Package ‘iotables’

January 8, 2024

Type Package
Title Reproducible Input-Output Economics Analysis, Economic and Environmental Impact Assessment with Empirical Data
Date 2024-01-08
Version 0.9.3
Maintainer Daniel Antal <daniel.antal@dataobservatory.eu>
Description Pre-processing and basic analytical tasks related to working with Eurostat’s symmetric input-output tables and provide basic input-output economics calculations. The package is part of rOpenGov <http://ropengov.github.io/> to open source open government initiatives.
URL https://iotables.dataobservatory.eu/
BugReports https://github.com/rOpenGov/iotables/issues
License MIT + file LICENSE
Encoding UTF-8
LazyData true
RoxygenNote 7.2.3
Imports dplyr, eurostat, magrittr, tidyr, forcats, utils, plyr, lubridate, knitr, kableExtra, tibble, readxl, assertthat, glue, tidyselect, rlang
Suggests testthat, rmarkdown, spelling, covr, roxyglobals
Depends R(>= 3.5.0)
VignetteBuilder knitr
Language en-US
Config/roxyglobals/filename globals.R
Config/roxyglobals/unique FALSE
NeedsCompilation no
Author Daniel Antal [aut, cre] (<https://orcid.org/0000-0001-7513-6760>), Kasia Kulma [ctb] (<https://orcid.org/0000-0002-2952-9720>), Pyry Kantanen [ctb] (<https://orcid.org/0000-0003-2853-2765>)
Repository CRAN
Date/Publication 2024-01-08 20:10:02 UTC
## R topics documented:

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>airpol_get</td>
<td>3</td>
</tr>
<tr>
<td>backward_linkages</td>
<td>4</td>
</tr>
<tr>
<td>coefficient_matrix_create</td>
<td>5</td>
</tr>
<tr>
<td>conforming_vector_create</td>
<td>6</td>
</tr>
<tr>
<td>croatia_2010_1700</td>
<td>7</td>
</tr>
<tr>
<td>croatia_2010_1800</td>
<td>8</td>
</tr>
<tr>
<td>croatia_2010_1900</td>
<td>9</td>
</tr>
<tr>
<td>croatia_employment_2013</td>
<td>10</td>
</tr>
<tr>
<td>croatia_employment_aggregation</td>
<td>10</td>
</tr>
<tr>
<td>direct_effects_create</td>
<td>11</td>
</tr>
<tr>
<td>employment_get</td>
<td>12</td>
</tr>
<tr>
<td>employment_metadata</td>
<td>13</td>
</tr>
<tr>
<td>empty_remove</td>
<td>14</td>
</tr>
<tr>
<td>equation_solve</td>
<td>14</td>
</tr>
<tr>
<td>forward_linkages</td>
<td>15</td>
</tr>
<tr>
<td>germany_1995</td>
<td>16</td>
</tr>
<tr>
<td>germany_airpol</td>
<td>17</td>
</tr>
<tr>
<td>ghosh_inverse_create</td>
<td>18</td>
</tr>
<tr>
<td>household_column_find</td>
<td>19</td>
</tr>
<tr>
<td>household_column_get</td>
<td>19</td>
</tr>
<tr>
<td>indirect_effects_create</td>
<td>20</td>
</tr>
<tr>
<td>input_coefficient_matrix_create</td>
<td>21</td>
</tr>
<tr>
<td>input_flow_get</td>
<td>22</td>
</tr>
<tr>
<td>input_indicator_create</td>
<td>23</td>
</tr>
<tr>
<td>input_multipliers_create</td>
<td>24</td>
</tr>
<tr>
<td>iotables_download</td>
<td>25</td>
</tr>
<tr>
<td>iotables_metadata_get</td>
<td>26</td>
</tr>
<tr>
<td>iotables_read_tempdir</td>
<td>28</td>
</tr>
<tr>
<td>iotable_get</td>
<td>29</td>
</tr>
<tr>
<td>iotable_year_get</td>
<td>31</td>
</tr>
<tr>
<td>is_html_output</td>
<td>32</td>
</tr>
<tr>
<td>is_latex_output</td>
<td>32</td>
</tr>
<tr>
<td>key_column_create</td>
<td>33</td>
</tr>
<tr>
<td>leontief_inverse_create</td>
<td>34</td>
</tr>
<tr>
<td>leontief_matrix_create</td>
<td>35</td>
</tr>
<tr>
<td>matrix_round</td>
<td>35</td>
</tr>
<tr>
<td>metadata</td>
<td>36</td>
</tr>
<tr>
<td>metadata_uk_2010</td>
<td>37</td>
</tr>
<tr>
<td>multiplier_create</td>
<td>37</td>
</tr>
<tr>
<td>netherlands_2006</td>
<td>39</td>
</tr>
<tr>
<td>output_coefficient_matrix_create</td>
<td>40</td>
</tr>
<tr>
<td>output_get</td>
<td>41</td>
</tr>
<tr>
<td>output_multiplier_create</td>
<td>41</td>
</tr>
<tr>
<td>primary_inputs</td>
<td>42</td>
</tr>
<tr>
<td>primary_input_get</td>
<td>43</td>
</tr>
<tr>
<td>rows_add</td>
<td>43</td>
</tr>
</tbody>
</table>
### airpol_get

**Get air pollutant data**

Get air emissions accounts by NACE Rev. 2 activity for environmental impact assessments.

#### Usage

```r
airpol_get(
  airpol = "GHG",
  geo = "BE",
  year = 2020,
  unit = "THS_T",
  data_directory = NULL,
  force_download = TRUE
)
```

#### Arguments

- **airpol**: The code of the air pollutant. Defaults GHG. 
  ACG, CH4, CH4_CO2E, CH4_NMVOCE, CO, CO2, CO2_BIO, CO_NMVOCE, 
  CH4_CO2E, GHG, HFC_CO2E, N2O, N2O_CO2E, NF3_SF6_CO2E, NOX, 
  NOX_NMVOCE, NOX_SO2E, O3PR, PFC_CO2E, PM10, PM2_5, SOX_SO2E.
- **geo**: The country code. The special value 'germany_1995' will return the replication data set `germany_airpol`.
- **year**: The year. The average employment will be created for the given year, starting with 2008, when the NACE Rev 2 was introduced in employment statistics.
- **unit**: Defaults to "THS_T" (thousand tons.)
- **data_directory**: Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.
- **force_download**: Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists.
Details

Currently tested only with product x product tables. The dataset air emissions accounts by NACE Rev. 2 activity [env_ac_ainah_r2] has five dimensions: The Air pollutant airpol variables are collected on the emissions of the following pollutants: carbon dioxide without emissions from biomass (CO2), carbon dioxide from biomass (Biomass CO2), nitroux oxide (N2O), methane (CH4), perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs), sulphur hexafluoride (SF6) including nitrogen trifluoride (NF3), nitrogen oxides (NOx), Non-methane volatile organic compounds, (NMVOC), carbon monoxide (CO), Particulate matter smaller than 10 micrometre (PM10), Particulate matter smaller than 2,5 micrometre (PM2.5), Sulphur dioxide (SO2), Ammonia (NH3).

See Reference Metadata in Single Integrated Metadata Structure (SIMS) for further details, particularly on the calculation of Global warming potential GHG, Acidifying gases ACG and Tropospheric ozone precursors O3PR.

Value

A data.frame with auxiliary metadata to conform the symmetric input-output tables.

Source

Eurostat folder Air emissions accounts by NACE Rev. 2 activity

See Also

Other import functions: employment_get(), iotables_download(), iotables_metadata_get(), iotables_read_tempdir()

Examples

airpol_get(airpol = "CO2", geo="germany_1995", year = 1995, unit = "THS_T")

backward_linkages(Im)

Arguments

Im A Leontief inverse matrix created by the leontief_inverse_create function.
coefficient_matrix_create

Details

Backward linkages are defined as the column sum of the Leontief inverse, in line with the Eurostat Manual of Supply, Use and Input-Output Tables (see p506-507.) and the Handbook on Supply and Use Tables and Input-Output Tables with Extensions and Applications of the United Nations (see p636.)

Value

The vector of industry (product) backward linkages in a wide data.frame class, following the column names of the Leontief inverse matrix.

See Also

Other linkage functions: forward_linkages()

Examples

```r
decoeff <- input_coefficient_matrix_create( iotable_get(),
                                         digits = 4 )
I <- leontief_inverse_create (decoeff)
backward_linkages (I)
```

coefficient_matrix_create

Create a coefficient matrix

Description

Create a coefficient matrix from a Symmetric Input-Output Table.

