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THE EU INTER-COUNTRY SUPPLY, USE AND INPUT-OUTPUT TABLES (FIGARO PROJECT): RECENT PROGRESS

(Progress report for the Group of Experts on National Accounts: measuring Global Production, organized jointly with Eurostat and OECD, 31 May – 2 June 2017, Geneva)

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THE FIGARO PROJECT: THE EU INTER-COUNTRY SUPPLY, USE AND INPUT-OUTPUT TABLES

Abstract:

This paper describes the joint project between Eurostat and the European Commission's DG Joint Research Centre, which aims to establish an annual production of EU Inter-country Input-Output Tables and a five-yearly production of EU Inter-country Supply, Use and Input-Output Tables (EU-ICSUIOTs). The EU-ICSUIOTs constitute a further development of the current regularly published EU and Euro area consolidated SUIOTs. The EU-ICSUIOTs will serve to support the analyses of the economic, social and environmental consequences of globalisation in the EU by means of studies on competitiveness, growth, productivity, employment and international trade (e.g. global value chains). It is complemented with (i) a regular combination of micro and macro data sources; (ii) a careful checking of user needs of various European Commission's DGs for policy analyses, and (iii) an institutional perspective by setting up consistent EU-ICSUIOTs, recognised by international agencies such as OECD, WTO and UN, and used as such in a Global Inter-country Supply, Use and Input-Output framework. The project started in October 2015 and we summarise here the current state of play, providing information on the project and the methodological aspects of the construction of EU Supply, Use and Input-Output Tables, integrated as much as possible with the OECD's global ICIO tables.

Contents

1. Background

1. Over the last decade, the scientific community has been working on the construction of several multi-regional input-output (MRIO) databases. The main aim of the work has varied from environmental applications (e.g. footprints) to socio-economic applications (e.g. global value chains). The development of multiple databases alongside each other has given researchers the opportunity to compare their approaches. Methodologies, and their underlying assumptions, differ among the databases, and so do the results. Convergence of these methods is now called for, and Eurostat, together with the European Commission's Joint Research Centre (JRC), has taken up the challenge to develop a statistical standard recognised by international organisations such as the OECD, UN and WTO. The acronym of the project is FIGARO, meaning *Full International and Global Accounts for Research in Input-Output Analysis* and it has started in October 2015 and will be finished in December 2017.

2. This project fits in the medium term strategy for National Accounts in the context of the European statistical programme for the period from 2013 to 2017 regarding the following headings: (1.3) Economic globalisation with the enhanced measurement of globalised production; analysis of global value chains, through appropriate input-output tables and global business statistics; (2.1) Economic and social performance with the implementation of ESA 2010 and the database for growth and productivity measurement; and (2.2) Environmental sustainability as the European Supply, Use and Input-Output Tables are an input for input-output modelling with environmental accounts.

3. The Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European System of National and Regional Accounts (ESA2010) in the European Union determines the underlying methodology of the EU-IC-SUIOTs.

4. The FIGARO project aims to produce an experimental EU-Inter Country Supply, Use and Input-Output Tables (EU-IC-SUIOTs) by December 2017 for the reference year 2010 in the ESA 2010 methodology. From the experience gained in the project, a work plan will be developed concerning the yearly production of EU-IC-SUIOTs and the production of a time series of EU-IC-SUIOTs from 2010 to 2015 (Input-Output tables – IOTs – 2010-2015; Supply and Use tables – SUTs – 2010 and 2015). The EU-IC-SUIOTs constitute a further development of the current regularly published EU and Euro area consolidated SUIOTs.

5. The EU-IC-SUIOTs will serve to support the analyses of the economic, social and environmental consequences of globalisation in the EU by means of studies on competitiveness, growth, productivity, employment, environmental footprints and international trade (e.g. global value chains).

6. This project will rely on the re-use of available data in Eurostat and it is based on the latest relevant methodological framework of the ESA 2010, thus ensuring quality assurance of the published data in regards to the National Accounts framework. The project output – the EU-IC-SUIOTs - will serve to evaluate European Union policies and to assess the position of the European Union and the Euro Area in the world. The FIGARO project should create the conditions for sustainable data availability of EU-IC-SUIOTs on a continuous basis to guarantee the provision of data for European policies in the long-term.

7. The development of the EU-IC-SUIOTs will be based on:

(a) A regular combination of global business statistics and macro-economic data sources (e.g. trade statistics, trade by enterprise characteristics, business statistics, National Accounts…) to construct the EU-IC-SUIOTs;

(b) A careful check of user needs of various European Commission's Directorate-Generals (DGs) for policy analyses, i.e.: DG ESTAT, DG ECFIN, DG TRADE, DG ENV, DG RTD, DG EMPL, DG GROW, among other European institutions such as the European Central Bank;

(c) An institutional perspective by setting up consistent EU-IC-SUIOTs, recognised by international agencies such as OECD , WTO and UN , and used as such in a Global Inter-country Supply, Use and Input-Output framework. National compilers of the EU Member States will also be involved in order to ensure that they can take ownership of the national data used in the construction of the EU-IC-SUIOTs.

