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TOWARDS A GLOBAL TRADE IN SERVICES DATASET BY SECTOR AND BY MODES OF SUPPLY

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ABSTRACT

The non-availability of trade in services data by mode of supply hampers the analysis, monitoring, and formulation of trade negotiating strategies and may lead to counterproductive outcomes from both national and global perspectives.

A number of initiatives have been launched recently in this area, at national, regional and international level. This paper will present some of these initiatives, based on either the simplified approach (e.g. Eurostat or US BEA) or on approaches to amend existing surveys to collect information (e.g. Spain or New Zealand).

The international initiative described here aims at creating an analytical dataset at global level for the period of 2005 to 2016. Sector data will follow the structure as defined in the Extended Balance of Payments Classification (EBOPS 2010) in the Manual on Statistics on International Trade in Services (MSITS 2010). It will be complemented by estimates developing information on the size of mode 3.

While the simplified approach is taken as starting point, results of new case and pilot studies will serve to improve estimates at country and consequently global level. Therefore it is hoped that the dataset will develop into an international benchmark incorporating gradually any new information that becomes available over time.

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[1] The authors work at the European Commission and World Trade Organization. Results of this paper do not represent any of the organization's Members opinion.

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1   Introduction

Academics and trade negotiators search a global trade in services dataset by modes of supply for their analysis of trade developments and formulation of trade negotiating strategies. When bilateral trade in services data broken down by modes of supply data are part of the analytical toolbox available to policymakers, trade negotiators will be equipped with a state-of-the-art analytical platform that can guide them towards a more optimal outcome of bilateral, plurilateral or multilateral services negotiations.

Completing this analytical platform requires to combine trade in services data by mode of supply and by partner with services trade restrictiveness indices. This complete analytical chain would allow analyzing trade in services in a trade creating or trade diverting context along GVCs or PTAs. Distinct modules on trade in services by partner, breakdown by modes of supply, and services trade restrictiveness indices are under process at the OECD, WTO and World Bank. These datasets would also help to identify major trade asymmetries.

However, developing such a platform faces a number of issues, apart from the lack of reported data. First, most services are traded through multiple modes. A service can be produced, distributed, marketed, sold or delivered through many modes. The implementation of the concepts and definitions developed in the manual of statistics, through for example the "simplified approach", applies shares to individual services sectors, for instance, computer services are delivered 50% through mode 1 and 50% through mode 4 for all countries. This is an arbitrary assumption which can only be refined on a comparable basis by shares resulting of surveys of individual countries. Amending existing national surveys however depends on the countries' priorities and resources allocated for such statistical work.

Keeping these limitations in mind, this paper describes a WTO project on producing a trade in services dataset by mode of supply. It describes the parameters of the project, previous work undertaken on this topic by other organizations and national statistical offices, and the methodology followed by WTO in order to develop the dataset.

The WTO is also developing a balanced dataset on bilateral trade in services with OECD. Results of it were released in December 2017 Experiences and lessons learnt from this project on trade in services by partner will be used in the development of the dataset on trade in services by mode of supply.

2   Parameters of the project

2.1   The four modes of supply

Services can be internationally supplied through different channels. The definition of modes of supply is provided by the General Agreement on Trade in Services (GATS), one of the landmark achievements of the Uruguay Round, entered into force in January 1995. The GATS defines four ways (or "modes") of trading services:

- **Mode 1, cross border supply:** services supplied from the territory of one country into the territory of any another country. This implies that neither a consumer nor a producer has to move and only the service itself crosses border. For example, any service provided by electronic means, such as phone, fax, email, online. One can think of medical diagnosis, legal advice, financial services, etc.

- **Mode 2, consumption abroad:** services supplied in the territory of one country to the service consumer of any other country. Customers travel to another country by their own to consume services locally. For instance, visits to museums or theatres, visit to doctors, language courses, ship repair abroad, etc.

- **Mode 3, commercial presence:** services supplied by any type of business or professional establishment of a country, through commercial presence in the territory of any another country. It is often useful for the supplier company to establish closer contact at various stages of the delivery (production, distribution, marketing, sale and delivery, after-sales services), by for example establishing an affiliate in a foreign country to serve the market locally. For instance, a foreign bank setting up operations in another country.

- **Mode 4, presence of natural persons:** services supplied by individuals of a country through temporary presence in the territory of another country. These services include, for example, a computer services company sending its employee directly to a customer of another country or a self-employed lawyer delivering legal advice to foreign consumers.

In terms of sectoral coverage, the agreement includes all services excluding those supplied in the exercise of governmental authority (i.e. any service which is supplied neither on a commercial basis nor in competition with other suppliers) and air traffic rights and services directly related to the exercise of such rights.

The Manual on Statistics of International Trade in Services 2010 (MSITS 2010) describes different approaches for how trade in services data can be broken down by modes of supply. As a first approximation, trade values can be allocated to their dominant mode of supply or, where there is no single dominant mode, to the most significant mode of supply. (see MSITS2010, p. 122). This approach, called "simplified approach", will be described in more detail in chapter 3.1.

In practice, though, many types of services are supplied internationally via a combination of modes, for instance mode 1 and 4, mode 2 and 4, mode 3 and 4 or mode 1, 2 and 4. Even a combination of all modes is possible, as in the provision of services through a services value added network, MSITS2010, table V.2, page 132/133. Some balance of payments transactions might include the purchase of goods together with the services supplied or received (for instance, for travel and construction). In this case, a precise measure of the service component is needed. As a consequence, additional information is needed to allocate the trade values to the correct mode of supply. This information could be obtained by

conducting specific surveys or by amending existing surveys to include questions on modes of supply.

A number of countries have carried out sector-specific or one-time studies to either prove the feasibility of more regular data collection or to gain information on the functioning of their priority sectors of the economy.

2.2   Project sketch

The aim of the project described here is to develop a complete trade in services dataset broken down by mode of supply. It is funded by the European Commission and builds upon the work on bilateral data.

The parameters of the project can be grouped into four branches: (i) concepts and methodological guidelines; (ii) approaches about how to split trade by modes and related statistical frameworks; (iii) major players; as well as (iv) timelines, possible communication and visibility activities.

By way of background, the WTO Secretariat aims at leveraging resources to continuously improve trade in services statistics. It cooperates with UNCTAD and ITC to compile a comprehensive trade in services dataset by sector based on officially reported data, detailed by partner when available and complemented with some estimates. This "joint" WTO/UNCTAD/ITC services dataset represents the starting point for the work on the modes of supply.

With OECD, its ongoing collaboration resulted in a complete and balanced bilateral trade in services matrix, where the reported data are complemented with imputations, interpolations and extrapolations against given constraints, and finally gravity-based models. However, this dataset is developed in BPM5 from 1990 to 2012. It will be converted to CPA (for the ICIO compilation) and to BPM6 for further updating. It is hoped that this approach will result in an international benchmark dataset that will benefit of any additional reported data by national authorities over time. That is, national data compilers and professionals' feedback is not only included at a given moment but newly available reported data can be worked in at any time.
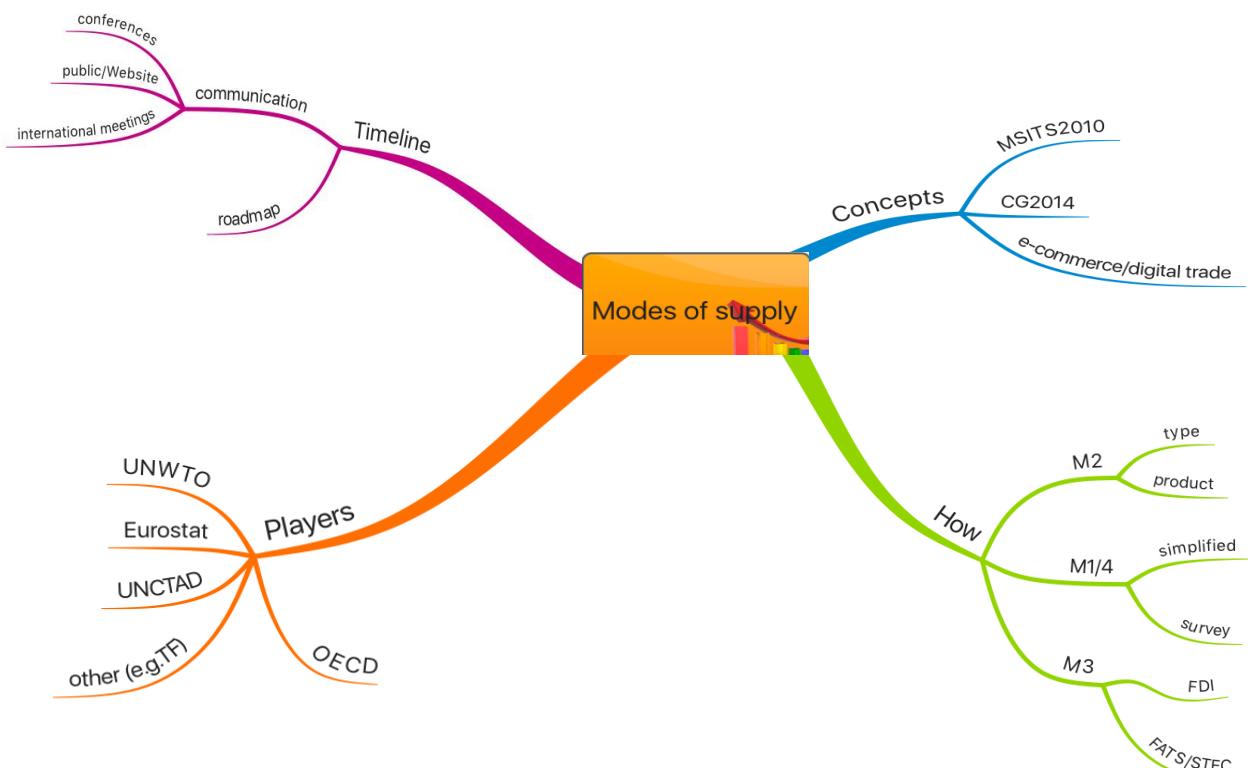
Figure 1 : project sketch

Trade in services data are based on the Balance of Payments 6th edition (BPM6) for resident/non-resident transactions and on foreign affiliates statistics (FATS).

As for mode 1 and potential overlaps to other modes, in particular for mode 4, there are in principal two ways to estimate: the simplified approach or the survey-based approach. While the first uses existing data and works with assumptions, the second would attempt to amend existing surveys to derive information according to modes of supply. In addition, the WTO Secretariat engaged in a task force on labour mobility driven by the UNECE which develops case studies and may also help to refine further information on mode 4.

Mode 2 is traditionally linked to the BOP travel sector; it would be interesting to analyse information stemming from tourism statistics and/or the tourism satellite accounts to refine the BOP travel component by excluding goods.

The allocation suggested in MSITS2010 of services transactions to individual modes however does not take into account interlinkages between modes nor any potential changes as to their allocation introduced by digital trade.
In order to make the dataset an international benchmark, all players, national and internationalcan bring in their data and expertise to make the dataset as comprehensive and consistent as possible.

The individual steps identified for the project are summarized by the timeline below:

2017

Q1	Q2	Q3 & Q4
•Fix reported data	•First allocation by MoS	•ISI 2017
•Previous work	•GTAP 2017	•Include comments
•OECD WPTGS		•Add activity-based FDI/FATS
		•Expert meeting (EM)

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2018
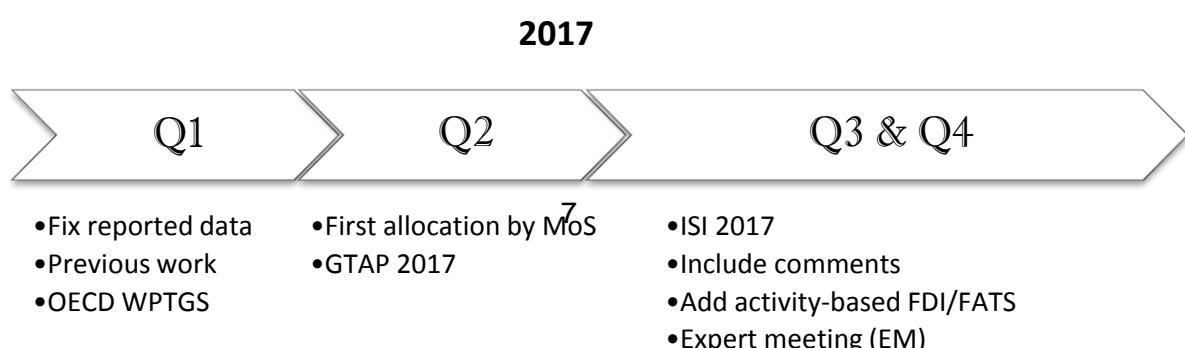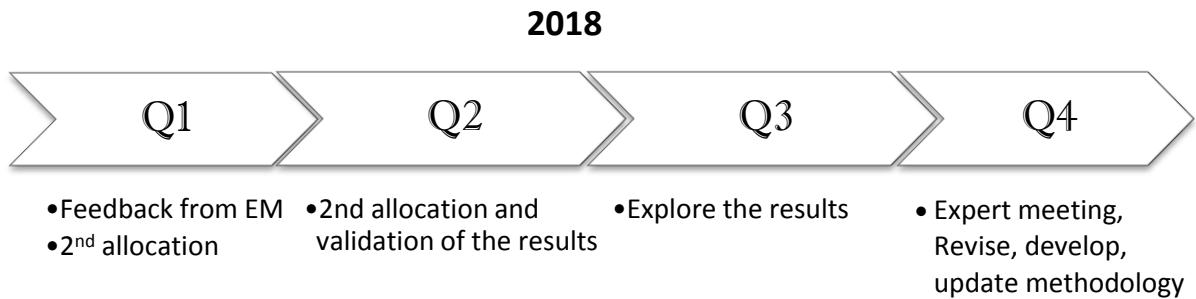
3   Previous studies

3.1   The simplified approach – the case of the EU

The European Commission estimated that the overall EU trade policy agenda has the potential to deliver up to 2% additional growth to the EU economy (European Commission (2013)). A big part of it would come from successful services negotiations as part of EU PTA. For this, it is important to ensure an optimal negotiating outcome at global level and focus the negotiations on the most important combinations of sectors and modes of supply. Data on trade in services by mode of supply would support these negotiations.

Eurostat's approach (see Rueda-C. et al. (2016)), to develop a trade in services dataset by modes of supply, uses existing BoP and FATS data, available publically. If data were missing in the Eurostat public database, due to confidentiality or reliability matters, national databases were investigated. A top-down approach for estimating modes 1, 2 and 4 was used, meaning that the services total values were taken as the benchmark and the goods' value was subtracted from the travel item. However, due to the residual values being distributed across the service items, some discrepancies may have occurred.

While Eurostat's methodology follows the simplified approach described in the MSITS2010, which consists of a three-step procedure of allocating, evaluating and refining the data, some further assumptions and developments are made.

Regarding modes 1, 2 and 4, the EBOPS service categories are allocated to either one dominant mode or, where there is no single dominant mode, to the most significant modes of supply. This allocation is done at the most detailed level of the service categorization. Some assumptions, on how specific services items are most likely to be supplied by exporters (and importers) of the economy, are made.[2] For this reason, the results are considered a rough approximation of how services are supplied. Furthermore, national experiences of Spain and Germany have been used to validate the EU-wide dataset.

Regarding mode 3, FATS statistics are used. A correspondence table has been developed to link the activity classification (NACE) to the EBOPS services items. This draft correspondence

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[2] See (Rueda-Cantuche, 2016).

table has been developed for analytical purposes. It, only contains the main EBOPS services' classification (i.e. SA, SB, SE, SF, SG, SJ, SI, and SK).

The turnover variable is used for estimating mode 3, except for estimating trade in distribution services (wholesale and retail sales activities), where the production value is used. The production values are only available for inward FATS, so production values for outward FATS have been derived from the production value/turnover ratio derived for inward FATS. The resulting "sales" are allocated to Mode 3 as "distribution services".

