A GLOBAL TRADE IN SERVICES DATA SET BY SECTOR AND BY MODE OF SUPPLY (TISMOS)

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ABSTRACT

This paper describes in detail the approach to create an analytical dataset on trade in services by mode of supply (TiSMoS) at global level for the period of 2005 to 2017.

The countries' balance of payments data are broken down into modes of supply using an "enhanced simplified approach". The sectors are based on the structure of the Extended Balance of Payments Services Classification (EBOPS 2010) in the Manual on Statistics of International Trade in Services (MSITS 2010).

A worldwide Foreign AffiliaTes Statistics (FATS) dataset is constructed to complement the dataset, notably to estimate the size of the supply of services of foreign affiliates.

The dataset is built in modular form with a transparent methodology. Its aim is to develop into an international benchmark, incorporating gradually any new available information.

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The team at WTO carrying out the project was Steen Wettstein, Antonella Liberatore, Joscelyn Magdeleine and Andreas Maurer. At the European Commission, Lucian Cernat and Alessandra Tucci were the focal points. John Breckenridge and Laura Suntham followed the financial execution of the project at WTO.

1 Introduction

International trade in services is changing rapidly as new technologies expand the cross-border tradability of services. For the need of proximity between producers and consumers to supply and consume services, trade agreements define four modes of supplying services, adding to the cross-border supply the consumption of services abroad and the establishment of firms or the temporary presence of natural persons. However, trade in services statistics do not keep pace with this broad coverage of trade in services.

The WTO Secretariat, in cooperation with other organizations, is at work on expanding the information base on trade in services. It approaches the issue from different but complementary angles to leverage resources and seek synergies with other international organizations, data compilers and academics. This work covers:

1. The WTO-UNCTAD-ITC trade in services dataset by detailed service sector. It is based on officially reported data, to and from the world, and by partner country when available. The reported information is complemented by estimations and adjustments to ensure the highest possible country and sectoral coverage, timeliness and comparability. The cooperation among the three agencies implies joint data collection, processing and dissemination.
2. The OECD-WTO Balanced Bilateral Trade in Services (BaTiS) dataset. This dataset, experimental in nature, consists of a complete matrix of bilateral trade in services flows for the period 1995-2012. It was created in response to the need for complete and consistent trade in services data at bilateral level. It serves a number of analytical purposes. At the time of writing, work on compiling a dataset for 2005 to 2017 in BPM6 is ongoing.
3. This note describes the trade in services dataset by mode of supply (TiSMoS). Its development was funded by the directorate of trade of the European Commission. It has been carried out through consultation with other international organizations, selected data compilers and academics and is based on expertise derived from BaTiS.
4. On regulatory issues, the Services component of the Integrated Trade Intelligence Portal (I-TIP), run by WTO and World Bank, includes four modules: the GATS commitments, services commitments in regional trade agreements, services applied policies and services statistics. Services restrictiveness indices by country, sector and modes of supply will be released during 2019.

TiSMoS uses the WTO-UNCTAD-ITC data set as a starting point for the measurement of resident-to non-resident transactions and leverages the expertise built with BaTiS. It is developed with the objective of providing another analytical dimension to the information available to the public - namely, the mode of supply dimension. The WTO has been working on this project in close consultation with experts in other international organizations, selected data compilers and academics who have discussed and validated the assumptions to build the dataset. The resulting experimental dataset is released online in July 2019.

All these products benefit from each other's methodological approach (estimation and adjustment) and data collection.

Following the template used for BaTIS, the experimental TiSMoS dataset is framed along three main principles:

- **Baseline**: the dataset is a starting point with an agreed and established methodology. The aim is to develop the dataset further through additional input of data compilers, academics, and users in general.

- **Modularity:** estimates are replaced by hard data as and when they become available. The dataset could be analysed in the context of restrictions to trade in services and thus would enable to provide a complete analytical string to analyse trade in services.
- **Transparency:** in addition to documenting the methodology used, each single data point is documented with relevant metadata, enabling users to understand how each figure is built.