2. Scope and objectives

8. The scope and objectives of the project are:

(a) To take stock of all current international projects related to the construction of inter country SUIOTs and of user needs of various European Commission's DGs for policy analyses;

(b) To define a suitable methodological framework for the regular production of EU-IC-SUIOTs, including the analysis and treatment of specific issues producing inconsistencies or asymmetries in trade statistics and overall balance procedure;

(c) To construct EU-IC-SUIOTs at basic prices for the reference year 2010 based on SNA2008/ESA2010 methodology and the NACE Rev.2/CPA 2008/ISIC Rev. 4 classifications;

(d) To integrate the EU-IC-SUIOTs into Global (World) Supply, Use and Input-Output Tables, in collaboration with the OECD and UN;

(e) To include a reduced version of the EU-IC-SUIOTs at the A10 sector classification with linked capital and labour productivity indicators;

(f) To integrate the EU-IC-SUIOTs with environmental accounts (in particular, air emission accounts, material flow accounts and energy accounts);

(g) To explore possible extensions of the EU-IC-SUIOTs with global business statistics taking into account the recommendations of the OECD Expert Group of Extended Supply and Use Tables;

(h) To propose a strategy for a regular production of Eurostat's annual EU-MC-IOTs and five-yearly EU-IC-SUIOTs, linked to labour and environmental accounts and possibly with an extended SUIOT format using global business statistics;

9. The EU-IC-SUIOTs aim to be the reference for national and international agencies in terms of analysis of trade, globalisation, socio-economic, National Accounts and environmental policies.

10.Preliminary versions of the first EU-IC-SUIOT compiled under the FIGARO Project (base year 2010) will be presented to the NAWG (National Accounts Working Group), the DMES (Directors of Macroeconomic Statistics) and the BSDG (Business Statistics Directors Group) as well to international instances (OECD and UN) and the academic community (e.g. International Input-Output Association Conference) during 2017.

11. Section 3 describes the main features and organization of the project. Section 4 makes a methodological proposal for the construction of the EU-IC-SUIOTs with Section 5 concluding with a view to the next steps of the project.

3. Description and organisation of the FIGARO Project

12. FIGARO is a project based on National accounts framework. It builds up on available data from the National accounts domain (national SUIOTs) and trade statistics (International trade service statistics and international trade in goods statistics). Business statistics, labour and capital productivity statistics and environmental accounts are part of the project as well, considered for extensions to the European IC-SUIOTs.

13. The EU-IC-SUIOTs will use the latest classifications in terms of activity and products applied on EU currently: NACE Rev 2 (ISIC 4) and CPC/CPA. The scope of the tables are European Member States (28) plus USA to capitalise on work already undertaken by Eurostat in the last years to provide US data within the same classifications as the European SUIOTs[1].

14. The EU-IC-SUIOTs are meant to be further integrated as the European Union part into the OECD ICIO global database at first and into any other recognised world database built up by international organisations.

15. The FIGARO project will establish the framework, infrastructure and capacity for a regular compilation and dissemination of EU-IC-SUIOTs: annually Eurostat will produce EU-IC-IOTs and an EU-IC-SUT on a five-yearly basis. Every 5 years due to the extensive availability of national data (i.e. use tables at basic prices and its split between domestic and imports, plus the Input-Output Tables) the EU-IC-SUIOTs will serve as a benchmark for the years in between. The benchmark years will be those ending in 0 and 5.

Table 1: list of work packages and leading partners

WP	Leading partner
1. Inception, format of EU IC Tables	ESTAT (C)
2. Review methodologies	JRC
3. Treatment of asymmetries in trade statistics	ESTAT (G)
4. Construction EU IC SUT	JRC
5. Construction EU IC IOT	JRC
6. Integration with global ICIOTs	ESTAT (C)
7.Link to capital and labour inputs	JRC
8. Environmental accounts	ESTAT (E)
9. Extended format EU ICIOT	ESTAT (C)
10. Analysis, future	JRC
11. Technical developments	ESTAT (C)
Global business statistics	ESTAT (G)
Sectoral and regional statistics	ESTAT (E)
National Accounts; prices and key indicators	ESTAT (C)
Joint Research Centre	JRC

[1] Eurostat has developed a methodology for converting US data from the NAICS classification to NACE, CPA classifications.

16. The project implementation is divided into eleven work packages with one leading partner each (see the list in Table 1). As of mid-February 2017, all work packages have already started in some way or another, with a particular focus on WPs 3 to 6.

