



JRC SCIENTIFIC INFORMATION SYSTEMS AND DATABASES

Trade-SCAN 1.1 – a tool for Trade Supply Chain Analysis

User Manual

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2019



Explore the key figures on the employment
and income effects of EU exports

PocketBook Data



Decompose the factor content
of trade in your desired way

Create Ad-hoc Queries

Load Pre-saved Query



Visualization tools
of the factor content of trade

Dashboard

Joint
Research
Centre

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Foreword

This User Manual explains the usage of Trade-SCAN 1.1, which has been developed by the European Commission's Joint Research Centre (JRC) to help users understand how international trade flows affect employment and income.

The main data source is the World Input-Output Database (WIOD - www.wiod.org), 2016 release, complemented with data on employment by age, skill and gender from other sources such as EUKLEMS (www.euklems.net) and the International Labour Organization (ILO - www.ilo.org). The geographical breakdown of the data includes the 28 EU Member States, Australia, Brazil, Canada, China, India, Indonesia, Japan, Mexico, Norway, Russia, South Korea, Switzerland, Turkey, Taiwan, the United States, and an aggregate "Rest of the World" region. The industry breakdown consists of 56 sectors: primary (4), manufacturing (22) and services (30).

The tool offers three modules. In the first place, Trade-SCAN 1.1 allows the calculation of value added in exports type of indicators (also for employment by skills, gender, sectors, age groups, etc.) on the spot through ad-hoc queries specified by the user.

Secondly, the tool offers the possibility to download the tables and charts from two joint reports published by the JRC and DG TRADE on the employment and income effects of EU exports to the world (Arto et al., 2018a, 2018b) using this tool. These reports feature a series of indicators to illustrate in detail the relationship between trade, income and employment for the EU as a whole and for each EU Member State. Most indicators are available as of 2000 but, due to data constraints, the indicators on employment split by skill, gender and age are only available from 2008 to 2014. Another report on the employment and income effects of EU exports to the EU countries (Arto et al., 2018c) has also been produced with Trade-SCAN 1.1.

This tool aims to be free and publicly available at a later stage. For the time being, the tool is in a test phase and only restricted to the European Commission services. Further improvements to the tool (web interface, official statistics, environmental indicators...) are expected to be carried out by 2020.

Thirdly, this tool provides the user with a dashboard with two indicators, i.e. a breakdown of gross exports into a domestic content, a foreign content and a double counting term; and the bilateral trade balances both in gross and value added terms.

This manual describes all the functionalities of the tool and provides illustrative examples. In addition, it contains screenshots of the tool to support the explanations in this document.

The authors are pleased to share their work and hope users find this tool helpful for their analysis of the economic and social consequences of global supply and value chains.

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1 Introduction

The Trade-SCAN (Trade Supply Chain Analysis) tool has been jointly designed and created by the European Commission's Joint Research Centre (JRC) and the Basque Centre for Climate Change (BC3 - www.bc3research.org) in the framework of the TALES Project.

As in many policy and academic areas, international trade is at the core of the Trade-SCAN tool. Exports constitute the object of analysis of this tool, encompassing both intermediate and final products exports. These exports generate a series of effects across all industries and countries participating upstream in the supply chain.

Recent research on global value chains, together with the availability of global multi-regional input-output databases, has made it possible to trace the origin of the value incorporated in traded goods depending on their final destination.

Trade-SCAN implements a novel mathematical framework for the decomposition of bilateral gross exports developed by Arto et al. (2019). The approach lies on the foundations of input-output economics and matrix algebra. This framework allows the decomposition of the gross exports of a country, measured at the border, into a single expression. It covers the domestic and foreign value added in trade, the trade in value added, and the double counting term of domestic and foreign value added. It distinguishes (and can be shown simultaneously) the country and industry in which the value added is generated, the exporting country and industry, the importing country and industry, the country and industry producing the final goods and the country whose final demand is driving the exports.

Trade-SCAN's main data source is the European Commission-funded World Input-Output Database (www.wiod.org), 2016 release (Timmer et al., 2015, 2016), which consists of a series of World Input-Output Tables covering the period 2000-2014, 43 countries and 56 industries. Data on employment by age, skill level and gender come from EUKLEMS (www.euklems.net) and the International Labour Organization (www.ilo.org).

This tool has been designed to facilitate trade effects analysis, informing EU trade policies. Therefore the intended audience of Trade-SCAN is mainly policy-makers, but it can also be useful for academic, educational or informational purposes.

2 Home page

The home page gives access to the three modules of Trade-SCAN:

- Pocket book Data: set of 53 indicators focused on the employment and value added effects of exports from the European Union to the rest of the world.
- Ad-hoc Queries: module that computes the decomposition of the factor content of trade in the terms specified by the user.
- Dashboard: tool for the graphical representation of the factor content of trade by country and bilateral trade balances.

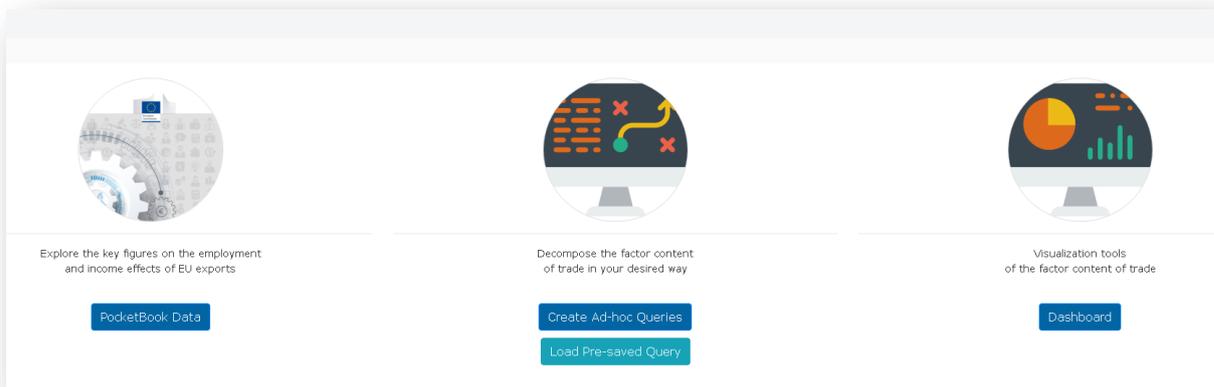


Figure 1. Home screen

3 Pocket book data

This module gives access to the tables and figures contained in Arto et al. (2018a, 2018b). Note that for several indicators, this electronic version contains more data than the printed and online versions of the pocket books (i.e.: extra years).

This module is organised in two parts: to the left is the list of indicators and the search box; to the right the selected indicators are displayed.

3.1 Left-hand side

At the top of this part of the screen, there is a search box that admits two types of entries: table codes or keywords. Table codes refer to the codes used in the titles of the sections of the pocketbooks. See in the example below that if we introduce "a1" in the search box, we get access to two elements, which correspond to tables/figures coded A1 in the two pocketbooks: "Total (European Union and rest of the world) employment / value added in the exports of each Member State". Note that the search engine is not case sensitive.

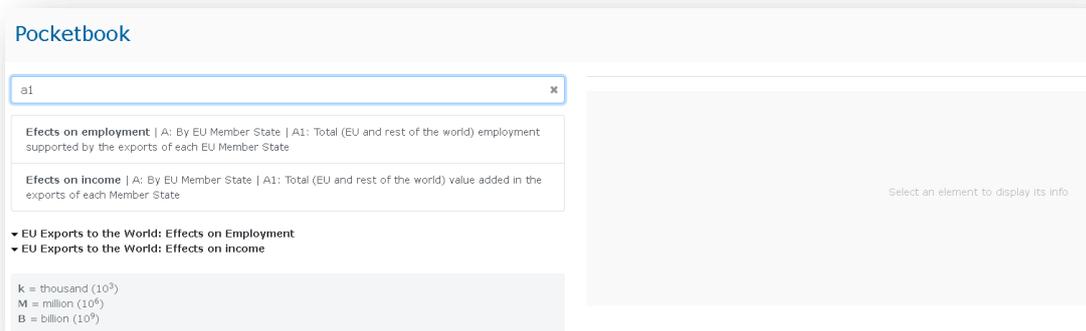


Figure 2. Search Pocket book indicators: table codes

Alternatively, searches can be done by keyword, for example "skill". See below that the result of the search is three elements of effects on employment. Keywords can be any word in the titles of the pocketbooks' indicators.

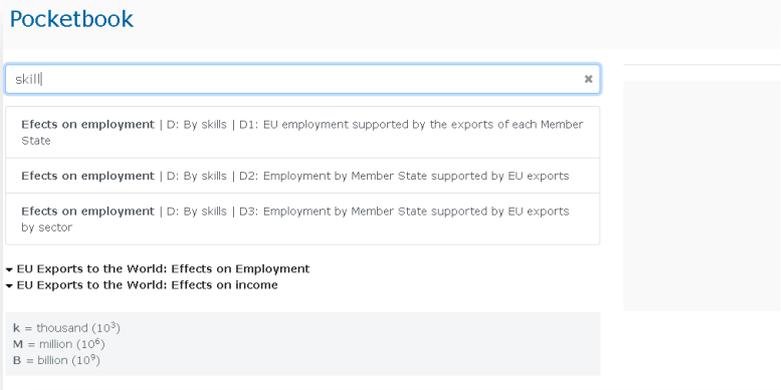


Figure 3. Search Pocket book indicators: keywords

Pocketbook indicators can also be accessed through the tree menu. See next how to access, for example, indicator G1. By clicking on the name of the indicator, the corresponding figure is displayed on the right hand side of the page.

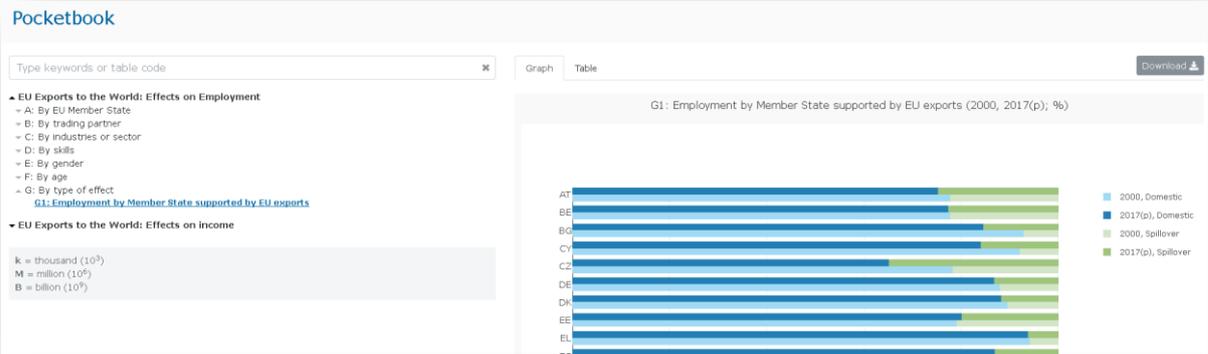


Figure 4. Access Pocket book indicators: tree menu

3.2 Right-hand side

The selected indicators are displayed on this side, both in the form of a graph or a table. When hovering over the charts, the specific value and label of the data pointed at each moment is shown in a tooltip. A "Download" button enables the user to save the underlying data on their own computer (as .jpg for graphs and as .xlsx for tables) ready to be used.

