32nd International Input-Output Conference
Seville, Spain, June 23rd – June 26th 2026

SUT and IOT indicators and visualisation on HCSO website

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Abstract

The supply and use tables (SUTs) constitute an integral component of the national accounts compilation process in Hungary, playing a central role in the balancing of the accounts. Over time, their compilation framework has undergone a series of phased improvements, including the replacement of the earlier SUT system with a more streamlined and manageable structure. Historically, supply and use input–output tables (SUIOTs) were published at a relatively high level of aggregation and with a three-year time lag, which limited their timeliness and usefulness for users. In response to evolving user needs and with a view to enhancing the quality of the FIGARO (Full International and Global Accounts for Research in Input-Output Analysis) tables, several methodological and production improvements have recently been introduced in the Hungarian SUT/IOT system. As part of these developments, the publication time lag has been reduced, and from the 2019 reference year onwards, Hungarian SUT tables are released with a two-year delay instead of the previous three years. In addition, the tables are now produced at a more detailed level of breakdown than the minimum mandatory requirements.

To date, input–output tables (IOTs) had been compiled only for benchmark years ending in 0 and 5, and in line with the level of detail required by compulsory data transmission. However, as part of an Eurostat grant project entitled “ESA 2010 and BPM6 implementation, quality improvements, and execution of the GNI control cycle”, further developments have been implemented. Within this framework, the Hungarian Central Statistical Office has compiled input–output tables (both industry-by-industry and product-by-product) on an annual basis at the two-digit level of classification.

This paper presents an ongoing development project focusing on the visualisation of indicators derived from input–output tables. Since the most recent data transmission (December 2025), the Hungarian Central Statistical Office has published input–output tables on an annual basis,

enabling the use of multi-year datasets for short-term queries and analytical purposes. The development of the visualisation tool was inspired by the website of the Office for National Statistics UK (ONS), which provides interactive access to a range of input–output indicators. Building on this approach, multiplier calculations based on industry-by-industry input-output tables (IOTs) and supply and use tables (SUTs) were subsequently introduced. Initially there are planned 3 multipliers from SUT and IOT for the following years: 2020-2023.

Planned multipliers together with their visualisation:

- Change in use of imports: Query the distribution of how imports are used between intermediate consumption and various end uses, as well as to identify the industry that are the most significant users of a given imported product.
- Effects of changes in final demand: breakdown of imports destined for final demand is presented according to direct and cumulative import content.
- Composition of final use in terms of direct and indirect GVA: components of final consumption are broken down based on their indirect and direct GVA contributions.

Alongside the dissemination of numerical data, visual representation has gained increasing importance in official statistics, and in recent years the website of the Hungarian Central Statistical Office has been enriched with a wide range of visualisation tools. This growing emphasis on data visualisation has also become prominent in publications related to national accounts. Within the field of Hungarian input–output analysis, particular analytical attention is devoted to import dynamics, reflecting the structural characteristics of a small open economy. In addition, the gross value added (GVA) content of final use categories represents another important area of analysis. The current release constitutes a first step in the development process, with the range of indicators planned to be extended further in future editions.

The development work has already commenced: the indicators have been defined, and the mathematical processing of the input–output tables has been completed. The first results are scheduled for publication in the first half of 2026. This presentation outlines the entire process, from the calculation of multipliers through the visualisation of the resulting indicators to their publication on the website of the Hungarian Central Statistical Office.

Introduction

The input–output table is one of the fundamental statistical tools of the national economy. It shows what products and services different industries purchase from each other and how they contribute to final use. It helps reveal the interdependencies between industries, as well as the direct and indirect effects that changes in the output of a given industry have on the economy as a whole. The input–output table provides an important basis for economic policy analysis, impact assessments, and forecasting.

To capture different dimensions of economic interdependence, input–output analysis commonly distinguishes between Type I and Type II multipliers, depending on whether household consumption effects are incorporated into the analytical framework.

- In the analysis, which were used the institutional input–output table and the so-called “Type I” multipliers derived from it. Type I multipliers are key indicators in impact analyses based on input–output tables. These multipliers capture direct and indirect effects, meaning they show how a unit increase in the final demand of a given industry generates additional output, value added, or employment in the economy through industrial supply relationships. Type I multipliers do not include the induced effects arising from income feedback into consumption; therefore, they measure only the effects occurring within the production chain. For this reason, they are particularly suitable for structural analyses and short-term economic impact assessments.
- The ‘Type II’ multiplier shows the total impact of an economic change (e.g. an increase in demand) on the economy when households’ consumption responses are also considered.