17. The experimental EU-IC-SUIOTs to be compiled within the FIGARO project will provide an industry breakdown of at least 10 activities, being the ultimate goal to be in line with the 64 activities breakdown available at national level. The project shall provide optimum ways for Eurostat to compile soon after the end of the project EU-IC-SUIOTs for the years in between 2010 and 2015 (depending on availability).

18. Dealing with trade, data will capitalise as well on TEC data (Trade by Enterprise Characteristics) disseminated on the Eurostat web-site and STEC data (Services Trade by Enterprise Characteristics), available from a project run by Eurostat in collaboration with eight countries (Austria, Czech Republic, Denmark, Estonia, Ireland, Luxembourg, Netherlands and Poland). STEC data cover the year 2011 in BPM5 classification. The partners are limited to intra and extra EU. These datasets are provided in NACE Rev.2 (2-digits) for all services and NACE Sections for services categories.

19. In liaison with the FIGARO project Eurostat and OECD will update the Memorandum of Understanding for data transmission regarding Supply, Use and Input-Output tables.

4. Methodology for the construction of EU Inter-Country Supply, Use and Input-Output Tables

20. This note describes the method Eurostat is developing to construct the EU Inter-country Supply, Use and Input-Output tables. The approach builds on the latest developments of the OECD (Fortanier and Sarrazin, 2016; Fortanier et al, 2016; Miao and Fortanier, 2017) regarding the construction of balanced bilateral trade statistics; and Ahmad (2017) in relation to the construction of global Input-Output tables.

21. Following Fortanier and Sarrazin (2016), the full process for the construction of the EU IC-SUIOTs is also characterised by the following key features: transparency; modularity; collaboration and collective ownership; and long-term perspective.

22. Regarding *transparency*, it means that any necessary adjustment of the reported official data will be well-documented and the balancing procedure shall be based on simple and transparent calculations (e.g. weighed symmetry index), thus avoiding as much as possible mathematical model-based optimisations.

23. The construction of the EU Inter-country Supply, Use and Input-Output tables involves different steps (or *modules*) that are described in a flow chart (see Figure 1 in the Annex). The full process pivots around five main blocks of (official) **source data**: national accounts (as benchmark), national Supply and Use tables, national Input-Output tables, international merchandise (goods) trade data and international services trade data. All of them are used to construct the three main **data inputs** feeding the construction process of the EU IC-SUIOTs, i.e. a balanced bilateral trade database (for goods and services), a full set of national Supply and Use tables and a full set of national Input-Output tables.

24. The EU IC-SUIOTs are designed to continuously build on the work of EU national statistical offices in order to increase mutual *collaboration* and gain *collective ownership* at the EU level. The same applies to other international agencies such as the OECD. There have been already regular reports of the FIGARO team to the Eurostat's National Accounts Working Group meetings and bilateral meetings related to trade data and national compilation of SUIOTs.

25. The project has a *long time-horizon* and it aims to be a permanent source of data for users with frequent updates and annual (and five-yearly) publications.

4.1. Preparing national Supply, Use and Input-Output tables

26. The first step is to collect and prepare the source data. A collection of *national Supply and Use tables* (at basic prices) with a distinction between domestic and import uses shall be prepared. Besides, Use tables at purchaser's prices are required to confront them with the resulting balanced view of international trade. There are some missing countries that have been estimated using a set of good practices guidelines developed by Eurostat and the DG Joint Research Centre (Rueda-Cantuche et al, 2013b). These missing estimates will be later benchmarked with the latest figures of National Accounts. The sectorial classification is NACE Rev. 2 and the commodity classification refers to CPA/CPC 2008. The tables comprise 64 industries and 64 commodities, which can also be easily referred to ISIC Rev. 4 classification.

27. A collection of *national Input-Output tables* with a distinction between domestic and import uses shall also be prepared. However, this collection is usually incomplete provided that some of the EU Member States ask for derogations in the submission of the data. At this stage, we would not attempt to estimate missing national Input-Output tables but rather wait until the full balanced EU Inter-country Supply and Use tables are produced. Once this is achieved, we would use (nation-wise) the industry technology assumption (Model B, in Eurostat, 2008) for product by product IO tables and the fixed product sales structure assumption (Model D, in Eurostat, 2008) for industry by industry IO tables. Official Input-Output tables (of whatever type, product by product or industry by industry) would act as constraints to the system in each case.

4.2. Creating a coherent view of EU bilateral trade statistics

28. The process is less straightforward regarding the construction of a *bilateral balanced trade dataset* for goods and services trade. For **goods trade** data, we use a combination of COMEXT and UN COMTRADE databases.