Graph Table Download 

G1: Employment by Member State supported by EU exports (2000, 2014, 2017(p); % and 1,000 jobs)

	2000, Domestic	2000, Spillover	2000, Total	2014, Domestic	2014, Spillover	2014, Total	2017(p), Domestic	2017(p), Spillover	2017(p), Total
AT	77.69%	22.31%	365.25	76.51%	23.49%	619.69	75.18%	24.82%	659.05
BE	77.64%	22.36%	563.42	77.79%	22.21%	847.20	77.27%	22.73%	922.65
BG	92.79%	7.21%	178.17	84.68%	15.32%	723.13	84.46%	15.54%	784.04
CY	91.96%	8.04%	39.07	80.69%	19.31%	61.02	83.97%	16.03%	74.91
CZ	78.18%	21.82%	616.42	63.16%	36.84%	826.70	65.14%	34.86%	972.61
DE	87.95%	12.05%	4,212.10	86.63%	13.37%	7,016.97	86.71%	13.29%	7,849.40
DK	89.54%	10.46%	362.74	88.17%	11.83%	439.78	88.23%	11.77%	486.08
EE	79.03%	20.97%	66.42	80.96%	19.04%	132.33	80.11%	19.89%	138.43
EL	94.13%	5.87%	259.81	94.91%	5.09%	505.15	93.76%	6.24%	455.81
ES	84.58%	15.42%	1,145.01	86.94%	13.06%	1,848.81	86.86%	13.14%	2,043.61
FI	85.56%	14.44%	303.21	84.21%	15.79%	373.01	83.89%	16.11%	409.70
FR	87.72%	12.28%	2,349.63	83.52%	16.48%	2,891.81	83.98%	16.02%	3,292.89
HR	94.80%	5.20%	315.32	87.10%	12.90%	322.75	89.45%	10.55%	438.63
HU	84.28%	15.72%	543.28	68.80%	31.20%	642.84	69.76%	30.24%	740.83
IE	90.82%	9.18%	359.56	90.54%	9.46%	522.38	92.38%	7.62%	700.92
IT	87.95%	12.05%	2,108.73	84.45%	15.55%	2,923.91	84.30%	15.70%	3,232.75
LT	90.69%	9.31%	144.61	88.90%	11.10%	319.84	88.80%	11.20%	351.49
LU	91.58%	8.42%	85.54	83.03%	16.97%	135.06	81.73%	18.27%	141.90

Figure 5. Display of Pocketbook indicators

When the indicator consists of more than one file, the following message may pop up:

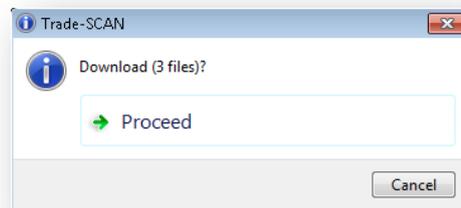


Figure 6. Download multiple-file Pocket book indicators

Once the user clicks "Proceed" a new window opens to allow for saving the 3 files in the desired folder.

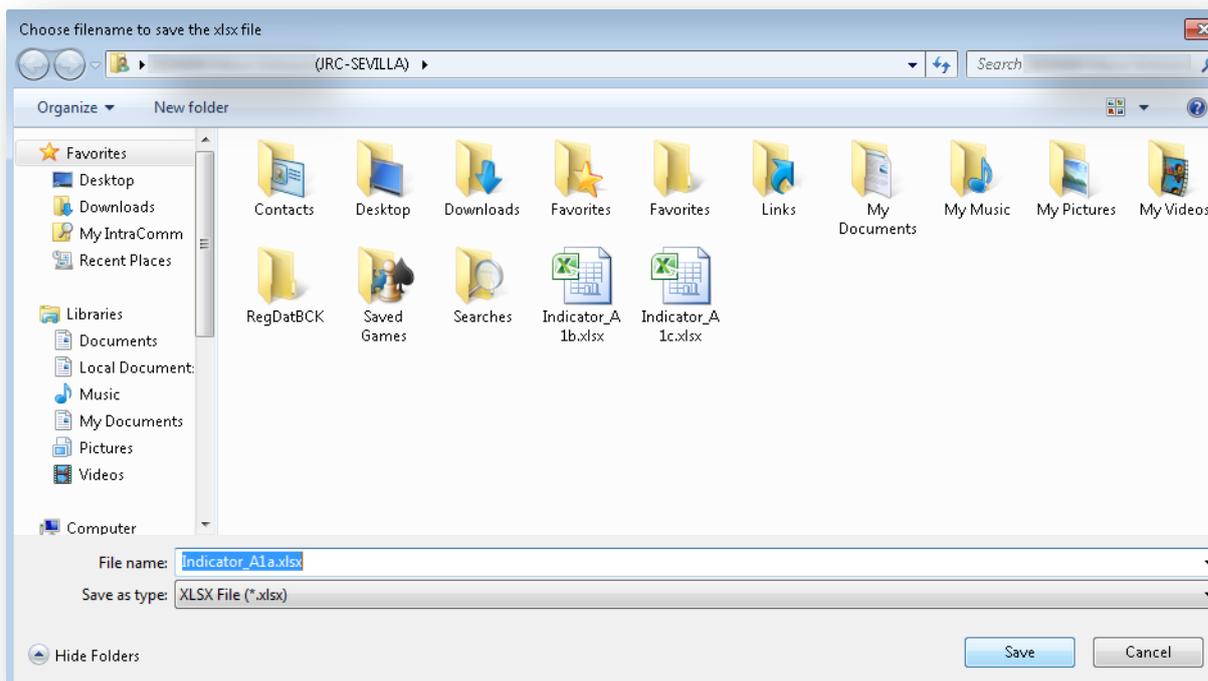


Figure 7. Download Pocket book indicators

4 Ad-hoc queries

This module enables to choose the parameters of the decomposition of the factor content of exports to answer one specific question (i.e. creating ad-hoc queries). The parameters to be chosen are:

- Time: years between 2000 and 2014.
- Variables: value added (total or by factor, gender or skill level) and employment (total or by gender, skill level or age).
- Elements of the decomposition: Domestic/foreign effects of final/intermediate exports and domestic/foreign double-counted terms of final/intermediate exports.
- Countries and Regions: 43 countries (plus Rest of the World) and 18 regions.
- Industries: 56 industries individually or grouped into 10 or 3 industry groups.

This module has two parts: "Create ad-hoc queries" and "Load pre-saved queries". User's queries can be saved and re-loaded later on. This can be useful to save time modifying previously defined queries to share with other Trade-SCAN users, to ease reproducibility, etc.

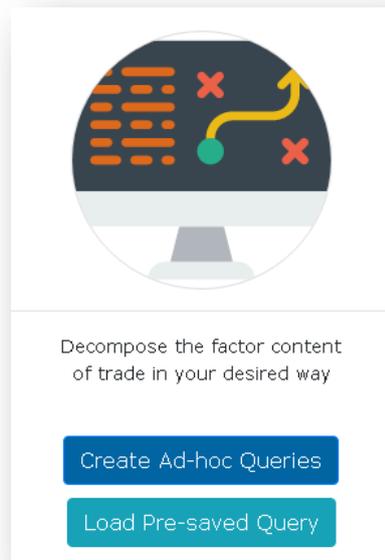


Figure 8. Ad-hoc Queries module

4.1 Create Ad-hoc queries

Click on the "Create Ad-hoc queries" button and the following window pops up:



Figure 9. Create Ad-hoc Queries: select database

In this window, select the desired geographical level of analysis for the factor content of trade i.e. countries (left icon) or regions (right icon). The country-level analysis breaks down the factor content of the exports of a country with respect to other countries, while the region-level analysis considers the exports of a group of countries (e.g. EU) to countries outside that region (e.g. non-EU). The region-level analysis includes intra-region spillovers (e.g. intra-EU), which are not considered in the country-level analysis.

In other words, for instance, jobs in Poland supported by French intermediate goods embodied in the German exports to non-EU countries would not be captured with the country-level analysis. This level of analysis would only cover Polish jobs linked to Polish intermediates embodied in German exports to non-EU countries.

4.1.1 Queries with countries

Assume the following research question:

In 2014, how many jobs in the Polish basic metals industry were supported by the German exports of motor vehicles to the United States?

To answer this question, choose the option "Countries". In the next step, select the year 2014 and variable "total employment". Note that there are other years/variables available, and "select all" / "clear all" buttons can be used if necessary. Once the year(s) and variable(s) are selected, click on "Continue to step 2".

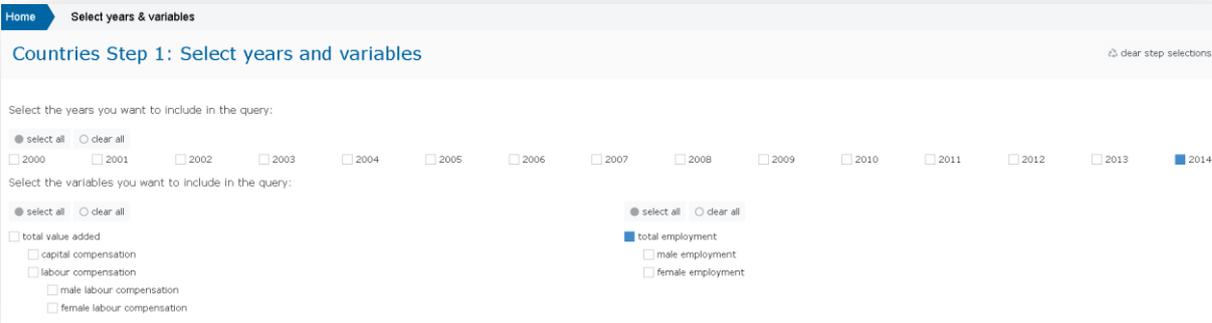


Figure 10. Countries Step 1

Note that certain indicators are only available from 2008 onwards. A message pops up at the bottom of the screen when selecting them for a year earlier than 2008.

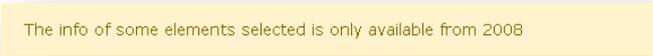


Figure 11. Unavailability time warning

In Step 2, select the components of the decomposition and the corresponding countries and industries. In our example, since the question is focused on the effects in Poland of the German exports of motor vehicles (both for intermediate and final use), select foreign effects of final and intermediate exports.