The remainder of this paper describes the steps followed to build the trade in services data set by mode of supply. Chapter 2 outlines the definition and general approach to estimate these modes. Chapter 3 summarizes other national and international initiatives on the measurement of service trade by mode of supply. Chapter 4 describes the balance of payments data set and the refinements needed to align these data to the modes of supply. Chapter 5 illustrates how the FATS framework is used to estimate commercial presence (mode 3) and the steps followed to build a worldwide data set of FATS output. Chapter 6 presents the EBOPS-ISIC bridge table that is used to join the two data sets, and describes some aggregate results. Chapter 7 concludes.

2 Measuring service trade by mode of supply: overview of the approach

The modes of supply can be derived from the definition included in the General Agreement on Trade in Services (GATS). It is used in almost all bilateral and regional trade agreements. These four ways ("or modes") are:

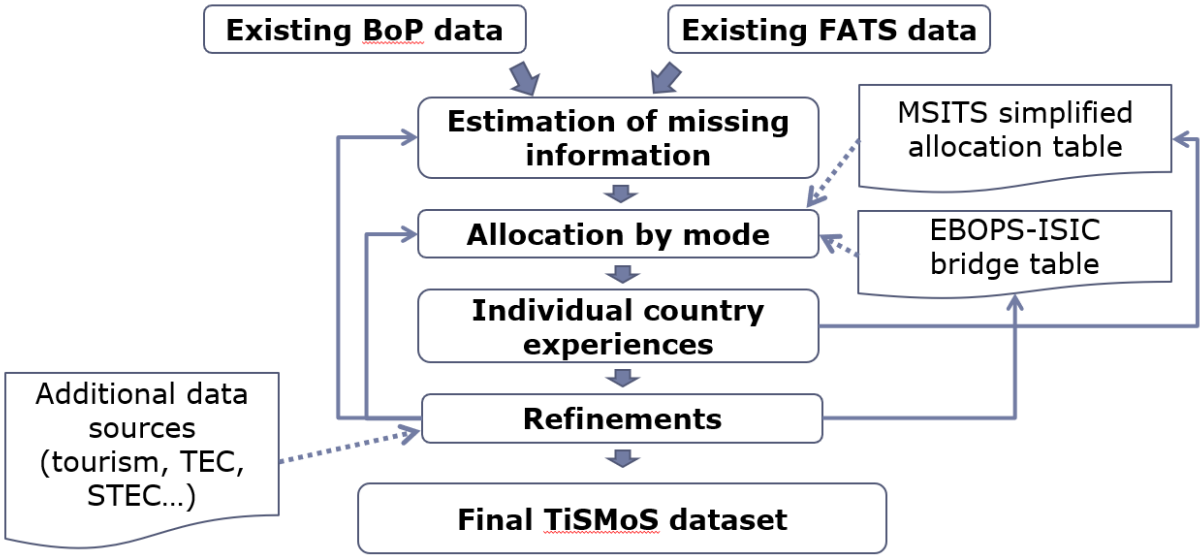
- **Cross border supply (mode 1):** services supplied from the territory of one country into the territory of any another country. This implies that neither a consumer nor a producer has to move and only the service itself crosses the border. Examples cover services provided by phone, fax, or electronic means, such as medical diagnosis, legal advice, financial services, etc.
- **Consumption abroad (mode 2):** services supplied in the territory of one country to the service consumer of any other country. For example, persons who travel to another country to consume services locally (visits to museums or theatres, visit to doctors, language courses). This covers also cases where the services are related to the property of the consumer while abroad (e.g., ship repair abroad).
- **Commercial presence (mode 3):** 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.
- **Presence of natural persons (mode 4):** 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 to a customer of another country or a self-employed lawyer going abroad to deliver legal advice to foreign clients.

The aim of this project is to provide, for the first time, estimated data on trade in services by mode of supply for a large number of economies.

Figure 1 gives an overview of the steps followed to build the dataset:

1. Existing Balance of Payments (BOP) and FATS data are collected.
2. Adjustments and corrections are carried out to ensure cross-country comparability; missing information is estimated through a variety of methods, including gravity models for economies that do not report[2].
3. The "simplified approach" as defined in MSITS2010 is applied to allocate balance of payments data to modes of supply. Each type of service is allocated to one dominant mode or, where there is no single dominant mode, allocation shares are applied. For instance, computer services are allocated 75% to mode 1 and 25% to mode 4. These modal shares are constant over time.
4. Individual experiences are incorporated for the economies that have conducted specific surveys or studies. In thoses cases, the default allocation is replaced by information provided at the national level ("enhanced simplified approach").
5. Refinements to BOP data and FATS are made to meet the scope of this study. BOP items *travel* and *construction* are adjusted, and *distribution services* traded through mode 1 are estimated. FATS are amended to only cover output sold locally.