29. On the one hand, COMEXT has, in principle, higher quality data due to the existing production process and the amount of resources behind, as compared with UN COMTRADE. Besides, COMEXT is the official reference regarding international trade in goods within the European Statistical System and it is a well-recognised statistical product by users. However, the main caveat is that it reports the country of consignment (or the first EU country where the good enters the EU Market) instead of the country of origin in the imports made by EU Member States. Yet, this is not a problem for extra-EU trade; it can distort not negligibly the geographical picture of trade within the EU. According to the regulation, EU Member States are obliged to provide to Eurostat the country of consignment but not the country of origin, while for UN COMTRADE the country of origin[2] is reported directly by the countries to the UN.

30. On the other hand, UN COMTRADE does not separate domestic exports from exports of foreign goods (or re-exports), while COMEXT can provide information to make such distinction in UN COMTRADE data. We can illustrate this with a real example about the crude oil trade between Spain and Portugal. UN COMTRADE and COMEXT both report around 576 million EUR of Portuguese imports (cif) of crude oil

[2] In some occasions, the data in UN COMTRADE seems to be quite close to the data in COMEXT due to the fact that some of the EU countries might not have been able to identify the country of origin and therefore, the information on country of consignment was instead submitted to UN, too.

from Spain. Both databases also report exports (fob) of crude oil from Spain to Portugal for around 510 million EUR. The difference can easily be attributed to cif/fob margins. However, by looking at the information on country of origin in COMEXT (whenever available), we see that Portugal reports 505 million EUR of crude oil imported from Algeria (country of origin) and 71 million EUR really coming from Spain (country of origin). This clearly indicates that Spain is re-exporting crude oil from Algeria to Portugal for an amount of 505 million EUR. This is confirmed by the total output of mining and quarrying products (including crude oil) from the Spanish Supply table, which amounts to around 110 million EUR of production, of which 71 million is exported to Portugal (domestic exports).

31. Trade asymmetries are well known among trade statisticians. For the sake of consistency, a balanced view of international trade requires that exports/imports and mirror exports/mirror imports coincide. However, this is not generally the case for several reasons. One of them is merely the different valuation between exports (fob) and imports (cif), the latter including international transport and insurance costs. Hence, before addressing a realistic analysis of trade asymmetries, import (cif) values must be converted into imports (fob) values. In order to do so, we need therefore data on cif/fob margins on a bilateral basis and for individual products.

32. The estimation of cif/fob margins by product and partner of each bilateral trade flow shall be based on the estimations made by national statistical institutes as in Miao and Fortanier (2017). Unfortunately, for EU Member States, this information is rarely available[3]. Alternatively, we used the difference between exports (fob) and mirror exports (cif) as a proxy variable to build up a gravity model[4]. This model is based on geographical distance; GDP per capita of reporter and partner countries; average annual oil price; EU median unit values (at CPA08-4 digit level) as a proxy of insurance costs; a dummy variable reflecting contiguity of countries; fixed factor effects for products and partner countries; and a time trend.

33. Data on imports and exports for the gravity model were taken from the COMEXT database EU Trade Since 1988 By CPA_2008 (DS-057009) for the period 1995-2015. Imports and exports were available in both monetary values (euro) and quantities (100kg) for all EU 28 Member States at 4-digit level and by partner country. Gravity variables (distance and contiguity) were taken from the CEPII database. GDP per capita (in current US dollars) comes from the World Bank, while the average oil price is obtained from the Europe Brent Spot Price FOB (Dollars per Barrel) from the US Energy Information Administration. Finally, we used exchange rates from Eurostat to convert GDP per capita and the oil price from US dollar to euro.

34. Remaining differences between exports and mirror exports (Jansen, 2014) can be attributed to: time lag between exports and imports (e.g., goods leaving country A in 2015 might only reach country B in 2016); goods passing through third countries (i.e.: transit trade, re-exports); goods entering Customs warehousing for several months; unallocated trade flows or goods being classified differently; countries having different trade systems (General versus Special Trade System); and goods passing through industrial processing zones that may or may not be recorded by the exporting country.

[3] The Eurostat Unit C5 collected some information from the EU Member States on a voluntary basis and will reinitiate the request. It is therefore expected that more data on cif/fob margins would be available for the next few years. Presently, we could only have data for Germany (5 observations for 2010, total products); Finland (28 observations, for 2013) and Slovakia (510 observations for 2010), which clearly was insufficient.

[4] Miao and Fortanier (2017) also used this (implicit) approach as a measure of the robustness of their results with national data on cif/fob margins (explicit approach).

35. Next, the reconciliation process of bilateral trade flows shall be based on a symmetry index (or reliability index) calculated to compute a weighted average of the two reported values available for each bilateral trade flow. The weights are based on the proportion of each country's total trade that approximately match the other partner's reported trade. This process basically follows the same philosophy as the OECD reconciliation methodology (Fortanier and Sarrazin, 2016).