Usage

```r
coefficient_matrix_create(
  data_table,
  total = "output",
  digits = NULL,
  remove_empty = TRUE,
  households = FALSE,
  return_part = NULL
)
```

Arguments

data_table A symmetric input-output table, a use table, a margins or tax table retrieved by the iotable_get function.
total Usually an output vector with a key column, defaults to "output" which equals "P1" or "output_bp". You can use other rows for comparison, for example "TS_BP" if it exists in the matrix.
conforming_vector_create

digits An integer showing the precision of the technology matrix in digits. Default is NULL when no rounding is applied.
remove_empty Defaults to TRUE. If you want to keep empty primary input rows, choose FALSE. Empty product/industry rows are always removed to avoid division by zero error in the analytic functions.
households Defaults to NULL. Household column can be added with TRUE.
return_part Defaults to NULL. You can choose "product" or "industry" to return an input coefficient matrix or "primary_inputs" to get only the total intermediate use and proportional primary inputs.

Details

The coefficient matrix is related by default to output, but you can change this to total supply or other total aggregate if it exists in your table.

Value

A data.frame that contains the matrix of data_table divided by total with a key column. Optionally the results are rounded to given digits.

References

See United Kingdom Input-Output Analytical Tables 2010 for explanation on the use of the Coefficient matrix.

See Also

Other indicator functions: direct_effects_create(), input_indicator_create()

Examples

coefficient_matrix_create(data_table = iotable_get(source = "germany_1995"),
total = "output",
digits = 4 )

conforming_vector_create

Create an empty conforming vector

Description

This helper function creates you a named vector that conforms your analytical objects, such as the use table, the Leontief-matrix, etc. With 60x60 matrixes it is easy to make mistakes with manual definition. The empty effects vector can be used in .csv format as a sample to import scenarios from a spreadsheet application.
Usage

conforming_vector_create(data_table)

Arguments

data_table A use table, Leontief-matrix, Leontief-inverse, a coefficient matrix or other
named matrix / vector.

Value

A wide-format conforming vector of data frame class, with column names matching the metadata
of the data_table.

See Also

Other iotables processing functions: household_column_get(), iotable_year_get(), key_column_create(),
matrix_round(), output_get(), primary_input_get(), rows_add(), supplementary_add(),
total_tax_add(), vector_transpose_longer(), vector_transpose_wider()

Examples

dec_input_flow <- input_flow_get(data_table = iotable_get())

conforming_vector_create (data_table = dec_input_flow)

croatia_2010_1700


Description

1700 - Symmetric input-output table at basic prices (product x product) In thousand kunas (T_NAC)

Usage

data(croatia_2010_1700)

Format

A data frame with 13 variables.

t_rows2 Technology codes in row names, following the Eurostat convention.
t_rows2_lab Longer labels for t_rows2
t_cols2 Technology codes in column names, following the Eurostat convention.
t_cols2_lab Longer labels for t_cols2
iotables_col The standardized iotables column labelling for easier reading.
col_order The column ordering to keep the matrix legible.
row_order  The row ordering to keep the matrix legible.
iotables_row  The standardized iotables row labelling for easier reading.
unit  Different from Eurostat tables, in thousand national currency units.
geo  ISO / Eurostat country code for Croatia
geo_lab  ISO / Eurostat country name, Croatia.
time  Date of the SIOT
values  The actual values of the table in thousand kunas

Source

Državni zavod za statistiku.

See Also

Other Croatia 2010 datasets: croatia_2010_1800, croatia_2010_1900, croatia_employment_2013, croatia_employment_aggregation, primary_inputs


Description

1800 - Symmetric input-output table for domestic production (product x product) In thousand kunas (T_NAC)

Usage

data(croatia_2010_1800)

Format

A data frame with 13 variables.
t_rows2  Technology codes in row names, following the Eurostat convention.
t_rows2_lab  Longer labels for t_rows2
values  The actual values of the table in thousand kunas
t_cols2  Column labels, following the Eurostat convention with differences. CPA_ suffix added to original DZS column names.
t_cols2_lab  Longer labels for t_cols2
iotables_col  The standardized iotables column labelling for easier reading.
col_order  The column ordering to keep the matrix legible.
iotables_row  The standardized iotables row labelling for easier reading.
row_order  The row ordering to keep the matrix legible.
unit  Different from Eurostat tables, in thousand national currency units.
geo  ISO / Eurostat country code for Croatia
geo_lab  ISO / Eurostat country name, Croatia.
time  Date of the SIOT
croatia_2010_1900

Source
Državni zavod za statistiku.

See Also
Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1900, croatia_employment_2013, croatia_employment_aggregation, primary_inputs

croatia_2010_1900


Description
1900 - Symmetric input-output table for imports (product x product) In thousand kunas (T_NAC)

Usage
data(croatia_2010_1900)

Format
A data frame with 13 variables.

t_rows2 Technology codes in row names, following the Eurostat convention.
t_rows2_lab Longer labels for t_rows2
values The actual values of the table in thousand kunas
t_cols2 Column labels, following the Eurostat convention with differences. CPA_ suffix added to original DZS column names.
t_cols2_lab Longer labels for t_cols2
iotables_col The standardized iotables column labelling for easier reading.
col_order The column ordering to keep the matrix legible.
iotables_row The standardized iotables row labelling for easier reading.
row_order The row ordering to keep the matrix legible.
unit Different from Eurostat tables, in thousand national currency units.
geo ISO / Eurostat country code for Croatia
geo_lab ISO / Eurostat country name, Croatia.
time Date of the SIOT

Source
Državni zavod za statistiku.

See Also
Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_employment_2013, croatia_employment_aggregation, primary_inputs
croatia_employment_2013

*Croatian employment data for the year 2013*

**Description**

Aggregate Croatian detailed employment statistics into the Croatian (EU standard) Symmetric input-output table format.

**Usage**

`data(croatia_employment_2013)`

**Format**

A data frame with 107 observations in 2 variables:

- `code` Short labels
- `iotables_row` iotables style labels
- `employment` Employment in the sector in Croatia, not in thousands!

**See Also**

Other Croatia 2010 datasets: `croatia_2010_1700`, `croatia_2010_1800`, `croatia_2010_1900`, `croatia_employment_aggregation`, `primary_inputs`

croatia_employment_aggregation

*Aggregation table for Croatian employment statistics*

**Description**

Aggregate Croatian detailed employment statistics into the Croatian (EU standard) Symmetric input-output table format.

**Usage**

`data(croatia_employment_aggregation)`

**Format**

A data frame with 105 rows (including empty ones) and 2 variables.

- `employment_label` Labelling in DZS English language export
- `t_cols2` Labelling of EU/DZS SIOTs.
direct_effects_create

See Also

Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_2010_1900, croatia_employment_2013, primary_inputs

direct_effects_create Create direct effects

Description

The function creates the effects.

Usage

direct_effects_create(input_requirements, inverse, digits = NULL)

Arguments

input_requirements A matrix or vector created by input_indicator_create
inverse A Leontief-inverse created by leontief_inverse_create.
digits Rounding digits, defaults to NULL, in which case no rounding takes place.

Value

A data.frame containing the direct effects and the necessary metadata to sort them or join them with other matrixes.

See Also

Other indicator functions: coefficient_matrix_create(), input_indicator_create()

Examples

nl <- netherlands_2006

input_coeff_nl <- input_coefficient_matrix_create(
data_table  = netherlands_2006,
households = FALSE)

compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')

I_nl <- leontief_inverse_create(input_coeff_nl)

direct_effects_create(input_requirements = compensation_indicator,
            inverse = I_nl)
employment_get

Get employment data

Description

Download the employment data for a country and arrange it to the 64x64 SIOTs.

Usage

```r
employment_get(
  geo,
  year = "2010",
  sex = "Total",
  age = "Y_GE15",
  labelling = "iotables",
  data_directory = NULL,
  force_download = FALSE
)
```

Arguments

- `geo`: The country code.
- `year`: The year. The average employment will be created for the given year, starting with 2008, when the NACE Rev 2 was introduced in employment statistics.
- `sex`: Defaults to "Total". Enter "Females" or "F" for female employment, "Males" or "M" for male employment.
- `age`: Defaults to "Y_GE15", which is the Eurostat code for employment in all age groups starting from 15-years-old. Any Eurostat code can be used as a parameter.
- `labelling`: Either "iotables" or the applicable short code, for product x product SIOTs "prod_na" and in the case of industry x industry SIOTs "induse".
- `data_directory`: Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.
- `force_download`: Defaults to FALSE. It will use the existing downloaded file in the data_directory or the temporary directory, if it exists.

Details

Currently works only with product x product tables.

