Office for National Statistics

Article

Input-output analytical tables: guidance for use

This is a guide for the use of input-output analytical tables (IOATs). It provides insights on how to interpret them and is aimed at users looking to familiarise themselves with IOATs.

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Release date:
1 April 2022

Next release:
To be announced

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1 . Input-output tables and the supply and use framework

The input-output analytical tables (IOATs) are derived from the annual supply and use tables (SUTs). The SUTs provide a picture of the flows of products and services in the economy for a single year. They are used to set the level of annual current price gross domestic product (GDP). The IOATs are derived from the SUTs and can be used for additional analysis, as described in this article. The latest published IOATs contain a 105 product or industry breakdown; consistent with the SUTs.

2 . Interpreting the input-output analytical tables

This section explains how the main product-by-product input-output analytical tables (IOATs) should be interpreted. The descriptions are based on simplified and fictional examples. They show tables broken down into four products, which are:

- cheese
- pastries
- milk
- other

The tables also show the primary inputs of the four products, which are:

- imports
- taxes less subsidies on products
- taxes less subsidies on production
- compensation of employees
- gross operating surplus

The taxes less subsidies on production, compensation of employees and gross operating surplus are gross value added (GVA) components. Therefore, in the tables in this article they are shown collectively as GVA.

Differences between product-by-product and industry-by-industry tables

The Office for National Statistics (ONS) produces a set of industry-by-industry tables, as well as product-by-product input-output tables. To interpret both correctly, it is important to highlight their differences.

Product-by-product and industry-by-industry tables are different because products and industries have different components. While product tables focus on one product group (for example, dairy products), industry tables contain the outputs of the whole industry. This includes primary (main output) and secondary production (products produced by the industry other than their main output). Product-by-product tables apply to individual product groups, while industry-by-industry tables apply to several product groups in the same industry.

Domestic and imports use tables, and matrix of coefficients

Domestic use refers to the consumption of domestically produced products. The domestic use table shows how domestically supplied products (rows) are allocated between inputs to new products and final uses (column). For example, Table 1 shows that £1 billion of domestic milk is used to make cheese. Additionally, the total production of cheese required £500 million of imported goods and services.

Table 1: Product-by-product domestic use (annual, £ million)
Total input required to produce products

Product	Cheese	Pastries	Milk	Other
Cheese	700	200	1,200	8,000
Pastries	10	50	20	3,000
Milk	1,000	240	900	6,500
Other	15,000	17,000	16,500	150,000
Imports	500	110	350	15,000
Taxes less subsidies on products	15	10	5	750
GVA	7,540	11,220	6,620	370,000
Total	24,765	28,830	25,595	553,250

Source: Office for National Statistics – Fictional data

The imports use tables can be viewed in a similar way, with the values showing use of imports instead of domestically produced products.

The matrix of coefficients shows the direct input requirements (rows) per unit of output (columns) and consists of two parts. The first is the top square, which displays domestic intermediate consumption requirements. This is also called the A matrix and is a notation the ONS uses in the publication of the IOATs. The second is the bottom rectangle, which displays primary input requirements.

For example, in Table 2, £100 million of cheese requires £2.8 million of domestically produced cheese products, £2.0 million of imported products and generates £30.4 million GVA.

Table 2: Product-by-product matrix of coefficients (annual)
Direct input requirements per unit of output

Product	Cheese	Pastries	Milk	Other
Cheese	0.028	0.007	0.047	0.014
Pastries	0.000	0.002	0.001	0.005
Milk	0.040	0.008	0.035	0.012
Other	0.606	0.590	0.645	0.271
Imports	0.020	0.004	0.014	0.027
Taxes less subsidies on products	0.001	0.000	0.000	0.001
GVA	0.304	0.389	0.259	0.669
Total	1.000	1.000	1.000	1.000

Source: Office for National Statistics – Fictional data

Leontief inverse

The Leontief inverse shows the input requirements per unit of final use. It allows the user to calculate the total requirements for products across the economy based on a change in final use.

The direct, indirect and total use concepts are important to interpret the Leontief inverse. If households increased their cheese purchases (direct use), production of cheese would increase proportionately. This creates a supply chain impact across the economy; cheese producers will need more cheese inputs (for example milk). Likewise, milk producers will need more inputs to produce milk. This impact extends across the economy and is known as indirect use. Overall, the direct use from households and indirect use by cheese producers and their supply chain make up the total use in the economy.

Therefore, in Table 3, £100 million of additional final use for cheese creates a total increase in use of £202.8 million. Of this, £100 million is the final use of cheese, and the remaining £102.8 million is indirect use, created by the supply chain of inputs needed to make the additional cheese.