NACE manufacturing activities are excluded from mode 3 as these mainly concern the manufacturing of goods. Moreover, to avoid over-estimation of mode 3, the trade of accommodation and food activities (NACE I) was estimated at 50%, as part of that trade may already be covered by the BOP travel.

Due to a large amount of confidential and non-publishable values, mode 3 has not been estimated at the country level - in contrast to mode 1, 2 and 4 - but only at the EU aggregate level. In the future, progress has to be made on FATS data and mode 3. Three suggestions were made: (1) missing values in FATS data will have to be estimated; (2) information on mode 3 statistics, broken down by "domestic turnover" and "exports", are essential; (3) mode 3 statistics and international trade in services statistics, broken down by "goods" and "services", are needed for improving the quality of the estimates.

On average EU exports by mode 1 account for 64% of all exports. However, it hides high variations across Member states, in terms of the importance of various modes of supply (for modes 1, 2 and 4). This is mainly due to structural differences and types of services traded in the EU countries. Mode 1 accounts for a considerable share in certain countries, like Luxembourg, Denmark and Ireland (90%, 78% and 77% respectively), whereas mode 1 is the least used supply mode for services in Greece, Croatia and Bulgaria (16%, 20%, 35%, respectively). In countries, with a relatively large tourism sector, like Portugal, Spain, Bulgaria, Croatia or Greece, mode 2 is more important. In regards to mode 4 (presence of natural persons), Finland, Ireland and Sweden rank the highest — 22%, 19% and 17% respectively. This is probably due to business travelers arriving in those countries (estimated by the exports of business travel services).

In regards to mode 1 (cross-border supply), the range of figures is not as wide for imports as it is for exports. Luxembourg and Ireland have the highest share (90%) of mode 1 imports; Greece and the United Kingdom have the lowest (41 and 43% respectively). In regards to services channeled through mode 2 (estimates based mainly on travel services), the value of goods purchased by travelers is estimated at about 30% and has been excluded from the travel value.

The results show that, in the sectoral distribution of mode 3 at the EU aggregate level, two thirds of the total value are associated to distribution services, other business services, and financial and insurance services.

The results from the Eurostat project are in line with different pilot studies. Mode 3 estimation for EU aggregate is considerably larger (69%) than all modes 1 (21%), 2 (6%) and 4 (4%) combined, for both imports and exports. Also, the results for Spain don't deviate much from the estimates made by the Spanish National Statistical Institute (INE); even though the years of reference are not the same (2012 for Eurostat and 2014 for INE).

Nevertheless, this study has a few limitations: (1) it is not based on surveys and is, therefore, an approximation; (2) in addition, for GATS negotiators, it has not been possible to separate

the goods from the services for all items; (3) there is, inevitably, some double counting by using both FATS and BoP data in the analysis. Sales of services of foreign affiliates, based in the compiling economy, can include exports by the affiliate; which should have already been captured by the trade in services statistics.

3.2   Use of existing data – the case of the US

(Paul Farello, 2017) presents exploratory estimates for U.S. international services categorized by modes of supply. These are based on (1) Bureau of Economic Analysis' (BEA) most detailed trade-in-services statistics that are published annually as an extension of the U.S. BOP accounts; (2) an estimate of distribution services; (3) BEA's FATS statistics covering services supplied through the channel of direct investment by affiliates of multinational enterprises.

The allocation method also follows the simplified approach. Some of the services items are considered to be delivered under a unique mode and some can be delivered under various modes. The mode distribution is summarized in the table below:

Table 1: Distribution of modes by main item categories

Services type published in the annual statistics	EBOPS	M1	M2	M3	M4
Maintenance and repair services n.i.e.	SB		100		
Transport (exclude port)	SC	100			
Port component of Transport	??		100		
Travel (for all purposes including education and health)	??		100		
Insurance services	SD	100			
Financial services	SG	100			
Charges for the use of intellectual property n.i.e.	SH	100			
Telecommunications services	SI	100			
Computer services	SI2	50			50
Information services	SI3	100			
Other business services (except Construction, Mining, Archit., etc.)	SJ	75			25
Professional and management consulting services	SJ2	66,67			33,33
Architectural and engineering services	SJ31	33,33		33,33	33,33
Construction	SE			50	50
Mining	-			50	50
Services supplied by US MNEs through their MOFAs to the local market	-			100	
Distribution services (estimates)	-	100			
international wholesaling (estimates)	-				
Other personal, cultural and recreational services (Sports and performing arts)	SK2				100

Source: (Paul Farello, 2017)

The results indicate that, for both services supplied and services received, commercial presence (mode 3) is the predominant mode, since it exceeds all other modes combined. Mode 1 is the second largest, followed by mode 2, and then mode 4 (see Figure 2 below).

Figure 2: U.S. Supplied (Exports) and received (imports) services by modes of supply (in millions of $)
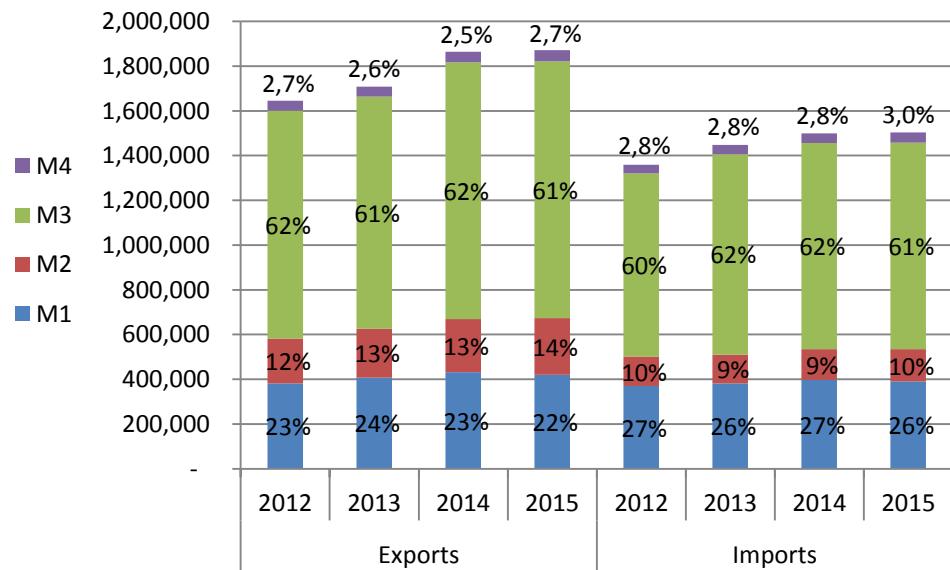
Source: (Paul Farello, 2017), page 14

As next steps, the US BEA plans to:

a. share their exploratory work for comments;
b. compare estimates and methods with other countries' results;
c. consider changes to their existing survey or whether a new special survey is needed to collect service transactions by mode;
d. consider alternative methods, for example, relying on administrative data sources to measure services provided by self-employed non-residents working in the U.S. (part of mode 4 imports), following Statistics Canada's approach;
e. analyze whether a survey respondent can be expected to know and allocate the value of transactions across modes. If not, could BEA take the respondent's data and identify a reliable method for allocating the transactions across modes?
f. consider amending its direct investment surveys. For instance, U.S. parent companies might be able to provide information on employees sent abroad, which might help to measure mode 4;
g. consider ideas from independent researchers and consider reconciliation exercises with other countries.

3.3   Survey-based approach

Information on trade in services by modes of supply prepared by other countries is limited. Countries such as Canada, New Zealand and India have begun to explore this area. Other initiatives, including one taken by Turkey, are known at the time of writing but the results are not yet available.

3.3.1   Canada

The core estimates of trade in services are derived from enterprise surveys. Canada's current estimates do not distinguish between mode 1 and 4. Statistics Canada (Denis Caron, 2015) is exploring the possibility of using administrative data (tax records) to measure mode 4. Canadian companies must report payments, to non-residents, for services they performed in Canada which were not performed in the ordinary course of employment. This is a valuable alternative and complement to enterprise surveys; however, this would only work for imports (debits) of mode 4. In addition, tax data would not capture services provided by juridical foreign persons sent by foreign firms, and estimates would, consequently, only cover services provided by self-employed persons. Tax data do not provide the type of service provided but it is suggested that this information can be imputed, based on the available information on the industry of the provider.

Canada had projects underway in 2015 to develop inward FATS and expand their outward FATS. Outwards FATS was initiated in 1999 but currently only employment and sales are recorded. The work, published in spring 2015, used re-designed FDI questionnaires adding 4 to 5 variables; including trade and possibly financial variables. More information has been collected on: the number of firms, their size, the degree of ownership, banking data, sales, employment, asset-liabilities, earnings (measured by FDI surveys), value added by component, and for a wider range of partners.

3.3.2   New Zealand

Statistics New Zealand (Meehan, 2014) collected data, for the first time in 2011, on how commercial services are delivered overseas, through modes 1, 2 and 4. Mode 3 was not covered. They found that mode 1 accounted for 86%, mode 2 for 3% and mode 4 for 12% of total commercial service exports on a balance of payments basis (see Figure 3 below).
While physical distance may not be a barrier to mode 1 services trade, New Zealand's distance to markets is likely to have negatively impacted on its degree of international connectedness.

Figure 3: Commercial service exports by MoS and type of service (2011)
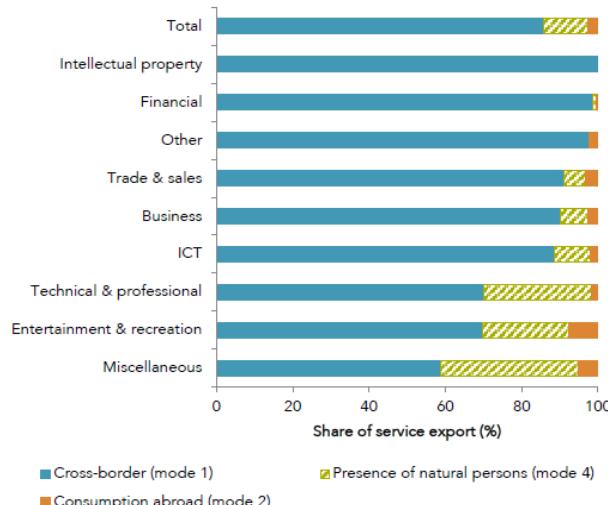
Source: Statistics New Zealand Census of International Trade in Services and Royalties

3.3.3 Spain

The Spanish National Statistical Institute (NSI) (Isanta, 2014) incorporated additional information on services trade by modes of supply to the national services trade survey as of 2013. To reduce the burden to respondents, the Spanish NSI opted for providing a box where respondents only have to tick (one or more) dominant modes. No figure is required from the respondent at this stage. They only have to report the type of service exported/imported (and its code), the country of destination/origin. The Spanish survey distinguishes 62 EBOPS categories, but mostly covers mode 1 and mode 4. In order to get primary data for travel services (mainly supplied by mode 2), two different data sources are currently used: a) for the consumption of non-residents in the domestic territory (export of services), the Tourist Expenditure Survey (EGATUR) and the Tourist Movement on Borders (Frontur); b) for the consumption abroad (import of services), the Residents Travel Survey.

In the Balance of Payments and National Accounts systems, travel exports are estimated mostly on the basis of the information provided by the Tourist Expenditure Survey (EGATUR), and travel imports on the basis of information on the transactions payments with debit/credit cards. This variety of source data and their subsequent heterogeneity may constitute a limitation to develop a more accurate measure of the amount of services traded through mode 2.

In Spain, inward FATS have more information than outward FATS. The Structural Business Survey can also be helpful to complement the information coming from inward FATS. Last but not least, the estimation of services trade by modes of supply also faces another complexity, which is the conversion from NACE/CPA industries to EBOPS service items.

3.3.4 Germany

During the last two years, the Deutsche Bundesbank (Walter, 2016) has devoted some efforts to investigate the allocation of service transactions collected for EBOPS statistics to the different modes of supply. As it is recommended in MSITS2010, the simplified approach was used as a starting point. In this case, services categories were allocated to one dominant mode or to a maximum of two modes. No hard information was available about the real distribution of the service categories through the modes of supply. Therefore, allocations were done on the basis of different simplifying scenarios. For example, allocations across modes 1 and 4, the first step was to allocate 50% to mode 1 and 50% to mode 4. In rare cases, extra information was used (e.g. computer services, legal service, research and development and other services) to refine the estimations. In this example, some indications from the income statements of important software companies showed that it is more likely that most of the computer services in this sector are provided via mode 1, and only a minor part via mode 4. An Excel program was developed to simulate and visualize the impact of different distributions of the modes, allowing a representation of the results within bandwidths. The results showed that there was a high sensitivity in the outcomes, depending on the type of allocation used.

Attributing the values of the EBOPS categories to mode 2 (single correspondence according to MSITS2010) was straightforward. Nevertheless, the Deutsche Bundesbank recognizes that no assumption can compete with real information directly collected from the companies. For this purpose, they designed a questionnaire, which was sent out to fifty companies that import and export services to know more about the different modes of supply.

In the German case, the treatment of mode 3 through FATS was made using inward FATS data and a bridge matrix linking EBOPs categories and NACE/CPA codes. This bridge matrix is based on existing correspondence tables. However, the work is still in its early stages and the results are not considered to be official European statistics.

3.3.5   India

Given its interest in the international supply of computer services, the Reserve Bank of India (RBI) (see (The Reserve Bank of India, 2016)) has conducted, since 2002-03, annual surveys to collect data on exports of Information Technology/software services according to the four modes of supply. This follows the 2001 Indian National Statistical Commission recommendation to envisage another methodology of collecting information regarding the exporting of Indian software services. It was recommended that this survey be conducted every three years and that a quarterly representative survey would be also implemented.

Export of Software services are divided into two major categories in this survey: (1) Computer Services exports which include IT services as well as Software Product Development and (2) Technology Enabled Services (ITES)/ Business Process Outsourcing (BPO) services (including engineering services).

The survey conducted for the reference years 2013-14 canvassed around 7,000 Software and ITES and BPO companies. Responses were received from 1,095 companies, which included most of the large IT companies. Among these, 134 cases were for Nil-return or for closed companies and the remaining 961 companies together accounted for 76.7% of the total software services exports. The methodology for estimation of software exports of the non-responding companies is given in their annex chapter.[3]

The total international trade in computer services by India of all four modes of supply together stood at 95.8 billion USD in 2014-15. The share of software services exports by India through commercial presence increased in 2014-15 while cross-border supply, which has highest share among all modes, declined marginally.

Table 2: Software exports by different modes

(per cent)

Type of Mode	2010-11	2011-12	2012-13	2013-14	2014-15
	(1)	(2)	(3)	(4)	(5)
Mode 1 (cross-border supply)	67.4	69.0	74.7	69.0	68.4
Mode 2 (consumption abroad)	0.1	0.5	1.6	0.1	0.1
Mode 3 (commercial presence)	14.8	15.4	9.4	13.7	14.4
Mode 4 (presence of natural person)	17.7	15.1	14.3	17.1	17.1

Source : (The Reserve Bank of India, 2016)

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[3] The paper can be found here:
https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/03ARDB2374853DA84396984AD4F882335AD8.PDF

4   First WTO breakdown by modes 1, 2 and 4 using the simplified approach

4.1   Description of the BPM6 dataset

The WTO/UNCTAD/ITC trade in services dataset is used as starting point for estimating trade by modes 1, 2 and 4. This dataset contains exports and imports of services broken down by EBOPS 2010 sector for 215 reporters and for the years 2005 to 2016. The figures are sourced from (i) Eurostat; (ii) the OECD Trade in Services by Partner Country dataset; (iii) the IMF Balance of Payments Statistics; (iv) and relevant national sources in some specific cases. Where possible, reported data are complemented by estimations produced by the WTO, UNCTAD and ITC. Estimations based on alternative official sources are published (and flagged with E), while some supplementary estimations are considered less reliable and only used for internal working purposes (flagged with X).

For the purposes of this project, 64 EBOPS 2010 items are selected (See ANNEX 1.) for inclusion in the final dataset. To begin with, only the partner world is considered. The choice of the items was driven by the necessity to have a sufficient sectoral breakdown to implement the simpliefied approach at the most detailed level possible, while bearing in mind the data availability.