Value

A data.frame with auxiliary metadata to conform the symmetric input-output tables.
employment_metadata

Source

Eurostat statistic Employment by sex, age and detailed economic activity (from 2008 onwards, NACE Rev. 2 two digit level) - 1 000

See Also

Other import functions: `airpol_get()`, `iotables_download()`, `iotables_metadata_get()`, `iotables_read_tempdir()`

Examples

```r
## Not run:
io_tables <- get_employment (
  geo = "CZ",
  year = "2010",
  sex = "Total",
  age = "Y_GE15",
  data_directory = NULL,
  force_download = TRUE
)
## End(Not run)

employment_metadata Employment metadata

Description

An arrangement of the Eurostat national accounts vocabulary to match with employment statistics data.

Usage

data(employment_metadata)

Format

A data frame with 6 variables.
- **emp_code**: code used in the employment statistics
- **code**: Eurostat labels for SIOTs corresponding to emp_code
- **label**: Eurostat label descriptions for SIOTs corresponding to emp_code
- **variable**: Eurostat vocabulary source, i.e. t_rows, t_cols, prod_na, induse
- **group**: Different from Eurostat tables, in thousand national currency units.
- **iotables_label**: Custom, machine_readable snake format variable names

See Also

Other Metadata datasets: `metadata_uk_2010`, `metadata`
**empty_remove**  
*Symmetrically remove empty rows and columns*

**Description**
Symmetrically remove columns with only zero values or with missing values.

**Usage**
empty_remove(data_table)

**Arguments**
- **data_table**: A symmetric input-output table, or a symmetric part of a use table or a supply table.

**Value**
A tibble/data.frame with a key row and a symmetric matrix, after removing all empty columns and rows at the same time.

**Examples**
```r
test_table <- input_coefficient_matrix_create(iotable_get(source = "germany_1995"))
test_table[, 2] <- 0
eempty_remove (test_table)
```

---

**equation_solve**  
*Solve a basic (matrix) equation*

**Description**
The function matches to parts of the matrix equation, using the named formats with row names and solves the matrix equation.

**Usage**
equation_solve(LHS = NULL, Im = NULL)

**Arguments**
- **LHS**: A left-hand side vector with a key column containing the industry or product names for matching, for example the employment coefficients.
- **Im**: A Leontief-inverse with a key column containing the industry or product names for matching.
**forward_linkages**

**Details**

This function is used in wrapper functions, such as `multiplier_create`, to solve particular problems, but it can be used directly, too. The function only performs the lhs pairing industries and checking for exceptions.

**Value**

A data.frame with auxiliary metadata to conform the symmetric input-output tables.

**Examples**

```r
Im = data.frame (
a = c("row1", "row2"),
b = c(1,1),
c = c(2,0))
LHS = data.frame (
a = "lhs",
b = 1,
c = 0.5)
equation_solve (Im = Im, LHS = LHS)
```

**Description**

The increased output of a sector indicates that additional amounts of products are available to be used as inputs by other sectors which can increase their production, which is captured in this indicator vector.

**Usage**

```r
forward_linkages(output_coefficient_matrix, digits = NULL)
```

**Arguments**

- `output_coefficient_matrix` An output coefficient matrix created with the `output_coefficient_matrix_create` function.
- `digits` Number of decimals for rounding, defaults to NULL.

**Details**

Forward linkages as defined by the Eurostat Manual of Supply, Use and Input-Output Tables (pp. 506–507) and the United Nations Handbook on Supply and Use Tables and Input-Output Tables with Extensions and Applications p637.
Value

The vector of industry (product) forward linkages in a long-form data.frame, containing the meta-data column of the the row names from the output_coefficient_matrix.

See Also

Other linkage functions: backward_linkages()

Examples

data_table = iotable_get()

de_out <- output_coefficient_matrix_create ( 
  data_table, "tfu", digits = 4
)

forward_linkages(output_coefficient_matrix = de_out,
  digits = 4 )

Description

Replication data taken from the Eurostat Manual, Table 15.4: Input-output table of domestic output at basic prices (Version A)

Usage

data(germany_1995)

Format

A data frame with 228 observations and 10 variables.

prod_na  Technology codes in row names, following the Eurostat convention.
prod_na_lab Longer labels for t_rows2.
induse  Column labels, following the Eurostat convention with differences.
iotables_row Row labels, i.e. to be used in key column, for iotables package abbreviations.
iotables_col Column labels for iotables package abbreviations.
values  The actual values of the table in million euros.
unit  MIO_EUR, the same as Eurostat.
unit_lab  Million euros. Eurostat usually has euro and national currency unit values, too.
geo  ISO/Eurostat country code for Germany, i.e. DE.
geo_lab  ISO/Eurostat country name, Germany.
time  Date of the SIOT.
Details

For testing and documentation purposes a well documented example is taken the Eurostat Manual. The table in the Eurostat manual is brought to the format used by the Eurostat database. It is a small dataset for examples, but it is also instructive to understand how Eurostat stores the highly structured SIOTs in long-form tidy datasets. The labels were slightly altered to reflect the transition from the vocabulary of ESA95 to ESA2010 since the publication of the Manual.

Source

Eurostat Manual of Supply, Use and Input-Output Tables p 482

Usage

data(germany_airpol)

Format

A data frame with 72 observations and 4 variables.

- `airpol` The abbreviation of the air pollutant.
- `induse` Column labels, following the Eurostat convention with differences.
- `iotables_col` Column labels for iotables package abbreviations.
- `value` The actual values of the table in thousand tons.

Details

For testing purposes and cross-checking with the Eurostat manual. The labels were slightly altered to reflect the transition from the vocabulary of ESA95 to ESA2010 since the publication of the Manual.

Source

Eurostat Manual of Supply, Use and Input-Output Tables p 482.

See Also

Other Validation datasets: `germany_1995, netherlands_2006, uk_2010_data, uk_test_results`
ghosh_inverse_create  

Create the inverse of a Ghosh-matrix

Description

Create the Ghosh-inverse from the output coefficients.

Usage

ghosh_inverse_create(output_coefficients_matrix, digits = NULL)

Arguments

output_coefficients_matrix
          A technology coefficient matrix created by the output_coefficient_matrix_create.

digits    An integer showing the precision of the technology matrix in digits. Default is
          NULL when no rounding is applied.

Details

The Ghosh-inverse is

\[ G = (I - B)^{-1} \]

where B is the output coefficient matrix created by output_coefficient_matrix_create. See
the United Nations Handbook on Supply and Use Tables and Input-Output Tables with Extensions
and Applications pp 622–639.

For the similar inverse created from input coefficients, see the leontief_inverse_create function.

See Also

Other analytic object functions: input_flow_get(), leontief_inverse_create(), leontief_matrix_create()

Examples

om <- output_coefficient_matrix_create(  
  data_table = iotable_get()  
)

ghosh_inverse_create( output_coefficients_matrix = om )
**household_column_find**

Return the position of final household expenditure

### Description
Return the position of final household expenditure

### Usage

```python
household_column_find(data_table)
```

### Arguments

- `data_table` A symmetric input output table, a use table or a supply table.

### Value
An integer value with the final household expenditure. Returns NULL if not found.

### Examples

```python
household_column_find( iotable_get ( source = 'germany_1995') )
```

---

**household_column_get**

Return Final Household Expenditure

### Description
Return Final Household Expenditure

### Usage

```python
household_column_get(data_table)
```

### Arguments

- `data_table` A symmetric input output table, a use table or a supply table.

### Value
The column containing final household expenditure. If not found NULL is returned.

### See Also
Other iotables processing functions: conforming_vector_create(), iotable_year_get(), key_column_create(), matrix_round(), output_get(), primary_input_get(), rows_add(), supplementary_add(), total_tax_add(), vector_transpose_longer(), vector_transpose_wider()
**indirect_effects_create**

**Create indirect effects**

**Description**

The function creates the indirect effects vector.

**Usage**

`indirect_effects_create(input_requirements, inverse, digits = NULL)`

**Arguments**

- `input_requirements`: A matrix or vector created by `input_indicator_create`.
- `inverse`: A Leontief-inverse created by `leontief_inverse_create`. 
- `digits`: Rounding digits, defaults to `NULL`, in which case no rounding takes place.

**Value**

A data.frame containing the indirect effects and the necessary metadata to sort them or join them with other matrixes.

**Examples**

```
nl <- netherlands_2006
input_coeff_nl <- input_coefficient_matrix_create(
  data_table = netherlands_2006,
  households = FALSE)
compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')
I_nl <- leontief_inverse_create(input_coeff_nl)
indirect_effects_create(input_requirements = compensation_indicator, inverse = I_nl)
```
**Description**

Create an input coefficient matrix from the input flow matrix and the output vector. The two input vectors must have consistent labelling, i.e the same column names must be found in the use table (input flow) and the output vector.

**Usage**