36. Finally, one additional important issue before the final balancing is the treatment of not geographically specified trade, which in some cases can be very important (e.g. German and Austrian trade in petroleum and natural gas). Here, we develop a two-fold strategy, i.e.: on the one hand, we assume proportionality and distribute non-specified trade in order to get a fully balanced view of bilateral trade (analytical approach) and, on the other hand, we leave them as unspecified trade without any further adjustments (statistical approach). Clearly, the former option is aimed for users and input-output analysts and the latter aims to have a more statistical grounded approach. This strategy was endorsed by the Steering Committee of the FIGARO Project last November 2016.

37. Regarding international **services trade** data, the estimation process of missing trade data can be more burdensome than for merchandise (goods) trade data. There are various reasons why the availability and quality of services trade data are unsatisfactory, certainly when compared to goods trade statistics. Unlike goods which can be seen and physically measured and observed as they cross borders, services transactions can be delivered via a variety of modes (Rueda-Cantuche et al, 2016) and typically only the financial flows are observable (Fortanier et al, 2016). Hence, a variety of different data sources and estimation techniques are necessarily used in practice, and these can be sometimes different by country. Data confidentiality and the different classification of services (EBOPS vs. CPA/CPC) can also complicate the scheme, too.

38. Following Fortanier et al (2016), we have firstly started to collect all available information on trade in services available in Eurostat (i.e.: for the period 2010-2015 in BPM6 and by EBOPS2010 categories). In doing so, we may also use additional national data sources (wherever available) as, for instance, the Services by Trade Enterprise Characteristics (STEC) data. Secondly, we follow a top-down approach to estimate missing trade flows whenever official data were available (e.g. using structural information over time; simple derivations; mirror data; linear interpolations; moving average based backcasting and nowcasting methods) and otherwise, gravity models for specific items. Total services trade by EBOPS category and country were available, all of which are expected to be used as benchmark for the estimation of the other sub-items.

39. The gravity models use four types of independent variables: economic (such as GDP of reporter and partner countries, GDP per capita of reporter country and overall exports and/or imports of services by partner and reporter countries); distance; dummy variables specifying: common border (contiguity), language affinity, territorial link (e.g. Czech and Slovakia were one single country in the past), EU membership (for more than 20 years), euro area; and fixed effects for partner and year. The models were estimated for the following items: *Travel services* (SD), which consists of Goods (SD1), Local transport services (SD2), Accommodation services (SD3), Food-serving services (SD4) and Other services (SD5); *Charges for the use of intellectual property rights* (SH), which consists of Franchises and trademarks licensing fees (SH1), Licences for the use of outcomes of research and development (SH2), Licences to reproduce and/or distribute computer software (SH3), Licences to reproduce and/or distribute audio-visual products (SH41), Licences to reproduce and/or distribute other than audio-visual products (SH42), *Audio-visual and related services category* (SK).

40. Once a complete (although unbalanced) dataset of bilateral trade flows of services data is achieved, the same balancing approach and principle (symmetry index) set out in Fortanier and Sarrazin (2016) will be applied to deal with trade asymmetries. At this stage, we will also benefit from the additional information provided by the conclusions of the Workshop on Trade in Services Asymmetries organised by Eurostat with representatives of the EU Member States side by side with the Balance of Payments Working Group (BOPWG) Meeting last October 2016. During this Workshop, experts from EU Member States had the opportunity to exchange experiences, discuss bilaterally and decide on specific actions to resolve their corresponding trade asymmetries. The conclusions will be discussed at the next BOPWG meeting next April 2017.

41. Differently from merchandise trade data, the resulting balanced bilateral trade dataset will eventually have to be converted from EBOPS items into CPA/CPC categories using a combination of EBOPS-CPA/CPC concordance tables, SUIOTs and STEC data. On the basis of an initial conversion table, we will use the RACE algorithm (Rueda-Cantuche et al, 2013a) to come up with country-wise and service-wise specific conversion tables.

4.3. Aligning the balanced view of trade with National Accounts estimates

42. According to Ahmad (2017), there are two sources of differences between the balanced view of bilateral trade in goods and services and the comparable view of imports and exports shown in national accounts (and SUTs): an unallocated component, reflecting the outcome of the balancing process (that can be allocated on a proportional basis if needed for analytical purposes); and the adjustments needed to align the concepts underlying the balanced bilateral trade estimates with the concepts and coverage of the System of National Accounts (SNA). Regarding concepts, differences include the treatment of goods sent abroad for processing and merchanting activities; and differences in coverage, include imputations of unobserved trade (e.g. smuggling, low level trade below a certain threshold used by Customs officials), re-exports and purchases by non-residents in the recording economy.

