STATISTICS DENMARK

Documentation of statistics for Multiplier Tables 2022

Statistics Denmark
Sankt Kjelds Plads 11
DK 2100 København Ø

STATISTICS DENMARK

1 Introduction

Economic multipliers measure the effect on e.g. production, income or employment at a detailed industry level, following a 1 million DKK "shock" to final use in an industry or in a final use category. Multipliers are not statistics in the traditional sense but may be termed more correctly as model calculations. As it is not entirely uncomplicated to calculate multipliers, a collection of the most used multipliers are made available for download this way. The statistics is a resume - now in electronic form - of the publication Danish input-output tables and analyses, that was published annually in a period up until 2011.

2 Statistical presentation

The tables contain a variety of multipliers, which can be considered a tool for assessing the impact of various "shocks" on demand. The tables are divided into three groups, production multipliers, employment multipliers and input multipliers. Each of these three groups is further subdivided into whether it is a shock to the demand in a particular industry or in a specific final use. In each table, it is also possible to further choose which type of multiplier you want to work with or what kind of employment you find most interesting. The multipliers are used when, for example, one wants to assess the effects of a possible shock to the demand. By multiplying a multiplier with the size of the shock, one can assess what effects it will have on production, employment, etc.

2.1 Data description

Input-output multipliers are a measurement of the economy's response to changes in final use (consumption, investment and exports). The answer can be calculated in the form of changes in the national accounts' most detailed industry level in different variables, e.g. production, employment, income, imports, energy consumption, CO2 emissions or others. One of the most used multipliers indicates, for example, how many employed persons are required if 1 million DKK on investments in housing construction is needed. The multipliers contain both the direct effects in the industry which must initially meet a demand and the indirect effects in the industries that are formerly part of the chain of production processes needed before a product is ready for its final use.

The tables are divided into 3 categories, 1. Production multipliers, 2. Employment multipliers and 3. Input multipliers. Each of these is divided further into two types of multipliers 1 and 2, where the 1-tables e.g. PROMUL1N are characterized by the fact that here the initial change in demand occurs in an industry, while in the 2-tables e.g. PROMUL2N, the initial shock come from one of the components of the demand, such as housing construction or export. It gives a total of 6 different tables. For each of the 6 tables it is possible to specify further, for example, what type of multiplier you are interested in and for the employment multipliers the type of employment you are interested in, including the number of employees, the number of wage earners, the number of full-time employees or the number of full-time employed wage earners .

For the production multipliers PROMUL1N and PROMUL2N you can choose between 3 different multiplier types, while for the other four multiplier tables you can choose between 5 different types. What lies behind the 5 types is outlined here:

** Direct effect ** For tables of the type "... MUL1", the direct effect on production in the sector considered is assumed to be equal to 1 (mill. DKK). This means that the production here in isolation will increase by one mill. In the tables BESMUL1N and INPMUL1N, the direct effect is the quantity of imports, employment etc. the industry requires in order to increase production by 1 mill DKK. If the direct import multiplier is 0.31, this means that imports will increase by DKK 310,000 if the industry in question has to produce for an additional DKK 1 million.

For "..MUL2" type tables, the direct effect is related to components of the final use. That is, how much extra production, employment, import, etc. this gives rise to directly, in e.g., exports or household consumption of meat directly in the industries that must initially supply this demand.

** Simple multiplier. ** This is the traditional multiplier that also includes the directs as well as the indirect indirect effects. That is, when a specific industry has to produce 1 mill. it has a large number of subcontractors who also have to produce extra, and the subcontractors even have subcontractors, etc. The initial shock to the demand of a single industry is spreading like rings in the water.

** Total multiplier ** This multiplier covers the so-called induced effects. The modeling goes a step further here. Now it is assumed that the wages paid to the new extra employees are spent within the same period on private consumption, which, in turn, will give rise to even more extra Danish production, extra imports, extra employment and so on. This means that the total multiplier is always higher than the simple one. It should be noted, however, that a reduced (truncated) version of the total multiplier is used, which is not so much larger than the simple multiplier. However, caution should be exercised in using this multiplier rather than the simple one. This is due to the implicit assumption that the "new" employees had no employment or consumption earlier, which would often be wrong. If you change from another job or social transfers, you have probably had some consumption in advance.

