**Preliminary Form to Add Social Determinants to CSDUL**

**Request date (2025-09-08):**

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| **Indicator or Model Name:** | Economic Input-Output multipliers |

**Purpose of the document**

This document includes several questions that must be answered by the researcher interested in incorporating dataset information, indicators or models into CSDUL. These questions pretend to briefly explain the mathematical and theoretical framework of the indicator or model being incorporated. The researcher must be able to fill out every question clearly and concisely, supporting their explanation with respectable academic sources.

The document will be added to the model or indicator documentation in CSDUL-OUT and CSDUL-RDC. It must serve as a quick and straightforward introduction to the indicator or model for anyone interested and give relevant references to guide the learning process to other researchers.

**To be completed by the responsible analyst.**

**If there are questions that cannot be answered because of the nature of the indicator/model, write N/A.**

**For the second part, you can support your completion using the example document located in this link:** [**Documents - Add inputs to CSDUL - 02 - Example.docx - Google Docs**](https://docs.google.com/document/d/1t4_Bh5pRtHzd8GQ3ifJWY2zjjjch8DFf/edit)

1. **Indicator Description:**
2. **Will you share the inputs through CSDUL-RDC, CSDUL-OUT, or both?**

Both

1. **Explanation of the indicator/model.**

Input-output multipliers provide estimates of economic impact per dollar of output delivered to final demand (final consumption expenditures, capital formation, or exports). The output is defined by industry according to the Input-Output Industry Classification. The economic impact is estimated for:

* Output
* Gross Domestic Product (GDP) and its components
* Jobs
* Imports

Types of Multipliers

Direct multiplier

Measures the initial requirements for a unit of output by an industry. Also referred to as an industry input coefficient.

Indirect multiplier

Defined as the simple multiplier minus the corresponding direct multiplier.

Simple multiplier

Measures the total value of production required from all industries across all stages of production to produce one unit of output for final use.

Induced multiplier

Measures the value of production driven by household expenditures associated with labour income (e.g., wages) generated from direct and indirect effects.

Total multiplier

Sum of the direct, indirect, and induced multipliers.

**Type I and Type II Multipliers**

Type I multiplier: Expresses the simple multiplier as a multiple of the direct multiplier. Type I multiplier = Simple multiplier ÷ Direct multiplier.

Example: Simple jobs multipliers show the direct and indirect impacts on jobs of one million dollars’ worth of manufacturing output.

Type I jobs multipliers show the direct and indirect impacts across the whole economy of one job in the manufacturing industry.

**Type II multiplier**

Expresses the total multiplier as a multiple of the direct multiplier:  
Type II multiplier = Total multiplier ÷ Direct multiplier.

Example: Total jobs multipliers show the direct, indirect, and induced impacts on jobs of one million dollars’ worth of manufacturing output.

Type II jobs multipliers show the direct, indirect, and induced impacts across the whole economy of one job in the manufacturing industry.

* 1. **In simple words, explain what the indicator/model to be added consists of.**

Multipliers show how much the economy grows when money is spent in one area.

**Direct multiplier**The first impact of spending.  
Example: If a factory buys $1 million of steel, that creates jobs and output in the steel industry.

**Indirect multiplier**The “ripple” effect occurs when suppliers also buy from other industries.  
Example: The steel company then buys iron ore, electricity, and transport services — creating more jobs.

**Simple multiplier**  
Adds up direct + indirect effects.  
Example: The factory’s steel purchase triggers production across several industries.

**Induced multiplier**The extra boost when workers spend their wages (on groceries, rent, clothes, etc.).  
Example: Steel workers spend their paychecks in local shops, creating even more jobs.

**Total multiplier**Adds up direct + indirect + induced effects — the full impact of the original spending.

* 1. **Are there assumptions associated with the indicator/model? If there are, please briefly describe them.**

**Assumption 1: Fixed Production Relationships**

Each industry always needs the same proportion of inputs to make its output.