The initial dataset used contains 131,929 (out of 330,240 possible data points) data points (33.46%), and 21,394 estimations (6.5%) which are summarised in Table 3.

Table 3: Initial flags and estimations in the WTO/UNCTAD/ITC services dataset

Count	Code	Description
6731	E	Estimate based on official source
13829	X	Estimate not shown
2	Y	Estimate not shown and break in series
822	Z	Not applicable

In addition, 46 data points are flagged as break in series.

4.2   Dataset preparation, imputations and estimations

When starting with the source data, the preliminary step towards our complete dataset is to check for problems of reported data. Hence, 152 implausible negative values and about 200 inconsistencies between parent and child values (i.e. the sum of subitem values is not equal to the total value for the parent item), have been detected. Some unexpected "jumps" in the time series (not identified as breaks), measured by high growth rates, have also been noticed and carefully checked. If possible, these values are corrected[4] and are assigned an estimation code "E6".

The dataset has a large portion of information not reported. In terms of total number of data points, about 60.05% of the dataset is missing, due to the fact that many economies (expecially developing) do not report the detailed EBOPS breakdown required.

In order to apply the simplified approach for the allocation by mode at the most detailed level possible for all economies, all non-reported data in the dataset are estimated. The procedure

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[4] As the correction of these potential misreported values requires verifications and, if possible, comparison with other available sources, the data will be corrected before the final version of this draft.

used follows a "top-down" approach in the sense that it ensures that the highest level of aggregation is complete before estimating more detailed breakdowns. More specifically, the consistency of the estimates is checked to ensure additivity, i.e. for each year, all components of a category (all subitems) add up to their total (item). The procedure is divided into three consecutive steps, as summarized by Table 4 and described below.

Table 4: Overview of the steps involved in estimating BPM6 non-reported data

Step	Code	Description	Number of points	In value terms
Step 0	E6	Correction of mistakes in source data		
Step 1	E1	Simple derivation	5.67%	0.05%
Step 2	E8	Interpolation, backcasting and forecasting	7.06%	13.65%
	E1.2	Simple derivation	11.80%	0.01%
Step 3	E4	Estimate completely missing information using bilateral BOP data	2.99%	6.37%
	E5	Estimate completely missing information using clusters	28.29%	7.33%

Table 5 and Table 6 are artificial numeric examples to illustrate steps 1.1, 2.2 and 2.3 in the algorithm described below. The shaded cells represent non-reported values.

Step 1 :   Simple derivations

First, by taking advantage of the hierarchical aggregation structure, all possible non-reported values are derived by simple addition or subtraction from the reported data (within each column of Table 5 and Table 6). More specifically, three cases of derivation are applied:

For a given year:
   1.1. if there is exactly one missing value in the hierarchical structure, it is computed as the difference between the parent value and the sum of the available subitems (see column 9 and 13 of Table 5). However, if the sum of the available subitems is greater than the value reported in the parent item, the value is set to zero except for insurance (SF), which can be negative[5];
   1.2. if an item is reported as zero, the corresponding subitems are set to zero;
   1.3. if the sum of the reported subitems is equal to the value of the item, and there are one or more additional subitems missing, these are set to zero.

In total, 5.67% of possible points in the dataset are added after step 1.

Step 2 :   Interpolation, backcasting, forecasting

   2.1. Repeat steps 1.1 and 1.3.

While step 1 is an iterative procedure which takes into account one year at a time, the estimations in step 2 exploit the information contained in the time series. If a subitem is reported for at least two years in the 2005-2016 time span, but there is at least one missing value, the shares of the available subitems are computed as the value of subitem divided by the total value of the item.

   2.2. Gaps between two values, are estimated by spline interpolation[6] (see column 5 and 6 of Table 6).

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[5] Although the adjustments for claim volatility introduced with BPM6 should limit the occurrence of negatives.

[6] More specifically, the Fritsch & Carlson algorithm is used for monotonic cubic interpolation. It is a variant of cubic spline that preserves monotonicity of the dataset being interpolated.

2.3. The five-year moving average[7] of difference of shares are used to backcast, and respectively, forecast missing shares at the beginning (see column 3 of Table 5) and the end of the series.

2.4. Only the estimated shares are rescaled to sum (with available shares) to a 100%.

2.5. Shares are transformed back into values.

In total, 7.06% of all data points are estimated by backasting/forecasting and interpolation. These estimations are assigned "E8" code and represent about 13.65% of the values in dollar terms.

Since additional values can be calculated via simple derivations after step 2, step 1 is repeated at this stage. Simple derivation resulting from E8 estimations in step 2 are coded "E1.2" and represent 11.8% of the dataset. However, in terms of values, these estimates represent only 0.01% of the total value.

Step 3 :   Completely missing information

3.1. If all values of a subitem are missing for all years (or if only a few are reported), the missing shares are estimated. This would correspond, in the tables below, to all cells being coloured in SPX4, SC, SD and SPX1. When information is available for a specific country in the mirror flows of the bilateral BOP data, the shares are derived using total trade across all partners but only if there are more than 8 partners. These estimates are coded 'E4' and are applied for 19 countries[8] 2.99% of the data points are estimated representing 6.37% of the total trade in dollar terms.

3.2. For all the other countries, the shares are estimated using clusters of countries that share similar characteristics, for both import and export trade flows separately. Five clusters are created by K-means algorithm, using the shares of main items SPX4, SC, SD and SPX reported in 2013.[9]

This method is used for 28.29% of the total number of cells, corresponding to 7.33% the total amount of trade in values.

In total, 31.28% of the final dataset is estimated at step 3, corresponding to 13.71% in dollar terms.

Table 5: example value level (in M$)

1	2	3	4	5	6	7	8	9	10	11	12	13
Code	Hierarchy	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
S	20000000	65160	72926	82256	89293	82979	98435	107276	111936	112624	107720	96270
SPX4	21000000	306	331			235	216	302	614	709	791	887
SC	22000000	15129	16996			17563	21559	23924	23754	23376	22365	20012
SD	23000000		20625			24215	29990	33323	35058	35115	33768	29394
SPX1	24000000		34974			40966	46670	49727	52509	53424	50796	45977

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[7] If less than 5 years are available, averages are computed using the number of values reported until at least 5 years are available.

[8] The first version of this step was done by estimating the shares by replacing the (rescaled) average shares reported by all other countries. This is a naïve approach. Obviously, assigning shares by region or by closer similarities provides better estimation.

[9] Different methods have been investigated using the variables mentioned above. However, in the end, using the shares of the main items give the best results in terms of coverage and economic interpretation. Five clusters are retained in order to have enough data to compute the shares at the most detailed levels.

In both flows, the five clusters are interpreted as the following, one cluster:
1) of countries contains countries that essentially trade in other services (SOX1 shares >60%);
2) corresponds to similar shares between SC, SD and SOX1 (~30% each);
3) contains the smallest countries and islands reporting small amout or zero trade;
4) contains trader with Other services item between 35% and 60%;
5) and one cluster with (SC) shares of Transport > 40%.

Finally, whithin a time series, if there are at least 5 shares computed and the rest is missing, the remaining years are computed as the total trade across all years and the points are flaged E4.2.

Table 6: example of share transformation

1	2	3	4	5	6	7	8	9	10	11	12	13
Code	Hierarchy	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
S	20000000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SPX4	21000000	0.5%	0.5%	0.4%	0.2%	0.3%	0.2%	0.3%	0.5%	0.6%	0.7%	0.9%
SC	22000000	23.2%	23.3%	23.4%	23.8%	21.2%	21.9%	22.3%	21.2%	20.8%	20.8%	20.8%
SD	23000000	27.7%	28.3%	29.9%	30.1%	29.2%	30.5%	31.1%	31.3%	31.2%	31.3%	30.5%
SPX1	24000000	48.6%	48.0%	46.4%	45.9%	49.4%	47.4%	46.4%	46.9%	47.4%	47.2%	47.8%

4.3   Simplified allocation by mode and discussion of the results

In the simplified approach, trade is allocated according to the dominant mode(s). Having a complete dataset resulting from the previous estimation procedures, the trade values of all countries are distributed among modes 1, 2 and 4 following the simplified allocations provided in ANNEX 1. The modes of the more aggregated service categories (namely Services, Goods-related services, Transport, Sea transport, Air transport, Other transport and Other services) are not provided in the table, as they are derived using the less aggregated categories.

A few countries - namely the United States, Canada, the European Union, Spain, India or New Zealand - have conducted surveys or have provided additional information on the distribution of modes of their economy. The simplified allocations are adapted to reflect any available country-specific analysis. The list of countries and sector that diverge from the default distribution of ANNEX 1. is presented in ANNEX 2. The provided distributions are used for both trade flows and for all years.

The first figure of ANNEX 3. shows some aggregated results, presenting total trade in services by region between 2005 and 2016. While the distribution of trade by modes varies substantially by region, it seems to be stable over time. At a global level, mode 1 is estimated to account for 55 to 58% of total services trade, mode 2 between 32 and 35% and mode 4 between 8 and 10%. However, the average figures hide significant variability across countries which sould be analyzed in detail.

The results have to be taken with caution because of the assumptions on which they are based: (1) almost two thirds of the dataset is estimated. In particular, the shares of the missing subitems are estimated by simple arithmetic averages of reported shares; (2) the simplified allocations are fixed for all countries.

Lastly, the next step of this analysis will be to derive and include mode 3 according to the methods mentioned earlier and results of existing surveys will be incorporated to the simplified allocation.

5   Estimation of mode 3

This chapter details the estimation procedure. The final dataset contains both inward and outward sales for 204 economies, broken down by 13 main services sectors from 2005 to 2015.

5.1   How to estimate mode 3?

Commercial presence or mode 3 in the GATS parlance is not measured by traditional resident/non-resident BOP trade statistics. It can be captured by the Foreign Affiliates Statistics (FATS) framework, which describes the operations of foreign-controlled affiliates.

As our primary interest is the international supply of services, the most pertinent economic variable is sales (or output) of "enterprises locally established but foreign-controlled". We can (roughly) compare these sales to the gross exports/imports of services. Inward and outward FATS sales are used to measure, for each country, the supply of services through commercial presence, bearing in mind the following caveats:

(i) GATS refers to majority ownership or control, while FATS data are based on majority ownership alone. Statisticians have selected this criterion because it is well defined and operational. This means that FATS do not include all companies covered by GATS. For example, FATS do not include minority-owned enterprises where control is exercised (i.e. level of ownership between 10 and 50%). However, the difference between these categories is not generally deemed to be significant.

(ii) GATS covers services whether produced by a service company or a company classified in the manufacturing sector, whereas FATS statistics refer to companies classified according to their primary activity. This means that the turnover of the foreign affiliates is not broken down by product categories but by activity, according to ISIC, Rev.4 Categories for Foreign Affiliates in Services (ICFA, Rev.1). If compilers were able to classify the turnover/output of foreign affiliates on a product basis, one could directly compare the value of a specific service supplied via a resident-non resident transaction with the same service supplied via commercial presence. Unfortualely, for now there is no available clear-cut correspondence between ISIC, Rev.4, ICFA, Rev.1 and EBOPS 2010. A good strategy would be to separate, at least as a first approximation, the value of goods from the services that are sold by these affiliates.

(iii) Sales data of foreign affiliates are compiled by activity, however, for certain service industries such as wholesale and retail trade or financial intermediation, output would be a more appropriate measure. For example, for the wholesale and retail trade, sales include the value of the goods that are sold. Output only refers to the trade margins realized on goods purchased for resale and, therefore, would exclude the value of the goods that are sold. Similarly, output would be a preferred measure for financial intermediaries and insurance companies as it would exclude the amounts that pass through the enterprises as part of its intermediate consumption.

(iv) In addition, from a statistical point of view, there exists the possibility of double counting when using total sales of the affiliates to measure commercial presence, because some affiliates' exports might be captured by international trade in services statistics (see MSITS 2010 par. 4.49 and 5.74). In the future, distinguishing between local sales or "domestic turnover", and "exports", will be essential to avoid this duplication.

The use of FDI data to assess mode 3

The lack of available data on the activities of foreign affiliates has often compelled researchers to use FDI stocks as a proxy for foreign affiliate operations. However, FDI and foreign affiliate activity statistics (FATS) reflect different facets of the role of multinationals in the world economy. Table 7 below summarizes the main differences between the two statistical frameworks.

Table 7: Main conceptual differences between FDI and FATS frameworks

CATEGORY	FDI	FATS
VARIABLES MEASURED	International transactions (and positions) between investors and direct investment enterprises. (International transfer of funds rather than their operations)	Overall operations of majority-controlled foreign affiliates such as sales, production, and employment. (i.e. real economic activity generated by the investment)
COVERAGE	All direct investment enterprises (foreign investor with 10% or more of the voting rights)	Majority-controlled foreign affiliates (foreign investor with more than 50% of the voting rights)
PARTNER	Immediate counterparty country (i.e. the country of the immediate investor/recipient even if the capital is passing through a third country)	Country of the Ultimate Controlling Institution (UCI) for inward, country of location of the affiliate for outward

In addition to those conceptual differences, other practical aspects may limit the use of FDI as a measure of commercial presence

If FDI statistics measure transactions between direct investors in a country and their affiliate, as well as their investment positions, it does not capture funds from unaffiliated persons. According to Fukui and Lakatos (2012), this can lead to an estimation bias of foreign affiliate activity; especially in countries with well-developed financial markets. Nevertheless, FDI data might be useful to highlight certain trends, including the increasing extent to which certain economies are relying on commercial presence to supply services internationally. A major problem with FDI data, however, is data quality, especially of allocating foreign investments by industry. Misallocations may bias the importance of individual industry sectors, apart from the simple non-availability of the respective data. (UNCTAD, 2017)

5.2   Previous work on estimating a complete FATS dataset (USITC approach/CGE)

Little empirical research has been done using sector specific data in predicting bilateral FATS data. Lakatos and Fukui (2012) constructed a set of tools to model the behavior of foreign affiliates. Their constructed database contain the Eurostat's Foreign Affiliate Statistics database as a primary source, as well as the OECD, the U.S BEA, UNCTAD and the National Bureau of Statistics of China databases.

There are 21 sectors, 22 European reporters and 41 partners, from 2003 to 2007. According to the raw data, approximately two thirds of foreign affiliate sales reported in the dataset take place in three countries (Germany, the United Kingdom, and Italy). Sector level data is also highly concentrated, with nearly 80% reported by two sectors: 46% by wholesale and retail trade and 33% in manufacturing.

They use an econometric model to produce a set of coefficients that provide information about the relationship between various independent variables and foreign affiliate sales. These

coefficients are then used to extrapolate to the full set of countries and sectors needed by the Global Trade Analysis Project (GTAP) computable general equilibrium (CGE) model that explicitly models FDI.

In the absence of FATS data, Karsenty (2000) used the total products of companies classified in service sectors as a proxy for service products. Companies classified in other sectors, such as agriculture or manufacturing, often have secondary (and sometimes important) service-producing activity. Similarly, companies classified in service sectors may also produce goods. The effect of this approximation of service product by service activity is unclear.

Gross output was derived in each industry using the gross output/value added ratio. For the US, an alternative method was applied. "Sales of services to US persons by non-banks majority-owned US affiliates of foreign companies" was used in place of gross output in services, and an average between the estimates was obtained by these two methods. For all countries in the sample, value added and gross output in services were obtained by summation across service industries. Finally, their shares in world FDI stocks were used to extrapolate world value added and gross output from foreign affiliates (shares in world FDI stocks were drawn from UNCTAD). If FDI flows had been used rather than stocks, the estimates of world gross outputs and value added would have been much higher.

5.3   Dataset preparation, imputations and estimations

The estimation approach follows a top-down approach beginning with completing the highest level of aggregation (in this case the total services sector with partner world) before detailing the subsectors. This method leverages the greater amount and the better quality of data available at a higher level of aggregation and ensures full consistency of the lower level estimates. The estimation procedure is described in detail in the following paragraphs. Box 1 gives an overview of the three steps followed.

