy one extra dollar's worth of final demand for one industry's output. _Big numbers are seductive but Output is a very poor indicator of economic activity. Output can happen with very little employment and value added (income or GDP), but it is employment and income that we value._

So we only report:

- **Value Added**: the total value of income to businesses (EBITDA in accounting terms) and to household (wages, salaries and self-employed income. This can be interpreted as **contribution to (local) GDP**.

- **Employment**: the additional employment, expressed in Full Time Equivalent (FTE) jobs.

- **Household Income**: the part of Value Added which is paid to households.

Direct and Indirect Impacts

- **Direct effect**
The effect directly caused by the activity e.g. a purchase

- **Flow on effect**

  - **Indirect**. Impacts arising from purchases of inputs by farms to support the direct spend. E.g. cardboard packaging for apples, ink for packaging, electricity for the ink maker.

  - **Induced**. Impacts arising when additional household income (wages and self-emp. income) is spent, generating more indirect and induced effects, until it finally disappears through "leakages".

Total impact = Direct + Indirect + Induced

How to measure impact?

Find out where the money goes by breaking down the expenditures, then use one of the two types of IO multipliers to estimate the impact:

- Type I: (Direct + Indirect) : Direct
- Type II: (Direct + Indirect + Induced) : Direct

Multipliers vs. ratios:

Multipliers capture the size of the secondary effects, as a ratio of total effects to direct effects. But do we have direct effect? Usually no. So:

If you have people's expenditure (Final demand) or the investment in an industry, then multiply that by the appropriate ratios:

- Value Added : Direct Output ratio
- Employment per $Million : Direct Output ratio
- Household Income : Direct Output ratio

➢ Find direct, indirect and total ratios in columns B, D and G of Hutt City multipliers spreadsheet.

How to measure impact? (con't)

Repeat this for all the relevant expenditures, then add up all the impacts. The total change, resulting from the new policy/project, in all the relevant industries of the study area is:

- ✓ Sum (Dollars spent x total value added ratio) = TOTAL value added impact

Dollars spent on industry 1 x total value added ratio for industry 1
+ Dollars spent on industry 2 x total value added ratio for industry 2
+ ....
+ Dollars spent on industry n x total value added ratio for industry n

= TOTAL value added impact of the project/policy

- Similarly:

  - ✓ Sum (Dollars spent x total employment ratio) = TOTAL jobs impact

  - ✓ Sum (Dollars spent x total household income ratio) = TOTAL household income impact

- Alternatively, use DIRECT ratios to get the DIRECT impact of the project/policy.

Example: Building a Library

What is the <u>Direct Impact</u> of Council investing $5 M on the construction of a new library? Let's see where the money goes:

1- Calculating how much of the money is spent locally in each industry:

Industry	Share (%)	Amount ($)	Industry's Direct Value Added ratio (table's cell)	Impact on local GDP ($)
Scientific, architectural, and engineering services	15%	750,000	0.57 (B313)	427,500
Non-residential building construction	25%	1,250,000	0.17 (B273)	212,500
Construction services	10%	500,000	0.42 (B275)	210,000
			Total Direct Impact of Construction	**850,000**

* Assuming that the other 50% are spent on purchasing goods and services from out of the City. We don't include the leakages because they have no local impact!
** Percentages are for illustration only. They vary in each project.

Example: Building a Library (con't)

2- Visitors' expenditure:

The library attracts people from neighbouring cities. Using library services might be free of charge; however, visitors may buy other things such as books, food and beverage, clothes and shoes while they are travelling to Lower Hutt to go to the library.

Let's assume every year 100 people buy a pair of shoes for $120, and we are analysing a 20 years period! The total visitors' expenditure would be $240,000 (=120x100x20).

Then assuming that we found that 30% of this money goes to the retailer selling shoes, and the rest goes to the shoe manufacturer, the breakdown is as follows:

Industry	Share (%)	Amount ($)	Industry's Direct Value Added ratio (table's cell)	Direct Impact on local GDP ($)
Recreational, clothing, footwear, and personal accessory retailing	30%	72,000	0.54 (B286)	38,880
Clothing, knitted products, and footwear manufacturing	70%	168,000	0.43 (B249)	72,240
			Total Direct Impact of visitors' expenditure	**111,120**

* You may add any other expenditures by visitors from out of the City. **Avoid double counting!**

Example: Building a Library (con't)

3- Sum up: Direct Impact of developing a new library is equal to $961,120.

> $850,000 (i.e. construction impact)
> + $111,120 (i.e. visitors' expenditure impact)
> = $961,120

- Follow a similar process to calculate Total Value Added Impact and Direct and Total Impacts on Employment, etc.

This is a highly simplified example. In a real world analysis, you need to:

a.   Provide **supporting evidence** for each assumption

b.   Calculate Net Present Value (NPV) of the impacts at a certain date:
       NPV = Present Value of Positive Impacts minus the Present Value of Negative Impacts.

c.   Consider GST. Deduct it first, go through multipliers, then add it again after the calculation of impacts. (The reason behind this is GST should not be multiplied by ratios/multipliers.)

Don't forget: Consider only <u>additional dollars</u> spent <u>locally</u>

on <u>the most relevant industry</u> because of <u>this specific project/policy</u>.

Typical Errors

- Double Counting
  - e.g. in an event: Impacts of performers, then impacts due to attendees spending on ticket prices!
  - Justify the capital cost, then use the same impacts to justify the event support!
  - Economic impact, then Non-user benefits!

- Not separating tourist spending from local spending (we usually ignore local resident's spending on the assumptions that residents would have otherwise spent their money elsewhere in the City with a similar impact.)

- Failure to remove transfers (e.g. grants come from ratepayers)

- Focussing on Output / Sales rather than yield / Value Added

- Long term vs short term jobs (also consider the negative impacts of seasonal jobs)

Typical Errors (con't)

- Crowding out effect (scarce resources in big projects, e.g. full employment and booming construction industry: EIA offers the upper bound while dynamic CGE models provide the lower bound)

- Not netting off negative impacts

- Confusing study area and time periods

- Assuming a facility's capacity equals the actual level of activity

- Applying multipliers in events where only local residents attend

- Using wrong Industrial categorization: choose the best matching category to get the most accurate estimation. Avoid averaging the multipliers! Don't forget that multipliers are calculated for the industry, so they are not very exact for specific projects.

IMPACTS
are not equal to
BENEFITS

- If you run a business, and sell $100 worth of goods how much better off are you ?

  - Not turnover ($100)

  - Not even value added (maybe $40) because you could have done other things

  - ✓ The net benefit would be part of value added

Do multipliers get outdated?

- IO model is constructed using annual data for a single "base year", while the local businesses and interdependencies change over time.
  - ✓ The IO tables are often updated every 5 years, **use the latest table**

- How about inflation? It affects primarily employment ratios as they are based on $1 M expenditure in the industry.
  - ✓ **Employment ratios should be adjusted, according to inflation**.

Conclusion: The Power of IO Models

- IO analysis is a tremendously popular and powerful analytical tool. "The chief value of regional input-output analysis is in its descriptive analytical power."

- "As a descriptive tool, input-output tables:
  - *present an enormous quantity of information in a concise, orderly, and easily understood fashion*;
  - *provide a comprehensive picture of the inter-industry structure of the regional economy*;
  - *point up the strategic importance of various industries and sectors*;
  - *highlight possible opportunities for strengthening regional income and employment multiplication*." (Bendavid-Val, p.113)

Urban Planners should be able to understand the structure, assumptions, and data requirements of Input-Output Analysis.
While you may not be performing this analysis in your job, you almost certainly will come across this type of work sometime in your career.