Countries Step 2: Select components

- Select the components of the decomposition of the factor content of exports you want to include in the query.
- Select the countries, depending on the selected components, (P,Q,R,S,T,Z) and industries (f,g,h,i,j,k) you want to include in the query.
- If you select two or more components, the countries and industries selected will be the same for all the components in the query.

Effects

select all clear all

Domestic effects of final exports

Domestic effects of intermediate exports

Foreign effects of final exports Select countries and industries

Foreign effects of intermediate exports Select countries and industries

Double counted terms

select all clear all

Domestic double counted terms of final exports

Domestic double counted terms of intermediate exports

Foreign double counted terms of final exports

Foreign double counted terms of intermediate exports

Figure 12. Countries Step 2: select components

Next, select countries and industries, as indicated in the two red arrows in Figure 12. By clicking on any of those red callouts, a diagram of red boxes appears at the bottom of the screen. This diagram displays the countries and industries involved in the computation of the corresponding effect. See the diagram corresponding to "Foreign effects of final exports".

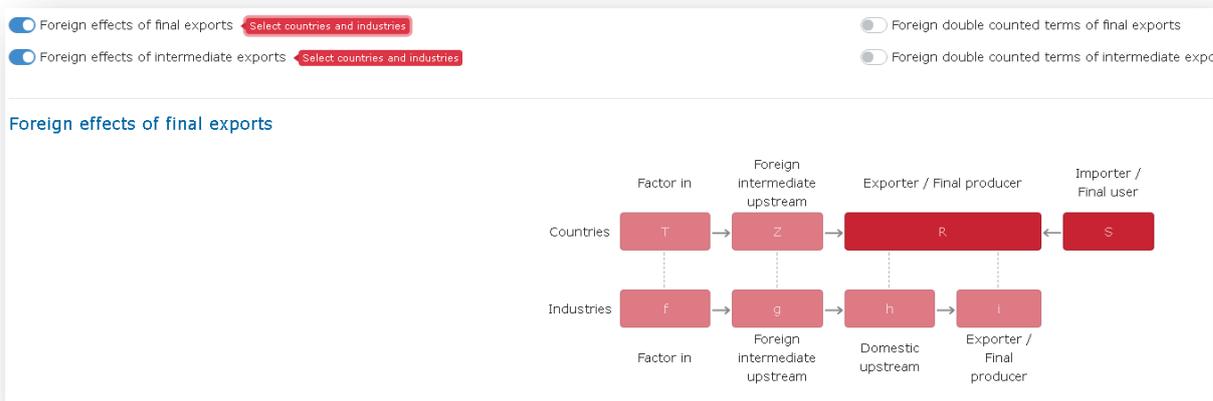


Figure 13. Countries Step 2: display diagram

In the example, T is Poland, R is Germany, S is the United States, f is the "Manufacture of basic metals", and i stands for "Manufacture of motor vehicles, trailers and semi-trailers". For all other boxes, there is no need to select a specific country or industry so they are all summed in each of the corresponding elements (g, Z and h).

To select Poland, click on T; a new window pops up (Figure 14), then click on Poland in the list of countries on the left. Selected countries will move to the column on the right. Note that this window contains two tabs: one for individual countries ("Countries") and another for country groups ("C. Groups"). The latter only avoids selecting the countries of a region one by one (e.g. selecting the 28 EU member states). The results would not change in any case. Next, by clicking on the green button "Add selection" the window closes and the selection for such dimension is saved.



Figure 14. Countries Step 2: selection of Poland

The T box in the diagram should have turned green, indicating that the selection has been saved (see Figure 15).

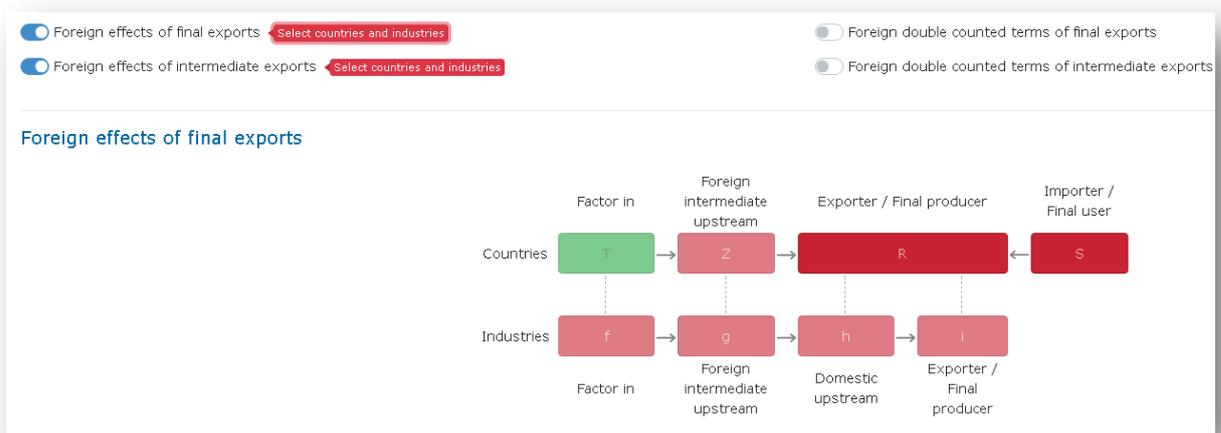


Figure 15. Countries Step 2: countries selection confirmation

The next element is Z, i.e. "Foreign intermediate upstream". In this example, we focus on all jobs in Poland supported by German exports regardless of which country is supplying inputs to Germany to produce such exports. Therefore, click on the Z box and select all countries and aggregate the results. To do that, use the "select all" button at the top and the "Summation" button at the bottom of the window.

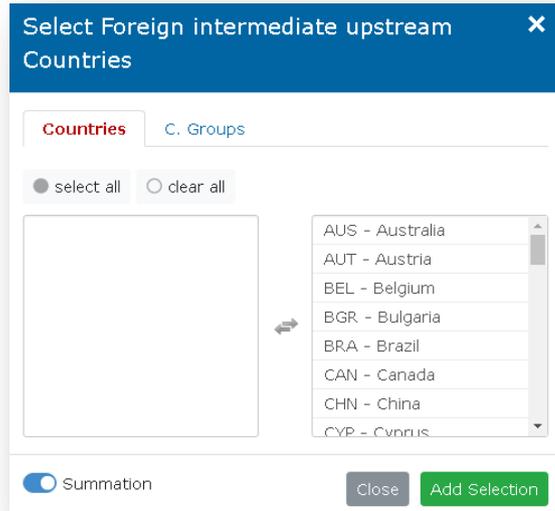


Figure 16. Countries Step 2: summation

A summation symbol will appear close to the boxes where this option is activated (see Figure 17).

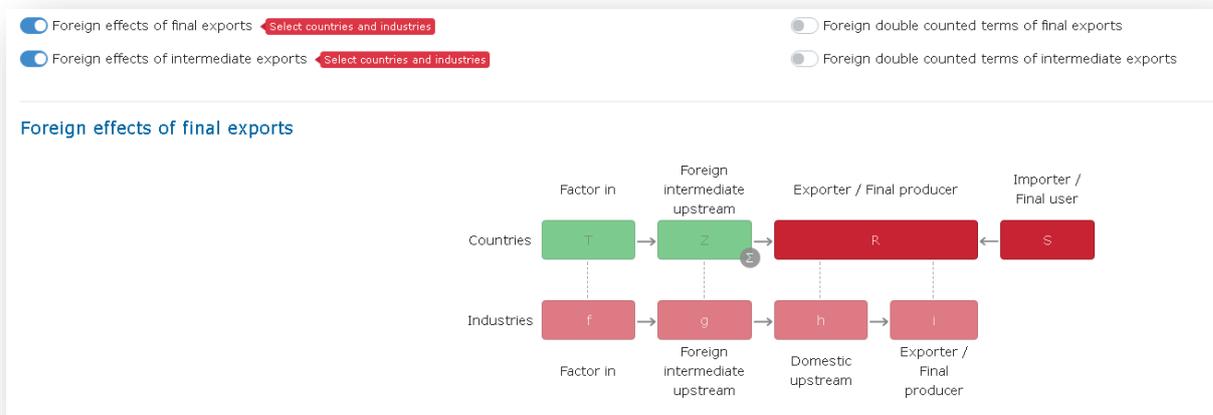


Figure 17. Countries Step 2: summation confirmation

Continue with the selection of the other boxes referring to exporters and final users. For R, select Germany as shown in Figure 14 for Poland and for S, United States. The result is shown in Figure 18.

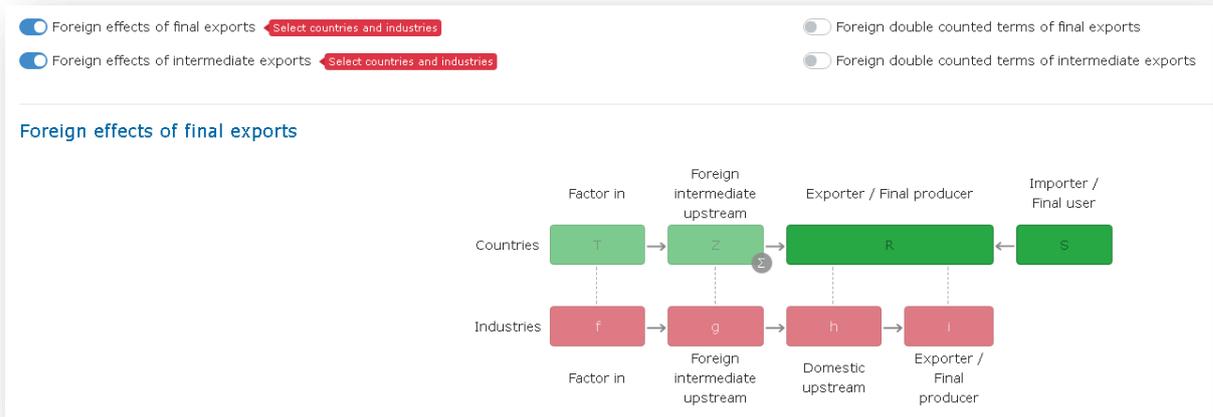


Figure 18. Countries Step 2: summation of countries

For industries, similar to Z, sum across all industries for domestic (g) and foreign intermediate upstream effects (h) since the focus is on the industry where the jobs are located (f, basic metals) and the exporter industry (i, motor vehicles). For instance, by clicking on the g box, a window pops up as shown in Figure 19. Then, use the "select all" button at the top and the "Summation" button at the bottom of the window.