Figure 1: Building TiSMoS: an overwiew



[2] As one of the main puposes of TiSMoS is to be used for research and economic modelling, no policy-oriented variables were used in the regressions to predict missing values.

3 Other initiatives on measuring trade in services by mode of supply

TiSMoS builds on work carried on by national and international data compilers on the measurement of trade in services by mode of supply. The different initiatives were discussed in expert meetings and most of the results described below are included in TiSMoS.

Eurostat

Eurostat's work on service trade by mode is summarized in Rueda-C. *et al*. (2016) and made available in the Eurostat *Statistics Explained* series[3].

The information base consists of all publicly available balance of payments data and FATS as collected by Eurostat. The "Eurostat pilot model" uses the reported BOP data and the MSITS2010 simplified approach as a starting point, where the individual EBOPS service items are allocated to the most pertinent mode(s) of supply according to fixed percentages that define how specific service items are most likely to be supplied to consumers. Such percentages reflect evidence and data from some EU countries (the national experiences of Spain, Germany and France have been used to validate the EU-wide dataset), as well as expert opinion.

For estimating mode 3, FATS country data are used. Due to a large amount of confidential and non-publishable values, mode 3 has not been estimated at the country level but only at EU aggregate level - in contrast to mode 1, 2 and 4 for data drawn form the BOP. Additional data sources - namely trade by enterprise characteristics (TEC) and structural business statistics (SBS) - are used to refine the estimations for distribution services.

A correspondence table was developed to link the FATS activity classification (NACE Rev.4) to the EBOPS services items. It underlies the disseminated results which are updated yearly (the last update concerns the reference year 2015).

The dataset is considered experimental and work is ongoing to improve both the estimation methodology and the direct data collection. In particular, at the time of writing, areas of further research include:

- removal of double counting of trade between FATS and residents to non-residents flows, as the exports of a foreign affiliate are recorded both in the turnover of the affiliate and in the country's BOP data;
- exclusion of the value of goods for items such as construction[4];
- estimation of the services supplied by enterprises whose primary activity is not services (namely manufacturing).

Finally, Eurostat created a task force to foster direct data collection on modes of supply. The long-term goal is to replace the hypothetical distributions by empirical data, when they become available. Eurostat plans to develop a guide for compilers in cooperation with WTO.

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Services_trade_statistics_by_modes_of_supply

[4] The goods component was excluded from the travel item, based on information that several EU members provided to Eurostat.

The United States

The United States Bureau of Economic Analysis (US BEA) has been working for several years on the relationship between GATS modes and BEA data. In 2017, exploratory estimates were developed, based on (1) Bureau of Economic Analysis' (BEA) most detailed BOP trade-in-services statistics, allocated to the different modes using the MSITS2010 simplified approach; (2) an estimate of distribution services; and (3) BEA's FATS covering in particular the services supplied through foreign affiliates (see Mann, 2017).

Starting in 2017, BEA's *Benchmark Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons* was amended to explicitly collect, for selected service items, the share of the total transaction that was supplied/received via mode 1. The share of mode 4 is calculated as a residual. The results of this survey, that is now carried out on an annual basis, shed new light on how certain services are actually delivered and allowed to refine the fixed allocation shares of the simplified approach. For instance, mode 4 appears as more important than expected for sectors like accounting or education, while the share of mode 1 is higher than anticipated for architectural and legal services, to name a few.