The multipliers are derived from the Leontief inverse matrix. The Leontief inverse is defined in input–output analysis as the matrix that shows the total (direct and indirect) output requirements needed to satisfy a given level of final demand. The Leontief inverse indicates how much total output each industry must produce in order to meet one unit of final demand for a product, taking into account all inter-industry linkages in the economy.

The elements of this matrix capture not only the direct input requirements, but also the full chain of indirect effects across the economy. In particular, the i-th column indicates the total increase in output required from each industry—both directly and indirectly—to produce one additional unit of the i-th good. The Leontief inverse provides a straightforward and powerful framework for mapping inter-industry relationships; however, its assumptions are relatively restrictive, as it does not incorporate adjustments in prices, technology, or production capacities. Consequently, it is primarily suited for short-run structural analysis rather than long-term dynamics or general equilibrium modelling.

Analyses tool’s data are from SUT and input–output tables. In the case of imports, the SUT framework already provides substantially richer information compared to national accounts aggregates. In the national accounts, imports appear on the expenditure side of GDP, with a breakdown limited to goods and services. By contrast, within the SUT framework, the Use table presents imports in a detailed product classification and also provides information on their direct use. A portion of imports is used directly as intermediate consumption, while another portion does not enter the production process but is allocated directly to final uses.

In the case of data visualizations, the following aspects are important for users:

- **Easy to understand, clear and transparent:** Users expect to understand the message of a visualization at a glance.
- **Simple and creative**: Users rated clean-looking, yet creative and visually striking solutions the highest.
- **Relevant and attention-grabbing**: The timeliness and relevance of the topic presented are of key importance to users.
- **Credible and identifiable**: the results are plausible, consistent with economic logic, and sufficiently robust to be considered reliable and the indicator are clearly defined, uniquely derived from the available data and methodology, and reproduced in a consistent way.

About the input–output analytical tool

This interactive tool demonstrates how different industries depend on one another, both through domestic linkages and imports. The analysis is based on the institutional input–output table and the corresponding supply and use table (SUT), supplemented with a brief analytical description and visualizations. Within the tool, three different indicators can be queried.

Available indicators

• ***Indicator 1.: Distribution of the direct use of imports***

This section shows how direct import use is distributed between intermediate (current production) and final uses, and which industries are the main users of imported products that are directly used for production purposes.

• ***Indicator 2.: Total import content of final use item***

The total import content of final use consists of two components: direct and indirect (cumulative) import content. This section presents the distribution of imports allocated to final purposes according to these two components.

• ***Indicator 3.: Indirect GVA generated through production linkages in supplier industries***

Based on direct and indirect gross value added (GVA) contributions, the individual components of final consumption are decomposed in this section.

Methodology

The analytical tables are compiled in three main steps:

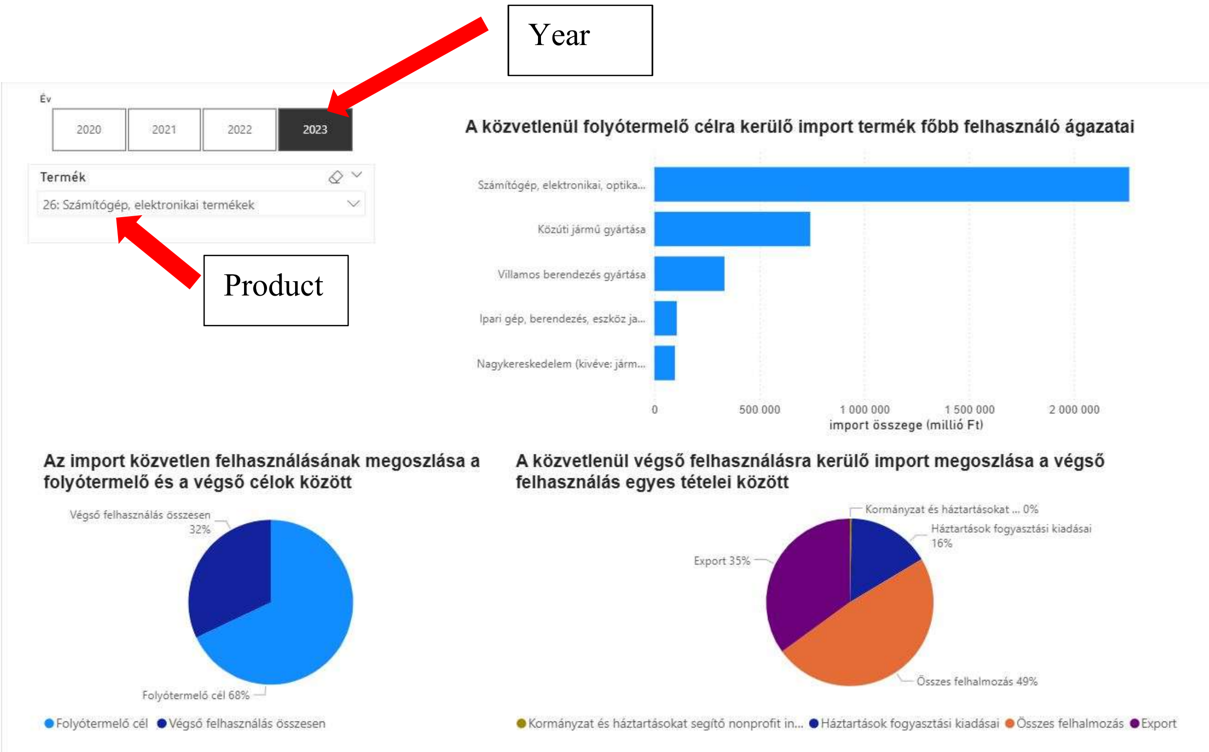
1. The Supply and Use Table data at purchasers' prices are transformed into basic prices.
2. Using import data, the use matrix at basic prices is split into domestic and imported components.
3. These are usually using one of the following technology assumptions to transform IOT from SUT's:
   - Product technology assumption (A)
   - Industry technology assumption (B)
4. HCSO used the B-type assumption of fixed product sales structure (each product is characterized by its own sales structure, regardless of the industry in which it is produced) — following the methodology described in the UN manual—the industry by industry IOT, the coefficient matrix, and the Leontief inverse are constructed.

Indicator 1.: Distribution of the direct use of imports

This section shows how direct import use is distributed between intermediate (current production) and final uses, and which industries are the main users of imported products that are directly used for production purposes.

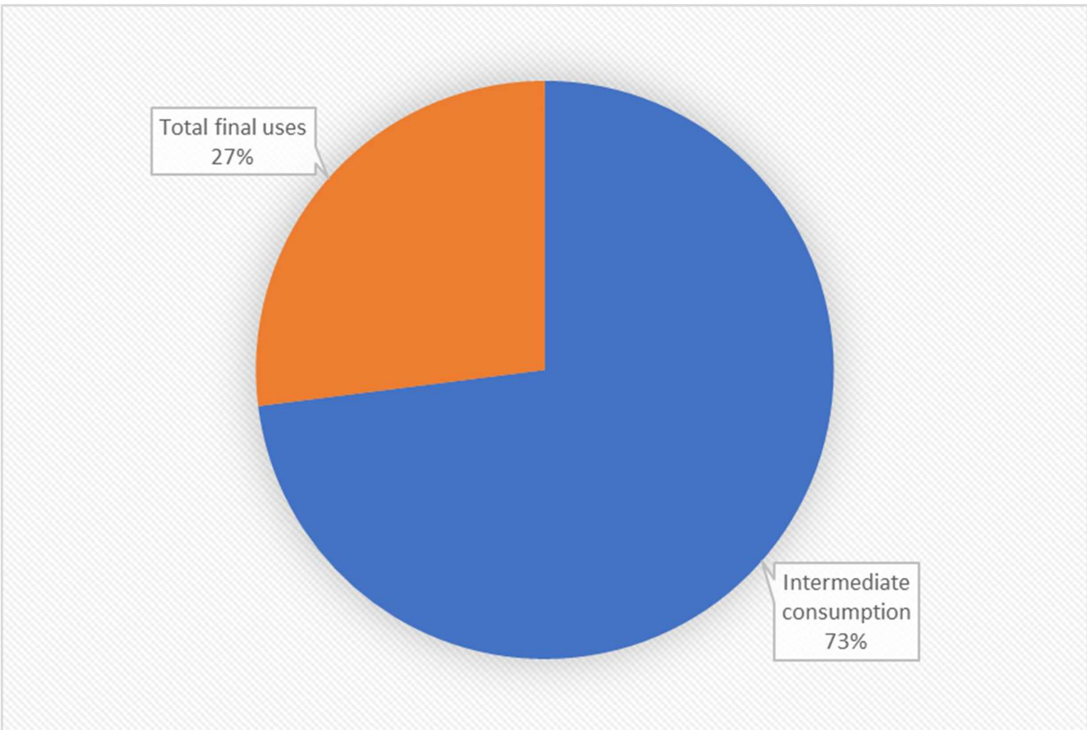
To calculate this indicator, Use table at purchasers' prices first had to be converted to basic prices. Then split into a domestic use table (which includes domestically produced output) and an import use table (which includes imported products). After that, the ratios required for the three charts of the first indicator were calculated. The methodology is simple division, and the results are presented in percentage terms.