Table 3: Product-by-product Leontief inverse (annual)
Total input requirements per unit of final use

Product	Cheese	Pastries	Milk	Other
Cheese	1.046	0.021	0.065	0.022
Pastries	0.005	1.006	0.006	0.008
Milk	0.055	0.020	1.051	0.018
Other	0.922	0.849	0.989	1.413
Total	2.028	1.896	2.112	1.460

Source: Office for National Statistics – Fictional data

Effects and multipliers

Effects show the impacts on the economy per unit of final use. Unlike the Leontief inverse, which focuses on individual products and total output, effects provide insights into economic transactions and total output. In addition, while the Leontief inverse shows the direct, indirect and total impacts, effects only show total impacts.

For example, cheese has a GVA effect of 0.951 (Table 4). This means that an increase of £100 million in final use of cheese is estimated to increase total GVA by £95.1 million. The remaining £4.9 million comprises taxes on products and imports. More detail is available in the published tables.

Table 4: Selected product effects (annual)
Total impacts per unit of final use

Product	Imports	Taxes less subsidies on products	GVA
Cheese	0.047	0.002	0.951
Pastries	0.028	0.002	0.971
Milk	0.043	0.002	0.956
Other	0.039	0.002	0.959

Source: Office for National Statistics – Fictional data

Multipliers measure the ratio between the direct and the total impact. Like effects, multipliers provide insights into economic transactions and total output. However, unlike effects, which are used when final use is known, multipliers are used when either the direct or total impact is known.

For example, if a change in final use led to the cheese industry increasing direct imports by £100 million, the total increase in imports across the economy would be estimated to be £232.2 million. Consequently, the indirect impact would be £132.2 million.

Table 5: Product multipliers (annual)
Ratio of direct to total impact from final use

Product	Imports	Taxes less subsidies on products	GVA
Cheese	2.322	3.130	3.124
Pastries	7.221	4.372	2.495
Milk	3.111	8.130	3.696
Other	1.439	1.427	1.434

Source: Office for National Statistics – Fictional data

Type 1 and Type 2 effects and multipliers

Effects and multipliers of the form published by the ONS are referred to as Type 1. They include the impact on production of a change in final use (direct impact) and the supply chain impacts stemming from the initial change in final use (indirect impact).

Type 2 effects and multipliers include direct, indirect and induced impacts. Induced impacts cover changes to households' spending from employment changes linked to a change in final use. Currently, the ONS does not produce Type 2 effects and multipliers.

Data coverage and comparability

The first year that IOATs are available on the ONS website is 1984. However, they have only been published on a yearly basis since 2013.

The IOATs for each year are based on the most recent vintage of the Annual National Accounts available at the time. For example, the 2018 IOATs are based on the 2021 Annual National Accounts. This means that IOATs are based on different vintages of the National Accounts, and so care must be taken when making comparisons over time.

Separately, the industry-by-industry IOATs show values for exports by industry. These industry values are different from exports by industry in the trade dataset. Reasons for these differences include:

- the IOAT data have been transformed to basic prices as this is most relevant for understanding supply chains; the trade data are in purchaser prices
- the IOAT industry data are the result of putting product data (which is consistent with the trade dataset) through the input-output production process; the trade data are produced by classifying exporting businesses by industry
- the IOAT data for “margin” industries (motor trade, wholesale and retail) reflect the margins earned; in the trade data, they reflect the value of exports by businesses classified to those industries

3 . Further tables

In addition to the tables mentioned so far, the Office for National Statistics (ONS) also publishes further tables.

Primary input content of final use

Shows the total primary inputs generated by final use.

Composition of final use in terms of direct and indirect gross value added (GVA)

Shows how much direct and indirect GVA can be attributed to each category of final use.

Indirect import content from final use

Shows imports used indirectly for final use of domestic production. This is different from direct imports, which can be found in the imports use table.

4 . Contact

We would be very interested to hear your thoughts and priorities on the input-output analytical tables. Please contact us at SUT@ons.gov.uk.

5 . Methodology

Constructing input-output analytical tables

The input-output analytical tables (IOATs) are derived from our Input-output supply and use tables (SUTs); the process involves two steps. First, the SUTs are converted from purchaser into basic prices by removing taxes and subsidies on products, distributor trading margins and separating out imports.

Second, the tables at basic prices are transformed into product-by-product or industry-by-industry tables. For product-by-product, we use a “product technology” or “industry technology” assumption for each product and industry combination. The choice of technology assumption is stored in a “hybrid technology” matrix. Then, a transformation matrix is calculated to complete the transformation into a product-by-product matrix.

For the industry-by-industry tables, we apply the “fixed product sales assumption”, which assumes that the sales of products are independent of where they are produced. The technology assumption is stored in a matrix. Then, a transformation matrix is applied that reassigns products to the industries producing them. This transformation is based on domestic output for all uses, which reflects the degree of secondary production in each industry.