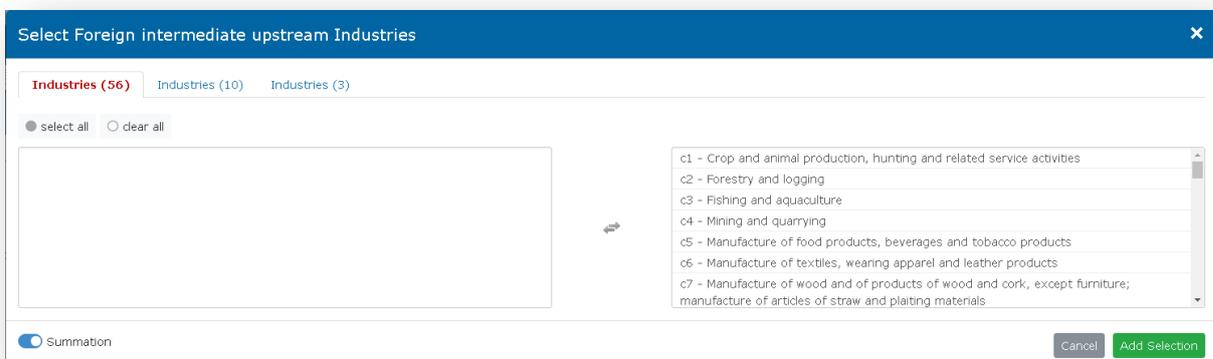


Figure 19. Countries Step 2: industries

Do the same for the h box and the resulting diagram must look like Figure 20.

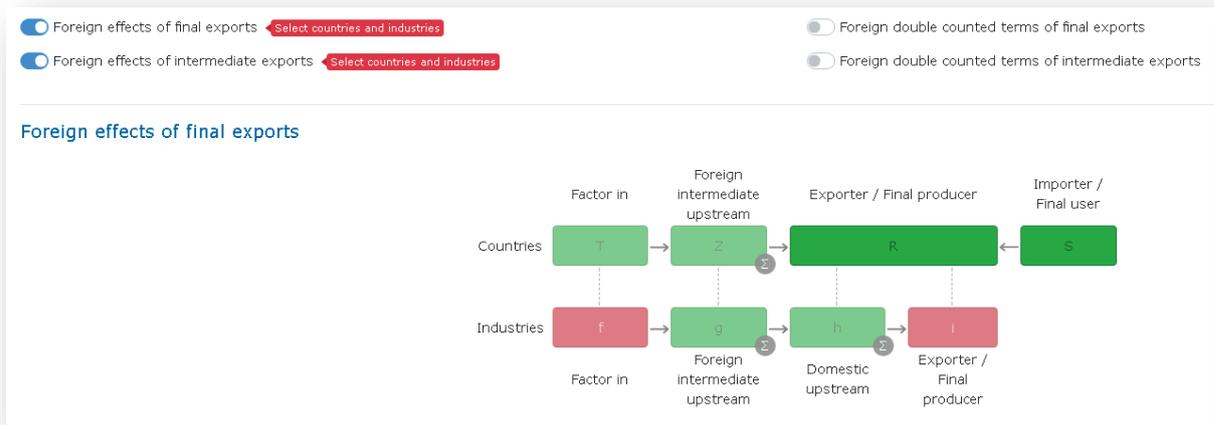


Figure 20. Countries Step 2: summation of industries

To select "basic metals", click on the red box f; a new window pops up (Figure 21), then click on "c15 – Manufacture of basic metals" in the list of industries on the left. Selected industries will move to the column on the right. Note that this window contains two additional tabs with aggregations to 10 and 3 industries, respectively. Next, by clicking on the green button "Add selection" the window closes and the selection for such industry is saved.

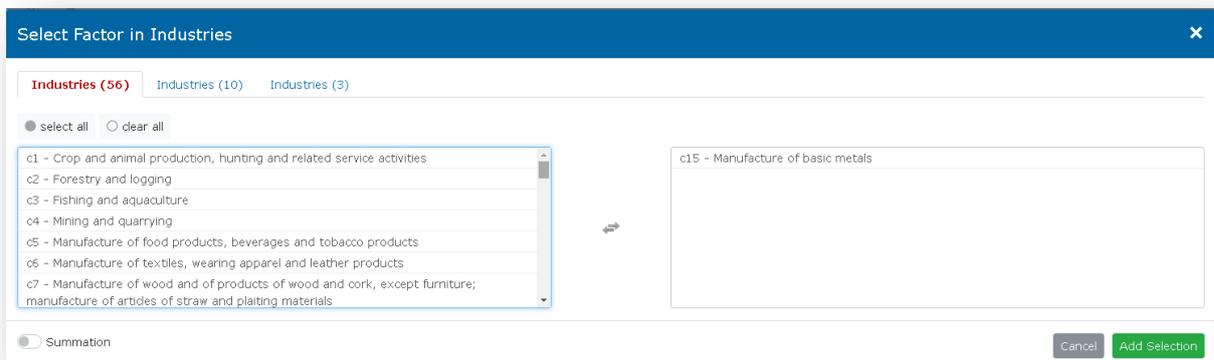


Figure 21. Countries Step 2: selection of industries

The f box in the diagram should have turned green, indicating that the selection has been saved.

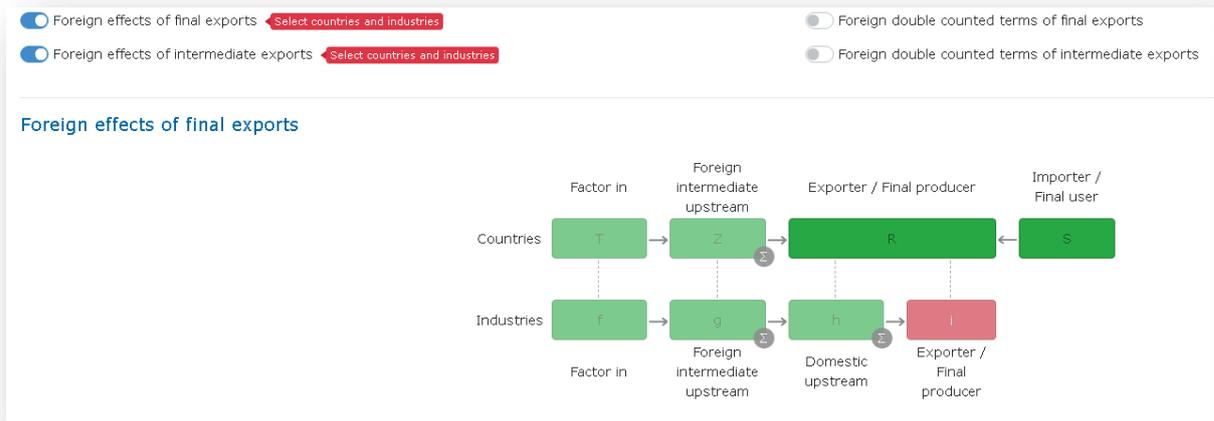


Figure 22. Countries Step 2: selection of basic metals

The next element is i, i.e. "Exporter/final producer". In this example, we focus on all jobs in Poland supported by German exports of motor vehicles. Therefore, click on the i box and select "c20 – Manufacture of motor vehicles, trailers and semi-trailers" as shown in Figure 23.

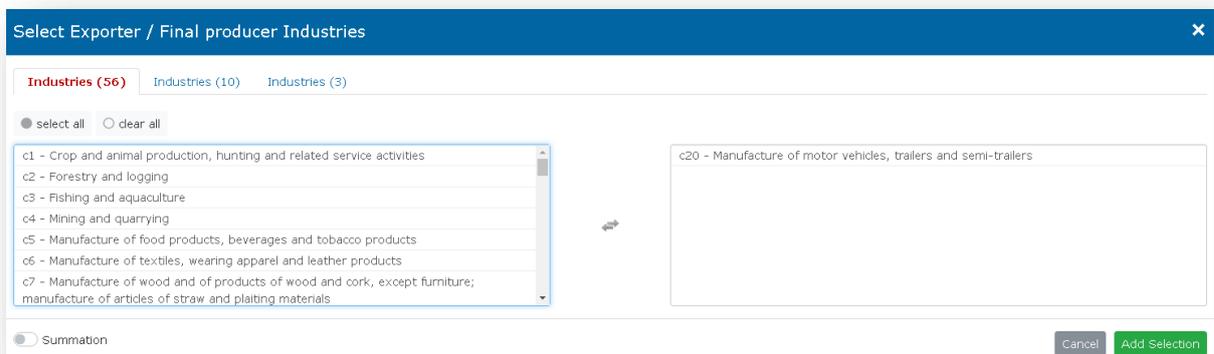


Figure 23. Countries Step 2: selection of motor vehicles

Once all elements are selected in the diagram, the red arrow next to "Foreign effects of final exports" will turn into green. Now, click on red arrow below next to "Foreign effects of intermediate exports". The diagram becomes now bigger with new elements to be selected.

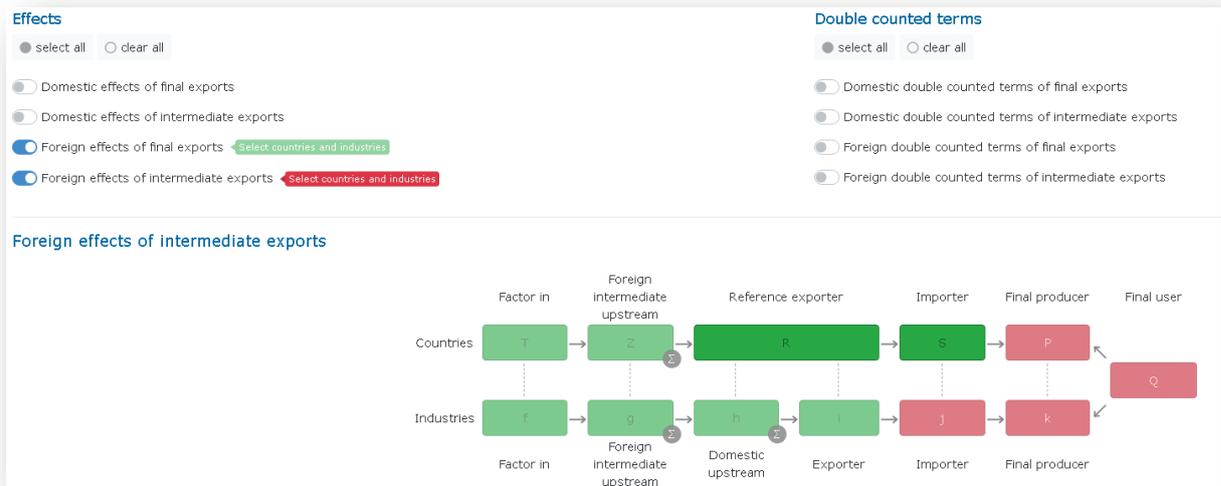


Figure 24. Countries Step 2: complete diagram

Our example does not require further details on specific final producers and final users of the goods exported by Germany so, for instance, follow the same procedure described above for boxes Z (for countries) and g (for industries) to complete the full diagram (see Figure 24). Once all these elements are green, then the red arrow will also become green (see Figure 25). Then click on "Continue to step 3" to proceed to the next step.