```r
input_coefficient_matrix_create(data_table, households = FALSE, digits = NULL)
```

**Arguments**

- `data_table`  
  A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get` function.

- `households`  
  Defaults to `NULL`. Household column can be added with `TRUE`.

- `digits`  
  An integer showing the precision of the technology matrix in digits. Default is `NULL` when no rounding is applied.

**Details**

The input coefficients of production activities may be interpreted as the corresponding cost shares for products and primary inputs in total output. Our terminology follows the *Eurostat Manual of Supply, Use and Input-Output Tables*. Input-Output Multipliers Specification Sheet and Supporting Material, Spicosa Project Report, which cannot be linked due to a malformatted url, but can be found with a search engine. This matrix is called ’technological coefficients’. The results of the function are tested on both sources. This is a wrapper function around `coefficient_matrix_create`.

**Value**

A data frame that contains the matrix of first quadrant of the use table as `input_flow` divided by output supported by a key column of product or industries, with a key column. Optionally the results are rounded to given `digits`.

An input coefficient matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

**Examples**

```r
input_coefficient_matrix_create ( 
    iotable_get(),
    digits = 4 )
```

#This is a wrapper function and equivalent to
input_flow_get

coefficient_matrix_create( iotable_get(),
    total = "total",
    return = "products")

input_flow_get  Create an inter-industry or input flow matrix

Description
Select the first quadrant of the symmetric input-output table.

Usage
input_flow_get(data_table, empty_remove = FALSE, households = TRUE)

Arguments
data_table A symmetric input-output table or use table retrieved by the iotable_get function.
empty_remove Defaults to TRUE. If you want to keep empty primary input rows, choose FALSE. Empty product/industry rows are always removed to avoid division by zero error in the analytic functions.
households Defaults to FALSE. If TRUE, the final household expenditure is added to the input flow table.

Details
The first quadrant is called the input flow matrix, or the input requirements matrix, or the inter-industry matrix in different contexts.

Value
A data flow matrix (a symmetric use table) with a key column.

See Also
Other analytic object functions: ghosh_inverse_create(), leontief_inverse_create(), leontief_matrix_create()

Examples
input_flow <- input_flow_get(data_table = iotable_get(),
   empty_remove = FALSE,
   households = TRUE)
input_indicator_create

Create input indicator(s)

Description
The function creates the input indicators from the inputs and the outputs.

Usage
input_indicator_create(
  data_table,
  input_row = c("gva_bp", "net_tax_production"),
  digits = NULL,
  households = FALSE,
  indicator_names = NULL
)

Arguments
- data_table: A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get` function.
- input_row: The name of input(s) for which you want to create the indicator(s). Must be present in the `data_table`.
- digits: Rounding digits, if omitted, no rounding takes place.
- households: If the households column should be added, defaults to `FALSE`.
- indicator_names: The names of new indicators. Defaults to `NULL` when the names in the key column of `input_matrix` will be used to create the indicator names.

Value
A tibble (data frame) containing the `input_matrix` divided by the `output_vector` with a key column for products or industries.

See Also
Other indicator functions: `coefficient_matrix_create()`, `direct_effects_create()`

Examples
input_indicator_create( data_table = iotable_get(),
  input_row = c("gva", "compensation_employees"),
  digits = 4,
  indicator_names = c("GVA indicator", "Income indicator"))
input_multipliers_create

Create input multipliers

Description

The function creates the multipliers (direct + indirect effects).

Usage

```
input_multipliers_create(
  input_requirements,
  Im,
  multiplier_name = NULL,
  digits = NULL
)
```

Arguments

- **input_requirements**
  A matrix or vector created by `input_indicator_create`

- **Im**
  A Leontief-inverse created by `leontief_inverse_create`.

- **multiplier_name**
  An optional name to be placed in the key column of the multiplier. Defaults to `NULL`.

- **digits**
  Rounding digits, defaults to `NULL`, in which case no rounding takes place. Rounding is important if you replicate examples from the literature, rounding differences can add up to visible differences in matrix equations.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column, containing an automatically given row identifier (for joining with other matrixes) which can be overruled with setting `multiplier_name`.

See Also

Other multiplier functions: `multiplier_create()`

Examples

```
nl <- netherlands_2006

input_coeff_nl <- input_coefficient_matrix_create(
  data_table = netherlands_2006,
  households = FALSE)
```
compensation_indicator <- input_indicator_create(netherlands_2006, 'compensation_employees')

I_nl <- leontief_inverse_create(input_coeff_nl)

input_multipliers_create(input_requirements = compensation_indicator,
                         Im = I_nl)

### iotables_download

**Download input-output tables**

**Description**

This function downloads standard input-output table files. Currently only Eurostat files are supported. You are not likely to use this function, because `iotable_get` will call this function if necessary and properly filter out an input-output table.

**Usage**

```r
iotables_download(
  source = "naio_10_cp1700",
  data_directory = NULL,
  force_download = FALSE
)
```

**Arguments**

- `source` See the available list of sources above in the Description.
- `data_directory` Defaults to NULL when the files will be temporarily stored in the path retrieved by `tempdir`. If it is a different valid directory, it will try to save the pre-processed data file here with labelling.
- `force_download` Defaults to FALSE which will use the existing downloaded file in the `data_directory` or the temporary directory, if it exists. TRUE will try to download the file from the Eurostat warehouse.

**Details**

The data is downloaded in the `tempdir()` under the name the statistical product as an rds file. (For example: `naio_10_cp1750.rds`) The temporary directory is emptied at every normal R session exit.

To save the file for further use (which is necessary in analytical work because download times are long) set the `download_directory` [see parameters]. The function will make a copy of the rds file in this directory.

- `naio_10_cp1700` Symmetric input-output table at basic prices (product by product)
- `naio_10_pyp1700` Symmetric input-output table at basic prices (product by product) (previous years prices)
naio_10_cp1750  Symmetric input-output table at basic prices (industry by industry)
naio_10_pyp1750 Symmetric input-output table at basic prices (industry by industry) (previous years prices)
naio_10_cp15  Supply table at basic prices incl. transformation into purchasers’ prices
naio_10_cp16  Use table at purchasers’ prices
naio_10_cp1610 Use table at basic prices
naio_10_pyp1610 Use table at basic prices (previous years prices) (naio_10_pyp1610)
naio_10_cp1620 Table of trade and transport margins at basic prices
naio_10_pyp1620 Table of trade and transport margins at previous years’ prices
naio_10_cp1630 Table of taxes less subsidies on products at basic prices
naio_10_pyp1630 Table of taxes less subsidies on products at previous years’ prices
uk_2010_siot  United Kingdom Input-Output Analytical Tables data

Value
A nested data frame. Each input-output table is in a separate row of the nested output, where all the metadata are in columns, and the actual, tidy, ordered input-output table is in the data column. The data is saved into the actual tempdir(), too.

See Also
Other import functions: `airpol_get()`, `employment_get()`, `iotables_metadata_get()`, `iotables_read_tempdir()`

Examples
```r
io_tables <- iotables_download(source = "naio_10_pyp1750")
```

---

**Description**
Remove the data column and return only the metadata information of input-output (or related tables) from a source. If dat is not inputed as a nested data frame created by `iotables_download`, validate the source input parameter and try to load the table from the current sessions’ temporary directory.

naio_10_cp1700  Symmetric input-output table at basic prices (product by product)
naio_10_pyp1700 Symmetric input-output table at basic prices (product by product) (previous years prices)
naio_10_cp1750  Symmetric input-output table at basic prices (industry by industry)
naio_10_pyp1750 Symmetric input-output table at basic prices (industry by industry) (previous years prices)
naio_10_cp15  Supply table at basic prices incl. transformation into purchasers’ prices
naio_10_cp16  Use table at purchasers’ prices
naio_10_cp1610 Use table at basic prices
naio_10_pyp1610 Use table at basic prices (previous years prices) (naio_10_pyp1610)
naio_10_cp1620 Table of trade and transport margins at basic prices
naio_10_pyp1620 Table of trade and transport margins at previous years’ prices
naio_10_cp1630 Table of taxes less subsidies on products at basic prices
naio_10_pyp1630 Table of taxes less subsidies on products at previous years’ prices
uk_2010_siot United Kingdom Input-Output Analytical Tables data

Usage

iotables_metadata_get(dat = NULL, source = "naio_10_cp1700")

Arguments

dat  A nested data file created by iotables_download. Defaults to NULL in which case an attempt is made to find and read in the nested data from the current R sessions’ temporary directory.

source  See the available list of sources above in the Description.

Value

A data frame, which contains the metadata of all available input-output tables from a specific source.

See Also

Other import functions: airpol_get(), employment_get(), iotables_download(), iotables_read_tempdir()

Examples

# The table must be present in the sessions' temporary directory:
iotables_download(source = "naio_10_pyp1750")

# Now you can get the metadata:
iotables_metadata_get(source = "naio_10_pyp1750")
**iotables_read_tempdir**  
*Read input-output tables from temporary directory*

**Description**

Validate the `source` input parameter and try to load the table from the current sessions' temporary directory.

**Usage**