First, all the available information contained in the source data is exploited in order to derive as many missing values as possible (by using zero derivation and mirror values). Secondly, for the countries available in the source data with partner world, the missing values within a time series are estimated by back and forecasting, as well as interpolation techniques. Time series completely empty are estimated through regressions. Thirdly, FATS sales are estimated for countries outside the initial dataset. For this, bilateral gravity models are used to predict sales by partner. These bilateral values are then summed up to derive the total sales with partner world. Finally, the FATS figures are merged with the BoP dataset using a correspondence table presented in chapter 6.

Box 1: Steps towards a complete dataset of Foreign Affiliates' sales

The steps below are executed separately for both inward (IWA) and outward (OWA) statistics.

Step 1.   Assess initial data availability and derive all possible values

1.1.   Merge existing FATS datasets;
1.2.   Derive zero values from original datasets;
1.3.   Derive mirror data from original dataset;
1.4.   Reconstruct the total service sector (TSER) when necessary.

Step 2.   Develop a complete dataset of FATS sales for OECD/European countries with partner world

2.1.   Complete the sectors using back/forecasting and interpolation;
2.2.   Estimate missing services subsectors;
2.3.   Rescale the main services subsectors on TSER value.

Step 3.   Develop a complete dataset of FATS sales for the remaining countries by partner and derive values for partner world

3.1.   Complete the sectors using back/forecasting and interpolation;
3.2.   Use econometric techniques to compute bilateral sales;
3.3.   Derive partner world by summing up values for all partners;
3.4.   Rescale subsectors estimations on TSER;
3.5.   Discussion of the results.

5.3.1   Assess initial data availability and derive all possible values

Merge existing FATS datasets

Two main publically available sources of data are used: Eurostat's data[10] and OECD's data on foreign affiliates broken down by investing country (trading partner) and by economic activity (sector level). The measure of interest is the sales of foreign affiliates (turnover) in both inward and outward statistics. According to the FATS Recommendations Manual (2013):

"*The turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. The sales of goods include the goods produced by the enterprise as well as the merchandise purchased by a retailer or land and other property held for resale.*"[11]

Eurostat foreign affiliate sales turnover is the primary source. Non-EU reporters are selected from the OECD database to avoid mixing sources. In addition, some FATS data sourced from national statistical authorities are added, with partner world only. The detailed list of countries with the corresponding sources are presented in ANNEX 8. The Eurostat dataset contains 32 reporters and 42 partner countries. The OECD dataset has 7 non-EU reporters and 75 partner countries (after selection of reporters highlighted in bold in ANNEX 8.). Values originally expressed in euros and other currencies are converted into US dollars with the exchange rates provided by the International Financial Statistics (IFS). In total, 38 sectors are covered but only 13 are selected in the combined dataset, due to very limited data availability. The breakdown of the selected sectors (according to ISIC4) is presented in Figure 4.

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[10] The Eurostat datasets fats_out2_r2, fats_out2, fats_out1 for outward FATS and fats_g1a_03, fats_g1a_08 for inward FATS "Turnover" are loaded from Eurostat website. Latest accessed date: 08.2017
[11] See page 13 of the Eurostat's Recommendation Manual for more definitions.

Figure 4: Brakdown of the total services in the ISIC classification
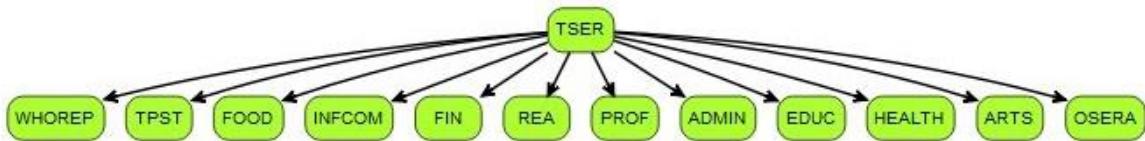
Derive zero values from original datasets

The original data contain about 68% of reported zeros (118,304 out of 174,083 data points). However, this number increases when deriving zeros from reported data. For example, when an aggregated item ("TSER" or Total sales "TOT") is reported as zero, all its subitems are set to zero. This adds 114,484 additional points with the estimation code "D0", resulting in a total of 288,567 observations, of which 80.7% are zeros.

Derive mirror data from original dataset

In general, bilateral FATS sales reported in inward FATS by one country do not coincide with reported outward FATS of the corresponding partner. This is particularly true in the case of complex ownership chains, when the correct partner attribution is problematic. Even though discrepancies can be large, mirror data are used, especially for non-OECD countries, to estimate missing cells. When inward (or outward) values are not available and outward (or inward) values are reported by the trading partners, outward (inward) values are taken as first estimates. After this step, 206,874 additional points are estimated (190,743 are zeros). The updated dataset contains now 495,441 observations with about 83% of zero values. Table 8 gives an overview of the data availability by year.

Our final dataset does not necessarily have to be balanced, unlike previous studies (e.g. see CEPII and USITC) that use FDI and FATS data as an input for a CGE model.

Table 8: FATS sales number of observations*

Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Total	13745	18877	63538	76945	94383	43777	43090	43533	44656	45222	1305	489071
Zero	9529	13953	57748	69225	85524	34410	33730	33748	34651	34801	123	407442
Positive	4216	4924	5790	7720	8859	9367	9360	9785	10005	10421	1182	81629
Zero %	69	74	91	90	91	79	78	78	78	77	9	83.31
Pos. %	31	26	9	10	9	21	22	22	22	23	91	16.70

*Eurostat, OECD and national source after derivations steps. All reporters-partners, excluding E27, E28

Table 9: Number of reporters, partners, sectors per source

Description of the sources	Source codes	Reporter	Partner	Sectors
European countries from the Eutostat database	EU	32	63	15
European countries from the WTO database	EURO	30	1	12
Mirror data from EU	M-EU	60	30	15
Mirror data from OECD ISIC Rev.3	M-OECD3	40	2	4
Mirror data from OECD ISIC Rev.4	M-OECD4	67	5	13
National Sources	NAT	10	1	13
OECD country from WTO database	OECD	5	1	12
Data from OECD ISIC Rev.3	OECD3	3	41	4
Data from OECD ISIC Rev.4	OECD4	6	68	13

The proportion of missing data points is 77% in the reconstructed dataset with 39 countries. For a dataset of 205 countries, a full matrix contains about 95% of missing cells. However, in terms of trade values, the reported data represent more than 80% of the final dataset.

Reconstruct the total service sector (TSER) when necessary

Following the top-down approach, we first compile the dataset at the level of total services (TSER) before individual sectors. However, the composition of total services is different for NACE 1 and NACE 2. Furthermore, due to the different coverage of the surveys used by Eurostat to compile inward and outward FATS, total services sales are reported only on the outward side and have to be reconstructed for each country on the inward side. Table 10 summarizes the different TSER definitions used in the processing.

In 2008, Eurostat's methodology changed from NACE 1 to NACE 2. For this reason, two additional aggregated sectors TPSTC and REABU are only part of the NACE1 nomenclature and are only available before 2008.

Due to the unavailability of the sectors FIN, PERSO, EDUC, HEALTH, ARTS and OSERA[12] before 2008 in inward trade, the TSER definition changes before and after this break. When all sectors of each definition are reported, the total services for inward statistics are computed as:
- For NACE 1 (2005-2007):

$$TSER_{inward} = WHOREP + FOOD + TPSTC + REABU$$

- For NACE 2 (2008 onwards):

$$TSER_{inward} = WHOREP + FOOD + TPST + INFCOM + REA + PROF + ADMIN$$

It is important to note that the TSER definition excludes the wholesale and retail trade sector (WHOREP for the lack of adequate output data.

Finally, in order keep the consistency of the TSER definitions across years and flows, in chapter 5.3.3, the inward TSER for European countries is completed using bilateral mirror values taken from outward of the missing sectors FIN, EDUC, HEALTH, ARTS and OSERA.

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[12] Corresponding to respectively Financial intermediation; Social and personal services activities; Education; Health and social work; Arts, entertainment and recreation; Other service activities.

Table 10: List of the main services sectors available in the Eurostat FATS data

WTO Code	Description	NACE2	IWA-NACE1	IWA-NACE2	OWA-NACE1	OWA-NACE2
TSER	TOTAL SERVICES	G-S_X_O	X	X	X	X
WHOREP	Wholesale and retail trade	G	X	X	X	X
TPST	Transport and Storage	H		X		X
TPSTC	Transport, storage and communication		X		X	
FOOD	Accommodation and food services	I	X	X		X
INFCOM	Information and Communication	J		X		X
FIN	Financial Intermediation	K			X	X
REA	Real estate activities	L		X		X
REABU	Real estate, renting and business activities		X		X	
PROF	Professional, scientific and technical activities	M		X		X
ADMIN	Administrative and support activities	N		X		X
EDUC	Education	P85			X	X
HEALTH	Health and social work	Q			X	X
ARTS	Arts, entertainment and recreation	R				X
OSERA	Other service activities	S		X		X

5.3.2   Develop a complete dataset of FATS sales for EU/OECD countries with partner world

The first step towards a full matrix of FATS sales is to complete the European/OECD FATS sales with partner world and by main services sector. This is done for both inward (IWA) and outward (OWA) separately. The analysis follows a top-down approach by ensuring that all missing total services sectors (TSER) are estimated at the world level before estimating more detailed services sectors. As a second step, estimated subsectors are proportionally rescaled on the total services sales when TSER is reported. When no TSER can be derived due to the lack of reported data for all years, TSER is derived using the sum of the reported and estimated subsectors. This is an exception of the top-down approach. In this case, 330 individual observations, mostly for non-European countries, are flagged "tsum". Table 13 summarizes the counts of all estimation codes per country related to different steps described in this chapter.

Complete the sectors using back/forecasting and interpolation

Time series for which at least two observations are reported and starting after 2005 and or ending before 2015 are extrapolated using three-year moving average backcasting, and respectively forecasting to complete time series between 2005 and 2015. A smoothing parameter is introduced to ensure the smoothness of the time series, i.e. the increases or decreases are not big. Any series containing gaps are filled using a spline interpolation. All these estimates are assigned a code "int", applicable to 3441 individual observations.

Estimate missing services subsectors

For all the services subsectors containing a unique reported value within a time series, the ten remaining values are derived using the average growth rate reported in the source data. The average growth is computed over all sectors and all reporters. As no observation is reported for 2015, the average growth rate reporter in 2014 is used. The current procedure assigns a code "gr" to 613 cases.

Table 11: average growth applied

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Average IWA	1.28	1.40	1.18	0.82	1.02	1.13	0.98	1.02	1.04	1.04
Average OWA	1.16	1.47	0.88	1.02	1.020	1.20	1.04	1.12	1.01	1.01

In spite of the various basic estimations as explained above, 4306 cells remain empty. If no observations are reported for a specific subsector, the values are estimated by the models presented below.

Modelling

To complete the remaining cells, when no observations are reported for a specific sector, the values are estimated by regression models. The main problem with regressions is to find independent variables that significantly impact FATS sales while at the same time available by sector and for a maximum number of countries.

The full model is specified as:

$$ln(FAS_{rit}) = \alpha_0 + \beta_0 poly_t + \beta_1 sectors{:}ln(gdps_{rit}) + \beta_2 sectors{:}ln(BoP_{rit}) + \beta_4 ln(FDI_{rit}) + \beta_5 ln(ENT_{rit}) + \varepsilon_{rit}$$

where $\mathbf{FAS_{irt}}$ describes foreign affiliates sales in sector $\mathbf{i}$, host country $\mathbf{r}$ in year $\mathbf{t}$, and $\mathbf{\varepsilon_{rit}}$ is the error term. The regressions are run separately for both inward and outward trade flows. Because the explanatory variables presented do not have the same coverage, three nested models are used. In particular, when the FDI and the number of enterprises are available, they are used to predict sales. The extrapolated values come from three different models flagged "m1", "m2" and "m3" corresponding to the column names in Table 12.

Explanatory variables

$gdps_{rit}$ is the GDP broken down by sector. This dataset was gathered from different sources[13]. The higher the size of the reporting (host) country, the higher the chances are for the partner to establish and serve the local market via an affiliate.

BoP_{rit} is the trade from the Balance of Payment (BOP) estimated in chapter 4.1. Trade has the advantage of having a wide coverage and a reasonable good explanatory power. One can expect that higher services trade has a negative impact on FATS sales because affiliates are seen as a substitute of imports and exports.

FDI_{rit} is the foreign direct investment stocks indicator pulled out from Eurostat and OECD databases. Other sources will be later investigated. The higher the foreign direct investments in the total services, the higher the foreign affiliates sales. When investments are reported as zero, the sales are automatically set to zero. This happens for 286 observations, coded "set0".

ENT is the number of enterprises by sector available in the Eurostat and OECD FATS database. The set of coefficients is obtained using log-linearized Ordinary Least Squares (OLS) models. For this reason, the negative values in FDI have been discarded for the analysis. Models are fitted with and without country fixed effects (FE) for the sake of comparison. Because the models with country FE cannot be used for out-of-sample

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[13] UNCTAD, Eurostat, OECD and various national sources

predictions, the coefficients obtained without FE are used to predict corresponding non-reported values.

$poly_t$ represents the time trend modelled by a first order polynomial.

Finally, The impact of the GDP and the BOP may not be the same across sectors. Therefore, sector dummies are introduced to take into account the various interactions between sectors and GDP, as well as between sectors and BOP.

Table 12: Restults of regressions (IWA and OWA) with partner world

	IWA M1	IWA M1	IWA M2	OWA M2	OWA M3	OWA M3
CONSTANT	-41.400***	-48.700***	-26.400	-168.000***	-134.000**	-19.500
	(.006)	(.001)	(.163)	(.003)	(.014)	(.586)
POLY(YEAR, POLY, RAW = T)	.020***	.024***	.012	.079***	.061**	.004
	(.007)	(.002)	(.199)	(.005)	(.024)	(.803)
LNVALUEBOP	.205**	.206**	.342***	.413	.420	.382
	(.017)	(.019)	(.0001)	(.227)	(.227)	(.113)
LNGDP	.787***	.791***	.710***	.851***	.921***	.968***
	(0.000)	(0.000)	(0.000)	(.006)	(.003)	(0.00000)
LNVALUEFDI	.008***	.011***		.029***	.027***	
	(.004)	(.0002)		(.0004)	(.001)	
NUM_ENT	.00002***			.0004***		
	(0.000)			(0.000)		
ARTS				2.310	3.630	3.270
				(.659)	(.494)	(.409)
EDUC				6.800	7.970	6.350
				(.463)	(.398)	(.259)
FIN	-.180	-.197	1.670	2.080	-1.220	-.084
	(.872)	(.859)	(.252)	(.521)	(.704)	(.975)
FOOD	.874	.914	2.180*	-7.350*	-6.380	-6.450*
	(.326)	(.308)	(.054)	(.086)	(.140)	(.078)
HEALTH				-1.080	-1.010	-.917
				(.870)	(.881)	(.854)
INFCOM	3.580***	3.390***	3.930***	-7.620**	-8.830**	-9.810***
	(.00004)	(.0001)	(.0005)	(.038)	(.018)	(.001)
OSERA	-3.780	10.700	-2.500	-3.010	-1.770	-4.500
	(.985)	(.538)	(.223)	(.465)	(.672)	(.186)
PROF	.188	-.257	.123	-4.670	-8.760**	-8.810***
	(.833)	(.777)	(.913)	(.205)	(.017)	(.002)
REA	6.900***	6.300***	7.890***	-1.960	-1.710	-3.550
	(0.000)	(0.000)	(0.000)	(.555)	(.613)	(.200)
REABU	-1.770	-1.740	-.417	12.400	1.200	2.130
	(.201)	(.208)	(.839)	(.686)	(.914)	(.845)
TPST	2.710***	2.620***	4.240***	-9.390**	-9.560**	-7.580**
	(.004)	(.006)	(.001)	(.019)	(.015)	(.018)
WHOREP	3.820***	2.960***	5.410***	11.800***	4.850	4.040
	(.00001)	(.0005)	(0.00000)	(.001)	(.146)	(.130)
Reporter FE	YES	NO	YES	NO	YES	NO
Observations	1,494	1,534	1,954	1,004	1,051	1,549
R-squared	.921	.917	.829	.767	.756	.751
Adjusted R-squared	.919	.916	.826	.757	.746	.745