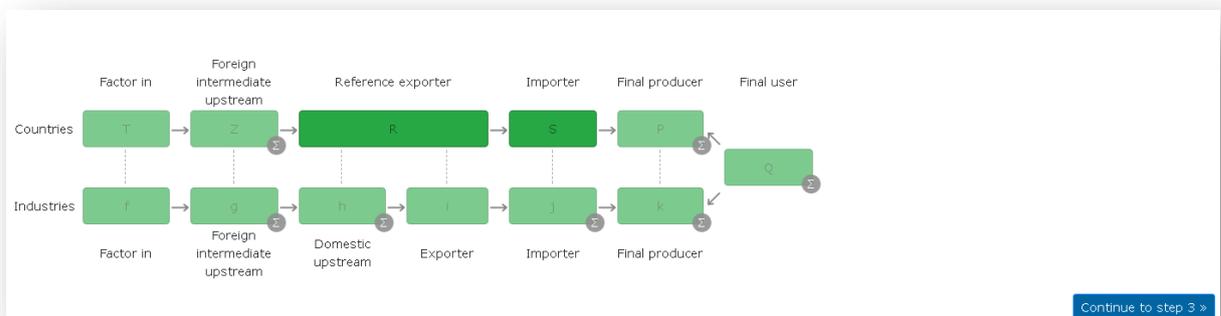


Figure 25. Countries Step 2: continue to step 3

In Step 3, the top part of the screen summarises the information of the query: years, variables and components. Below these dimensions, the summary of the regions and industries selected can be shown by clicking on "show". Note that although it is generally a long list, the "top" link allows going upwards again to the beginning. It also informs about the number of records and the size of the results at the top right corner. If the number of records is too big to be exported to MS Excel, a warning message will be shown. Note that despite the warning, you will be able to proceed, but the results will be produced only as GDX file (see section 4.3 below) and not in MS Excel. Note that given the size of the query, calculations may take long.

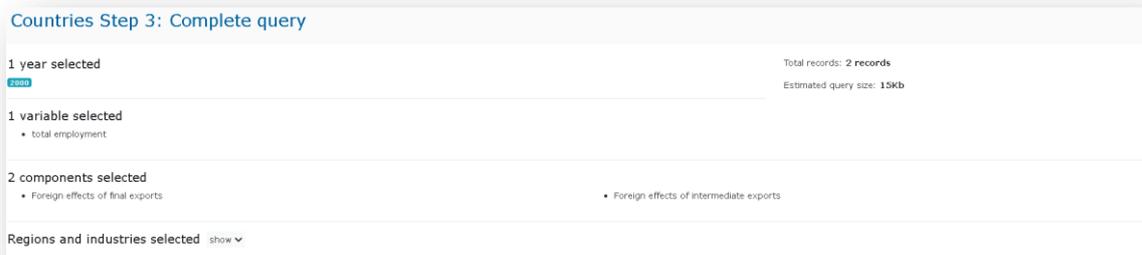


Figure 26. Countries Step 3

At the right-bottom corner of the screen, type the name of the query and the folder where the results will be saved. Enter the name¹ of the query and a description (optional) and click "Save + Export to GAMS" to execute the query and save both the query and the results in the desired folder. Note that there are two additional buttons: a blue icon button with a folder, to know where queries are saved by default², and the "Save Query" button which saves the query but does not execute it³.

Figure 27. Countries Step 3: save and execute queries

Once the name, (optional) description and the folder location of the query is specified, click "Save + Export to GAMS" and a new window pops up asking for a file name (by default, it is the name given to the query before) with the extension ".tscan":

¹ The query name must be up to 35 characters. Do not use blank spaces or special characters. Example of a valid name: Query_2018-04-30_01_EMP_VA_2000-2014_USA_EU28

² In case you need to see i.e. the names of existing queries, etc.

³ You may want to prepare a query to be run later or to be sent to another user that would run it using the "Load pre-saved queries" facility described in section 4.2

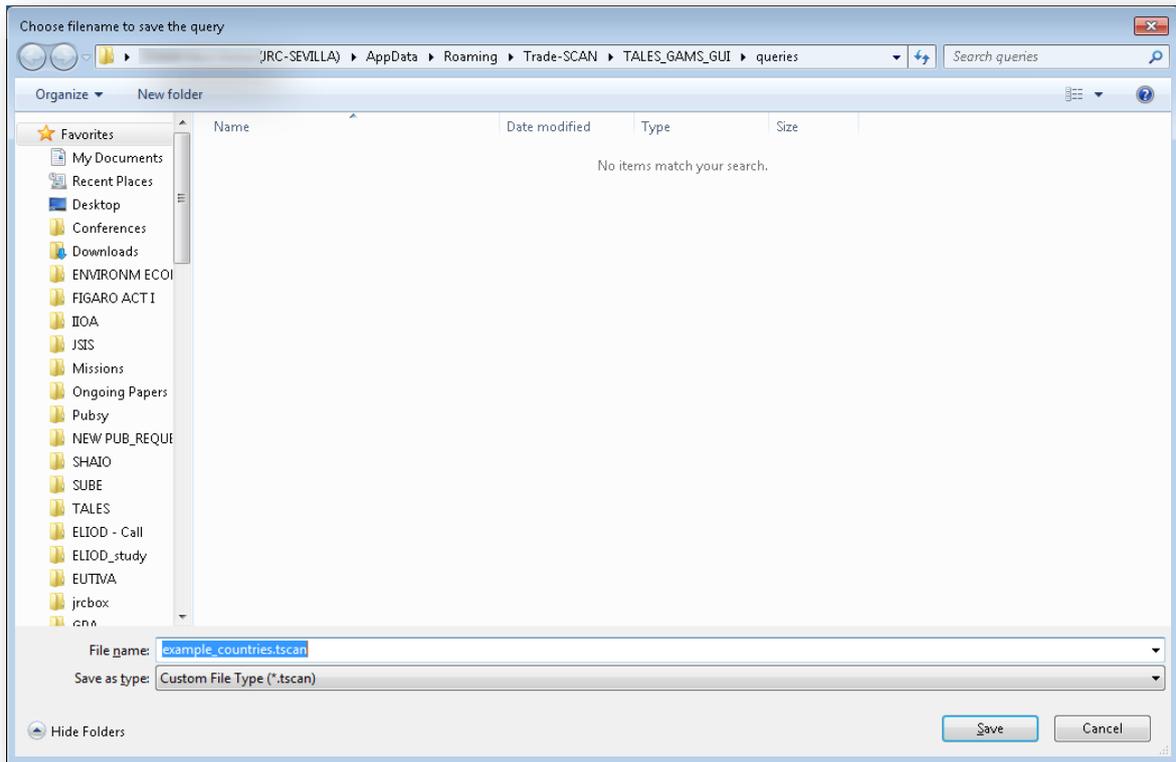


Figure 28. Countries: Save query

By clicking on "Save", the graphical user interface launches GAMS and a system command prompt window pops up showing the GAMS processes running.

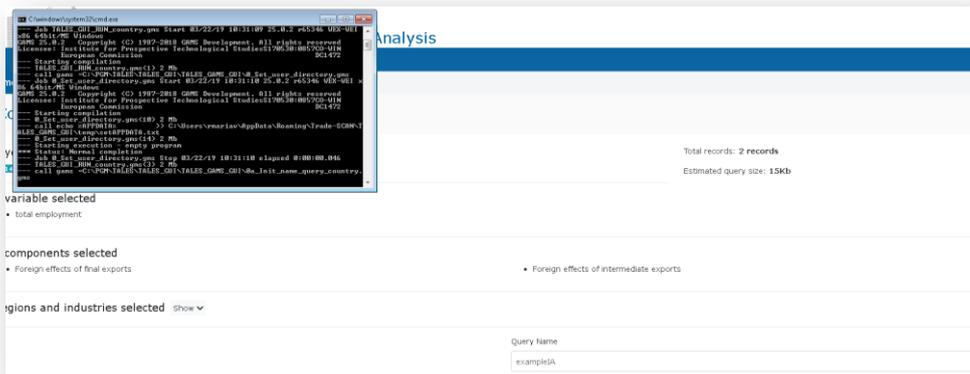


Figure 29. Countries: GAMS

Once the GAMS process is finished, a gdx⁴ file (GAMS Data eXchange) and a MS Excel Macro-Enable Workbook file (.xlsm) are saved in the same folder as the query file.

The xlsm file contains the following sheets:

- Info: contains the index of the file, contact information and the reference to be used for citation.
- Codes: contains the codes and their descriptions.
- Pivot: contains instructions to create a pivot table with the information from the different sheets using a tailored VBA code available in the xlsm file. Note that, in principle, MS Excel 2010 does not allow for creating pivot tables combining data from different sheets but you can do it using this VBA code. Although MS Excel 2013 allows for creating pivot tables from multiple sheets using model data features, using our VBA code might be preferable, for the ease of file compatibility across users with different versions of MS Excel.
- Summary: informs about the unit of measurement, the query description, and the selections made in the query.
- Final exports: contains country R's total exports of goods and services for final use of industry I, depending on the query made.
- Intermediate exports: contains country R's total exports of goods and services for intermediate use of industry I, depending on the query made.

Furthermore, the Excel Workbook includes one sheet for each of the components of the decomposition selected in the query. In our example, two additional sheets are obtained with the results of the query, indicating foreign final and foreign intermediate effects, respectively.

Each sheet contains data on the factor (e.g. EMP - employment), the year (e.g. 2014), the countries and industries selected in each stage of the value chain (SUM for all countries aggregated) and the value. See below.

Table 1. Foreign final

Factor	Year	T	f	Z	g	R	h	i	S	j	P	k	Q	Value
EMP	2014	POL	c15	SUM	SUM	DEU	SUM	c20	USA					0.618122

Source: Trade-SCAN

Table 2. Foreign intermediate

Factor	Year	T	f	Z	g	R	h	i	S	j	P	k	Q	Value
EMP	2014	POL	c15	SUM	SUM	DEU	SUM	c20	USA	SUM	SUM	SUM	SUM	0.191203

Source: Trade-SCAN

With this information, in 2014, around 809 jobs in the *Polish basic metals industry were supported by the German exports of motor vehicles to the United States?* Note that employment is measured in thousands of persons employed, as indicated in the summary sheet of the MS Excel workbook. The total intermediate and final gross exports by country and product (as specified in the query) are also provided in the resulting Excel file with other results for comparison purposes.

⁴ The gdx file is a platform independent binary file that can contain information regarding sets, parameters, variables and equations. Gdx files resulting from queries contain one parameter symbol for each component requested in the query and it can be managed using GAMS or other languages such as R, Python, etc.