```r
iotables_read_tempdir(source = "naio_10_cp1700")
```

**Arguments**

- **source**
  
  See the available list of sources above in the Description. Defaults to `source = "naio_10_cp1700"`.

**Details**

Possible source parameters:

- `naio_10_cp1700` Symmetric input-output table at basic prices (product by product)
- `naio_10_pyp1700` Symmetric input-output table at basic prices (product by product) (previous years prices)
- `naio_10_cp1750` Symmetric input-output table at basic prices (industry by industry)
- `naio_10_pyp1750` Symmetric input-output table at basic prices (industry by industry) (previous years prices)
- `naio_10_cp15` Supply table at basic prices incl. transformation into purchasers’ prices
- `naio_10_cp16` Use table at purchasers’ prices
- `naio_10_cp1610` Use table at basic prices
- `naio_10_pyp1610` Use table at basic prices (previous years prices) (naio_10_pyp1610)
- `naio_10_cp1620` Table of trade and transport margins at basic prices
- `naio_10_pyp1620` Table of trade and transport margins at previous years’ prices
- `naio_10_cp1630` Table of taxes less subsidies on products at basic prices
- `naio_10_pyp1630` Table of taxes less subsidies on products at previous years’ prices
- `uk_2010_siot` United Kingdom Input-Output Analytical Tables data

**Value**

A nested data frame. Each input-output table is in a separate row of the nested output, where all the metadata are in columns, and the actual, tidy, ordered input-output table is in the data column.

**See Also**

Other import functions: `airpol_get()`, `employment_get()`, `iotables_download()`, `iotables_metadata_get()`
Examples

# The table must be present in the sessions' temporary directory:
iotables_download(source = "naio_10_pyp1750")
iotables_read_tempdir (source = "naio_10_pyp1750")

Description

This function is used to filter out a single input-output table from a database, for example a raw file downloaded from the Eurostat website. It provides some functionality to avoid some pitfalls.

Usage

iotable_get(
    labelled_io_data = NULL,
    source = "germany_1995",
    geo = "DE",
    year = 1990,
    unit = "MIO_EUR",
    stk_flow = "DOM",
    labelling = "iotables",
    data_directory = NULL,
    force_download = TRUE
)

Arguments

labelled_io_data

If you have downloaded a bulk data file with iotables_download, it is faster to work with the data in the memory. Defaults to NULL when the data will be retrieved from the hard disk or from the Eurostat website invoking the same function.

source

A data source, for example naio_10_cp1700.

- naio_10_cp1700  Symmetric input-output table at basic prices (product by product)
- naio_10_pyp1700 Symmetric input-output table at basic prices (product by product) (previous years prices)
- naio_10_cp1750 Symmetric input-output table at basic prices (industry by industry)
- naio_10_pyp1750 Symmetric input-output table at basic prices (industry by industry) (previous years prices)
naio_10_cp15  Supply table at basic prices incl. transformation into purchasers’ prices
naio_10_cp16  Use table at purchasers’ prices
naio_10_cp1610  Use table at basic prices
naio_10_pyp1610  Use table at basic prices (previous years prices) (naio_10_pyp1610)
naio_10_cp1620  Table of trade and transport margins at basic prices
naio_10_pyp1620  Table of trade and transport margins at previous years’ prices
naio_10_cp1630  Table of taxes less subsidies on products at basic prices
naio_10_pyp1630  Table of taxes less subsidies on products at previous years’ prices

For further information consult the Eurostat Symmetric Input-Output Tables page.

geo  A country code or a country name. For example, SK or as Slovakia.
year  A numeric variable containing the year. Defaults to 2010, because this year has the most data.
unit  A character string containing the currency unit, defaults to MIO_NAC (million national currency unit). The alternative is MIO_EUR.
stk_flow  Defaults to DOM as domestic output, alternative IMP for imports and TOTAL for total output. For source = ‘naio_10_cp1620’ and trade and transport margins and source = ’naio_10_cp1630’ taxes less subsidies only TOTAL is not used.
labelling  Defaults to iotables which gives standard row and column names regardless of the source of the table, or if it is a product x product, industry x industry or product x industry table. The alternative is short or eurostat which is the original short row or column code of Eurostat or OECD.
data_directory  Defaults to NULL, if a valid directory, it will try to save the pre-processed data file here with labelling.
force_download  Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists. Will force download only in a new session.

Details

Unless you want to work with bulk data files, you should not invoke iotables_download directly, rather via this function, if and when it is necessary.

Value

A wide format data.frame with a well-ordered input-output table. The bulk data files on the Eurostat website are in a long form and they are not correctly ordered for further matrix equations.

Examples

germany_table <- iotable_get( source = “germany_1995”,
geo = 'DE', year = 1990, unit = "MIO_EUR",
labelling = "iotables" )
Description

The function selects the available tables by year or time as a date for a specific country and currency unit in the Eurostat bulk file.

Usage

```
iotable_year_get(
  labelled_io_data = NULL,
  source = "germany_1995",
  geo = "DE",
  unit = "MIO_EUR",
  time_unit = "year",
  stk_flow = "TOTAL",
  data_directory = NULL,
  force_download = TRUE
)
```

Arguments

- **labelled_io_data**: If you have downloaded a bulk data file with `iotables_download`, it is faster to work with the data in the memory. Defaults to NULL when the data will be retrieved from the hard disk or from the Eurostat website invoking the same function.

- **source**: A data source, for example `naio_10_cp1700`. Symmetric input-output table at basic prices (product by product) (`naio_10_cp1700`) Symmetric input-output table at basic prices (industry by industry) (`naio_10_cp1750`) Symmetric input-output table at basic prices (product by product) (previous years prices) (`naio_10_pyp1700`) Symmetric input-output table at basic prices (industry by industry) (previous years prices) (`naio_10_pyp1750`) Table of trade and transport margins at basic prices (`naio_10_cp1620`) and at previous years prices (`naio_10_pyp1620`) Table of taxes less subsidies on products at basic prices (`naio_10_cp1630`) and at previous years prices (`naio_10_pyp1630`) For further information consult the Eurostat Symmetric Input-Output Tables page.

- **geo**: A country code or a country name. For example, SK or as Slovakia.

- **unit**: A character string containing the currency unit, defaults to MIO_NAC (million national currency unit). The alternative is MIO_EUR.

- **time_unit**: Defaults to 'year' and years are returned as numbers. Alternative is to return 'time' as vector of dates.

- **stk_flow**: Defaults to DOM as domestic output, alternative IMP for imports and TOTAL for total output. For source = 'naio_10_cp1620' and trade and transport margins and source = 'naio_10_cp1630' taxes less subsidies only TOTAL is not used.
data_directory Defaults to NULL. Use it if you used a data_directory parameter with `iotable_get` or `iotables_download`.

force_download Defaults to TRUE. If FALSE it will use the existing downloaded file in the data_directory or the temporary directory, if it exists. Will force download only in a new session.

Details

Unless you want to work with bulk data files, you should not invoke `iotables_download` directly, rather via this function, if and when it is necessary.

Value

A vector with the years that have available input-output tables.

See Also

Other iotables processing functions: `conforming_vector_create()`, `household_column_get()`, `key_column_create()`, `matrix_round()`, `output_get()`, `primary_input_get()`, `rows_add()`, `supplementary_add()`, `total_tax_add()`, `vector_transpose_longer()`, `vector_transpose_wider()`

Examples

```r
germany_years <- iotable_year_get(source = "germany_1995", geo = 'DE', unit = "MIO_EUR")
```

---

**is_html_output**

Check if HTML output is required

Description

Check if HTML output is required

---

**is_latex_output**

Check if Latex output is required

Description

Check if Latex output is required
key_column_create

Create a key column

Description

Create a key column for matching the dimensions of matrixes.

Usage

key_column_create(key_column_name, key_column_values = NULL)

Arguments

key_column_name
  The name of the key column.
key_column_values
  The value(s) of the key column

Details

This function will likely be used with the creation of coefficients that need to be matched with a matrix that has a key column.

Value

A tibble with one column, named key_column_name and with values key_column_values.

See Also

Other iotables processing functions: conforming_vector_create(), household_column_get(), iotable_year_get(), matrix_round(), output_get(), primary_input_get(), rows_add(), supplementary_add(), total_tax_add(), vector_transpose_longer(), vector_transpose_wider()

Examples

key_column_create("iotables_row", c("CO2_multiplier", "CH4_multiplier"))
leontief_inverse_create

Create the inverse of a Leontief-matrix

Description

Create the Leontief inverse from the technology coefficient matrix.

Usage

leontief_inverse_create(technology_coefficients_matrix, digits = NULL)

Arguments

- technology_coefficients_matrix:
  A technology coefficient matrix created by the `input_coefficient_matrix_create`.
- digits:
  An integer showing the precision of the technology matrix in digits. Default is `NULL` when no rounding is applied.

Details

The Leontief-inverse is

$$ L = (I - A)^{-1} $$

where B is the input coefficient matrix created by `input_coefficient_matrix_create`. For the similar inverse created from output coefficients, see the `ghosh_inverse_create` function.

See Also

Other analytic object functions: `ghosh_inverse_create()`, `input_flow_get()`, `leontief_matrix_create()`

Examples