It was developed a query tool in which can be selected a CPA 2-digit level and the year for which the indicator data are to be retrieved.

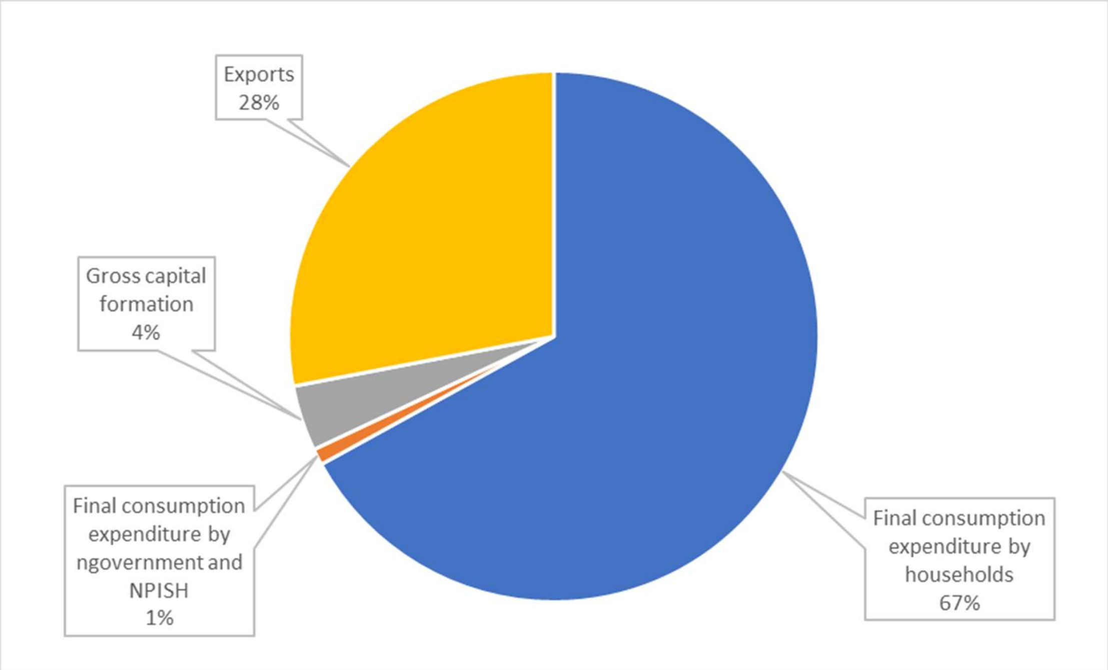


The first chart shows how the direct use of imports is distributed between intermediate consumption (IC) and final uses.