4.1.2 Queries with regions

Should we want to answer the same question but from the perspective of the EU (as region), then the effects in Poland due to German exports are no longer considered foreign effects but rather domestic effects, since both countries belong to the same region. So, in step 2, after selecting the option "Regions" (see Figure 9), select the domestic effects instead of foreign effects.

For both R1 "Factor in" and R "Exporter" select the European Union (EU28) with summation disabled in order to distinguish intra-EU effects (spillovers) in Poland due to German exports to the United States.

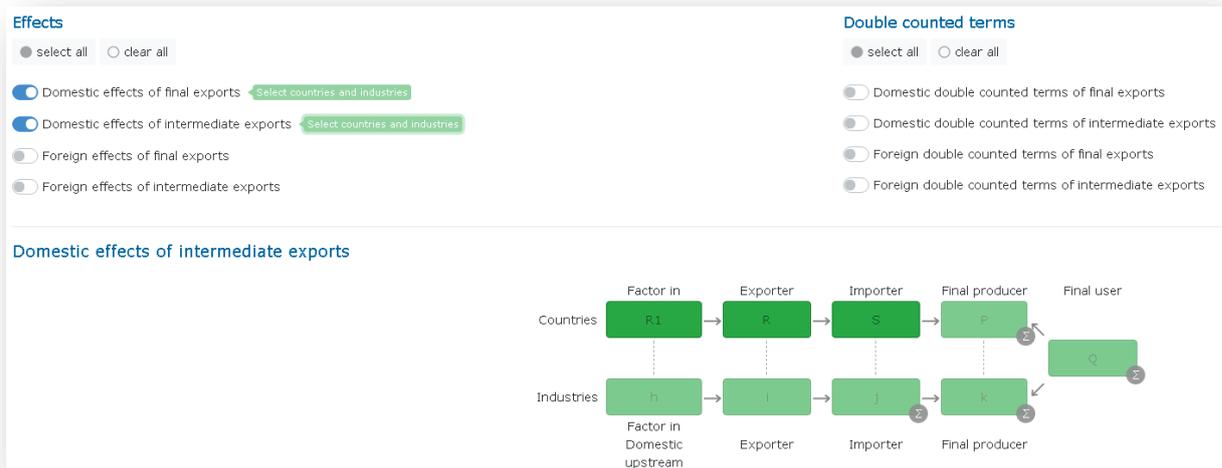


Figure 30. Regions Step 2: select components, countries and industries



Figure 31. Regions Step 2: regions selection

Notice that by definition in the selection window for R and R1 there is no option available for selecting individual countries as in the country-level of analysis (Figure 31); however,

for all other boxes individual countries or groups of countries can be selected. Hence, the S box remains with the United States selected and the other country P and Q boxes should be kept unchanged (all countries selected and summed).

Concerning industries, only boxes h (basic metals) and i (motor vehicles) have their own specification while the other boxes j and k should be grouped and summed, as eventually shown in Figure 30.

Once the query is complete and the results saved, it is easy to visualise the results using the instructions given in the Pivot sheet of the resulting MS Excel workbook (see Figure 32 and Figure 33).



Figure 32. Template file

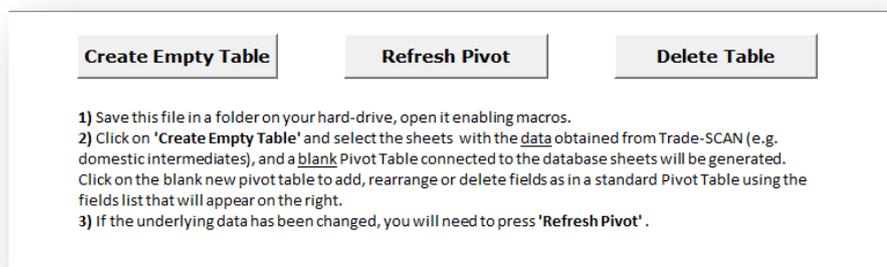


Figure 33. Create empty table

Click on the icon "create empty table", and put R1 as row labels, R as column labels and "Value" in the box Values. The resulting double-entry table displays the amount of jobs in each EU country (row) that is supported by the exports of the other EU countries (columns) to the rest of the world. As shown in Figure 34, the number of jobs in Poland (basic metals industry) supported by the German exports of motor vehicles to the United States is 824. Note that this number is larger than the one obtained using the country-level approach. Actually, the difference of 15 jobs refers to the employment in the Polish basic metals industry supported by the exports of intermediate goods and services of other EU countries to Germany for the production of the motor vehicles to be sold in the United States. These are called (intra-EU) spillovers.

Sum of Value	R1	AUT	BEL	BGR	CYP	CZE	DEU	DNK	ESP	EST	FIN	FRA	GBR	GRC	HRV	HUN	IRL	ITA	LTU	LUX	LVA	MLT	NLD	POL	PRT	ROU	SVK	SV	
0.063	0.002	0.000	0.000	0.002	0.334	0.000	0.007	0.000	0.000	0.004	0.012	0.000	0.000	0.016	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.007	0.000		
0.006	0.006	0.000	0.000	0.001	0.213	0.000	0.007	0.000	0.000	0.008	0.015	0.000	0.000	0.006	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.003	0.000	
0.002	0.002	0.001	0.000	0.000	0.038	0.000	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.002	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.000	
0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
0.024	0.004	0.000	0.000	0.022	0.462	0.000	0.011	0.000	0.000	0.005	0.023	0.000	0.000	0.028	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.005	0.000	0.002	0.045	0.000	
0.110	0.020	0.000	0.000	0.017	3.659	0.002	0.063	0.000	0.002	0.037	0.150	0.000	0.000	0.089	0.002	0.143	0.000	0.000	0.000	0.000	0.000	0.005	0.014	0.003	0.007	0.047	0.000		
0.001	0.000	0.000	0.000	0.000	0.034	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	
0.009	0.004	0.000	0.000	0.001	0.204	0.000	0.282	0.000	0.000	0.012	0.041	0.000	0.000	0.009	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.006	0.001	0.004	0.000	0.000	
0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
0.002	0.001	0.000	0.000	0.000	0.075	0.000	0.002	0.000	0.003	0.001	0.004	0.000	0.000	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.010	0.000	
0.017	0.009	0.000	0.000	0.003	0.467	0.000	0.042	0.000	0.000	0.065	0.044	0.000	0.000	0.015	0.000	0.061	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.002	0.010	0.000	0.000	
0.006	0.002	0.000	0.000	0.001	0.198	0.000	0.010	0.000	0.000	0.005	0.023	0.000	0.000	0.005	0.003	0.016	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.003	0.000	0.000	
0.002	0.001	0.000	0.000	0.000	0.050	0.000	0.004	0.000	0.000	0.002	0.006	0.000	0.000	0.003	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000	
0.003	0.000	0.000	0.000	0.000	0.023	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	
0.012	0.001	0.000	0.000	0.002	0.167	0.000	0.005	0.000	0.000	0.002	0.008	0.000	0.000	0.063	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.011	0.000	0.000	
0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.001	0.005	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.035	0.006	0.000	0.000	0.005	0.629	0.001	0.044	0.000	0.001	0.022	0.047	0.000	0.000	0.032	0.000	0.565	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.002	0.006	0.015	0.000	0.000	
0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.001	0.000	0.000	0.000	0.000	0.020	0.000	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.006	0.003	0.000	0.000	0.001	0.179	0.000	0.006	0.000	0.000	0.003	0.013	0.000	0.000	0.006	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000
0.032	0.007	0.000	0.000	0.017	0.824	0.001	0.021	0.000	0.001	0.009	0.054	0.000	0.000	0.054	0.000	0.043	0.000	0.000	0.000	0.000	0.000	0.001	0.042	0.001	0.004	0.038	0.000	0.000	0.000
0.001	0.001	0.000	0.000	0.000	0.016	0.000	0.013	0.000	0.000	0.001	0.004	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
0.010	0.003	0.000	0.000	0.003	0.250	0.000	0.008	0.000	0.000	0.003	0.014	0.000	0.000	0.029	0.000	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.103	0.009	0.000	0.000	0.000
0.019	0.002	0.000	0.000	0.008	0.194	0.000	0.005	0.000	0.000	0.002	0.008	0.000	0.000	0.028	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.031	0.000	0.000	0.000
0.006	0.000	0.000	0.000	0.001	0.069	0.000	0.002	0.000	0.000	0.001	0.003	0.000	0.000	0.005	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
0.006	0.003	0.000	0.000	0.001	0.167	0.001	0.005	0.000	0.001	0.003	0.016	0.000	0.000	0.005	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.002	0.000	0.000	0.000
Grand Total	0.374	0.080	0.002	0.000	0.086	8.304	0.007	0.541	0.001	0.010	0.188	0.501	0.000	0.000	0.401	0.006	1.071	0.000	0.000	0.000	0.000	0.014	0.084	0.022	0.139	0.237	0.000	0.000	

Figure 34. Result of the pivot table

4.2 Load pre-saved queries

This function enables the user to load a previously saved query. When clicking the "Load Pre-Saved Query" button, a window pops up displaying the folder where queries are saved by default. Select the desired query file (.tscan) and click on "Open" to load it. The Step 3 screen will be displayed showing the summary of the loaded query. From this screen, it is possible to go back and forth making any desired modifications to the original query before exporting it to GAMS.

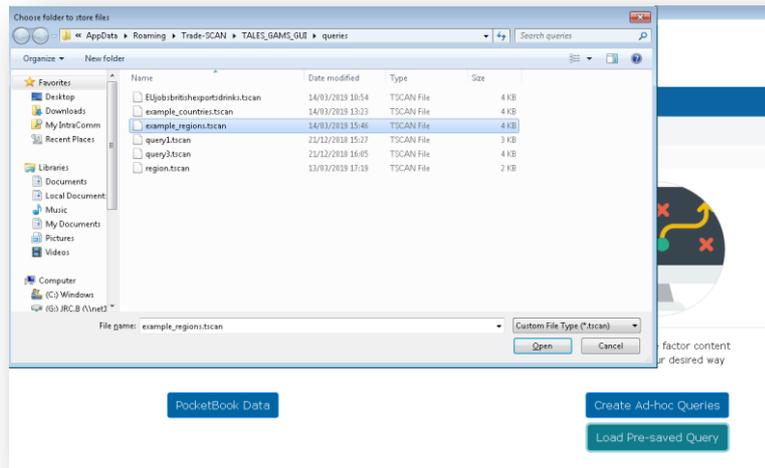


Figure 35. Load Pre-saved Query

4.3 Recommendations

- Size of queries:** Mind that workbooks of MS Excel 2010 or later versions can accommodate a maximum of 1 048 576 rows per worksheet. Therefore, the number of records shown in the screen divided by the number of selected components (components are exported in separate sheets) should not exceed 1 048 576 rows. Note that a query with so many rows is very large and its computation time would be very long. Moreover, the MS Excel workbook size would be huge and very difficult to handle. Therefore, it is advisable to fine tune the query as much as possible or to make separate queries, if necessary.
- Factor content of imports:** The underlying methodology breaks down gross exports. Therefore, if the user is interested in the value added/employment embodied in the imports of country A from country B, this must be calculated as the value added/employment embodied in the (mirror) exports of country B to country A.
- Computing performance:** The code architecture is optimised to make the most of the available computing power, especially the RAM memory. However, note that including extra components such as countries or years increases the computing time exponentially. Adding extra variables also increases the computing time but to a lesser extent. Instead, increasing the sectoral resolution does not have a significant impact on the performance of the calculations since they are always made at the maximum resolution (to avoid aggregation bias) and aggregated at the end of the process.