Table 1: Share of services supplied through Mode 1: Simplified Approach vs Survey Based

	Exports		***Imports***	
	Simplified approach	**Survey based**	**Simplified approach**	**Survey based**
Accounting	75	51	75	66
Advertising, market research, public opinion	75	78	75	70
Computer	50	80	50	56
Architectural	50	80	50	78
Education	75	37	75	32
Engineering	50	59	50	51
Legal	75	80	75	91
Management Consulting	67	77	67	68
Research and development	75	59	75	81

Source: (Paul Farello, 2019)

BEA's future work is aimed at possibly including explicit questions on modes of supply to other surveys and refine the exploratory estimates. A bridge table between BEA FATS, which are classified by industry, and BEA trade data, which are classified by product, will be also needed to compare the four modes by service type.

Germany

The simplified approach has also been explored by Deutsche Bundesbank as a starting point. More information was then gathered from important players in selected sectors (notably: computer services), which were using their income statements to apportion the services provided via mode 1 rather than mode 4. The preliminary results showed that there was a high sensitivity in the outcomes depending on the type of allocation used and a questionnaire for data collection was designed and tested with a sample of companies. However, it was decided not to pursue the direct reporting for the time being.

Spain

The Spanish National Statistical Office recently added the modes of supply dimension to their main BOP trade in services quarterly survey, which covers all sectors except travel. Respondents are not required to split the transactions across the different modes, but only to allocate their service transactions to the most important mode of supply. Editing rules are thus applied to correct the responses if needed to make sure that, for each sectors, only viable modes are considered. Work is ongoing to improve the results, especially regarding the product breakdown of travel and the split between goods vs services and local output vs exports for FATS.

United Kingdom

Given the surge in demand for detailed services statistics, the UK National Statistics Office has been investigating the feasibility of direct data collection on modes of supply. A voluntary questionnaire aiming at measuring the share of mode 1 trade (similarly to the US BEA's approach) was developed and tested with a few companies. Following that, a pilot survey run was conducted and questions were added to the annual survey. The first results are expected in the second half of 2019.

France

The Eurostat pilot model forms the basis for Banque de France's project on modes of supply. While some modal allocation shares were left as specified by Eurostat, others were amended following exchanges with the main French service suppliers. Preliminary results confirm the predominance of mode 3 overall in French exports, but also highlight the importance of mode 4 in specific sectors such as advisory, architectural, engineering and research and development.

India

Given the importance of computer services and business process outsourcing for the Indian economy, the Reserve Bank of India has been collecting and disseminating detailed data on exports of this sector by the four modes of supply for many years. In addition, a more comprehensive survey covering nine potentially ICT-enabled service sectors[5] was carried out for fiscal year 2016-2017. For the sectors included, a breakdown between services supplied via mode 1 and mode 4 is provided, again highlighting the significance of mode 4 for sectors such as computer services and engineering[6].

Colombia

The National Administrative Department of Statistics (DANE) added explicit questions on modes of supply to their quarterly BOP trade in services survey and detailed information by sector, mode and partner has been published every quarter since 2014.

[5] For the UNCTAD definition of *ICT-enabled services*, see https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1413.
For the pilot-study for India, see https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1917&Sitemap_x0020_Taxonomy=UNCTAD%20Home;

[6] For more information, see http://www.dgciskol.gov.in/Writereaddata/Downloads/IctExportReport.pdf

4 Balance of payments statistics and modes of supply

This chapter illustrates how resident to non-resident BOP transactions are used to measure services supplied through modes of supply. It describes the default simplified allocation of MSITS2010 to attribute trade values to their relevant mode of supply. The construction item in the BOP is the only services category that is identified as significant for mode 3.

The joint WTO-UNCTAD-ITC data set is used as a starting point, complemented by estimations to fill in data gaps in the detailed EBOPS2010 breakdown.

A number of adjustments are made to meet the scope of supply of services:

i. The balance of payments *travel* item includes both the goods and the services acquired by non-residents in the economy they visit. The expenditure on goods is estimated and excluded to isolate the service component.
ii. *Construction* includes both the construction work undertaken by residents for non residents (and vice-versa) and the acquisition of inputs from the residents of the economy where the construction project takes place. However, current data do not allow the separate identification of the pure service component for construction.
iii. Services trade covers *distribution services* as a separate sector[7], but in BOP these services are included in the value of goods traded. This requires the separate estimation of these services, which are then allocated to mode 1.