Standard errors are robust for plm p-values in parenthesis

* p<.1, ** p<.05, ***<.01

Notes :

Sectoral interactions have been introduced with

LNVALUEBOP and LNGDP but are not shown in the output table

Table 13 List of European countries - count of estimation codes
(all sectors, IWA & OWA)

id	Code	Name	I_TSER	O_TSER	back_sum	gr	int	msec	R	set0	tsum
1	AU	Australia				6	10		237	1		22
2	AT	Austria	8	10		34	74	44	146			
3	BE	Belgium	3	10	3		109	58	128			
4	BA	Bosnia and Herzegovina	1		6	20	54	182	14			11
5	BG	Bulgaria	9		3	10	22	157	73		11	11
6	CA	Canada		8	6		83	72	126			11
7	CN	China			6			248				22
8	CR	Costa Rica	2	2	6		234	6	52			
9	HR	Croatia	3	5	6		126	50	105		11	
10	CY	Cyprus		8		30	84	69	104			11
11	CZ	Czech Republic	10	10		10	78	47	163			
12	DK	Denmark	8	1	3	130	28	58	79			
13	EE	Estonia	4		3		34	179	60			11
14	E27	European Union (27)			6	10	54	1	13			
15	E28	European Union (28)			6		49	182	28			22
16	FI	Finland	8	10		10	84	22	160		22	
17	FR	France	10	7		10	87	47	154			
18	DE	Germany	9	10			69	55	174			
19	GR	Greece	3	10	3		102	58	135			
20	HK	Hong Kong, China			3		2	237	23			22
21	HU	Hungary	10	9			91	46	161			
22	IN	India			6		47	182	30			22
23	IE	Ireland	5	5	6	10	119	17	80		66	
24	IL	Israel			3		34	204	35			22
25	IT	Italy	10	10		10	59	44	185			
26	JP	Japan	5	5	6		98	105	89			
27	KR	Korea, Republic of			6	70		127	7		55	22
28	LV	Latvia	8	8			118	47	133			
29	LT	Lithuania	9	8			102	47	138		11	
30	LU	Luxembourg		6	3	13	97	72	80		11	11
31	MT	Malta	1	5	6	20	109	61	69		22	
32	NL	Netherlands	6		3	10	32	146	63		22	11
33	NZ	New Zealand			6	110		94	11		44	22
34	NO	Norway	6	6	3	3	109	61	122			
35	PL	Poland	7	6		17	96	69	116			
36	PT	Portugal	10	10		10	86	47	155			
37	RO	Romania	10	7		10	83	47	158			
38	RS	Serbia	5		6		48	182	40			11
39	SK	Slovak Republic	10	10		10	90	47	151			
40	SI	Slovenia	5	6	3	10	112	47	126			
41	ES	Spain	9	6		13	93	58	123		11	
42	SE	Sweden	10	8		10	91	47	150			
43	TH	Thailand			6		60	149	50			22
44	GB	United Kingdom	9	6		3	97	58	140			
45	US	United States of America	7	7			79	6	213			
46	VN	Viet Nam			6		60	127	72			22
47	ZM	Zambia			6	10	58	160	31			22
	Total	TOT	220	219	141	613	3441	4306	4466	286	330	

Table 14 List of estimation codes

Definition	Codes
Name	WTO country codes
I_TSER	Number of TSER points derived for inward FATS when all subsectors are reported
O_TSER	Number of TSER points available for outward FATS
back_sum	Number of NACE 1 aggregate sector points backcasted from the sum of the corresponding NACE2 sectors
gr	Number of points estimated by mean of available growth rate
int	Number of points estimated by three year moving average for- or backcasting and interpolations with corrections
msec	Number of points estimated by model by sector
R	Number of Reported points in the FATS dataset
set0	Number of points set to zero when FDI is reported as zero
tsum	Number of TSER points derived by the sum of subsectors estimated

5.3.3   Develop a complete dataset of FATS sales for the remaining countries with partner world

Having completed the dataset for the European and the remaining OECD countries, the next step is to predict sales for the remaining 157 countries with partner world. In order to take advantage of all available FATS information, reported bilateral statistics are used to predict sales by partner and by sector. Then, predicted bilateral sales are summed up to obtain partner world for the 157 remaining countries.

Complete the sectors using back/forecasting and interpolation

To estimate bilateral sales by services sector, the same approach as for partner world is used with slight differences. First, TSER and the subsectors are completed by means of interpolation, back- and fore-casting techniques as described in the previous chapter. Because the final TSER definition does not incorporate wholesale and retail trade.

Use econometric techniques to compute bilateral sales

It is difficult to find drivers of the FATS sales that have a wide coverage, i.e. explanatory variables that impact the FATS sales and at the same time are available for all countries, all years with information at the sector level. First, a gravity model is fit on a pooled sample to estimate the main drivers of the commercial presence. Then, the set of coefficients obtained is used to extrapolate missing values.

An additional problem presented by bilateral FATS dataset by sector is the large number of zeros and missing values due to confidentiality, rounding values, missing values and constrained set of countries available. To overcome these problems, the estimation procedure of this work is inspired by Lakatos and Fukui (2012). In their paper, different econometric strategies are investigated: the Poisson Pseudo Maximum Likelihood (PPML) proposed by Silva and Tenreyro (2006), the Zero Inflated Poisson (ZIP) and Zero Inflated Negative Binomial (ZINB). The PPML is retained because it produces a dataset with heterogeneity across sources, host, and sectors consistent with actual data.

Our full **gravity model** is specified as:

$$FAS_{rst} = \alpha_0 + \beta_1 year_t + \beta_2 ln(BoP_{rit}) + \beta_3 ln(gdps_{rit}) + \beta_4 ln(gdps_{sit})$$
$$+ \beta_5 ln(GDPpc_{rt}) + \beta_6 ln(GDPpc_{st}) + \beta_7 ln(dist_{rs}) + \beta_8 colony_{rs} \quad (Eq.\ 5\text{-}1)$$
$$+ \beta_9 contig_{rs} + \beta_{10} ln(comlang_{rs}) + \beta_{11} ln(landlocked_r)$$
$$+ \beta_{12} ln(smctry_{rs}) + \beta_{13} ln(islands_r) + \varepsilon_{rst}$$

where FAS_{irst} describes foreign affiliates sales in sector i, host country r of affiliates in country s in year t, and ε_{rst} is the error term.

The policy-related variables used by Lakatos and Fukui T. (2012) have been discarded from the analysis because: (1) they do not have a wide coverage and; (2) the users may want to combine the final bilateral FATS sales dataset with these trade policy variables. The source of the explanatory variables, their definition, and their abbreviation as well as their econometric interpretation are described below. In total, there are 13 variables included in the regressions.

Transport costs and trade barriers

The rational is that the higher the transport costs and trade barriers, the bigger the affiliates sales. Commercial presence is viewed as an alternative way of serving the foreign market if exports become more expensive. These first variables come from the CEPII website, in the GEODIST section. They are time invariant and available for the 224 different countries:

$dist_{rs}$ is the distance between source and host capital cities weighted by the relative population of the city compared to the country's population. As it is commonly done in gravity models, the distance is used as a proxy to account for trade costs between two countries. The distance is expected to have a negative impact on the level of sales of the foreign affiliates;

$colony_{rs}$ is a binary variable taking the value of 1 if the country is a colonial relationship with its trading partner and 0 otherwise. The sign is expected to be positive;

$Contig_{rs}$ is a binary variable that takes the value of 1 if the pair of countries share a common border;

$comlang_{rs}$, a binary variable that takes the value of 1 if at least 9% of the residents of both countries share at least one language;

$landlocked_r$, a dummy variable is equal to 1 for landlocked countries;

$smctry_{rs}$, a dummy variable is equal to 1 if the country are/were the same;

$islands_r$ a dummy variable taking the value 1 if the destination country is an island.

<u>Gross domestic products</u>

The most commonly used variables in trade models are certainly GDP, GDP per capita and growth rates of GDP. Larger size of home and host country raises affiliate sales with the former having a larger impact. The measures of GDP for the rest of the world and GDP per capita are directly pulled out from the World Bank's Development Indicators (WDI). They cover 194 countries.

$gdps_{sit}$ and $gdps_{rit}$ are the GDP broken down by sector of the source and host countries, respectively. This dataset was gathered and processed internally by the WTO staff for previous uses. The greater the size of the countries, the higher the chances to establish and serves the local market via an affiliate.

$GDPpc_{rt}$ and $GDPpc_{rt}$ are the gross domestic product divided by midyear population for both the origin and the destination countries. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. According to Lakatos and Fukui (2012), GDP per capita enables regressions to produce results after extrapolation less biased by the size of country.

<u>Trade related measures</u>

BOP_{rit} represents the full dataset of the Balance of Payment with partner world, estimated in chapter 4.1. Imports and exports are used for the estimation of inward and outward FATS respectively.

Table 15 provides a statistical summary of the above-mentioned variables. Only the reported values, the mirror values and the simple derivations are used in the samples of the regressions used to derive the sets of coefficients. The resuting predictions are flagged "ppml". The results of the econometric estimation are presented by flow and by sector in ANNEX 4. and ANNEX 5.

Econometric results

In ANNEX 4. , as expected, we find a positive effect (and generally significant) for both host and source country's GDP and GPD per capita. These variables are significant for all models for inward and outward. Imports seem to have a postivie impact on almost all the sectors. The distance variable has, as expected, a negative coefficient exept for the HEALTH sector. This means that foreign affiliate sales tend to be lower if two countries are farther away. Colony has a positive expected sign and contig has a negative sign in most cases. Comlang has a positive (but not always significant) impact on FATS sales.

5.4   Quadratic Optimization

The objective of chapter 5 is to obtain a full matrix of FATS sales data. The quadratic optimization ensures the consistency between the estimates and the reported data from the Eurostat and the OECD and between the different aggregation levels. However, this step does not balance the flows of the inward and outward matrices, like it is done in (BACKER, 2017) (Tani Fukui, 2012) or in (Gouel C. Guimard H. Laborde D., 2012).

For this purpose, the objective function is the miminization of the sum of squares of the difference between the dataset obtained after ch. 5.3.3 and the final values. The reported values are fixed and the starting values are set to the estimates obtained at 5.3.3.

The optimization problem is of the form:

$$Min \left\{ \sum_{irs} \frac{(FATS^1_{irs} - FATS^0_{irs})^2}{w_{irs}} + \sum_{rs} \frac{(FATS^1_{rs} - FATS^0_{rs})^2}{w_{rs}} + \sum_{ir} \frac{(FATS^1_{ri} - FATS^0_{ri})^2}{w_{ir}} \right.$$
$$\left. + \sum_{is} \frac{(FATS^1_{is} - FATS^0_{is})^2}{w_{is}} + \sum_{s} \frac{(FATS^1_{s} - FATS^0_{s}}{w_{s}})^2 \right\}$$

$s.t.$

$$\sum_{rs} FATS^1_{rs} = FATS^0_{rs}$$

$$\sum_{ri} FATS^1_{ri} = FATS^0_{ri}$$

$$\sum_{s} FATS^1_{s} = FATS^0_{s}$$

$$\sum_{r} FATS^1_{r} = FATS^0_{r}$$

The estimates are rescaled to ensure the sum across partners correspond to the values reported with partner world of ch. 5.3.2. The TSER are completed with the missing sectors estimated by the different regressions.

The opimization procedure is under process and the final version of the dataset will be consistence across all dimensions. For the time being the consistency between the different dimensions is not ensured in the preliminary version of the FATS sales dataset.

Table 15: Summary table of the variables for TSER

id	Description	Names	Years available	Source	Dimension	Units	Mean	Median	Min	Max	Std.error
1	FATS sales inward	VALUE_I	2005-14	Eurostat/OECD	sector, source, host, date	$ billion	2.25	0.000	0.00	366.49	14.73
2	FATS sales outward	VALUE_O	2005-14	Eurostat/OECD	sector, source, host, date	$ billion	2.75	0.000	0.00	425.12	17.85
3	Distance	DIST	-	CEPII	source, host	Km	8338	7954	60	19781	4606
4	Landlocked	ANDLOCKED	-	CEPII	source, host	binary	0.17	0.000	0.00	1.00	0.38
5	Are/were the same country	SMCTRY	-	CEPII	source,host	Binary	0.008	0.000	0.00	1.00	0.09
6	Colonial link	COLONY	-	CEPII	source, host	binary	0.01	0.000	0.00	1.00	0.10
7	Contiguity	CONTIG	-	CEPII	source, host	binary	0.01	0.000	0.00	1.00	0.12
8	Common language	COMLANG	-	CEPII	source, host	binary	0.16	0.000	0.00	1.00	0.37
9	GDP in total services, host	GDPS_O	2005-15	WTO	host, date	$ billion	247	13.151	0.00	30943.17	1257
10	GDP in total services, source	GDPS_OD	2005-15	WTO	source, date	$ billion	247	13.151	0.00	30943.17	1257
11	GDP per capita, host	GDPPCO	2005-15	World Bank	host, date	$ billion	13588	5048	102	116612	19209
12	GDP per capita, source	GDPPCOD	2005-15	World Bank	source, date	$ billion	13618	5042	0.84	1807771	20236
13	Total services import	BOP_I	2005-15	IMF	sector, source, host, date	$ million	18780	1866	0.00	467142	48759
14	Total services export	BOP_O	2005-15	IMF	sector, source, host, date	$ million	19462	1532	0.00	730590	56620
15	Islands	ISLANCDS	-	Wikipedia	Source	binary	0.28	0.000	0.00	1.00	0.45

Gdp per sector is, for the time being, not available for all countries. In particular, 31 countries (see ANNEX 9.) are missing in the estimation procedure. For the time being, because the size of their FATS sales may be negligible, for these countries, TSER is manually set to zero and the cells are coded "mset".

Discussion of the results

The final FATS sales dataset has 204 countries and 13 services sectors. It contains about 11 million cells, of which 74% are zero values.

Table 16: Number of observation in the final FATS sales dataset

Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Total	1001657	1001654	1001669	1002496	1002559	994582	994581	994581	994581	990620	990620	10969600
Zero	812174	792578	771961	750861	759738	733644	720132	714155	704863	699151	702429	8161686
Positive	189483	209076	229708	251635	242821	260938	274449	280426	289718	291469	288191	2807914
Zero %	81	79	77	75	76	74	72	72	71	71	71	74
Pos. %	19	21	23	25	24	26	28	28	29	29	29	26

Veryfing the validity of the results is a difficult task. The different services sectors ar are not reported by all countries and the data source is scarce. In ANNEX 10. , the shares are computed for the aggregated reported services sectors and for the extrapolated results. It makes more sense to compare shares computed for outwards trade flow ISIC4 definition because of the inconsistent statistical definitions of inward trade flow. The two tables look rather similar. The financial sector and the sector of Information and Communication are the dominant sectors in both cases.

6   Preliminary results for all modes

Convert values into EBOPS categories using a correspondence table and merge the dataset with the Balance of Payment dataset

The final dataset with partner world is merged with the BOP dataset using the distribution table between EBOPS 2010 product-based classification and the ISIC services sectors provided in ANNEX 7. . Further discussions will help refine the correspondences, especially the distribution of the allocation from the FATS sectors to the EBOPS product-based categories. In the future, new detailed breakdowns might be included in the estimation.

Compute the modes of supply

Table 17 presents the results for total services at the most aggregated level.

An interactive Shiny application[14] has been developed to better visualize and analyze the results broken down by mode.