5 Dashboard

This module is thought to facilitate the graphical representation of different indicators that can be downloaded. Click on "Add module" and choose one of the options of the drop-down menu.

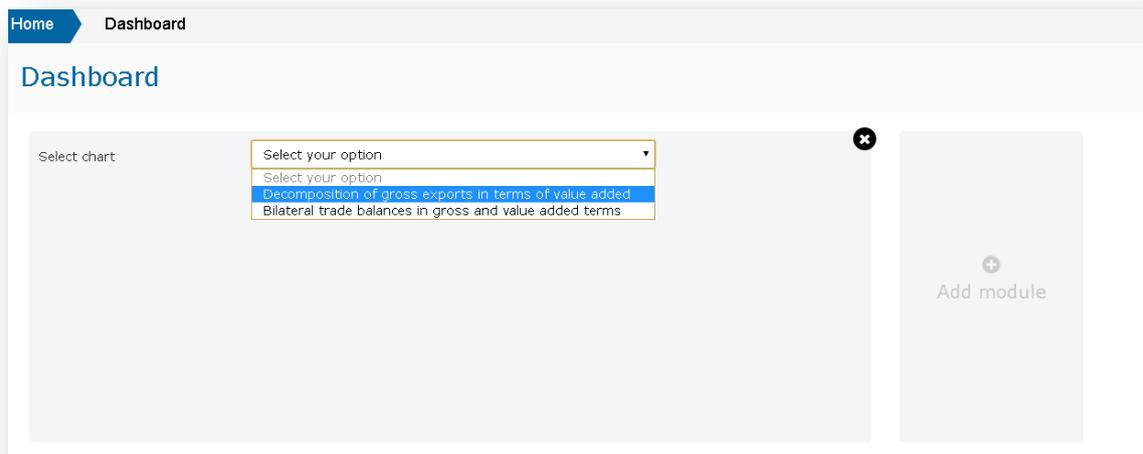


Figure 36. Dashboard: select chart

To show additional modules side-by-side, click on "Add module"; modules can also be deleted by clicking on the white encircled cross.

5.1 Breakdown of gross exports

This option enables the user to visualise the decomposition of gross exports in three components: domestic value added, foreign value added and the double-counted term (see Arto et al. (2019) for further details). Once this option is selected, choose the desired country in the drop-down menu:

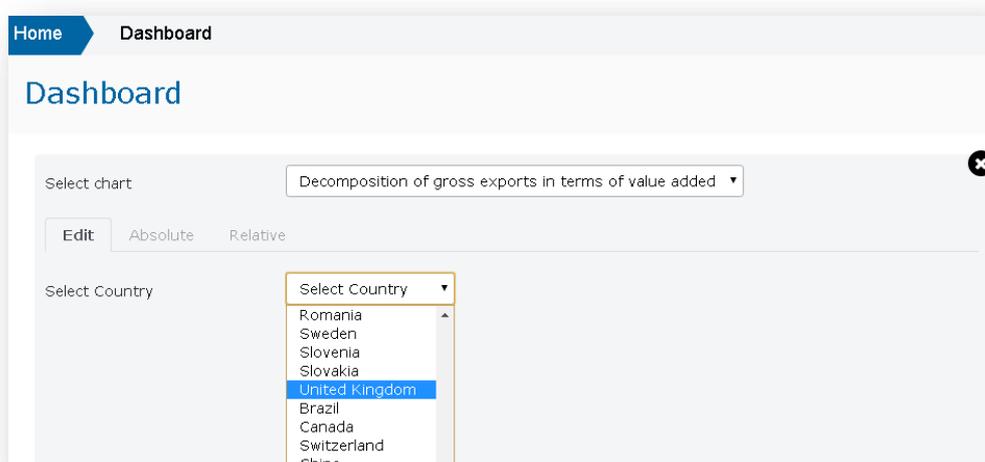


Figure 37. Dashboard: edit decomposition

As a result, two charts will be produced with the results in absolute and in relative terms. They can be visualised by switching the corresponding tab.

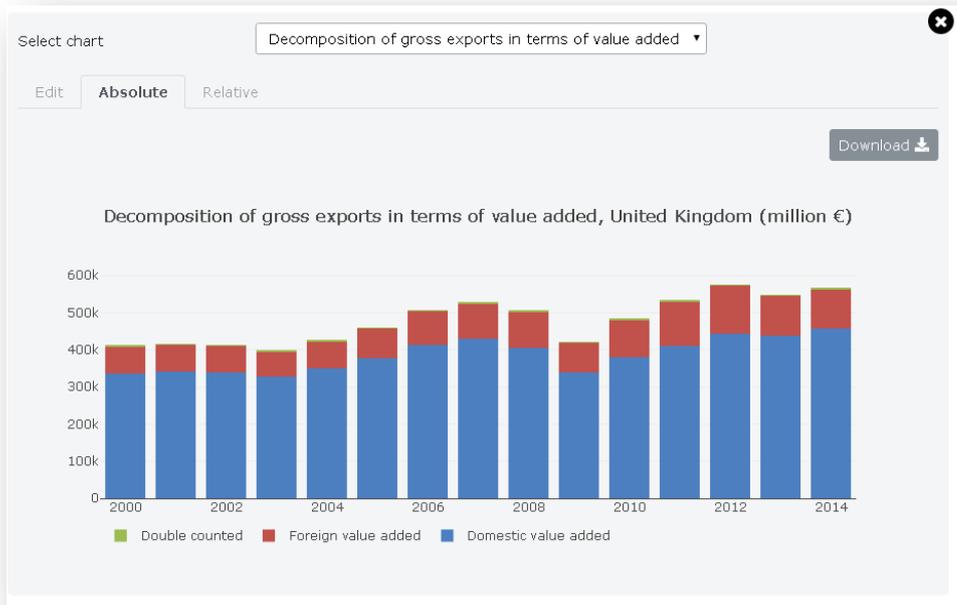


Figure 38. Dashboard: decomposition charts

To change the country selected, return to the "Edit" tab.

5.2 Bilateral trade balances

For bilateral trade balances, the user has to select the exporter and partner countries and choose between values in gross and value added terms.

The dashboard shows the configuration for bilateral trade balances. The 'Edit' tab is active, and the chart title is 'Bilateral trade balances in gross and value added terms'. The 'Select Exporter' dropdown is set to 'United Kingdom', and the 'Select Partner' dropdown is set to 'Rest of the world'. The 'Select Gross/DVA' dropdown is currently open, showing three options: 'Select Gross/DVA', 'Gross balance', and 'Domestic value added balance'. The 'Domestic value added balance' option is highlighted in blue.

Figure 39. Dashboard: edit bilateral trade balances

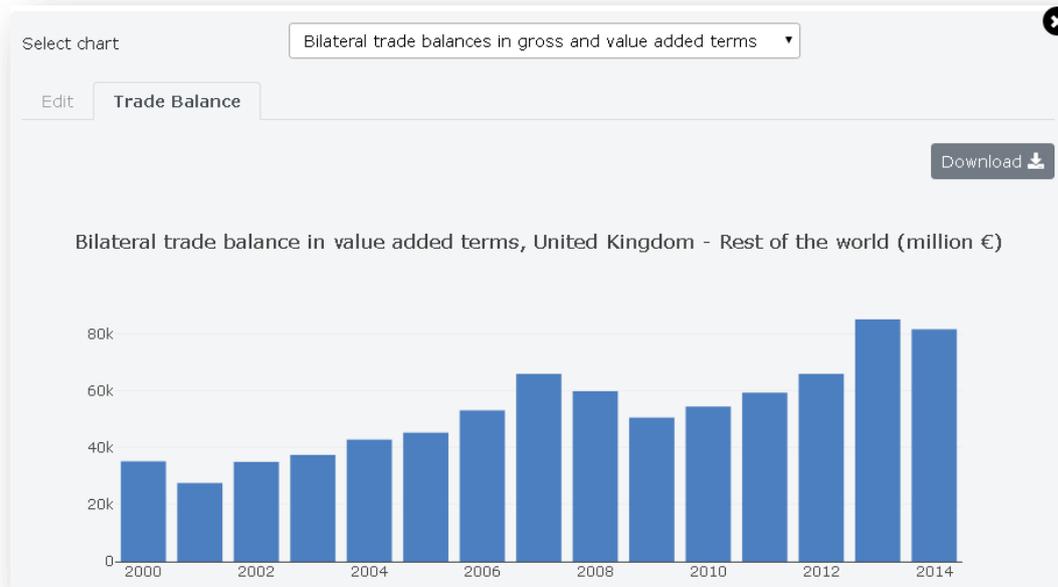


Figure 40. Dashboard: bilateral balances charts

To change the country and the Gross/DVA selection, return to the "Edit" tab.