43. *Goods sent abroad for processing*; SNA does not count as an export the movement of a good across borders if they have not changed economic ownership; therefore, the goods sent abroad for processing and the goods sent back (or to another country) already processed are neither exports nor imports according to the SNA. Instead, SNA counts for imports of processing (service) fees, which are the difference between the value of the processed goods and the value of the goods sent abroad for processing[5]. However, international merchandise (goods) trade statistics do count these transactions as exports and imports. Hence, the solution would be to decrease imports and exports from trade in goods data and move the difference to imports of services. For instance, suppose Germany exports 100 EUR of a certain good for being processed to Slovakia and it comes back to Germany (it can be elsewhere, too) processed for 110 EUR. There is no change in economic ownership in the goods exported and imported. Therefore, Germany should have 110 EUR less of imports from Slovakia and 100 EUR less exports to Slovakia. Ultimately, an import of a processing fee from Slovakia should also be allocated to Germany. Unfortunately, the information needed to make these additional adjustments to international merchandise (good) trade data is limited[6], i.e.: how much

[5] The reference to ESA2010 paragraph 18.34 has to be moderated with the recommendation stated in paragraph 2.5 of the Manual on goods sent abroad for processing (Eurostat, 2014).

[6] The Eurostat's Task Force on Integrated Global Accounts (IGA) is presently collecting this information from the EU Member States on a voluntary basis. It is therefore expected that more data on trade of goods sent abroad for processing would be available within the next few years.

gross trade is related to these types of goods and how much processing services fees are paid, by country and by type of good traded (e.g. partial information can be found in the Balance of Payments – BPM6 – and/or STEC).

44. *Merchanting transactions*; in practice, a merchanting activity is nothing else than a re-export but without the good crossing the border of the merchanting country. Suppose a Dutch trader sells fish from a Norwegian ship at Helsinki's harbour for 150k EUR, being 50k EUR the merchanting fee. The international merchandise (good) trade statistics record Finnish imports of fish from Norway for 100k EUR and Finnish imports of trade services from the Netherlands for 50k EUR. However, SNA requires to count for a Dutch import (negative export) of fish from Norway for 100k EUR and a Dutch export of fish to Finland for 150k EUR, including the merchanting fee. Hence, the necessary adjustments to align trade statistics with SNA would consist in decreasing Finnish imports of fish from Norway by 100k EUR, decreasing Finnish imports of merchanting (trade) services from the Netherlands by 50k EUR, adding (negative) exports of fish from Norway to the Netherlands for 100k EUR and adding Dutch exports of fish to Finland by 150k EUR. The difference is considered the output of the merchanting activity recorded in the Dutch economy (merchanting fee). Unfortunately, data of goods traded under merchanting is limited and adjustments can only be made in some cases; for instance, EBOPS categories in BPM6 can only provide gross trade flows, with that including the merchanting fee.

45. *Re-exports*; re-exports are goods sold without being processed or modified from one country to another via a third country. The goods need to cross the borders of the third country. Typically, SUTs/SNA include re-exports (also denoted as foreign exports) in the export column of the import use table by type of product (although this might not be true for all EU countries). However, international merchandise (good) trade statistics do not distinguish between domestic and foreign exports (re-exports). Therefore, we need to make sure that the SNA total values of domestic and foreign exports are aligned with the balanced view of trade achieved in previous steps, also on a bilateral basis.

46. *Unobserved trade*; the difference between the balanced view of trade (including merchanting adjustments) and the comparable view shown in SUTs/SNA (including adjustments for re-exports and goods sent abroad for processing) can be attributed to unobserved trade (e.g. data on illegal activities, small scale transactions...) and errors in conversions, corrections, etc. Provided that the necessary information for making such adjustments is almost inexistent, then we will adopt a pragmatic solution without any extra additional information or data requirement. In other words, following Ahmad (2017), we will reduce as much as possible this difference by a transparent and replicable conversion matrix where the main idea is to allocate the differences across products in a way that preserves each country's recorded total imports by industry and partner.

47. As a result of all these adjustments, the SNA values will still differ (hopefully not too much) from the adjusted balanced view of bilateral trade within the EU. Let us denote it "discrepancy" item. Similar to par. 37, there are here two alternatives to follow. Either we allocate the discrepancy item across the balanced view of international trade using RAS-type bi-proportional methods (i.e.: GRAS, in Temurshoev et al, 2013) (analytical approach) or we allow for a discrepancy column/row (statistical approach). Eventually, the final balanced bilateral trade data set will have to be compared with the export (fob) values of the national Use tables at purchaser's prices. Big deviations will indicate that further corrections are still needed in the trade data. Then, a feedback loop may start by going back to Eurostat/OECD trade statisticians in order to look into the problems encountered and find coordinated solutions.

48. As a summary, **imports** in SUTs are adjusted for various reasons: (a) goods sent abroad for processing (added to SUTs); (b) merchanting (imports in fob adjusted from partner country's exports for a given product); (c) re-exports (added to SUTs data) and re-allocation of import flows (row-wise) by product so as to replicate the geographical distribution of the balanced view of international trade, which is preserved, and the total import by industry per each country.