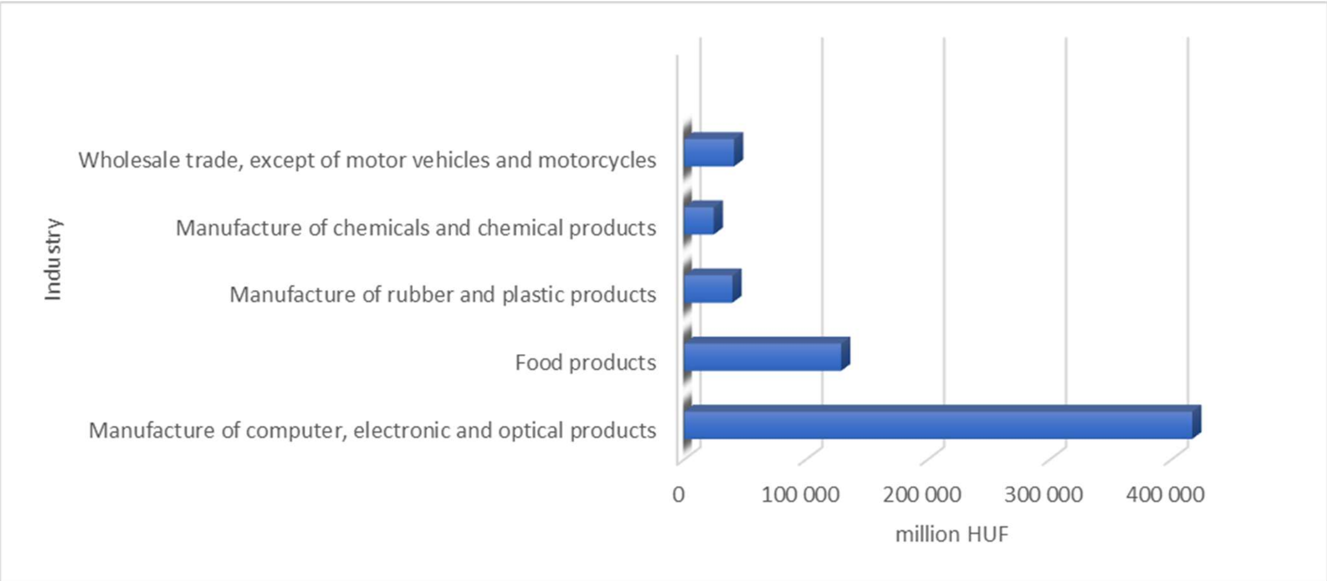
The following figures show data for CPA01: Crop and animal production, hunting and related products



By further breaking down the figure above, the second chart shows the distribution of imports used directly for final uses across the different components of final uses:



Finally, the last chart of the first query shows which industries are the main users of the chosen imported product that are used directly for intermediate consumption purposes.



Indicator 2.: Total import content of final use item

The total import content of final uses consists of two components: direct and cumulative import. **Meaning of direct import**: meaning of distribution of direct import used for final use across the different components of final uses.

In the case of **cumulative import content**, it is calculated the import content of final use categories (through production linkages).

Using the Leontief inverse, it is also possible to estimate—in the case of imports used for intermediate consumption purposes—which final use these imports ultimately serve, that is, into which final-use categories they are embodied through the ripple effects along the production chain.

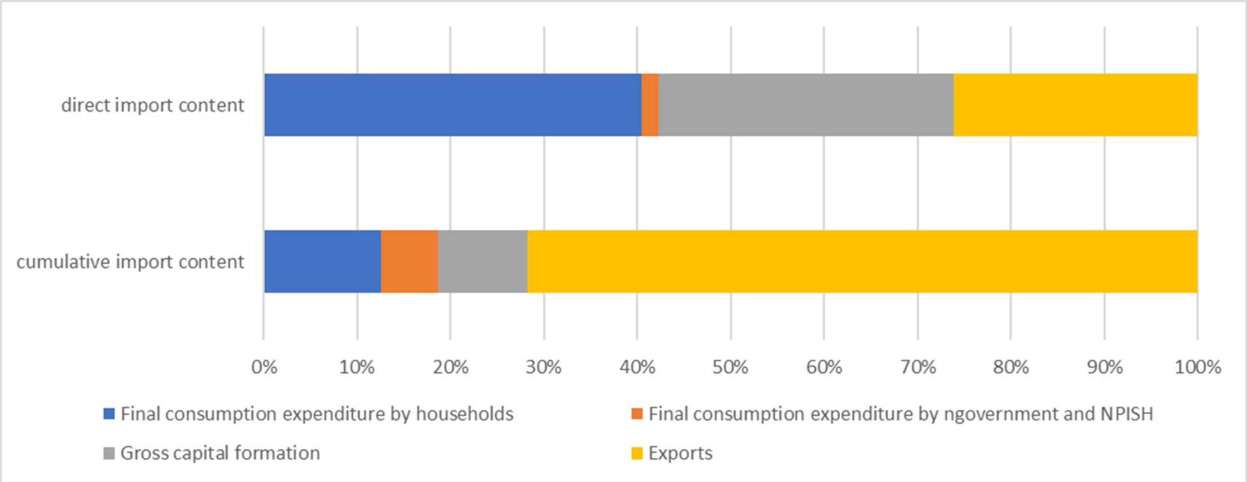
Methodology: The calculation of this indicator required the disaggregation of Use table at basic prices into domestic and imports. Direct import content comes from Symmetric input-output table for domestic production (industry x industry), row 'Use of imported products, cif'.