** Type I multiplier. ** This is a "normalized" version of "Simple multiplier". This is the simple multiplier divided by the direct effect. The interpretation of the Type I multiplier is what is the total employment in all industries if the size of the investment results in a direct employment effect of exactly one new employee. This multiplier is applicable in situations where it is known that a project will give rise to e.g. 200 new employees, and the question is, how many new employees such an investment will generate throughout the economy.

** 5th Type II multiplier. ** This is a "normalized" version of "Total multiplier". The same description as in the Type I multiplier applies here. Compiled as the Total multiplier divided by the direct effect.

Thus, the tables contain a number of different multipliers, which can be considered a tool for assessing the impact of various "shocks" on demand. The multipliers can be used when it is estimated that a change in demand in the economy will result in, for example, larger production in Danish slaughterhouses or larger housing investments. For example, if it is to be assessed how many employees an investment in housing construction will give rise to, an appropriate employment multiplier just should be multiplied with the size of the expected investment. The simple multiplier is in this case 1,133. If there is to be invested 2 billion DKK in housing construction, this figure is multiplied by the multiplier 1,133 * 2000 = 2,266 employees.

For a more in-depth description of how the tables and multipliers are used and how results are interpreted, please see this document (only in Danish)

2.2 Classification system

Input-output tables which are the foundation for the multiplier tables are developed as an integrated part of the national accounts, and are therefore based on the same classifications and groupings as here. Danish Industry Code 2007 (DB07), a Danish version of the international nomenclatures EU NACE Rev. 2 and UN ISIC, Rev. 4, contains a number of default groupings: 127, 36, 19, and 10 groupings. The final national accounts 117 industry group corresponds - with few deviations - to the 127 standard grouping and the 117 industries of the national accounts can be aggregated to the other standard groups. National accounts can thus be compared and used in conjunction with other statistics using the DB07 standard groups.

Household consumption as well as the individual part of public consumption are found in the input-output tables broken down by the COICOP classification, while the collective share of public consumption is split according to the COFOG classification. However, comparisons with other statistics at a detailed level of industries will often show deviations, partly due to variable definition differences, partly as a result of the national accounts desire for calendar year delimitation and its requirements for overall coverage of economic activity.

Internationally, there is a high degree of comparability with other countries' national accounts, as the Danish national accounts are prepared in accordance with the ENS2010 guidelines

2.3 Sector coverage

The multipliers are organized on the basis of the industrial classification of the national accounts and input-output tables. Sectors in the national accounting sense, including the household sector or the financial sector, run across national accounts industries. No specific multipliers have been calculated for the national accounts sectors. Danish Industry Code 2007 (DB07), a Danish version of the international nomenclatures EU NACE Rev. 2 and UN ISIC, Rev. 4, contains a number of default groupings: 127, 36, 19, and 10 industry classifications. These groups are customized in the national accounts, so it is groupings of industries 117, 69, 38, 21 and 13. This includes the transport sector or the food sector, both of which can be formed by aggregating certain industries.

2.4 Statistical concepts and definitions

Input-output tables:

Multiplier: The multipliers express, in terms of changes in production, imports, income or employment, the magnitude of the response in the economy by industry to a 1 million DKK shock to final use in a specific industry or final use category. Because multipliers are calculated as a kind of unit value, in practice they are merely factors which, when multiplied by actual or potential changes in the final use, provide the effect on employment, production or import.

2.5 Statistical unit

The legal units in the industries of the national accounts are the local kind of activity unit. The is the smallest unit that a production account can be compiled for.

2.6 Statistical population

All units engaged in Danish economic activity.

STATISTICS DENMARK

2.7 Reference area

Denmark

2.8 Time coverage

Initially, multiplier tables are published only for the most recent year of final national accounts with full detail in the industry dimension. It is assessed that the primary application of the multipliers will be as a tool to measure in broad terms the effect of possible changes in final use in the current year. For that purpose only the most up-to-date multiplier available is required and not a series of multipliers.

The structural part of multipliers change rather slowly over time so in that respect there is generally no serious problem in using a multiplier which is a few years old. However, it is advisable to inflate the latest available multiplier to the current year. Otherwise, there will be a risk of overvaluing the effects slightly.

Naturally, analyzing time series of multipliers in chained values is an independent purpose in itself. It gives an impression of the size of structural changes in e.g. the amount of employment necessary for satisfying one unit of final demand. It can be seen as an alternative measure of productivity that may be useful to study in a time perspective. Especially multipliers which combine variables in monetary terms with variables in physical terms e.g. the employment multiplier, will be influenced by price changes over time. Therefore, if time series are required they need to be in chained values.