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Annex

List of countries and regions

	EU28	EU27	EU27 (excl. UK)	EU15	EU13	Euro zone
Austria	✓	✓	✓	✓		✓
Belgium	✓	✓	✓	✓		✓
Bulgaria	✓	✓	✓		✓	
Croatia	✓		✓		✓	
Cyprus	✓	✓	✓		✓	✓
Czechia	✓	✓	✓		✓	
Denmark	✓	✓	✓	✓		
Estonia	✓	✓	✓		✓	✓
Finland	✓	✓	✓	✓		✓
France	✓	✓	✓	✓		✓
Germany	✓	✓	✓	✓		✓
Greece	✓	✓	✓	✓		✓
Hungary	✓	✓	✓		✓	
Ireland	✓	✓	✓	✓		✓
Italy	✓	✓	✓	✓		✓
Latvia	✓	✓	✓		✓	✓
Lithuania	✓	✓	✓		✓	✓
Luxembourg	✓	✓	✓	✓		✓
Malta	✓	✓	✓		✓	✓
Netherlands	✓	✓	✓	✓		✓
Poland	✓	✓	✓		✓	
Portugal	✓	✓	✓	✓		✓
Romania	✓	✓	✓		✓	
Slovakia	✓	✓	✓		✓	✓
Slovenia	✓	✓	✓		✓	✓
Spain	✓	✓	✓	✓		✓
Sweden	✓	✓	✓	✓		
United Kingdom	✓	✓		✓		

	BRIC	USMCA	East Asia
Australia			
Brazil	✓		
Canada		✓	
China	✓		
India	✓		
Indonesia			✓
Japan			✓
Korea			✓
Mexico		✓	
Norway			
Rest of the World			
Russia	✓		
Switzerland			
Taiwan			✓
Turkey			
United States		✓	

List of industries

NACE Rev.2	Code	Description
A01	c1	Crop and animal production, hunting and related service activities
A02	c2	Forestry and logging
A03	c3	Fishing and aquaculture
B	c4	Mining and quarrying
C10-C12	c5	Manufacture of food products, beverages and tobacco products
C13-C15	c6	Manufacture of textiles, wearing apparel and leather products
C16	c7	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	c8	Manufacture of paper and paper products
C18	c9	Printing and reproduction of recorded media
C19	c10	Manufacture of coke and refined petroleum products
C20	c11	Manufacture of chemicals and chemical products
C21	c12	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	c13	Manufacture of rubber and plastic products
C23	c14	Manufacture of other non-metallic mineral products
C24	c15	Manufacture of basic metals
C25	c16	Manufacture of fabricated metal products, except machinery and equipment
C26	c17	Manufacture of computer, electronic and optical products
C27	c18	Manufacture of electrical equipment
C28	c19	Manufacture of machinery and equipment n.e.c.
C29	c20	Manufacture of motor vehicles, trailers and semi-trailers
C30	c21	Manufacture of other transport equipment
C31_C32	c22	Manufacture of furniture; other manufacturing
C33	c23	Repair and installation of machinery and equipment
D35	c24	Electricity, gas, steam and air conditioning supply
E36	c25	Water collection, treatment and supply
E37-E39	c26	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
F	c27	Construction
G45	c28	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	c29	Wholesale trade, except of motor vehicles and motorcycles
G47	c30	Retail trade, except of motor vehicles and motorcycles
H49	c31	Land transport and transport via pipelines
H50	c32	Water transport

NACE Rev.2	Code	Description
H51	c33	Air transport
H52	c34	Warehousing and support activities for transportation
H53	c35	Postal and courier activities
I	c36	Accommodation and food service activities
J58	c37	Publishing activities
J59_J60	c38	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
J61	c39	Telecommunications
J62_J63	c40	Computer programming, consultancy and related activities; information service activities
K64	c41	Financial service activities, except insurance and pension funding
K65	c42	Insurance, reinsurance and pension funding, except compulsory social security
K66	c43	Activities auxiliary to financial services and insurance activities
L68	c44	Real estate activities
M69_M70	c45	Legal and accounting activities; activities of head offices; management consultancy activities
M71	c46	Architectural and engineering activities; technical testing and analysis
M72	c47	Scientific research and development
M73	c48	Advertising and market research
M74_M75	c49	Other professional, scientific and technical activities; veterinary activities
N	c50	Administrative and support service activities
O84	c51	Public administration and defence; compulsory social security
P85	c52	Education
Q	c53	Human health and social work activities
R_S	c54	Other service activities
T	c55	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	c56	Activities of extraterritorial organizations and bodies

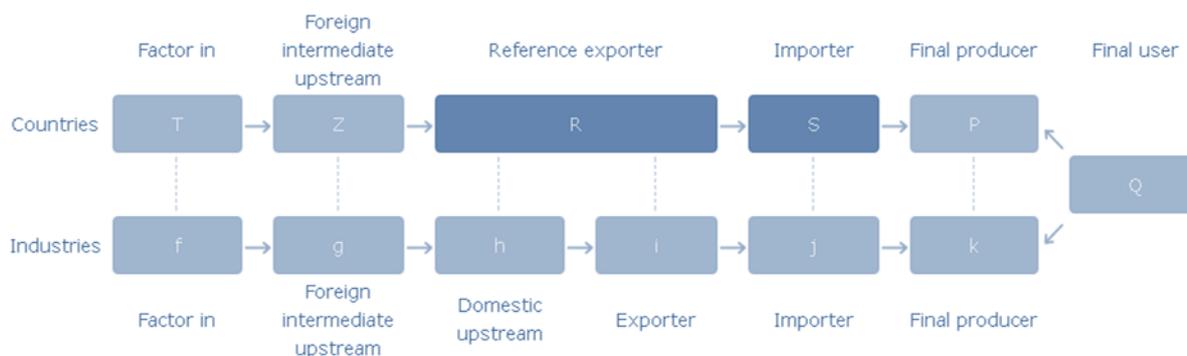
List of industries (aggregations)

NACE Rev.2	Code	Code_10	Name_10	Code_3	Name_3
A01	c1	P	Primary	P	Primary
A02	c2	P	Primary	P	Primary
A03	c3	P	Primary	P	Primary
B	c4	P	Primary	P	Primary
C10-C12	c5	M1	Food, beverage, tobacco	M	Manufacturing
C13-C15	c6	M2	Textiles	M	Manufacturing
C16	c7	M3	Wood, paper, printing	M	Manufacturing
C17	c8	M3	Wood, paper, printing	M	Manufacturing
C18	c9	M3	Wood, paper, printing	M	Manufacturing
C19	c10	M4	Energy	M	Manufacturing
C20	c11	M5	Chemicals	M	Manufacturing
C21	c12	M5	Chemicals	M	Manufacturing
C22	c13	M6	Other non-metallic and basic metals	M	Manufacturing
C23	c14	M6	Other non-metallic and basic metals	M	Manufacturing
C24	c15	M6	Other non-metallic and basic metals	M	Manufacturing
C25	c16	M6	Other non-metallic and basic metals	M	Manufacturing
C26	c17	M7	Machinery and transport equipment	M	Manufacturing
C27	c18	M7	Machinery and transport equipment	M	Manufacturing
C28	c19	M7	Machinery and transport equipment	M	Manufacturing
C29	c20	M7	Machinery and transport equipment	M	Manufacturing
C30	c21	M7	Machinery and transport equipment	M	Manufacturing
C31_C32	c22	M7	Machinery and transport equipment	M	Manufacturing
C33	c23	M7	Machinery and transport equipment	M	Manufacturing
D35	c24	M4	Energy	M	Manufacturing
E36	c25	M4	Energy	M	Manufacturing
E37-E39	c26	M4	Energy	M	Manufacturing
F	c27	S2	Other services	S	Services
G45	c28	S1	Transport, trade and business services	S	Services
G46	c29	S1	Transport, trade and business services	S	Services
G47	c30	S1	Transport, trade and business services	S	Services
H49	c31	S1	Transport, trade and business services	S	Services
H50	c32	S1	Transport, trade and business services	S	Services
H51	c33	S1	Transport, trade and business services	S	Services
H52	c34	S1	Transport, trade and business services	S	Services
H53	c35	S1	Transport, trade and business services	S	Services
I	c36	S2	Other services	S	Services
J58	c37	S1	Transport, trade and business services	S	Services
J59_J60	c38	S1	Transport, trade and business services	S	Services
J61	c39	S1	Transport, trade and business services	S	Services
J62_J63	c40	S1	Transport, trade and business services	S	Services
K64	c41	S1	Transport, trade and business services	S	Services
K65	c42	S1	Transport, trade and business services	S	Services
K66	c43	S1	Transport, trade and business services	S	Services
L68	c44	S2	Other services	S	Services
M69_M70	c45	S1	Transport, trade and business services	S	Services
M71	c46	S1	Transport, trade and business services	S	Services
M72	c47	S1	Transport, trade and business services	S	Services
M73	c48	S1	Transport, trade and business services	S	Services
M74_M75	c49	S1	Transport, trade and business services	S	Services
N	c50	S1	Transport, trade and business services	S	Services
O84	c51	S2	Other services	S	Services
P85	c52	S2	Other services	S	Services

NACE Rev.2	Code	Code_10	Name_10	Code_3	Name_3
Q	c53	S2	Other services	S	Services
R_S	c54	S2	Other services	S	Services
T	c55	S2	Other services	S	Services
U	c56	S2	Other services	S	Services

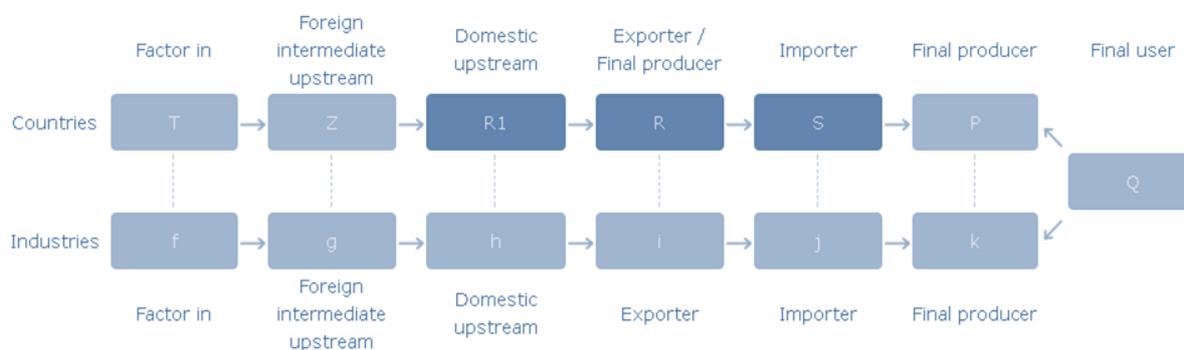
List of codes of components: country analysis

Country analysis	
Code	Component
T	Factor in country
f	Factor in industry
Z	Foreign intermediate upstream country
g	Foreign intermediate upstream industry
R	Factor in / Exporter / Final producer country
h	Factor in / Domestic upstream industry
i	Exporter / Final producer industry
S	Importer / Final user country
j	Importer industry
P	Final producer country
k	Final producer industry
Q	Final user country



List of codes of components: region analysis

Region analysis	
Code	Component
T	Factor in country
f	Factor in industry
Z	Foreign intermediate upstream country
g	Foreign intermediate upstream industry
R1	Factor in / Domestic upstream country
h	Factor in / Domestic upstream industry
R	Exporter / Final producer country
i	Exporter / Final producer industry
S	Importer / Final user country
j	Importer industry
P	Final producer country
k	Final producer industry
Q	Final user country



List of variables

Code	Description
EMP	Total employment
EMPF	Female employment
EMPM	Male employment
EMPHS	High skilled level employment
EMPMS	Medium skilled level employment
EMPLS	Low skilled level employment
EMP1	Employment aged between 15 and 29 years old
EMP2	Employment aged between 30 and 49 years old
EMP3	Employment aged 50 years old or more
VA	Total value added
CAP	Capital compensation
LAB	Labour compensation
LABF	Labour compensation paid to female workers
LABM	Labour compensation paid to male workers
LABHS	Labour compensation paid to high skilled workers
LABMS	Labour compensation paid to medium skilled workers
LABLS	Labour compensation paid to low skilled workers

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