4.1 Description of the initial BOP data set

The starting point for the measurement of the resident to non-resident transactions is the joint WTO-UNCTAD-ITC data set, covering exports and imports of services to and from the world for 200 reporters from 2005 to 2017. In addition to the individual reporters, the reporter European Union 28 (EU28) is presented as a unique entity trading with the rest of the world (i.e. with partner extra-EU28). For this reporter only, the time series starts with 2010 as that is the first reported year in Eurostat's database.

The figures are sourced from (i) Eurostat; (ii) the OECD Trade in Services by Partner Country data set; (iii) the IMF Balance of Payments Statistics; (iv) and the relevant national sources for specific cases. The data set also contains adjustments made to ensure cross-country comparability and, where possible, estimations to complement reported data. The sectoral breakdown follows the Extended Balance of Payments Services Classification (EBOPS 2010) to the extent possible, although not all economies report the same level of detail.

For the purpose of this project, 66 EBOPS 2010 items are selected[8]. The choice of the items to be included in TiSMoS is driven by the necessity to have a sufficient sectoral breakdown for the allocation by mode while bearing in mind data availability[9].

[7] See the GATT Services Sectoral Classification List, MTN.GNS/W/120.

[8] See Annex 1 for the complete list of sectors covered in TiSMoS. Some items are removed and others are aggregated in the final dataset.The final list of item contains 55 EBOPS-like codes and is presented in ANNEX 6.

[9] For instance, insurance is not broken down by its subcomponents (direct insurance, reinsurance, etc.) as in all cases the service is deemed to be supplied via Mode 1. For other sectors, like other business services, a further breakdown is needed to allow for different modal allocations across sub-components.

Since the initial data set is not complete at the desired level of disaggregation (only about 41% of the cells are reported, representing about 64% of total trade), the missing data have to be estimated.

4.2 Data set preparation, imputations and estimations

The first step towards completing the data set is to check for implausible negative values (flagged E4.1) and inconsistencies between parent and child values (i.e. the sum of subitem values is not equal to the total value of the parent, flagged E4.2). Some unexpected "jumps" in the time series (not identified as breaks in the methodology or data reporting), indicated by high growth rates, have also been noticed and carefully checked.

To apply the simplified approach at the most detailed level, all non-reported data in the data set are estimated. Given that the aggregate sectors (*total commercial services*, *goods-related services*, *transport*, *travel*, *other commercial services*) are completed in the initial data set, a "top-down" approach is followed to estimate any missing subitems. This means that the parent items are always estimated before their children to ensure internal consistency (i.e. for each year, all subitems add up to their parent item).

Different estimation procedures are used to estimate missing information – as summarized in Table 2. Table 3 and Table 4 include numeric examples to illustrate steps 1.1, 2.2 and 2.3 in the algorithm described below. In those tables, the shaded cells represent non-reported values.

Table 2: Estimating non-reported data in the BOP data set: Overview

Step	*Code*	*Description*	*% data points*	*% in value terms*
Step 0	E4.1	Correction of mistakes in source data	0.0	0.0
Step 1	E4.2	Correction of mistakes in source data (parent - sum of children <0)	0.3	0.0
	E1	Simple derivation	6.1	1.2
Step 2	E8	Interpolation back and forecasting	5.7	4.8
	E1.2	Simple derivation	11.1	0.0
Step 3	E6	Estimate completely missing information using bilateral data	2.0	1.3
	E7	Estimate completely missing information using clusters	28.7	12.4
Step 0	E4.1	Correction of mistakes in source data	0.0	0.0

Step 1 : Simple derivations

The first step exploits the hierarchical structure of EBOPS: non-reported values are derived by simple addition or subtraction from the reported data (within each column of Table 3 and Table 4). More specifically, three cases can be identified 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 3). 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;
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.

This step adds 6.1% of the possible data points (most of them are zeros).

Step 2 : Interpolation, backcasting, forecasting

While step 1 takes into account one year at a time, the estimations in step 2 exploit the information contained in the time series. If a subitem of the time series is reported for at least five years between 2005 and 2017, with at least one missing value either in the middle or at the beginning or at the end, the missing data point is interpolated, backcast or forecast. Again, given the hierarchical structure of the service sectors and since the aggregates are always complete in the base data set, these estimation techniques are applied on the shares (computed as the value of subitem divided by the total value of the item) in order to ensure internal consistency.