2.9 Base period

Initially, the multipliers are published only for the most recent year of final national accounts and input-output tables.

2.10 Unit of measure

All multipliers are calculated as effects in DKK millions or number of employees of a 1 DKK million shock to final use.

2.11 Reference period

The multiplier tables refer to a calendar year. All effects of the shocks to final demand are expected to take place within the year considered.

2.12 Frequency of dissemination

Annual statistics.

2.13 Legal acts and other agreements

Data are used in these tables, which are already published in other tables, and therefore no special data was collected for these statistics. The data used is based on the following legislation.

Lov om Danmarks Statistik §§ 6 og 8 - 12. Europa-Parlamentets og Rådets forordning (EU) Nr. 549/2013 af 21.maj 2013 om det europæiske national- og regionalregnskabssystem i Den Europæiske Union (ESA2010) (EUT L 174 26.06.2013, s. 1). Europa-Parlamentets og Rådets forordning nr. 691/2011 om europæiske miljøøkonomiske regnskaber.

2.14 Cost and burden

The statistics are based on information from existing statistical sources. Therefore, there is no direct reporting burden in the compilation of these statistics Input-output tables are derived from the final national accounts.

2.15 Comment

Further information about this statistics can be obtained from Statistics Denmark.

3 Statistical processing

The multiplier tables are based on already published data from Statistics Denmark, so the primary contribution that comes from these statistics is the statistical treatment of the basic material, which is done as a service for the users. Treatment is most easily done with software dedicated to the task and consists in working with data in matrix format and the use of certain matrix formulas picked up from the literature. One of the most important elements of the calculations is the compilation of the inverted matrix of inputs into the production - the so-called Leontief inverse matrix.

3.1 Source data

The source of this statistics is entirely the Input-output tables for Denmark. A description of these sources can be found in

input-output tables

3.2 Frequency of data collection

The statistics is based on other published statistics.

3.3 Data collection

The statistics is based on other published statistics.

This statistics is published simultaneous with its source data, so the data collection is in the form of an internal delivery in Statistics Denmark

STATISTICS DENMARK

3.4 Data validation

The statistics are based on other statistics published by Statistics Denmark. Therefore the first quality control is more concerned with securing that the source data are represented correctly than with the quality of the data themselves. The method as well as the actual compilation of the tables potentially can lead to errors. Going through the results it is made sure that the multipliers has a sensible size and that they develop over time in a plausible way.

3.5 Data compilation

The collection of data for the statistics consists solely of a draw on internal sources in Statistics Denmark. Input-output data in raw form is stored in GAUSS files. The software that creates the multiplier tables is also coded in GAUSS, so no conversion or formatting of data is required for the calculations.

The GAUSS program handles data in matrix format, and based on the methods and formulas set forth in the international input-output literature, represented by the most well-known textbook in the field of Miller, R. & Blair, P. (2009). Input-Output Analysis: Foundations and Extensions. Cambridge: Cambridge University Press. doi: 10.1017 / CBO9780511626982, the multipliers described previously are calculated. In Miller & Blair (2009), there is an overview of the formulas used to calculate the multipliers on page 258.

The results of the calculations are written directly from the GAUSS program to SDF files which are flat txt files used to load data into Statistics Denmark's internal database SUMDATABASEN, from which they are read into StatBank, at the date that is pre-announced in the publication calendar. As a rule, this will be the same date as the final national accounts and the input-output tables are published.

3.6 Adjustment

No correktions are made

4 Relevance

The multiplier tables are relevant for all those who would like to be able to calculate a general estimate of the effects on variables such as production, employment, imports etc.. when demand increases in an industry or one final use. It is an obvious choice for people who need to prepare and assess various policy initiatives who can use the multipliers to get an initial estimate of policy implications for key economic variables.

The multiplier tables are ready to use and requires no prior knowledge of input-output modeling.

4.1 User Needs

In the period from the mid-eighties to 2011, the publication Danish input-output tables and analyzes was published annually. The book was a work of reference that contained many of the same tables that have now been published in StatBank Denmark. After the publication of this publication, there have been ongoing inquiries from users who miss the old publication and the multipliers that were in it. As a result, Statistics Denmark has had to calculate multipliers ad hoc, often against payment by users. With the new tables published in StatBank Denmark, part of the user needs will be satisfied.