Table 17: Total trade in services by mode for all countries

Flow	Year	Values					Shares			
		M1	M2	M3	M4	TOT	M1	M2	M3	M4
M	2005	1499	893	2098	209	4699	32	19	45	4.4
M	2006	1710	959	2591	245	5504	31	17	47	4.5
M	2007	2013	1119	3273	304	6710	30	17	49	4.5
M	2008	2309	1230	3182	360	7082	33	17	45	5.1
M	2009	2056	1074	2819	343	6292	33	17	45	5.5
M	2010	2276	1177	3230	347	7030	32	17	46	4.9
M	2011	2553	1310	3534	388	7785	33	17	45	5.0
M	2012	2606	1383	3762	408	8159	32	17	46	5.0
M	2013	2739	1483	3935	437	8594	32	17	46	5.1
M	2014	2913	1637	4312	477	9339	31	18	46	5.1
M	2015	2727	1544	3761	451	8483	32	18	44	5.3
X	2005	1469	943	2791	234	5437	27	17	51	4.3
X	2006	1683	1024	3088	272	6068	28	17	51	4.5
X	2007	2028	1200	3489	332	7049	29	17	49	4.7
X	2008	2261	1335	3855	395	7846	29	17	49	5.0
X	2009	1994	1198	4023	370	7584	26	16	53	4.9
X	2010	2196	1303	4228	394	8121	27	16	52	4.9
X	2011	2463	1455	4560	452	8931	28	16	51	5.1
X	2012	2529	1487	4682	472	9170	28	16	51	5.1
X	2013	2688	1587	4928	504	9708	28	16	51	5.2
X	2014	2892	1660	5096	554	10202	28	16	50	5.4
X	2015	2712	1582	5144	523	9961	27	16	52	5.3

Total services with partner world are expressed in $ billion

6.1   Compare results

The estimated FATS services sales dataset will be compared the gross output as well as the total sales in order to validate the results.

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[14] for the time being, the application can only be launched from a PC within the WTO but the application with be published at a later stage.

7 Discussion of results at total level and by mode

7.1 Additional info

7.1.1 Relation with bilateral data – the OECD/WTO balanced trade in services data

The OECD and WTO are working on the development of a coherent bilateral trade in services dataset that leverages all available official trade in services information. The ultimate goal of this work is to develop a dataset that forms an international benchmark for trade in services statistics. It is based on a transparent methodology and is constantly improved as new data become available. The development of this dataset, its methodology, and the current ongoing work, is ultimately driven by the need to develop high quality and transparently developed detailed trade in services statistics for the purposes of constructing global Supply and Use and Input-Output tables. As such, it is difficult to overstress the importance of international collaboration; in order to achieve a common view of internationally coherent trade in services statistics – in other words, a public good and an international benchmark. In addition, however to its use for TiVA, the dataset serves as a standalone product, serving the development of new insights on trends in international trade in services and supporting the development trade in services policies. Finally, it is hoped that the dataset, in itself, creates a virtuous circle that helps countries in compiling trade in services data. For example, through the identification of important trade in services partners, that in turn will help to improve the quality of the global dataset.

Linking the dataset on trade in services by sector and mode of supply to this bilateral trade in services dataset would offer a more complete analytical basis of service trade.

7.1.2 Services trade restrictiveness indices

To be further elaborated…Ideally, this section will explore how best the resulting dataset by sector, partner and mode of supply can be exposed to trade restrictiveness indices to analyze the impact of a country's applied regime on trade in services.

7.1.3 Trade in value added

Services appear in global value chains in different ways. They can be input into the production of goods, or can itself be part of a value production. While the first may be organized in a linear way (snakes), the second may be the sum of components (spiders).
In the case of snakes or embodied services in goods production, input-output tables will be linked through trade in services data which cover resident/non-resident transactions. Hence, modes 1, 2 and 4 would be covered. However, mode 3 production will contribute to the domestic value added. (Cernat, Liberalizing global trade in Mode 5 services: how much is worth? (with A. Antimiani)) this chapter would further explore how to make the foreign affiliates share in value added terms evident.

7.1.4 Risks for developing the dataset

Interlinkages exist between modes. For example, a mode 3 commitment may facilitate the provision of a service; in combination with mode 4 by an intra-corporate transfer. Further, though certain EBOPS categories are associated with a particular mode, for instance, travel with mode 2, service transactions in other EBOPS categories may also fall under this mode. However, for the time being, such interlinkages between modes will not be considered further.
Double counting, between balance of payment transactions, relating to trade in services and information derived from foreign affiliates statistics (overlap between frameworks) is another issue of concern and will require further in-depth analysis; based on existing FATS data whose

turnover is split into domestic sales, sales to the home country of the affiliate and sales to third countries.

The newly developing digital trade agenda may also impact the allocation and analysis of modes. For example, is a (financial) service provided through the Internet a cross-border (mode 1) or consumption abroad service (mode 2)?

8 Conclusion

8.1 (to be added)

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10 Annex

ANNEX 1. FIRST EBOPS BREAKDOWN USED IN THIS STUDY AND SIMPLIFIED ALLOCATION

	Indicator code	Item EBOPS	M1	M2	M4
1	SOX	Commercial services			
2	¦--SPX4	Goods-related services			
3	¦ ¦--SA	Manufacturing services on physical inputs owned by others		100	
4	¦ °--SB	Maintenance and repair services not included elsewhere		90	10
5	¦--SC	Transport			
6	¦ ¦--SCA	Passenger (All modes of transport), alternative measurement	100		
7	¦ ¦--SCB	Freight (All modes of transport) , alternative measurement	100		
8	¦ ¦--SCC	Other (All modes of transport) , alternative measurement		100	
9	¦ ¦--SC1	*Sea transport*			
10	¦ ¦ ¦--SC11	Passenger (Sea)	100		
11	¦ ¦ ¦--SC12	Freight (Sea)	100		
12	¦ ¦ °--SC13	Other (Sea)		100	
13	¦ ¦--SC2	*Air transport*			
14	¦ ¦ ¦--SC21	Passenger (Air)	100		
15	¦ ¦ ¦--SC22	Freight (Air)	100		
16	¦ ¦ °--SC23	Other (Air)		100	
17	¦ ¦--SC3	*Other transport*			
18	¦ ¦ ¦--SC31	Passenger (Other)	100		
19	¦ ¦ ¦--SC32	Freight (Other)	100		
20	¦ ¦ °--SC33	Other (Other)		100	
21	¦ °--SC4	Postal and courier services	100		
22	¦--SD	Travel			
23	¦ ¦--SD1	Goods, alternative measurement		100	
24	¦ ¦--SD2	Local transportation services, alternative measurement		100	
25	¦ ¦--SD3	Accomodation services, alternative measurement		100	
26	¦ ¦--SD4	Food-serving services, alternative measurement		100	
27	¦ ¦--SD5	Other services, alternative measurement		100	
28	¦ ¦--SDA	*Business travel*			
29	¦ ¦ ¦--SDA1	*Acquisition of goods & services by border, seasonal & other short-term workers*		100	
30	¦ ¦ °--SDA2	*Other business travel*		100	
31	¦ °--SDB	*Personal travel*			
32	¦ ¦--SDB1	Health-related travel		100	
33	¦ ¦--SDB2	Education-related travel		100	
34	¦ °--SDB3	Other personal travel		100	
35	°--SOX1	Other commercial services			
36	¦--SE	Construction			100
37	¦--SF	Insurance and pension services	100		
38	¦--SG	Financial services	100		
39	¦--SH	Charges for the use of intellectual property n.i.e.	100		
40	¦--SI	Telecommunications, computer, and information services			
41	¦ ¦--SI1	*Telecommunications services*	100		
42	¦ ¦--SI2	*Computer services*	50		50
43	¦ °--SI3	*Information services*	100		
44	¦--SJ	Other business services			
45	¦ ¦--SJ1	*Research and development services*	75		25
46	¦ ¦--SJ2	*Professional and management consulting services*	75		25
47	¦ ¦ ¦--SJ21	Legal, accounting, management, consulting and public relations	75		25
48	¦ ¦ °--SJ22	Advertising, market research, public opinion polling	75		25
49	¦ °--SJ3	*Technical, trade-related, and other business services*			
50	¦ ¦--SJ31	Architectural, engineering, scientific and other technical services			
51	¦ ¦ ¦--SJ311	Architectural services	75		25
52	¦ ¦ ¦--SJ312	Engineering services	75		25
53	¦ ¦ °--SJ313	Scientific and other technical services	75		25
54	¦ ¦--SJ32	Waste treatment and de-pollution, agricultural and mining services		50	50
55	¦ ¦--SJ33	Operating leasing services	100		
56	¦ ¦--SJ34	Trade-related services	100		
57	¦ °--SJ35	Other business services n.i.e.	75		25
58	°--SK	Personal, cultural, and recreational services			
59	¦--SK1	*Audio-visual and related services*	75		25
60	°--SK2	*Other personal, cultural, and recreational services*			
61	¦--SK21	*Health services*	75		25
62	¦--SK22	*Education services*	75		25
63	¦--SK23	*Heritage and recreational services*	75		25
64	°--SK24	*Other personal services*	75		25

Note: Highlighted indicator codes are alternatives classifications to report SD and SC

ANNEX 2. LIST OF COUNTRY AND SECTOR SPECIFIC ALLOCATION

Indicator code	WTO			Spain			United States			India			European Union		
	M1	M2	M4	M1	M2	M4	M1	M2	M4	M1	M2	M4	M1	M2	M4
SOX															
SPX4															
SA		100		61	39	0.2									
SB		90	10	18	65	17		100							
SC				84	15	0.1							77	23	
SCA	100														
SCB	100														
SCC		100													
SC1															
SC11	100														
SC12	100														
SC13		100													
SC2															
SC21	100														
SC22	100														
SC23		100													
SC3															
SC31	100														
SC32	100														
SC33		100													
SC4	100														
SD		100													
SD1		100													
SD2		100													
SD3		100													
SD4		100													
SD5		100													
SDA															
SDA1		100													
SDA2		100													
SDB		100													
SDB1		100													
SDB2		100													
SDB3		100													
SOX1															
SE			100	38	0.2	42		50	50						
SF	100			80		0.8									
SG	100			100		0.4									
SH	100			99		0.8									
SI				98		2.2				70	0.1	17	63		37
SI1	100						100								
SI2	50		50												
SI3	100														
SJ				88	0.5	11							76		24
SJ1	75		25												
SJ2	75		25				67		33						
SJ21	75		25												
SJ22	75		25												
SJ3															
SJ31	75		25				33		33						
SJ311	75		25												
SJ312	75		25												
SJ313	75		25												
SJ32		50	50						50						
SJ33	100														
SJ34	100														
SJ35	75		25												
SK	75		25	88	0.5	8			100						
SK1	75		25												
SK2															
SK21	75		25												
SK22	75		25												
SK23	75		25												
SK24	75		25												

Total Import/Export by region broken down by MoS
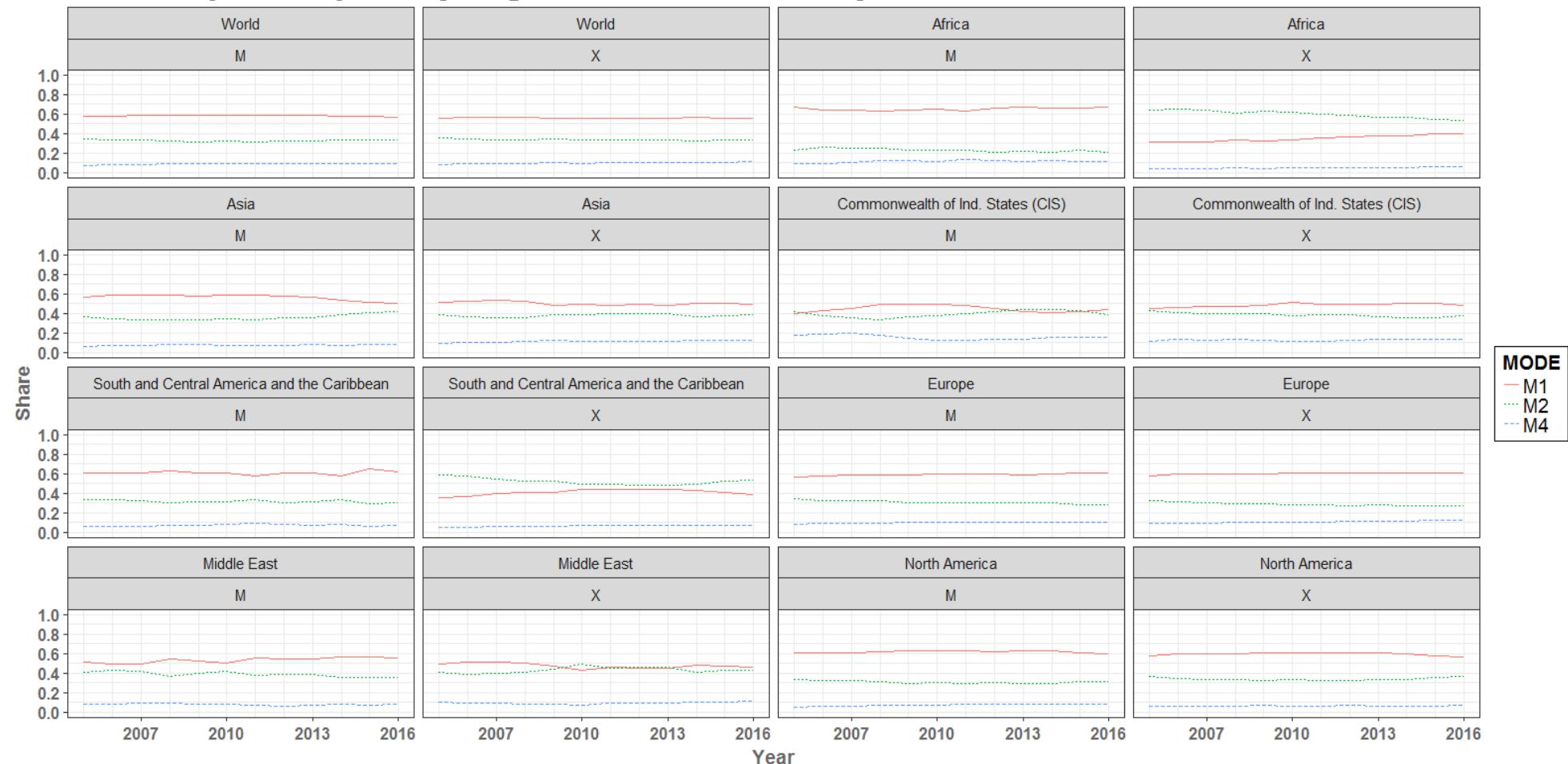
Total Import/Export by main item broken down by MoS
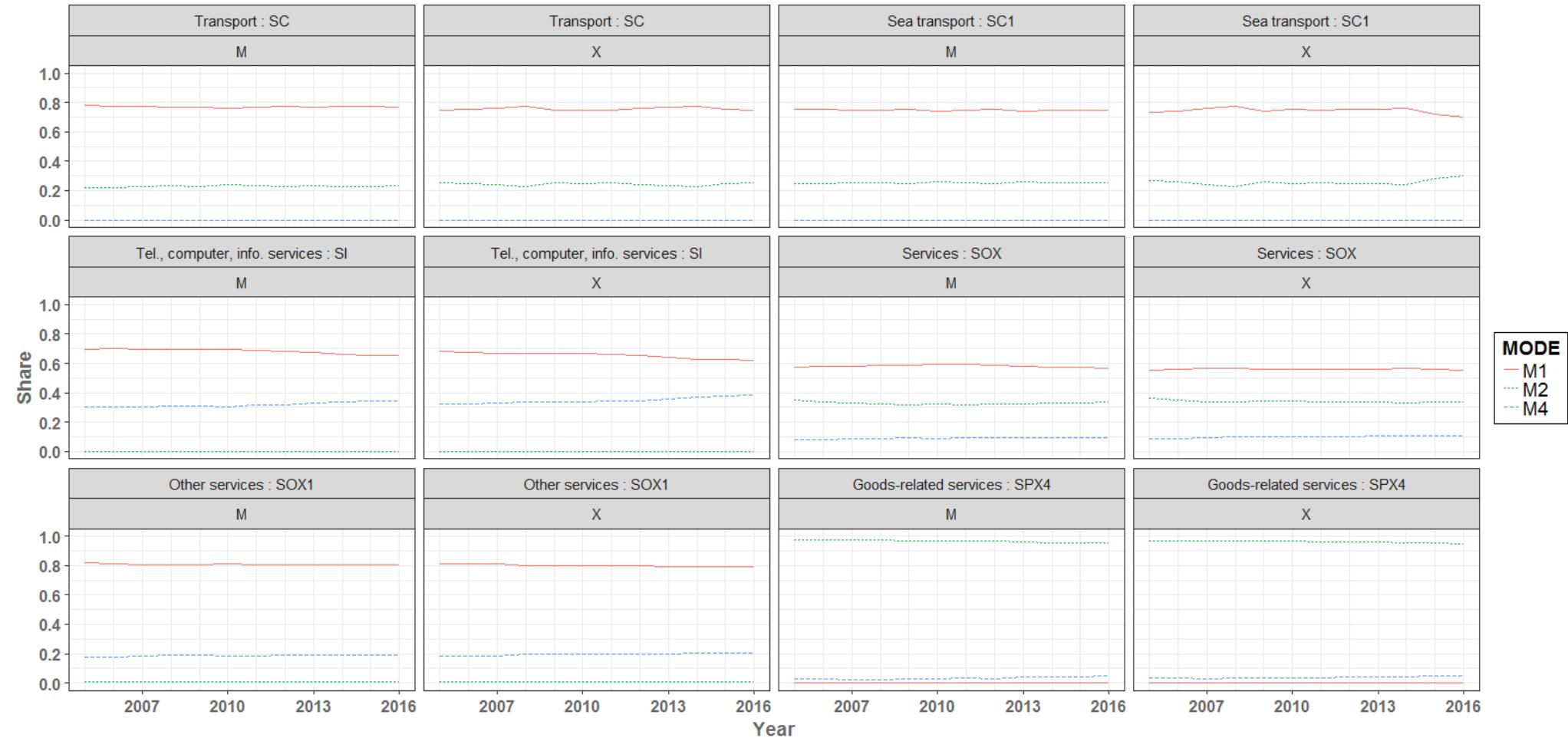
Inward - regression by sector (1)