```r
tm <- input_flow_get (
  data_table = iotable_get(),
  households = FALSE)
I <- leontief_inverse_create( technology_coefficients_matrix = tm )
```
Description

Create a Leontief matrix from technology matrix after some basic error handling. Most likely you will need this function as a step to invoke the function to create its inverse: leontief_inverse_create.

Usage

leontief_matrix_create(technology_coefficients_matrix)

Arguments

technology_coefficients_matrix
A technology coefficient matrix created by the input_coefficient_matrix_create or output_coefficient_matrix_create.

Value

A Leontief matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

See Also

Other analytic object functions: ghosh_inverse_create(), input_flow_get(), leontief_inverse_create()

Examples

```r
tm <- input_flow_get (
  data_table = iotable_get(),
  households = FALSE)
L <- leontief_matrix_create( technology_coefficients_matrix = tm )
```

matrix_round

Round all matrix values to required number of digits.

Description

For comparison with results created with other software or published with rounding, systematically round the values of an input-output table, a use, supply, tax or margins table.
Usage

```r
matrix_round(data_table, digits = 0)
```

Arguments

- `data_table` A symmetric input output table, a use, supply, tax or margins table.
- `digits` An integer number, defaults to 0.

Value

The matrix, with the intact key column and the numeric columns rounded.

See Also

Other iotables processing functions: `conforming_vector_create()`, `household_column_get()`, `iotable_year_get()`, `key_column_create()`, `output_get()`, `primary_input_get()`, `rows_add()`, `supplementary_add()`, `total_tax_add()`, `vector_transpose_longer()`, `vector_transpose_wider()`

---

### metadata

**Metadata**

**Description**

An arrangement of the Eurostat national accounts vocabulary, used to correctly order wide format rows and columns from bulk long-form tables.

**Usage**

```r
data(metadata)
```

**Format**

A data frame with 8 variables.

- **variable** Eurostat vocabulary source, i.e. `t_rows`, `t_cols`, `prod_na`, `induse`
- **group** Informal labelling for macroeconomic groups
- **code** Eurostat labels
- **label** Eurostat label descriptions
- **quadrant** Where to place the data from a long-form raw data file
- **account_group** Different from Eurostat tables, in thousand national currency units.
- **numeric_label** ordering from quadrant, account_group, digit_1, digit_2
- **iotables_label** Custom, machine_readable snake format variable names

**See Also**

Other Metadata datasets: `employment_metadata`, `metadata_uk_2010`
Description

The Excel-imported UK data.

Usage

data(uk_2010_data)

Format

A data frame with 10 variables.

- **variable**: Constant for the iotable_get function.
- **uk_row**: The UK row identifier. Dots and '&' converted to '-'.
- **uk_col**: The UK row identifier. Dots and '&' converted to '-'.
- **uk_row_label**: The original UK row labels.
- **uk_col_label**: The original UK column labels.
- **eu_prod_na**: The Eurostat vocabulary equivalent of uk_row
- **row_order**: Ordering variable for rows.
- **col_order**: Ordering variable for columns.
- **prod_na**: The Eurostat-like key values for rows.
- **induse**: The Eurostat-like column names

See Also

Other Metadata datasets: `employment_metadata`, `metadata`

---

**multiplier_create**

Create multipliers

Description

This function is in fact a wrapper around the `equation_solve` function, adding a key column with the name to the multiplier the maintain structural consistency.
Usage

```
multiplier_create(
  input_vector,
  Im,
  multiplier_name = "multiplier",
  digits = NULL
)
```

Arguments

- `input_vector`: An input matrix or vector created by the `input_indicator_create` function.
- `Im`: The Leontief inverse as a named object created by the `leontief_inverse_create` function.
- `multiplier_name`: A variable name to be given to the returned multipliers. Defaults to `multiplier`.
- `digits`: Rounding digits, if omitted, no rounding takes place.

Details

As opposed to direct effects, multipliers are expressed per input of product/industry.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

See Also

Other multiplier functions: `input_multipliers_create()`

Examples

```
data_table <- iotable_get()

coeff_de <- input_coefficient_matrix_create( data_table )

de_gva_indicator <- input_indicator_create (  
data_table = data_table,  
  input = 'gva' )  #this is a correct input

I_de <- leontief_inverse_create( coeff_de )

de_gva_multipliers <- multiplier_create (  
  input_vector = de_gva_indicator,  
  Im = I_de,  
  multiplier_name = "employment_multiplier",  
  digits = 4 )
```
**Description**

This simplified SIOT is taken from the Science Policy Integration for Coastal Systems Assessment project’s input-output multiplier specification sheet. It is used as a simple example SIOT for controlled analytical results. The column names were slightly altered to resemble more the current Eurostat conventions and the main example dataset `germany_1995`.

**Usage**

data(netherlands_2006)

**Format**

A data frame with 14 observations and 13 variables.

A data frame of 13 observations in 14 variables.

- `prod_na`  Product name, simplified, following the Eurostat conventions
- `agriculture_group`  Simple aggregated agricultural products
- `mining_group`  Simple aggregated mining products
- `manufacturing_group`  Simple aggregated manufacturing products
- `construction_group`  Construction
- `utilities_group`  Simple aggregated utilities products/services
- `services_group`  Simple aggregated services products
- `TOTAL`  Column / row sums, simple summary, not included in the original source
- `final_consumption_private`  Simple aggregated final private use
- `final_consumption_households`  Simple aggregated final household consumption
- `final_consumption_government`  Simple aggregated final government consumption
- `gross_fixed_capital_formation`  Gross fixed capital formation 'GFCF'
- `exports`  Simple aggregated exports
- `total_use`  Simple aggregated total use

**Source**

Source: Input-Output Multipliers Specification Sheet and Supporting Material in the Spicosa Project Report

**See Also**

Other Validation datasets: `germany_1995, germany_airpol, uk_2010_data, uk_test_results`
output_coefficient_matrix_create

*Create an output coefficient matrix*

**Description**

Create an output coefficient matrix from the input flow matrix or a symmetric input-output table.

**Usage**

```
output_coefficient_matrix_create(data_table, total = "tfu", digits = NULL)
```

**Arguments**

- `data_table`: A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get`. In case you use `type="tfu"` you need to input a full iotable, create by the `iotable_get`, because the final demand column is in the second quadrant of the IOT.
- `total`: The `output='total'` (or CPA_TOTAL, depending on the names in your table, default) returns the output coefficients for products (intermediates) while the `final_demand` returns output coefficients for final demand. See Eurostat Manual of Supply, Use and Input-Output Tables p495 and p507.
- `digits`: An integer showing the precision of the technology matrix in digits. Default is `NULL` when no rounding is applied.

**Details**

The output coefficients may be interpreted as the market shares of products in total output. If there are zero values in present, they will be changed to 0.000001 and you will get a warning. Some analytical equations cannot be solved with zero elements. You either have faulty input data, or you have to use some sort of data modification to carry on your analysis.

**Value**

An output coefficient matrix of data.frame class. The column names are ordered, and the row names are in the first, auxiliary metadata column.

**Examples**

```R
data_table <- iotable_get()

output_coefficient_matrix_create (data_table = data_table,
                               total = 'tfu',
                               digits = 4)
```
output_get

Get an output vector

Description

This is a wrapper function around the primary_input_get function.

Usage

output_get(data_table)

Arguments

data_table: A symmetric input-output table or use table retrieved by the iotable_get function.

Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

See Also

Other iotables processing functions: conforming_vector_create(), household_column_get(), iotable_year_get(), key_column_create(), matrix_round(), primary_input_get(), rows_add(), supplementary_add(), total_tax_add(), vector_transpose_longer(), vector_transpose_wider()

Examples

output_get ( data_table = iotable_get () )

output_multiplier_create

Create output multipliers

Description

Create a data frame of output multipliers.

Usage

output_multiplier_create(input_coefficient_matrix)
Arguments

input_coefficient_matrix
A Leontief inverse matrix created by the input_coefficient_matrix_create function.

Details

Output multipliers as defined by the Eurostat Manual of Supply, Use and Input-Output Tables on p500.

Value

A data frame with a key column and the output multipliers of the industries.

Examples