2.1. Gaps between two values, are estimated (in terms of shares) by spline interpolation[10] (see column 5 and 6 of Table 4).
2.2. The five-year moving average[11] of differences of shares are used to backcast, and respectively, forecast missing shares at the beginning (see column 3 of Table 3) and the end of the series.
2.3. The shares are rescaled to ensure that they sum to 100%[12] and thereafter transformed back into values.

This step adds 5.7% of all data points, representing about 4.8% of the value in dollar terms (coded E8).

Since additional values can be calculated via simple derivations after step 2, step 1 is repeated at this stage. Simple derivations resulting from E8 estimations in step 2 are coded E1.2 and represent 11.1% of the data set. However, in terms of values, these estimates represent less than 0.01% of the total value.

Step 3 : Completely missing information

In some cases an item is never reported by a country, or is reported only for some years. In the table below, this corresponds to all coloured cells (code labels are listed in Annex 1). In these cases, missing shares are estimated using the two methods outlined below.

3.1. Mirror data are used when at least 8 major trading partners report the missing item in their mirror flows. These estimates are coded E6 and are applied for 19 countries representing 2.0% of the data points and 1.3% of the trade in dollar terms.

3.2. When no mirror data are available, the shares for the non-reported items are estimated using averages computed for clusters of economies showing similar characteristics. A K-means clustering algorithm is used to group reporters based on their exports (imports) of *goods-related services*, *transport*, *travel* and *other commercial services* in 2013. Five clusters[13] are retained for each flow. These estimates are categorized as E7 and represent the 28.7% of the total number of cells, corresponding to 12.4% of total trade.

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

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

[12] If, for a given item, both estimated and reported shares exist, only the estimated shares are rescaled.

[13] Different ways of creating the clusters have been investigated. Using the shares of the main items provide the best results in terms of coverage and economic interpretation. Five clusters are retained in order to have sufficient data to compute the shares at the most detailed levels.

Table 3: example value level (in M$)

1	2	3	4	5	6	7	8	9	10	11	12	13
Code	**Flow**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
SK2	Export	65160	72926	82256	89293	82979	98435	107276	111936	112624	107720	96270
SK21	Export	306	331			235	216	302	614	709	791	887
SK22	Export	15129	16996			17563	21559	23924	23754	23376	22365	20012
SK23	Export		20625			24215	29990	33323	35058	35115	33768	29394
SK24	Export		34974			40966	46670	49727	52509	53424	50796	45977

Table 4: example of share transformation

1	2	3	4	5	6	7	8	9	10	11	12	13
Code	**Flow**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
SK2	Export	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SK21	Export	0.5%	0.5%	0.4%	0.2%	0.3%	0.2%	0.3%	0.5%	0.6%	0.7%	0.9%
SK22	Export	23.2%	23.3%	23.4%	23.8%	21.2%	21.9%	22.3%	21.2%	20.8%	20.8%	20.8%
SK23	Export	27.7%	28.3%	29.9%	30.1%	29.2%	30.5%	31.1%	31.3%	31.2%	31.3%	30.5%
SK24	Export	48.6%	48.0%	46.4%	45.9%	49.4%	47.4%	46.4%	46.9%	47.4%	47.2%	47.8%

4.3 Removing goods in travel expenditure

Travel (SD) includes both goods and services acquired by non-residents in the economy they visit.

The alternative presentation of travel, i.e. the breakdown into *goods* (SD1), *local transportation services* (SD2), *accommodation services* (SD3), *food-service services* (SD4), and *other services* (SD5) would be the best way to identify the services component. Unfortunately, only a few economies report this breakdown; for this reason, it was decided to use the BPM6/MSITS2010 standard breakdown of travel by purpose, and to remove goods proportionally from *business* and *personal travel*, as well as from their subitems.

For economies that report the alternative breakdown as non-zero[14], the share of goods on the total value of travel exports (imports) is calculated directly and subsequently subtracted from *business* and *personal travel* (and their subitems). These economies are listed in Table 5.