	TSER	ADMIN	ARTS	EDUC	FIN	FOOD
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	61.863***	56.964**	46.738	579.997***	5.465	42.549
	(.001)	(.011)	(.684)	(.00001)	(.818)	(.181)
POLY(YEAR, POLY, RAW = T)	-.052***	-.050***	-.040	-.309***	-.017	-.041**
	(0.000)	(.00002)	(.523)	(.000002)	(.196)	(.012)
LNBOP_I	.184**	-.107***	-.096	1.271**	.163**	.358**
	(.036)	(.009)	(.299)	(.015)	(.044)	(.014)
LNGDPS_O	.705***	.833***	.918***	-.283	.636***	.622***
	(0.000)	(0.000)	(.003)	(.594)	(0.000)	(.000001)
LNGDPS_D	.889***	.925***	.944***	1.895***	.855***	1.011***
	(0.000)	(0.000)	(.00005)	(.0001)	(0.000)	(0.000)
LNGDPPCO	.049	.315***	.769	.687*	.316***	.134
	(.660)	(.005)	(.158)	(.071)	(.005)	(.552)
LNGDPPCD	2.037***	2.316***	.526	-.539	.900***	1.476***
	(0.000)	(0.000)	(.186)	(.507)	(.00004)	(.000002)
LNDIST	-.705***	-.672***	-.594	-2.296***	-.548***	-.901***
	(0.000)	(0.000)	(.118)	(0.000)	(0.000)	(0.000)
COLONY	.805***	.764***	.142	2.631***	.785***	1.061***
	(.0001)	(.00001)	(.890)	(.001)	(.001)	(.009)
CONTIG	-.149	-.041	.964*	-3.269***	.393	-.428
	(.352)	(.831)	(.097)	(.000005)	(.122)	(.219)
COMLANG_ETHNO	.017	-.053	.976*	1.650***	-.010	.352
	(.921)	(.744)	(.056)	(.009)	(.962)	(.302)
LANDLOCKED	.323	.028	.016	-2.980*	-.008	-.074
	(.103)	(.897)	(.976)	(.054)	(.973)	(.777)
SMCTRY	.017	.070	-.703	-29.247***	-.320	-.652
	(.960)	(.887)	(.616)	(0.000)	(.528)	(.196)
ISLANDS	.170	.334**	.285	-.750	.443***	-.208
	(.379)	(.021)	(.593)	(.207)	(.005)	(.517)
R2	0.823	0.692	0.515	0.671	0.692	0.471
N	11686	14924	12926	14954	14924	18370
# Zeros	9414	12146	12875	12157	12146	16232
# of mirror	8236	9424	12820	13833	9424	11249
Mean MAE (USD in M)	392.53	88.94	0.47	643.09	88.94	32.94
Mean RMSE (USD in M)	2075.88	6.25	2928.25	503.94	248.83	
Observations	11,686	14,924	12,916	12,926	14,954	18,370

Notes :

Standard errors are robust for ppml
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

	HEALTH	INFCOM	OSERA	PROF	REA	TPST
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-394.882***	45.376**	-374.249***	-13.336	148.857***	2.260
	(.0003)	(.049)	(.0002)	(.530)	(.00001)	(.926)
POLY(YEAR, POLY, RAW = T)	.169***	-.039***	.161***	-.011	-.092***	-.020
	(.001)	(.001)	(.002)	(.316)	(0.000000)	(.116)
LNBOP_I	1.282**	.213**	.998**	.088	.233**	.175
	(.016)	(.014)	(.011)	(.429)	(.030)	(.167)
LNGDPS_O	-.043	.534***	.140	.790***	.611***	.664***
	(.924)	(0.000)	(.576)	(0.000)	(0.0000)	(0.0000)
LNGDPS_D	.631***	.931***	2.011***	.946***	.626***	1.046***
	(.007)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LNGDPPCO	1.306	.191	.109	.123	.236*	.238***
	(.201)	(.232)	(.497)	(.292)	(.086)	(.007)
LNGDPPCD	.697	1.350***	-.006	1.248***	2.039***	1.476***
	(.115)	(0.000)	(.995)	(0.000)	(0.000)	(0.000)
LNDIST	.334	-.497***	-1.196***	-.625***	-.827***	-.889***
	(.703)	(.000001)	(.004)	(0.000)	(0.000)	(0.000)
COLONY	1.726**	.387	1.879***	1.017***	.902***	.212
	(.028)	(.145)	(.009)	(.0003)	(.001)	(.379)
CONTIG	2.499	-.209	-2.571***	-.127	.275	-.020
	(.192)	(.460)	(.0001)	(.603)	(.171)	(.930)
COMLANG_ETHNO	1.585***	.511**	1.745***	-.279	.269	.003
	(.0002)	(.042)	(.004)	(.243)	(.232)	(.985)
LANDLOCKED	-.445		-.675	.918**	.616***	.115
	(.598)		(.195)	(.042)	(.007)	(.641)
SMCTRY	-26.542***		-29.715***	-.475	-.341	.109
	(0.000)		(0.000)	(.250)	(.546)	(.781)
ISLANDS	.922**	.398**	-1.421**	.353**	-.560*	.352
	(.033)	(.033)	(.024)	(.024)	(.070)	(.105)
R2	0.47	0.635	0.593	0.626	0.441	0.585
N	12866	15134	12571	15230	17195	15901
# Zeros	12750	11926	12428	11309	13972	12715
# of mirror	12729	9561	12465	9616	9907	10182
Mean MAE (USD in M)	3.67	257.67	122.76	29.45	88.94	126.91
Mean RMSE (USD in M)	63.64	773.02	157.52	503.94	596.21	
1846.59						
Observations	12,866	15,134	12,571	15,230	17,195	15,901

Standard errors are robust for ppml

Notes : *p-values in parenthesis*

* p<.1, ** p<.05, ***<.01

Outward - regression by sector (1)

	TSER	ADMIN	ARTS	EDUC	FIN	FOOD
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	166.400***	131.344***	92.541	696.852***	12.056	68.127**
	(0.000000)	(.0002)	(.488)	(.00001)	(.619)	(.046)
POLY(YEAR, POLY, RAW = T)	-.102***	-.087***	-.067	-.364***	-.020	-.056***
	(0.000)	(0.000000)	(.370)	(.000003)	(.121)	(.002)
LNBOP_O	.390***	-.007	.096	.580**	.153**	.503**
	(.000002)	(.706)	(.680)	(.010)	(.018)	(.010)
LNGDPS_O	.964***	.990***	1.228***	1.190***	.849***	1.106***
	(0.000)	(0.000)	(.00001)	(0.000)	(0.000)	(0.000)
LNGDPS_D	.442***	.779***	.761***	.483**	.652***	.496***
	(0.000)	(0.000)	(.0004)	(.017)	(0.000)	(.0003)
LNGDPPCO	1.431***	2.130***	.591	-1.197	.949***	1.597***
	(0.000)	(0.000)	(.113)	(.111)	(0.000)	(.00001)
LNGDPPCD	.137*	.291***	.706*	1.264**	.255**	.107
	(.063)	(.008)	(.094)	(.010)	(.031)	(.591)
LNDIST	-.347***	-.622***	-.470	-1.099***	-.511***	-.755***
	(.0003)	(0.000)	(.339)	(.00002)	(0.0000)	(0.0000)
COLONY	.658***	.816***	.332	.128	.801***	.915**
	(.002)	(.000001)	(.818)	(.890)	(.001)	(.017)
CONTIG	.326*	-.244	.796	.134	.321	-.044
	(.052)	(.174)	(.215)	(.861)	(.226)	(.893)
COMLANG_ETHNO	-.035	.071	.894*	.818	.006	.333
	(.855)	(.675)	(.059)	(.348)	(.978)	(.300)
LANDLOCKED	-.420	.759**	1.639***	-25.875***	-.202	-.375
	(.125)	(.025)	(.007)	(0.000)	(.745)	(.302)
SMCTRY	.649	.134	-.556	-18.519***	-.190	-.349
	(.250)	(.825)	(.756)	(0.000)	(.745)	(.523)
ISLANDS	.227	.102	-.238	4.359***	.196	.732**
	(.278)	(.421)	(.663)	(0.000)	(.254)	(.010)
R2	0.713	0.659	0.707	0.631	0.659	0.559
N	12937	14924	12926	14954	14924	18370
# Zeros	8263	12409	12875	12139	12409	16625
# of mirror	119	3487	106	870	3487	3891
Mean MAE (USD in M)	1908.19	85.31	0.33	692.07	85.31	30.52
Mean RMSE (USD in M)	10610.34	4.9	3392.32	492.73	240.34	
Observations	12,937	14,924	12,916	12,926	14,954	18,370

Standard errors are robust for ppml

Notes :
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

	HEALTH	INFCOM	OSERA	PROF	REA	TPST
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-215.789	72.189**	-407.955***	12.939	179.861***	29.023
	(.147)	(.037)	(.003)	(.599)	(.00001)	(.206)
POLY(YEAR, POLY, RAW = T)	.077	-.053***	.193***	-.024*	-.107***	-.035***
	(.321)	(.003)	(.006)	(.053)	(0.000000)	(.003)
LNBOP_O	1.156***	.013	-.064	-.003	.106	.192*
	(.00002)	(.889)	(.205)	(.860)	(.286)	(.075)
LNGDPS_O	1.063***	.937***	1.480***	.996***	.827***	1.141***
	(.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LNGDPS_D	-.239	.654***	.739***	.736***	.608***	.736***
	(.307)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LNGDPPCO	1.407	1.327***	-1.085	1.368***	1.849***	1.456***
	(.230)	(0.000)	(.195)	(0.000)	(0.000)	(0.000)
LNGDPPCD	1.004	.391***	.247*	.226	.229*	.247***
	(.210)	(.005)	(.097)	(.219)	(.078)	(.004)
LNDIST	.201	-.524***	-1.201***	-.667***	-.969***	-.943***
	(.831)	(.000001)	(.00001)	(0.000)	(0.000)	(0.000)
COLONY	1.718**	.462	.959	.769***	.694**	.300
	(.046)	(.181)	(.234)	(.001)	(.015)	(.313)
CONTIG	1.967	-.317	-.570	-.269	.331	-.313
	(.304)	(.271)	(.450)	(.226)	(.147)	(.234)
COMLANG_ETHNO	1.598***	.502	1.077	.059	.232	.075
	(.008)	(.118)	(.200)	(.786)	(.352)	(.716)
LANDLOCKED	-21.780***		-23.861***	.123	.851***	.119
	(0.000)		(0.000)	(.562)	(.007)	(.519)
SMCTRY	-16.460***		-17.042***	-.235	-.292	-.202
	(0.000)		(0.000)	(.514)	(.581)	(.643)
ISLANDS	.740	-.090	3.792***	.854***	.829***	-.253
	(.135)	(.627)	(0.000)	(.00001)	(.00002)	(.364)
R2	0.445	0.56	0.578	0.586	0.384	0.529
N	12866	15134	12571	15230	17195	15901
# Zeros	12747	12127	12428	11680	14427	12959
# of mirror	132	3371	106	3464	4959	3308
Mean MAE (USD in M)	3.74	254.67	108.75	29.98	85.31	132.55
Mean RMSE (USD in M)	72.96	658.85	183.68	492.73	731.15	
1734.85						
Observations	12,866	15,134	12,571	15,230	17,195	15,901
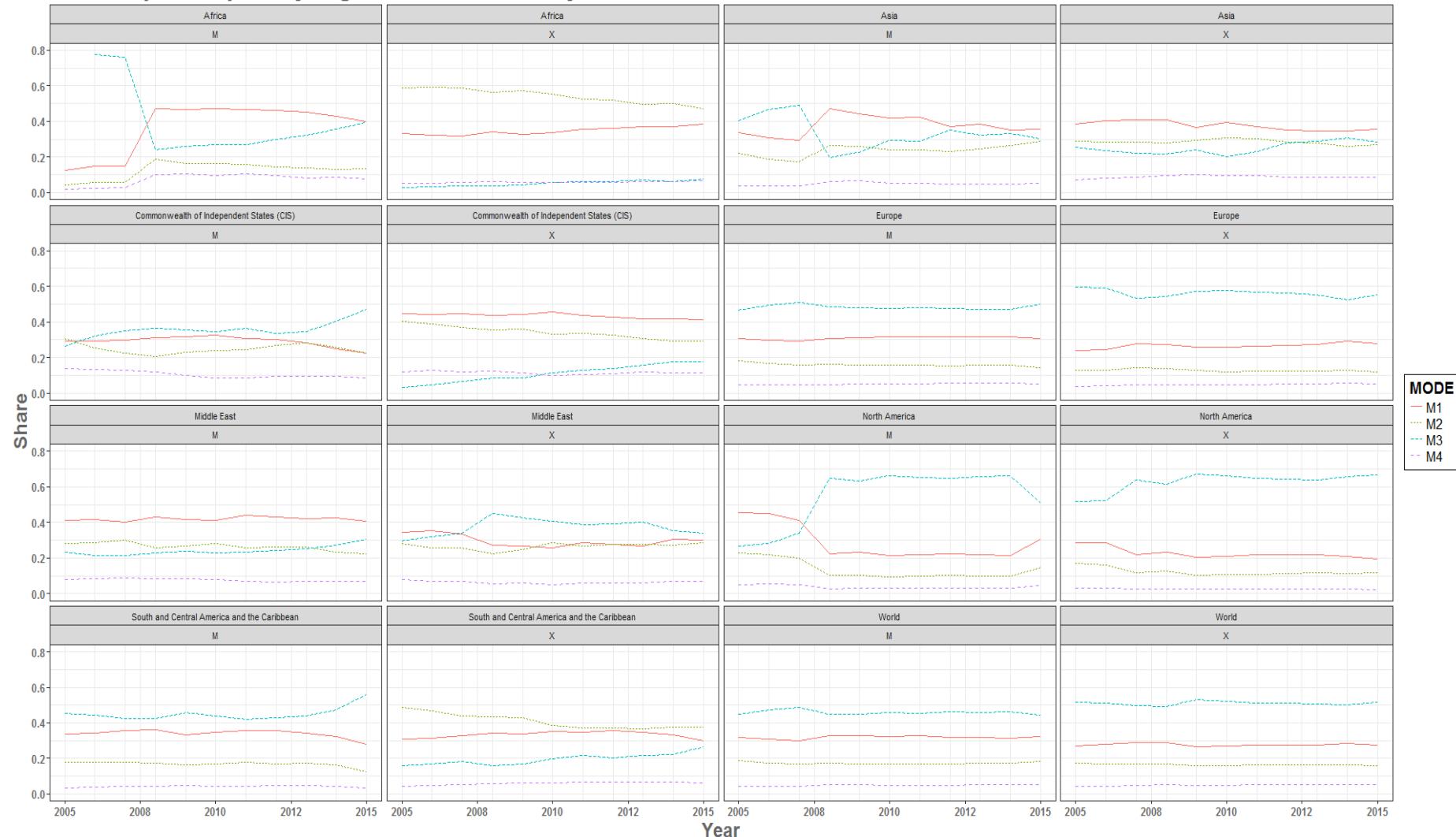
Total Import/Export by region broken down by MoS