In particular, it is the employment content multipliers in, for example, housing investments or the import content of the exports that have been in demand.

There will probably be user needs which are not met in this first edition of the tables. It could, for example, be time series of multipliers in fixed prices, which will show a structural development over time in e.g. direct and indirect labor requirements . It might also be a request for more up-to-date multipliers. Statistics Denmark is happy to hear about any wishes for content in the multiplier tables, which are not covered in the current edition.

4.2 User Satisfaction

This statistics is published for the first time June 2019, so there have been no reactions from users yet.

4.3 Data completeness rate

Not relevant for this statistics.

5 Accuracy and reliability

The multipliers are the result of model calculations, which are based on national accounting statistics and input-output tables. In each section, polls and adjustments are made under assumptions, which together mean that the calculation process builds some uncertainty about the figures. At the most detailed level, therefore, one can not necessarily expect the results to be accurate representations of reality. Conclusions from the tables should be drawn with some caution, taking account of the uncertainties that may arise in the various stages of the process.

5.1 Overall accuracy

There is a certain degree of uncertainty associated with the calculation of the figures, primarily because values are calculated and not observed. There are uncertainties related to the sources used in the national accounts, the assumptions made in the compilation of the national accounts and those made in the compilation of the input-output tables. The national accounts are a compilation of a wide range of microeconomic sources, and in order to establish consistent national accounts, some reconciliation of the figures may be necessary, which may contribute to a certain deviation from the observed data. However, it can be said that the conceptually consistent and over time uniform processing of the sources, however, contributes to a reduction in the uncertainty of the national accounts figures. In particular, the compilation of the primary sources in a single system means that in many cases errors are not revealed, which are thus not reflected in the final national accounts or input-output tables. The transformation from national accounts to input-output tables necessitates some assumptions that are best possible from international recommendations, but which may give some imbalance in the results in some areas. Conclusions, especially in the most detailed areas, should be drawn from these tables with some caution.

5.2 Sampling error

Not relevant for this statistics.

5.3 Non-sampling error

The overall effect of assumptions in the compilation of the input-output tables and the model calculation of the multipliers means that at the most detailed level, expect the results to be subject to uncertainty. Uncertainty can arise in connection with model assumptions, methods, and the data used. Conclusions should be drawn from these tables with some caution.

5.4 Quality management

Statistics Denmark follows the recommendations on organisation and management of quality given in the Code of Practice for European Statistics (CoP) and the implementation guidelines given in the Quality Assurance Framework of the European Statistical System (QAF). A Working Group on Quality and a central quality assurance function have been established to continuously carry through control of products and processes.

5.5 Quality assurance

Statistics Denmark follows the principles in the Code of Practice for European Statistics (CoP) and uses the Quality Assurance Framework of the European Statistical System (QAF) for the implementation of the principles. This involves continuous decentralized and central control of products and processes based on documentation following international standards. The central quality assurance function reports to the Working Group on Quality. Reports include suggestions for improvement that are assessed, decided and subsequently implemented.

STATISTICS DENMARK

5.6 Quality assessment

The quality of the applied source statistics input-output tables is crucial for the quality of the multiplier tables.

Input-output tables are based directly on the national accounts product balance sheet, which is the foundation of the building of the Danish national accounts. An assessment of the reliability of the national accounts figures is sought to be maintained by conducting the reconciliation of the national accounts at a very detailed level, just the core variable GDP is based on both the production and income side. The compilation of the national accounts and the use of data and methods is continuously monitored by the EU. The layout of the input-output tables is based on international recommendations in the United Nations manuals and is fully integrated with the national accounts.

The quality of the Danish national accounts is assessed in the following report: Quality Report, Denmark 2018

The compilation of multipliers on top of input-output tables adds another dimension of uncertainty to its source statistics, since it is a model calculation based on certain assumptions. The quality is good when it comes to punctuality and audit policy.

5.7 Data revision - policy

Statistics Denmark revises published figures in accordance with the Revision Policy for Statistics Denmark. The common procedures and principles of the Revision Policy are for some statistics supplemented by a specific revision practice.