For the remaining economies, estimations are applied:

a. For Italy, Poland, Spain and Austria the proportion of goods in the total travel expenditure were provided in a questionnaire of compilers developed by Eurostat (Questionnaire of the Eurostat Modes of Supply Task Force); these are presented in Table 7; and
b. For other OECD countries as well as some non-OECD economies the proportion of goods is estimated on the exports side by using information on inbound tourism expenditure,

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For both flows, the five clusters may be interpreted as follows:

1) economies where tourism is the main source of receipts (share of SD in total commercial services between 50% and 90%);
2) corresponds to similar shares between transport (SC), Travel (SD) and other commercial services (SOX1): ~30% each;
3) small countries and islands reporting little or zero trade;
4) contains trader with Other services item between 35% and 60%;
5) traders of transport services (share of SC > 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 flagged E4.2.

[14] For the countries that report this item as zero the given information is discarded as considered not plausible.

published by the OECD[15]. First, the ratio of other consumption products and the total consumption products is computed for each available year (2007-2016). Because of the patchy coverage and the small variations of the ratios across time, we use an average of the ratios over the available years (presented in Table 6 for each country).[16] Indeed, using tourism statistics to estimate the proportion of goods in travel has some shortcomings, as the concepts of tourism do not entirely match the concepts of the travel in BOP; moreover, the tourism statistics are only available on the inbound (exports) side. Nevertheless, the same ratios are used on both exports and imports, as it is assumed that the expenditure habits for travellers to and from OECD economies are similar.

c. For all the remaining countries, SD1 is estimated applying the shares reported by similar economies[17].

[15] See the Internal Tourism Consumption data set at Stats.oecd.org (variables "NAT_ECO_V_OTHER_TOUR_CONSUMP" and "NAT_ECO_V_CONSUMP_PRODUCTS" and consumption = "NAT_ECO_H_INBD_EXPEND"). Latest access date 04/12/2018.

[16] Slovenia, Sweden and Czech Republic report SD1 and, therefore, the reported values are used.

[17] The same clusters as in section 4.3, step 3 are used.

Table 5: Economies that report the product breakdown of travel (SD1)

	Economy	Imports		Exports	
		Number SD1	% Average share	Number SD1	% Average share
1	Armenia	13	33.6	13	30.88
2	Bahrain, Kingdom of	1	8.7	1	8.91
3	Barbados	1	0.01	2	2.31
4	Bolivia, Plurinational State of			7	6.82
5	Bosnia and Herzegovina	11	30.2	11	22.12
6	Costa Rica	13	14.6	13	10.53
7	Curaçao			6	21.75
8	Czech Republic	7	16.1	7	20.61
9	Netherlands Antilles			5	30.42
10	Saint Martin			6	31.89
11	Sierra Leone	9	20.4	9	20.91
12	Slovenia	7	8.0	7	13.54
13	Sweden	7	16.7	7	25.87
14	Turkey	12	20.2	12	24.21

Source: WTO-UNCTAD-ITC trade in services data set.

Table 6: Goods expenditure as % of total tourism expenditure average between 2007 and 2016

	Economy	% Average Share
1	Australia	44.0
2	Bulgaria	31.5
3	Canada	24.2
4	Croatia	37.5
5	Denmark	61.7
6	Egypt	26.5
7	Estonia	31.7
8	Finland	32.4
9	France	31.3
10	Hungary	29.1
11	Iceland	17.2
12	India	24.1
13	Indonesia	11.9
14	Ireland	21.0
15	Israel	21.2
16	Japan	28.1
17	Lithuania	59.2
18	Mexico	31.0
19	Morocco	27.0
20	Netherlands	49.5
21	New Zealand	35.2
22	Norway	45.0
23	Philippines	1.8
24	Portugal	23.5
25	Romania	14.6
26	South Africa	39.8
27	Switzerland	32.6
28	United Kingdom	41.6
29	United States of America	21.4

Source: OECD.stat, Internal Tourism Consumption

Table 7: Goods expenditure as % of total travel expenditure - as reported to the Eurostat Task Force on MoS

	Economy	Imports	Exports
		% Average share	% Average share
1	Austria	24.0	15.0
2	Germany	39.0	
3	Italy	12.8	14.8
4	Poland	34.3	72.4
5	Spain	17.5	16.6

Source: MoS Methodological Questionnaire presented at the Modes of Supply Task Force Meeting of February 2018

4.4 Construction

The BOP item *construction* (SE) is reported on a gross basis, allowing for the identification of the goods and services acquired from the residents of the economy where the construction project is taking place. However, the acquisition of inputs from residents of the host economy is not considered to constitute international trade. For this reason total exports and imports of construction are recalculated to include only the final value of construction work undertaken (i.e. the price paid by clients to contractors):

- $SE*$ exports = construction abroad (SE1) exports
- $SE*$ imports = construction in reporting economy (SE2) imports.