To calculate Cumulative import data, it was necessary compiling the following matrices:

- **Q matrix**= (E-A) inverse (where E = identity matrix, which has ones on the diagonal and zeros elsewhere;
- **A matrix**= direct input coefficients matrix) = **Leontief inverse** (The Leontief inverse shows the total output required from each industry to satisfy a unit increase in final demand, accounting for both direct and indirect effects.)
- **H matrix** = primary input coefficient matrix
- **Y matrix** = matrix of final uses
- **H * Q matrix**
- **H * Q * Y matrix** = It measures the cumulative primary input content embodied in the output for each final use category.

We now arrive at the calculation of cumulative import content, for which the import row is used from the H * Q * Y matrix.

The resulting output can be visualised as follows:



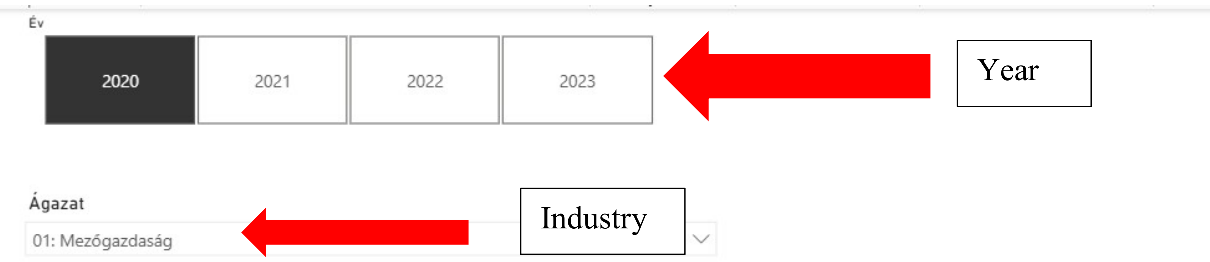
Indicator 3.: Indirect GVA generated through production linkages in supplier industries

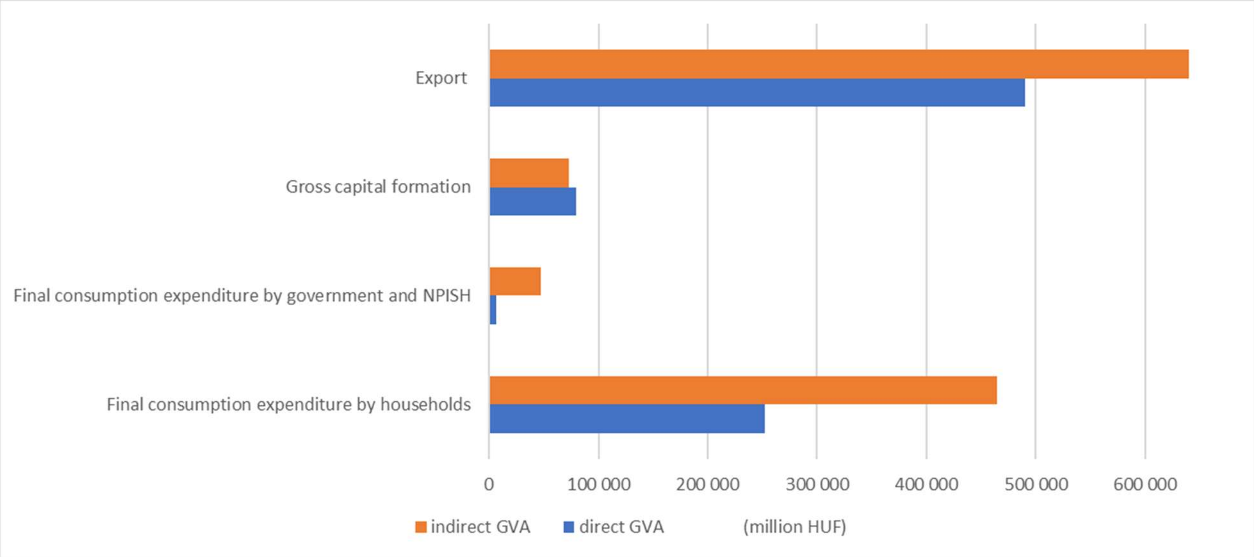
Direct GVA refers to the value generated solely by the production of the activity itself; it does not include the GVA of suppliers, subcontractors, or other ripple (indirect) effects.