Correspondence table between ISIC services sectors and EBOPS product based classification

WTO code	Description	EBOP	EBOP description	Share	NACE2
TSER	TOTAL SERVICES	S	Services	100	G-S_X_O
TPST	Transport and Storage	SC	Transport	100	H
FOOD	Accommodation and food services	SD	Travel	100	I
INFCOM	Information and Communication	SI	Telecommunications, computer, and information services	100	J
FIN	Insurance and pension funding, except compulsory social security	SF	Insurance and pension services	60	K
FIN	Activities auxiliary to financial intermediation	SG	Financial services	40	K
REA	Real estate activities			100	L
PROF	Professional, scientific and technical activities	SJ	Other business services	100	M
EDUC	Education	SD	Travel	60	P85
EDUC	Education	SK	Personal, cultural, and recreational services	40	P85
HEALTH	Health and social work	SD	Travel	60	Q
HEALTH	Health and social work	SK	Personal, cultural, and recreational services	40	Q
ARTS	Arts, entertainment and recreation	SK	Personal, cultural, and recreational services	100	R
OSERA	Other service activities	SK	Personal, cultural, and recreational services	100	S
ADMIN	Administrative and support activities	SJ	Other business services	70	N
ADMIN	Administrative and support activities	SI	Telecommunications, computer, and information services	30	N
TPSTC	Transport and Storage + Information and Communication (INFCOM after 2008 onwards) (2005 to 2007 for Eurostat)				
REABU	Real estate activities + Professional, scientific and technical activities (PROF) + Administrative and support activities (ADMIN) (For euro countries btw 2005 - 2007)				

ANNEX 8. **FATS - LIST OF COUNTRIES AVAILABLE IN PRIMARY SOURCES**

		Reported originally
Eurostat	Reporter	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Denmark, Estonia, Greece, Spain, European Union (27), European Union (28), Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Slovenia, Slovak Republic, United Kingdom, Bosnia and Herzegovina"
	Partner	AT, BR, CA, CH, CN, E27, E28, GX7, GXT, HK, IN, JP, RU, US, WL, AR, AU, BE, BG, CL, CY, CZ, DE, DK, EE, EG, GR, ES, FI, FR, HR, HU, ID, IE, IL, IS, IT, KR, LI, LT, LU, LV, MA, MT, MX, MY, NG, NL, NO, NZ, PH, PL, PT, RO, SE, SG, SI, SK, TH, TR, TW, GB, UY, VE, ZA, E25, G25, AD, AE, AF, AG, AI, AL, AM, AN, AO, AQ, AS, AW, AZ, BA, BB, BD, BF, BH, BI, BJ, BM, BN, BO, BS, BT, BV, BW, BY, BZ, CC, CD, CF, CG, CI, CK, CM, CO, CR, CU, CV, CX, DJ, DM, DO, DZ, EC, ER, ET, FJ, FK, FM, FO, GA, GD, GE, GG, GH, GI, GL, GM, GN, GQ, GS, GT, GU, GW, GY, HM, HN, HT, IO, IQ, IR, JE, JM, JO, KE, KG, KH, KI, KM, KN, KP, KW, KY, KZ, LA, LB, LC, LK, LR, LS, LY, MD, ME, MG, MH, MK, ML, MM, MN, MO, MP, MR, MS, MU, MV, MW, MZ, NA, NC, NE, NF, NI, NP, NR, NU, OM, PA, PE, PF, PG, PK, PN, PAL, PW, PY, QA, RS, RW, SA, SB, SC, SD, SH, SL, SM, SN, SO, SR, ST, SV, SY, SZ, TC, TD, FQ, TG, TJ, TK, TL, TM, TN, TO, TT, TV, TZ, UA, UG, UM, UZ, VA, VC, VG, VI, VN, VU, WF, WS, YE, ZM, ZW, AFR, AME, IAS, IEU, IOC
OECD	Reporter	**Australia, Canada, Costa Rica, Israel, Japan, Korea, Republic of, United States of America**, Austria, Belgium, Czech Republic, Germany, Estonia, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Sweden, Slovenia, Slovak Republic, Denmark
	Partner	WL, AD, AE, AF, AG, AI, AL, AM, AN, AO, AR, AT, AU, AW, AZ, BA, BB, BD, BE, BF, BG, BH, BI, BJ, BM, BN, BO, BR, BS, BT, BW, BY, BZ, CA, CD, CF, CG, CH, CI, CL, CM, CN, CO, CR, CU, CY, CZ, DE, DJ, DK, DM, DO, DZ, E27, EC, EE, EG, ER, ES, ET, FI, FJ, FM, FO, FR, GA, GB, GD, GE, GH, GI, GM, GN, GQ, GR, GT, GW, GY, HK, HN, HR, HT, HU, ID, IE, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KI, KM, KN, KR, KW, KY, KZ, LA, LB, LC, LI, LK, LR, LS, LT, LU, LV, LY, MA, MD, ME, MG, MH, MK, ML, MM, MN, MO, MR, MT, MU, MV, MW, MX, MY, MZ, NA, NE, NG, NI, NL, NO, NP, NZ, OM, PA, PE, PG, PH, PK, PL, PT, PY, QA, RS, RU, RW, SA, SB, SC, SD, SE, SG, SI, SK, SL, SN, SO, SR, ST, SV, SY, SZ, TD, TG, TH, TJ, TL, TM, TN, TO, TR, TT, TV, TW, TZ, UA, UG, US, UY, UZ, VC, VE, VG, VN, VU, WS, YE, ZA, ZM, ZW, E25, G32, MC
National	Inward	Canada, Hong Kong China, Israel, India, New Zealand, Serbia, Thailand, Viet Nam, Zambia
	Outward	Australia, Canada, Israel, India,

ANNEX 9.   LIST OF COUNTRIES FOR WHICH TRADE MANUALLY SET TO ZERO

id	ISO3	Name
1	VGB	British Virgin Islands
2	CYM	Cayman Islands
3	COM	Comoros
4	COK	Cook Islands
5	CIV	Côte d'Ivoire
6	GNQ	Equatorial Guinea
7	ERI	Eritrea
8	FRO	Faeroe Islands
9	FLK	Falkland Islands
10	PYF	French Polynesia
11	GIB	Gibraltar
12	GRL	Greenland
13	HTI	Haiti
14	PRK	Korea, Dem. People's Rep. of
15	MHL	Marshall Islands
16	FSM	Micronesia, Federated States of
17	MSR	Montserrat
18	NRU	Nauru
19	ANT	Netherlands Antilles
20	NCL	New Caledonia
21	NIU	Niue
22	MNP	Northern Mariana Islands
23	PLW	Palau
24	PAL	Palestine
25	PNG	Papua New Guinea
26	SPM	Saint Pierre and Miquelon
27	SOM	Somalia
28	SYR	Syrian Arab Republic
29	TKM	Turkmenistan
30	TUV	Tuvalu
31	UZB	Uzbekistan

Shares in the reported FATS sales dataset

flow	YEAR	ADMIN	ARTS	EDUC	FIN	FOOD	HEALTH	INFCOM	OSERA	PROF	REA	TPST
IWA	2008	12.8	0.0016	0.044	23	3.5	0.40	28.0	0.0011	13.9	2.9	15
IWA	2009	12.8	0.1158	0.056	22	3.5	0.50	29.1	0.2484	14.0	3.1	14
IWA	2010	11.8	0.1321	0.088	24	3.9	0.49	26.5	0.4793	14.7	3.1	14
IWA	2011	12.1	0.1103	0.091	23	3.8	0.46	26.0	0.5180	15.2	3.0	15
IWA	2012	11.8	0.1015	0.090	25	3.9	0.50	25.3	0.3941	15.1	2.9	15
IWA	2013	12.3	0.1192	0.092	23	4.0	0.56	24.6	0.3779	15.8	2.9	16
IWA	2014	12.4	0.0926	0.075	23	4.2	0.52	24.5	0.3637	16.2	2.9	16
OWA	2008	4.9	0.7453	0.151	49	2.8	0.66	18.7	1.1346	7.1	1.4	14
OWA	2009	4.4	0.6348	0.408	69	1.9	0.64	2.1	1.2729	1.7	2.1	16
OWA	2010	5.7	0.7204	0.383	54	1.9	0.54	14.7	1.2617	7.3	2.1	11
OWA	2011	5.9	0.7459	0.174	46	3.2	0.47	21.7	0.9102	8.9	1.4	11
OWA	2012	6.2	0.8430	0.197	46	3.2	0.50	20.5	1.2159	9.3	1.4	10
OWA	2013	5.9	0.9071	0.206	44	3.4	0.78	19.7	1.7931	11.7	1.2	10
OWA	2014	6.6	0.8825	0.207	45	3.2	0.63	19.4	0.9343	10.2	1.4	12

Shares in the extrapolated FATS sales dataset

flow	YEAR	ADMIN	ARTS	EDUC	FIN	FOOD	HEALTH	INFCOM	OSERA	PROF	REA	TPST
IWA	2005	5.1	0.16	0.027	37	4.6	0.17	29	1.6	6.2	3.2	13
IWA	2006	5.0	0.17	0.027	37	4.6	0.17	29	1.4	6.0	3.5	13
IWA	2007	4.9	0.17	0.030	38	4.4	0.17	28	1.1	5.8	3.6	13
IWA	2008	4.8	0.17	0.031	37	4.6	0.18	29	1.2	5.7	3.8	13
IWA	2009	4.3	0.16	0.030	40	4.8	0.18	28	1.3	5.6	3.5	12
IWA	2010	4.2	0.18	0.031	41	4.5	0.18	27	1.5	5.7	3.6	12
IWA	2011	4.5	0.17	0.034	38	4.5	0.19	29	1.6	6.2	3.8	12
IWA	2012	4.4	0.17	0.033	38	4.6	0.19	29	1.8	6.2	3.8	12
IWA	2013	4.6	0.17	0.034	37	4.6	0.20	30	1.5	6.3	3.9	12
IWA	2014	4.5	0.17	0.034	37	4.6	0.21	30	1.3	6.1	4.0	12
IWA	2015	4.4	0.17	0.033	37	4.8	0.22	30	1.2	6.4	3.9	12
OWA	2005	4.1	0.18	0.073	46	2.8	0.27	21	2.3	4.1	3.2	16
OWA	2006	4.0	0.18	0.069	46	2.9	0.25	22	1.9	4.0	3.5	15
OWA	2007	3.6	0.17	0.069	48	2.8	0.25	22	1.6	3.7	3.5	15
OWA	2008	3.6	0.17	0.068	45	3.0	0.25	24	1.6	3.7	3.8	15
OWA	2009	3.7	0.18	0.075	46	3.1	0.27	24	2.0	4.0	3.7	13
OWA	2010	3.9	0.19	0.080	45	3.2	0.29	23	2.2	4.2	3.8	14
OWA	2011	4.1	0.20	0.085	45	3.3	0.30	24	2.4	4.4	3.9	13
OWA	2012	3.9	0.20	0.078	44	3.2	0.27	25	2.1	4.2	4.0	13
OWA	2013	3.9	0.20	0.078	43	3.3	0.27	26	1.9	4.2	4.2	13
OWA	2014	4.0	0.19	0.083	44	3.2	0.29	25	2.1	4.2	4.1	13
OWA	2015	3.9	0.19	0.079	43	3.3	0.28	26	2.0	4.1	4.1	13

Code	Dataset	Field	Description
blank	FATS	ALL	No calculation/estimation/adjustment/correction
gr	FATS	FLAG_est	Estimated by mean of available growth rate
int	FATS	FLAG_est	Estimated by three year moving average for- or backcasting, or spline interpolations
tsum	FATS	flagT	TSER points derived by the sum of subsectors estimated
back_sum	FATS		Estimation of NACE 1 aggregate sector. Points are backcasted from the sum of the corresponding NACE2 sectors
m1.-	FATS	FLAG_est	Model estimates of TSER in bilateral FATS
ms1.-	FATS	FLAG_est	Model estimates of services sectors in bilateral FATS
modsec	FATS	FLAG_est	Estimation by model by sector with partner World
mset0	FATS	FLAG_est	Values manually set to zero for specific countries
R	FATS	FLAG_est	Reported data point in the source FATS datasets
set0	FATS	FLAG_est	Values set to zero when FDI is zero
b	FATS	FLAG_FATS	break in time series - original flag from source data
B	FATS	FLAG_FATS	Break in time series - original flag from source data
C	FATS	FLAG_FATS	Confidential - original flag from source data
d	FATS	FLAG_FATS	definition differs, see metadata - Original flag from source data
D0	FATS	FLAG_FATS	Derived from zero derivation
e	FATS	FLAG_FATS	estimated - original flag from source data
p	FATS	FLAG_FATS	provisional - original flag from source data
r	FATS	FLAG_FATS	revised - original flag from source data
EU	FATS	FLAG_source	European countries pulled out from the WTO database
EURO	FATS	FLAG_source	Eurostat FATS data
NAT	FATS	FLAG_source	National source data pulled out from the WTO database
OECD	FATS	FLAG_source	OECD FATS data pulled out from the WTO database
OECD3	FATS	FLAG_source	ISIC 3 OECD FATS data
OECD4	FATS	FLAG_source	ISIC 4 OECD FATS data
M-	FATS	FLAG_source	Derived by mirror data
bil	FATS	FLAG_data	Value with partner world derived from bilateral in chapter 5.3.3
WLdata	FATS	FLAG_data	Value with partner world derived in chapter 5.3.2
B	BOP	VALUE_FLAG	Break in series - original flag from source data
C	BOP	VALUE_FLAG	Coverage differs - original flag from source data
E	BOP	VALUE_FLAG	Estimate based on official source - original flag from source data
X	BOP	VALUE_FLAG	estimate not shown - original flag from source data
Y	BOP	VALUE_FLAG	Estimate not shown and break in series - from source data
Z	BOP	VALUE_FLAG	Not applicable
E1	BOP	EST_FLAG	Simple derivation
E4.1	BOP	EST_FLAG	Estimation using reported shares in the bilateral data BOP data
E4.2	BOP	EST_FLAG	Estimatimate using shares of total trade across all years in the bilateral BOP data
E4.2i	BOP	EST_FLAG	Estimate using interpolation of reported aggregated categories
E4.3	BOP	EST_FLAG	Estimate using interpolation of reported totals (S or SOX)
E5	BOP	EST_FLAG	Estimate using clusters
E5.1	BOP	EST_FLAG	Estimate using total trade across all years in the clusters
E5.2	BOP	EST_FLAG	Estimate using other cluster due to missing information
E6	BOP	EST_FLAG	Correction of mistakes (e.g. negative values) in source data
E8	BOP	EST_FLAG	Estimate derived by for- or backcasting or interpolations