4.4. Purchases by non-residents and residents' expenditure abroad

49. Direct purchases abroad by residents (imports) and direct purchases in the domestic territory by non-residents (exports); typically included in National Accounts as a lump-sum total but not separated by product. Nonetheless, these trade flows are reported by international services trade data under the "Travel" item in EBOPS categories and therefore, they need to be separated from pure travel services using Tourism Satellite Accounts, SUIOTs or any other related source data. The estimated values will then be transferred to the goods categories and partners (i.e.: country of origin of the non-resident).

50. Therefore, we will first split the balanced view of total travel services expenditures into pure travel services and goods purchased (if not already done yet) by using Tourism satellite accounts and the assumption of common spending patterns across tourists; then, we will use the balanced view of trade to allocate expenditures by product to countries of origin; and in a final stage, since there may be a remaining difference between the equivalent national accounts estimates, we will allocate this difference to the export column in the SUTs (but separately from residents' purchases) using the same proportions used to generate the bilateral estimates. As suggested by Ahmad (2017), for imports (residents' expenditure abroad), the difference will be allocated using a weighted average of the proportions generated by residents abroad.

4.5. Integrating the balanced view of trade with national SUTs

51. Once the balanced view of bilateral trade of goods and services is ready and the full set of national Supply and Use tables at purchaser's prices prepared, the next step is to build up the EU Inter-country Supply and Use tables (IC-SUTs) at purchaser's prices (either from an analytical approach – balanced – or from a statistical approach – unbalanced). The balanced view of trade will be used to geographically allocate bilateral trade in the EU Inter-country Use tables. For the allocation across users (intermediate use and final demand) further use of STEC and TEC data as well as the UN Classification of Broad Economic Categories (BEC) may provide more insight in the differentiation between intermediate and final exports. However, in the absence of STEC, TEC and BEC data, the Use table of imports (adjusted conveniently to fob values) can also provide a certain differentiation between intermediate and final exports by user category. Figure 2 (see Annex) illustrates a simplified framework of the Eurostat format for the EU Inter-country Use table and identifies the information to be collected through the national SUTs.

52. The conversion from purchaser's prices to basic prices is straightforward since for the EU countries (and for the year 2010) fully fledged tables of trade and transport margins and taxes less subsidies on products are available for (almost all) EU countries.

53. National import Use tables (cif) are generally compiled by national statistical offices without taking into account a global or an EU view of the whole trade affecting the compiler country. Trade asymmetries are not addressed at all except in very few cases, depending very much on the willingness of the affected countries. Consequently, our EU

balanced view of international bilateral trade will surely provide a better picture of the geographical distribution of trade and the amount of industry's imports than national import Use tables can do. This is the main reason why we made the choice to use exports (fob) values from the balanced view of trade to populate the EU Inter-country Use table as exogenous and subsequently, estimate endogenously the corresponding national import Use tables (fob) by country of origin.

54. The last step would be to benchmark the resulting EU IC-SUTs to the latest National Accounts totals by using RAS-type adjustments (e.g. GRAS). These types of adjustments should allow for a minimal deviation with respect to the base (or initial) matrix.

4.6. The construction of the EU Inter-country Input-Output tables

55. The construction of the EU Inter-country Input-Output tables shall be based on the already estimated EU IC-SUTs. For product by product IO tables, the final demand component remains unchanged by definition so no further changes need to be made in the final demand component of the EU IC-IOTs. The changes will therefore affect only to the intermediate uses by exporting country, trade partner and product and value added by country and product (using the industry technology assumption, Eurostat 2008). The final EU IC-IOT will have to respect anyway the official values of the available national IO tables and eventually be benchmarked to National Accounts data (i.e.: using GRAS). Regarding industry by industry IO tables, intermediate and final uses (from the EU IC-SUTs) will have to change by definition while value added would remain unchanged. In such case, we assume fixed product sales structures (Eurostat, 2008) for estimating the missing IO tables. Again, official IO tables will have to be respected. The final IO table will also have to be benchmarked to related National Accounts data.

56. It is worth noting that using the industry technology assumption or the fixed product sales structures assumptions over the full Inter-country Supply and Use tables would result in undesirable changes in the geographical balanced view of trade across countries (column-wise and row-wise, respectively), which should be avoided.

5. Next steps

57. As of February 2017, we have advanced significantly in the development of the methodology and data collection; we have also implemented the IT framework to store the FIGARO database. The estimation of missing national SUTs has been completed. Regarding missing IO tables, we prefer waiting a bit more just in case new submissions arrive to Eurostat. The same applies to National Accounts data; they will be collected at further stages of the project just in case new revisions come in.