5.8 Data revision practice

Multipliers are calculated on the basis of input-output tables for the national accounts' most recent final year. Thus, as a starting point, there will be no revisions. The only possible exception is if it should been found necessary to revise the national accounts. According to the schedule this is planned to take place in 2024 next time and after that in a 5-10 years interval.

6 Timeliness and punctuality

The multipliers that build upon the national accounts input-output tables are published simultaneously with the final version of the national accounts approximately 30 months after the end of the reference year. Despite the fact that the numbers are 30 month old when published it is assessed that the degree of actuality in the numbers is quite high. The multipliers represent economic structures that changes quite slowly and therefore the numbers do not need to be as new and recent as numbers representing the state of the market economy.

6.1 Timeliness and time lag - final results

The production time for the statistics is not long, but as it is based on another published statistics, it has to wait for it to be published. This statistics is published at the same time as the national accounts become final, approx. 30 months after the end of the reference year.

6.2 Punctuality

Henceforward this statistics will be published simultaneously with its only and crucial source the national account's input-output tables

7 Comparability

The input-output tables that make up the source for the multiplier statistics are fully coherent with the national accounts which makes the multipliers coherent as well. The classification of industries and final use categories are concurrent. The multipliers are published for the most recent final year of the national accounts because multipliers in current prices are not comparable over time. To the extent that similar multipliers are calculated in other countries a high degree of comparability can be expected.

7.1 Comparability - geographical

This is not statutory statistics, but to the extent that other countries have produced a similar statistics, the results should be fully comparable, as the methods are internationally known.

7.2 Comparability over time

This statistics cover only the most recent final year of the national accounts. But there will be full comparability between the updates. Multipliers compiled in currents prices are not comparable over time and therefore time series of multipliers are not published.

7.3 Coherence - cross domain

The multiplier statistics is fully coherent with national accounts and the input-output tables. The classification of industries and final use components is completely concurrent. The methodology behind the calculation of the multipliers follow international standards and leading textbooks in the area. To the extent that similar multipliers are compiled in other countries a high degree of comparability must be expected. The methodology is concurrent with the methodology behind the publication Danish input-output tables and analyses that was published by Statistics Denmark in a longer period ending with the 2011 version.

7.4 Coherence - internal

Full consistency applies to this database.

8 Accessibility and clarity

The statistics is published in the Statbank.

8.1 Release calendar

The publication date appears in the release calendar. The date is confirmed in the weeks before.

STATISTICS DENMARK

8.3 User access

Statistics are always published at 8:00 a.m. at the day announced in the release calendar. No one outside of Statistics Denmark can access the statistics before they are published.

8.2 Release calendar access

The Release Calender can be accessed on our English website: Release Calender.

8.4 News release

These statistics are not published in a press release.

8.5 Publications

This statistics is not presented in any publications from Statistics Denmark

8.6 On-line database

The statistics is published in Statbank under this heading Input-output tables. The single tables can be found here:

- PRODMUL1: Production multiplier by type of multiplier, chock by industry and effect by industry.
- PRODMUL2: Production multiplier by type of multiplier, chock by final use and effect by industry.
- BESKMUL1: Employment multiplier by type of multiplier, chock by industry, effect by industry and employment.
- BESKMUL2: Employment multiplier by type of multiplier, chock by final use, effect by industry and employment.
- INPMUL1: Input multiplier by type of multiplier, chock by industry, effect by industry and input.
- INPMUL2: Input multiplier by type of multiplier, chock by final use, effect by industry and input.

8.7 Micro-data access

There is no access to more detailed data than those that are published. Statistics Denmark can offer calculation of additional multipliers on request for payment

8.8 Other

Data is only disseminated in the Statbank.

8.9 Confidentiality - policy

Data Confidentiality Policy for Statistics Denmark.

8.10 Confidentiality - data treatment

There is no discretion as the statistics are based on a data source, which is published at a level of detail that does not require discretion.

8.11 Documentation on methodology

The methodology behind the calculation of multipliers is well described here Miller, R., & Blair, P. (2009). Input-Output Analysis: Foundations and Extensions. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511626982

8.12 Quality documentation

Results from the quality evaluation of products and selected processes are available in detail for each statistics and in summary reports for the Working Group on Quality.

9 Contact

The administrative placement of these statistics is in the division of National Accounts, Climate and Environment, Economic Statistics. The contact person is Peter Rørmose Jensen, tel.: + 45 4013 5126, and e-mail: PRJ@dst.dk.