```r
de_input_coeff <- input_coefficient_matrix_create(
  iotable_get(),
  digits = 4)
output_multiplier_create (de_input_coeff)
```

<table>
<thead>
<tr>
<th>primary_inputs</th>
<th>Primary input abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

Only currently used primary inputs. Abbreviations for filtering.

Usage

data("croatia_employment_aggregation")

Format

A data frame with 105 rows (including empty ones) and 2 variables.

- `t_rows2` Eurostat code of the input.
- `t_rows2_lab` Labelling of the input by Eurostat.
- `source` Eurostat / DZS
- `indicator` Human readable abbreviation

See Also

Other Croatia 2010 datasets: croatia_2010_1700, croatia_2010_1800, croatia_2010_1900, croatia_employment_2013, croatia_employment_aggregation
primary_input_get

Description
This function will retrieve any primary input from the input-output table.

Usage
primary_input_get(data_table, primary_input = "compensation_employees")

Arguments
- data_table: A symmetric input-output table, a use table, or a supply table retrieved by the iotable_get function.
- primary_input: The primary input to be returned from the table.

Value
A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

See Also
Other iotables processing functions: conforming_vector_create(), household_column_get(), iotable_year_get(), key_column_create(), matrix_round(), output_get(), rows_add(), supplementary_add(), total_tax_add(), vector_transpose_longer(), vector_transpose_wider()

Examples
comp_employees_de <- primary_input_get(
  data_table = iotable_get(),
  primary_input = "compensation_employees")

rows_add

Description
Add a conforming row, or elements of a conforming row to a names matrix.

Usage
rows_add(data_table, rows_to_add, row_names = NULL, empty_fill = 0)
Arguments

data_table A symmetric input-output table, a use table, a margins or tax table retrieved by the `iotable_get` function.
rows_to_add A data frame or a named numeric vector.
row_names An optional name or vector of names for the key column. Defaults to `NULL`.
empty_fill What should happen with missing column values? Defaults to 0. If you want to avoid division by zero, you may consider a very small value such as 0.000001.

Details

If you want to add a single row manually, you can input a named numeric vector or a data frame with a single row. For multiple rows, input them as wide form data frame (see examples.)

Value

An extended `data_table` with the new row(s) binded.

See Also

Other `iotables` processing functions: `conforming_vector_create()`, `household_column_get()`, `iotable_year_get()`, `key_column_create()`, `matrix_round()`, `output_get()`, `primary_input_get()`, `supplementary_add()`, `total_tax_add()`, `vector_transpose_longer()`, `vector_transpose_wider()`

Examples

```r
rows_to_add <- data.frame(iotables_row = "CO2_emission",
                            agriculture_group = 10448,
                            industry_group = 558327, # -> construction is omitted
                            trade_group = 11194)

rows_add (iotable_get(), rows_to_add = rows_to_add)

rows_add (iotable_get(),
          rows_to_add = c(industry_group = 1534,
                           trade_group = 4),
          row_names = "CH4_emission")
```

supplementary_add  Add supplementary data

Description

Add supplementary data to a SIOT, a use, supply or margins table.

Usage

`supplementary_add(data_table, supplementary_data, supplementary_names = NULL)`
supplementary_add

Arguments

data_table  A SIOT, a use table, a supply table, or a margins table.
supplementary_data
  Supplementary data to be added. It must be a data.frame or tibble with a key
  column containing the indicator’s name, and the column names must match with
  the data_table. Can be a vector or a data frame of several rows.
supplementary_names
  Optional names for the new supplementary rows. Defaults to NULL.

Details

  This function is a wrapper around the more general rows_add function.

Value

  An extended data_table with the new row(s) binded.
  A symmetric input-output table with supplementary data, of data.frame class. The column names
  are ordered, and the row names are in the first, auxiliary metadata column.

See Also

  Other iotables processing functions: conforming_vector_create(), household_column_get(),
iotable_year_get(), key_column_create(), matrix_round(), output_get(), primary_input_get(),
rows_add(), total_tax_add(), vector_transpose_longer(), vector_transpose_wider()

Examples

de_io <- iotable_get()
CO2_coefficients <- data.frame( agriculture_group = 0.2379,
                               industry_group = 0.5172,
                               construction = 0.0456,
                               trade_group = 0.1320,
                               business_services_group = 0.0127,
                               other_services_group = 0.0530)
CH4_coefficients <- data.frame( agriculture_group = 0.0349,
                                industry_group = 0.0011,
                                construction = 0,
                                trade_group = 0,
                                business_services_group = 0,
                                other_services_group = 0.0021)
CO2 <- cbind ( data.frame(iotables_row = "CO2"),
               CO2_coefficients)
CH4 <- cbind(data.frame(iotables_row = "CH4_coefficients"),
             CH4_coefficients)
de_coeff <- input_coefficient_matrix_create ( iotable_get() )
emissions <- rbind (CO2, CH4)

  # Check with the Eurostat Manual page 494:
  supplementary_add(de_io, emissions)
total_tax_add

### Description

Create and add a total tax row, if there are multiple tax rows present in the data_table.

### Usage

```r
total_tax_add(
  data_table,
  tax_names = c("d21x31", "d29x39"),
  total_tax_name = "TOTAL_TAX"
)
```

### Arguments

- **data_table**: A SIOT, a use table, a supply table, or a margins table that has product and production tax rows in among the primary inputs.
- **tax_names**: Defaults to ("d21x31", "d29x39"), which are the Eurostat names for taxes. The parameter is not case sensitive.
- **total_tax_name**: Defaults to 'TOTAL_TAX'. The name of the summarized row. It is case sensitive.

### Value

A data frame with the vector of multipliers and the an auxiliary metadata column (for joining with other matrixes.)

### See Also

Other iotables processing functions: `conforming_vector_create()`, `household_column_get()`, `iotable_year_get()`, `key_column_create()`, `matrix_round()`, `output_get()`, `primary_input_get()`, `rows_add()`, `supplementary_add()`, `vector_transpose_longer()`, `vector_transpose_wider()`

### Examples

```r
de_io <- iotable_get()

total_tax_add (de_io,
  tax_names = c("net_tax_products", "net_tax_production"),
  total_tax_name = "total_tax")
```
**Description**

Replication data exported from the Office of National Statistics.

**Usage**

```r
data(uk_2010_data)
```

**Format**

A data frame with 10 variables.

- **uk_row** The UK row identifier. Dots and `&` converted to `-`.
- **uk_row_lab** The original UK row labels.
- **uk_col** The UK row identifier. Dots and `&` converted to `-`.
- **uk_col_lab** The original UK column labels.
- **geo** Eurostat-style geocode, i.e. UK
- **geo_lab** United Kingdom
- **indicator** The name of the indicator, i.e. Excel sheet.
- **unit** Eurostat label equivalents units, i.e. MIO\_NAC.
- **unit_lab** Eurostat label equivalents, i.e. millions of national currency unit.
- **values** The numeric values of the variable
- **year** Constant = 2010.

**Details**

You can retrieve the data with `iotable_get`, setting the `source` parameter as follows:

- **uk_2010_siot** Input-Output table (domestic use, basic prices, product by product)
- **uk_2010_use** Domestic use table at basic prices (product by industry)
- **uk_2010_imports** Imports use table at basic prices (product by product)
- **uk_2010_coeff** Matrix of coefficients (product by product)
- **uk_2010_inverse** Leontief Inverse (product by product)

**Source**

United Kingdom Input-Output Analytical Tables 2010

**See Also**

Other Validation datasets: `germany_1995`, `germany_airpol`, `netherlands_2006`, `uk_test_results`
uk_2010_results_get  

*Get United Kingdom Multipliers and Effects, 2010*

**Description**

This function will retrieve the published effects and multipliers from the United Kingdom Input-Output Analytical Tables, 2010 (consistent with UK National Accounts Blue Book 2013 & UK Balance of Payments Pink Book 2013) by Richard Wild.

**Usage**

```r
uk_2010_results_get(path = NULL)
```

**Arguments**

- `path`  
  A path to the downloaded file, if already exists, given with `file.path()` function.

**Source**

`ukioanalyticaltablesio1062010detailedpubversion.xls`

**Examples**

```r
## Not run:
uk_results <- iotables::uk_2010_results_get()

## End(Not run)
```

---

uk_test_results  

*Multipliers and effects (product) for testing from the United Kingdom Input-Output Analytical Tables, 2010*

**Description**

The Excel-imported UK data.

**Usage**