Indirect GVA, on the other hand, represents the gross value added created along the supply chain—that is, the economic value generated not directly by the activity itself, but by the related supplier industries.

In this case you can choose an industry (NACE.Rev2.) and a year.

For a given year, this shows the total GVA content of all final use. It breaks down how much of this is direct GVA and how much is indirect GVA for each component of final uses.





Methodology:

To calculate GVA content the following matrices have to be calculated

- **Q matrix** = (E-A) inverse (where E = identity matrix, which has ones on the diagonal and zeros elsewhere; **A** = direct input coefficients matrix) = **Leontief inverse** (The Leontief inverse shows the total output required from each industry to satisfy a unit increase in final demand, accounting for both direct and indirect effects.)
- **diagGVA matrix** = a matrix where the diagonal consists of the GVA row of the 'H' matrix
  and zeros elsewhere
- **Y matrix** = matrix of final uses
- (**diagGVA** * **Q**) **matrix** = is a matrix multiplication, in which the above mentioned diagGVA is multiplied with Leontief inverse
- **(diagGVA** * **Q * Y**) **matrix**
- **directGVA matrix** = **(**diagGVA * Symmetric input-output table for domestic production (industry x industry) final uses columns)
- **indirectGVA matrix** = **(**diagGVA * Q * Y) - directGVA

Using the Leontief inverse, cumulative gross value added (GVA) content was calculated and subsequently decomposed into its direct GVA and indirect GVA parts.

The visualization of this indicator is shown in the accompanying figure, illustrating the direct and indirect GVA content of each final use category

Additional information to the methodology

The analysis is based on the institutional input–output tables, where that input–output tables do not form a time series. The data for the 2020 and 2021 institutional input–output tables are consistent with the Supply and Use Tables published in September 2024. The data for the 2022 and 2023 institutional input–output tables are consistent with the Supply and Use Tables published in September 2025.

Due to rounding, the data presented in the analysis may differ slightly from the officially published figures. The model assumes that the structure of the Hungarian economy remains unchanged within a given year, and that any increase in demand can be fully satisfied. This input–output analysis does not consider changes in household expenditure resulting from increasing or decreasing incomes within a given year. Such income effects may generate additional spending and further changes in final demand; these are referred to as “Type II” effects and are not included in the present analysis.

Further work

The development work has commenced, the Input–output analysis tables and the multipliers derived from them have been calculated, and their visualization has been completed in Microsoft Power BI. The preparations for publishing the content on the website are currently in progress.

The scope of indicators can be further expanded by incorporating the current year’s data into the existing matrices, as well as by developing additional indicators based on industry-by-industry Input-Output Tables (IOT) or through the processing of product-by-product IOT matrices.

Future Directions

The development phase of the project has been successfully initiated. As a pilot exercise, input–output analytical tables have been compiled, the corresponding multipliers have been calculated, and their visualisation has been implemented in Microsoft Power BI. In parallel, preparations are underway to publish the results on a dedicated web platform, thereby ensuring wider accessibility and effective dissemination of the findings.

Looking ahead, the analytical framework offers several opportunities for further refinement and expansion. One immediate direction involves the integration of the most recent annual data into the existing input–output matrices, thereby enabling the continuous updating and improved temporal relevance of the indicators.

In addition, the current set of indicators can be significantly extended through the development of new metrics derived from more detailed analytical structures. This includes the utilization of industry-by-industry input–output tables, which allow for a deeper exploration of intersectoral relationships, as well as product-by-product matrices, which enable a more granular analysis of production and supply chain dynamics.

Overall, these prospective developments will contribute to enhancing both the analytical depth and practical applicability of the framework, supporting more comprehensive economic analysis and evidence-based decision-making.