58. Most of the efforts in the last two months have been put in estimating the EU balanced bilateral view of trade in goods and services, including gravity models for the estimation of cif/fob margins and missing services trade. We expect to have it completed during March 2017.The expected deadline for a first preliminary EU IC-SUIOTs is July 2017.

59. This report describes the up-to-date methodological proposal for the production of EU IC-SUIOTs, as resulting from various bilateral meetings with the OECD as well as other similar regional initiatives (NAFTA, APEC...). In subsequent versions of this report, we will keep giving further details of the different processes involved in the construction of the EU IC-SUIOTs.

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Disclaimer

The views expressed herein are those of the authors and do not necessarily reflect an official position of the European Commission.

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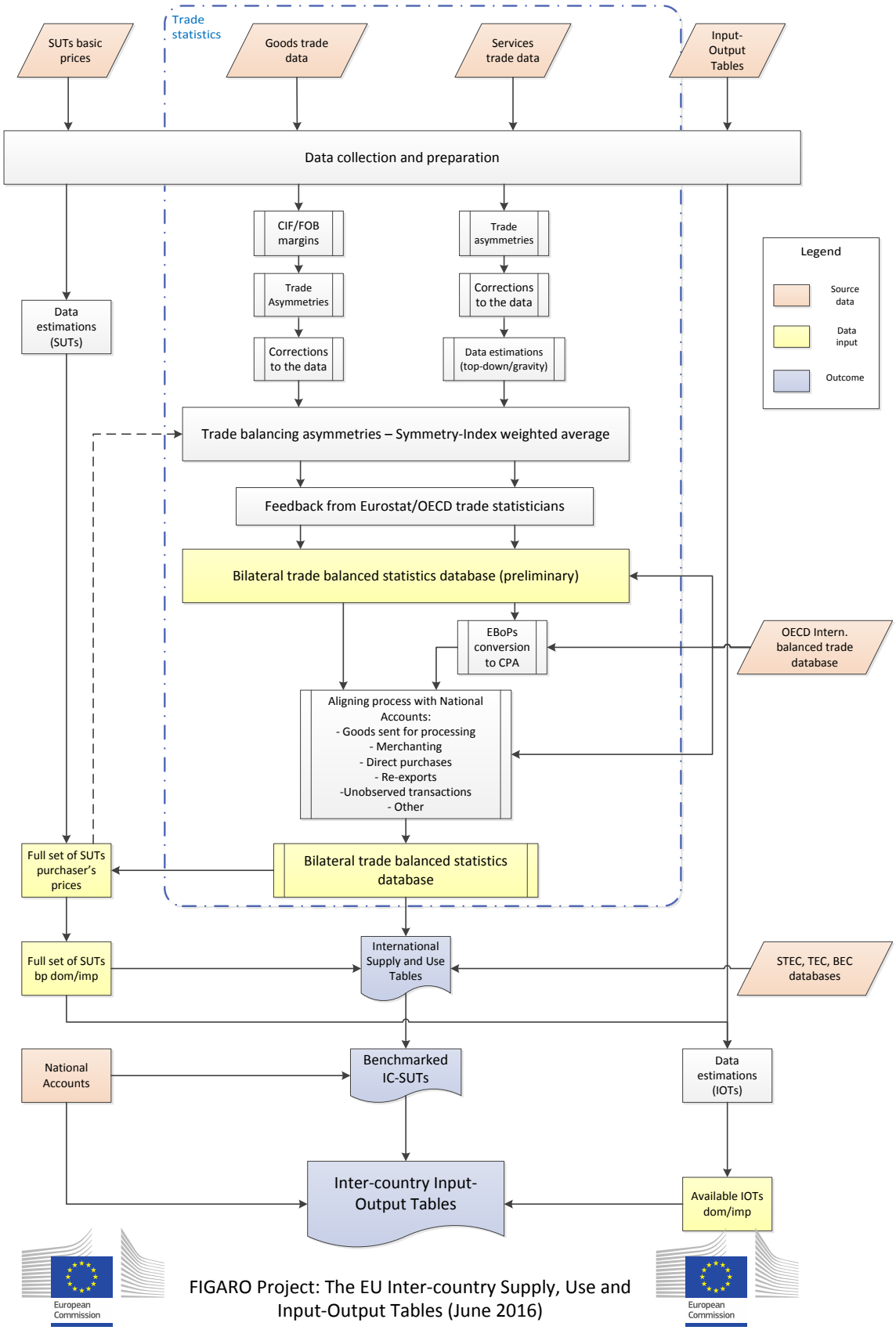
Annex

Figure 1. FIGARO's methodology flow chart



FIGARO Project: The EU Inter-country Supply, Use and Input-Output Tables (June 2016)

Figure 2. FIGARO's EU IC-SUIOT format