```r
data(uk_test_results)
```
vector_transpose_longer

Format

A data frame with 12 variables.

- **uk_row_label** The UK row label
- **Output multiplier** The imported Output multipliers
- **output_multiplier_rank** The imported ranking of output multipliers
- **Employment cost multiplier** The imported Employment cost multipliers.
- **employment_cost_multiplier** The imported ranking of Employment cost multipliers.
- **Employment cost effects** The imported Employment cost multipliers.
- **employment_cost_effects_rank** The imported ranking of employment cost multipliers.
- **GVA effects** The imported GVA effects.
- **gva_effects_rank** The imported ranking GVA effects.
- **gva_multiplier_rank** The imported ranking GVA multipliers.
- **GVA multiplier** The imported GVA multipliers.
- **indicator** Indicator names.

See Also

Other Validation datasets: germany_1995, germany_airpol, netherlands_2006, uk_2010_data

---

vector_transpose_longer

*Transpose a vector to a long form*

Description

Many vectors (indicators, multipliers) are create in the wide form to conform matrixes in analytical functions. For printing it is more useful to have them in long form.

Usage

```r
vector_transpose_longer(
  data_table,
  names_to = "nace_r2",
  values_to = "value",
  key_column_name = NULL,
  .keep = FALSE
)
```

```r
vector_transpose(
  data_table,
  names_to = "nace_r2",
  values_to = "value",
  key_column_name = NULL,
  .keep = FALSE
)
```
vector_transpose_wider

Arguments

data_table A matrix or vector that normally has a key column.
names_to Defaults to 'nace_r2'.
values_to Defaults to 'value'.
key_column_name The name of the first column. Defaults to NULL when it is not changed. It should usually match the key column of the matrix or vector you would like to join the new vector created with vector_transpose_longer.
.keep Keep the indicator identifier column? Defaults to FALSE.

Details

This is a wrapper around pivot_longer so you do not necessarily need to import or load the entire tidyr package.

Value

A long form vector with a key column, and optionally the identifier of the indicator in the first column.

See Also

Other iotables processing functions: conforming_vector_create(), household_column_get(), iotable_year_get(), key_column_create(), matrix_round(), output_get(), primary_input_get(), rows_add(), supplementary_add(), total_tax_add(), vector_transpose_wider()

Examples

vector_transpose_longer(
  data.frame(indicator = "my_indicator",
              agriculture = 0.0123,
              manufacturing = 0.1436,
              trade = 0.0921)
)

vector_transpose_wider

Transpose a vector to wider format

Description

Many vectors (indicators, multipliers) are create in the wide form to conform matrixes in analytical functions. For binding it is more useful to have them in wide format.
vector_transpose_wider

Usage

vector_transpose_wider(
    data_table,
    names_from,
    values_from,
    key_column_name = NULL,
    key_column_values = NULL
)

Arguments

data_table A matrix or vector that normally has a key column. If the key column must be
created or replaced, used key_column_name and key_column_values.

names_from, values_from
A pair of arguments describing which column (or columns) to get the name of
the output column (`names_from`), and which column (or columns) to get the
cell values from (`values_from`).

key_column_name
The name of the key column.

key_column_values
You can explicitly supply key column values. Defaults to NULL when the key
column values will be created from the long data.

Details

This is a wrapper around `pivot_wider` so you do not necessarily need to import or load the entire
tidyverse package.

See Also

Other iotables processing functions: conforming_vector_create(), household_column_get(),
iotable_year_get(), key_column_create(), matrix_round(), output_get(), primary_input_get(),
rows_add(), supplementary_add(), total_tax_add(), vector_transpose_longer()

Examples

vector_transpose_wider (data_table = germany_airpol[, -2],
    names_from = 'induse',
    values_from = 'value')

vector_transpose_wider (data_table = germany_airpol[1:8, 3:4],
    names_from = 'induse',
    values_from = 'value',
    key_column_values = "CO2_emission" )
Index

* Croatia 2010 datasets
  croatia_2010_1700, 7
  croatia_2010_1800, 8
  croatia_2010_1900, 9
  croatia_employment_2013, 10
  croatia_employment_aggregation, 10
  primary_inputs, 42

* Metadata datasets
  employment_metadata, 13
  metadata, 36
  metadata_uk_2010, 37

* Validation datasets
  germany_1995, 16
  germany_airpol, 17
  netherlands_2006, 39
  uk_2010_data, 47
  uk_test_results, 48

* analytic object functions
  ghosh_inverse_create, 18
  input_flow_get, 22
  leontief_inverse_create, 34
  leontief_matrix_create, 35

* datasets
  croatia_2010_1700, 7
  croatia_2010_1800, 8
  croatia_2010_1900, 9
  croatia_employment_2013, 10
  croatia_employment_aggregation, 10
  employment_metadata, 13
  germany_1995, 16
  germany_airpol, 17
  metadata, 36
  metadata_uk_2010, 37
  netherlands_2006, 39
  primary_inputs, 42
  uk_2010_data, 47
  uk_test_results, 48

* import functions
  airpol_get, 3
  employment_get, 12
  iotables_download, 25
  iotables_metadata_get, 26
  iotables_read_tempdir, 28

* indicator functions
  coefficient_matrix_create, 5
  direct_effects_create, 11
  input_indicator_create, 23

* iotables import functions
  iotable_get, 29

* iotables processing functions
  conforming_vector_create, 6
  household_column_get, 19
  iotable_year_get, 31
  key_column_create, 33
  matrix_round, 35
  output_get, 41
  primary_input_get, 43
  rows_add, 43
  supplementary_add, 44
  total_tax_add, 46
  vector_transpose_longer, 49
  vector_transpose_wider, 50

* linkage functions
  backward_linkages, 4
  forward_linkages, 15

* multiplier functions
  input_multipliers_create, 24
  multiplier_create, 37
  airpol_get, 3, 13, 26–28
  backward_linkages, 4, 16
  coefficient_matrix_create, 5, 11, 21, 23
  conforming_vector_create, 6, 19, 32, 33, 36, 41, 43–46, 50, 51
  croatia_2010_1700, 7, 9–11, 42
  croatia_2010_1800, 8, 8, 9–11, 42
  croatia_2010_1900, 8, 9, 9, 10, 11, 42
INDEX

croatia_employment_2013, 8, 9, 10, 11, 42
croatia_employment_aggregation, 8–10, 10, 42
direct_effects_create, 6, 11, 23
employment_get, 4, 12, 26–28
employment_metadata, 13, 36, 37
empty_remove, 14
equation_solve, 14, 37
forward_linkages, 5, 15
germany_1995, 16, 17, 39, 47, 49
germany_airpol, 3, 17, 17, 39, 47, 49
ghosh_inverse_create, 18, 22, 34, 35
household_column_find, 19
household_column_get, 7, 19, 32, 33, 36, 41, 43–46, 50, 51
indirect_effects_create, 20
input_coefficient_matrix_create, 21, 34, 35, 42
input_flow_get, 18, 22, 34, 35
input_indicator_create, 6, 11, 20, 23, 24, 38
input_multipliers_create, 24, 38
iotable_get, 5, 21–23, 25, 29, 32, 40, 41, 43, 44, 47
iotable_year_get, 7, 19, 31, 33, 36, 41, 43–46, 50, 51
iotables_download, 4, 13, 25, 26–32
iotables_metadata_get, 4, 13, 26, 26, 28
iotables_read_tempdir, 4, 13, 26, 27, 28
is_html_output, 32
is_latex_output, 32
key_column_create, 7, 19, 32, 33, 36, 41, 43–46, 50, 51
leontief_inverse_create, 4, 11, 18, 20, 22, 24, 34, 35, 38
leontief_matrix_create, 18, 22, 34, 35
leontieff_inverse_create
(leontief_inverse_create), 34
leontieff_matrix_create
(leontief_matrix_create), 35
matrix_round, 7, 19, 32, 33, 35, 41, 43–46, 50, 51
metadata, 13, 36, 37
metadata_uk_2010, 13, 36, 37
multiplier_create, 15, 24, 37
netherlands_2006, 17, 39, 47, 49
output_coefficient_matrix_create, 15, 18, 35, 40
output_get, 7, 19, 32, 33, 36, 41, 43–46, 50, 51
output_multiplier_create, 41
pivot_longer, 50
pivot_wider, 51
primary_input_get, 7, 19, 32, 33, 36, 41, 43, 44–46, 50, 51
primary_inputs, 8–11, 42
rows_add, 7, 19, 32, 33, 36, 41, 43, 45, 46, 50, 51
supplementary_add, 7, 19, 32, 33, 36, 41, 43, 44, 44, 46, 50, 51
tempdir, 25
total_tax_add, 7, 19, 32, 33, 36, 41, 43–45, 46, 50, 51
uk_2010_data, 17, 39, 47, 49
uk_2010_results_get, 48
uk_test_results, 17, 39, 47, 48
vector_transpose
(vector_transpose_longer), 49
vector_transpose_longer, 7, 19, 32, 33, 36, 41, 43–46, 49, 51
vector_transpose_wider, 7, 19, 32, 33, 36, 41, 43–46, 50, 50