Example: If a bakery needs 2 bags of flour for every 100 loaves, that ratio never changes, no matter how big production gets.

Reality: Firms can substitute inputs (e.g., more machines, less labour).

**Assumption 2: No Supply Constraints**

Industries can always increase production as much as needed to meet demand.

Example: If a new mine needs 1,000 more workers, it is assumed they can be hired without shortages.

Reality: Economies often face limits — skilled labour, land, raw materials.

**Assumption 3: Constant Prices (No Inflation or Wage Changes)**

Prices and wages don’t change when demand changes.

Example: If demand for steel doubles, the price of steel is assumed to stay the same.

Reality: Shortages often drive prices up.

**Assumption 4: Linear Impacts (No Scale Effects)**

Impacts grow proportionally with spending.

Example: Spending $10M has exactly 10 times the impact of $1M.

Reality: Economies may show diminishing or increasing returns.

**Assumption 5: Homogeneous Output**

Each industry produces a single, uniform product.

Example: All construction output is treated the same, whether it’s housing or highways.

Reality: Can be multiple outputs from one industry.

**Assumption 6: No Behavioural Changes**

People and firms always behave the same, no matter the project.

Example: If wages rise, workers are not assumed to change their spending or working patterns.

Reality: Individuals can change preferences.

**Closed Model (for Induced Effects)**

When induced multipliers are used, it assumes households immediately spend all their extra income within the economy.

Reality: Households save money, pay debts, or spend outside the region.

* 1. **How is the indicator/model derived? Support your explanation with formulas when possible.**

**Basic IO Model**

The input-output model can be written as: x = (I - A)(-1) y

Where:

* x = vector of total output (all industries)
* I = identity matrix
* A = matrix of technical coefficients (input requirements per unit of output)
* y = vector of final demand  
  (I - A)^(-1) = Leontief inverse (core of the multiplier model)

Industry or sectoral multipliers are obtained by summing the elements vertically within each column of the Leontief matrix.

* 1. **What is the unit of analysis of the indicator/model? (e.g. households, persons, cities)**

Province-year

* 1. **How can the indicator be integrated with other datasets?**

We can merge the dataset by year and geographic unit, which in this case are provinces and territories.

* 1. **What are the boundaries of the indicator/model?**

In theory, values can range from 1 to plus infinity; however, multipliers are not greater than 66 in the dataset.

* 1. **If you want to add a model to CSDUL, is this associated with a hypothesis? If yes, please describe their:**
     1. **Null hypothesis**
     2. **Alternative hypothesis**
     3. **The implications of rejecting the null hypothesis**
  2. **What is the interpretation of the values of the indicator/model?**

Input-output multipliers estimate the economic impact per dollar of output delivered to final demand (final consumption expenditures, capital formation, or exports). For example, an economic multiplier of 1.5 for mining indicates that every dollar invested in the mining industry, after one cycle year, increases to 1.5 dollars.

* 1. **Based on the literature and your experience working with this indicator/model, is it possible to identify weaknesses in its calculations or assumptions? To facilitate your answer, you can focus on:**

1. **Potential biases**
2. **Overestimation**
3. **Underestimation**
4. **Omitted variables**
5. **Endogeneity**
6. **Does the indicator/model have other mathematical or computational versions (not syntax) to build it? (provide references)**
   1. **Why are you building the indicator/model as you propose? Are there advantages compared to other versions?**
7. **Do you see potential improvements for the indicator/model? This could involve using other datasets, refining calculations, or modifying assumptions, among others.**

**What inputs are to be added to CSDUL? Write “X”**

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| **X** | Raw or intermediate datasets required to create the indicator/model. |
| **X** | Codes that create the indicator/model (be sure that your code is clear enough to be replicated in the future for yourself or any other researcher). |
| **X** | Documentation that explains step by step the entire process that builds the indicator or model. |
| **X** | Results, which consist of the list of variables, indicators, or model results. |
| **X** | Support files. They can be papers, chapter books, codes, etc. |

**References**