Both flows are allocated equally to mode 3 and 4. This correction reduces total construction flows by around 25%, on average. It is important to stress, however, that even after the correction SE*, the separate identification of the pure service component for construction is not possible based on current data availability.

4.5 Estimation of distribution services

The final adjustment needed is an estimation of distribution services. Those services are provided by enterprises in the wholesale and retail trade industry, which purchase and resell goods with no, or only minimal, processing. They supply a service to producers and consumers of goods by storing, displaying and delivering a selection of goods in convenient locations, thus making them easy to buy. Distribution services are included in W/120; however, those services are only partially covered in the BOP services account, namely under *trade-related services*, where the commissions of intermediaries who do not own the goods they buy and sell (dealers, merchants, commodity traders, etc.) are recorded. The margins of wholesalers and retailers, instead, who buy the goods before re-selling them, are generally included indistinguishably in the value of the products sold, as recorded in the goods account. This component, which represents the biggest share of distribution services, should be separately estimated and included under Mode 1 (as recommended by the MSITS 2010).

Our estimation procedure consists of four steps:

1. First, the percentage of goods traded by the wholesale and retail industry is computed as the ratio of the exports of goods of that industry over total exports for each country; this information is sourced from the OECD Trade by Enterprise characteristics (TEC) data set (ext_tec03), which covers 36 economies[18]. As there is no information on the trade arranged by (foreign) wholesalers and retailers on the import side, the same share is applied to both flows.
2. The value of exports (imports) of goods arranged by wholesalers and retailers is estimated using the total goods exports (imports) recorded in the BOP multiplied by the ratio estimated in step 1.
3. The trade margin (in percentage) of the wholesalers and retailers is estimated using the Eurostat Structural Business Statistics (SBS) (sbs_na_dt_r2), by computing the shares between the "gross margins on goods for resale" and "turnover". Data gaps in reported series are filled in with countries' averages presented in Table 8. This ratio is used for both

[18] Data gaps in reported series are filled in with countries' averages. For economies not in the OECD sample, the average values presented in Table 8 are applied.

flows. For the economies not in the Eurostat sample, the average trade margin of 19.8% is applied for both flows.

4. Lastly, the distribution services (in dollar terms) are calculated as the ratio estimated in step 3 multiplied by the exports (imports) by wholesalers and retailers, as estimated in step 2:

$$\textit{Distribution services} = \frac{\text{X by wholesale, retail trade and repair}}{\text{Total X}} * \text{BOP Goods X (M)} * \frac{\text{Gross margin on goods for resale for wholesale, retail trade and repair}}{\text{Turnover of wholesale, retail trade and repair}}$$

Finally, the estimated *distribution services* (coded SW) are added to the trade-related services (SJ34), and the resulting value of *total trade-related services* (coded SWSJ34) is allocated to Mode 1. [19]

Table 8: Ratio of goods exported by the wholesale and retail industry
Estimated trade margin of the wholesalers and retailers

		Export	
	Economy	***% Average share traded by wholeselers***	***% Gross margin to turnover ratio***
1	Austria	20.8	20.6
2	Belgium	32.0	20.2
3	Bulgaria	22.0	12.6
4	Croatia	12.3	20.8
5	Cyprus	41.7	20.2
6	Czech Republic	11.2	14.3
7	Denmark	29.0	28.5
8	Estonia	22.5	14.5
9	Finland	11.1	19.6
10	France	19.6	21.7
11	Germany	11.0	22.4
12	Hungary	29.1	16.4
13	Ireland	10.4	19.0
14	Italy	13.4	19.9
15	Latvia	41.2	15.5
16	Lithuania	24.3	19.3
17	Luxembourg	18.8	13.3
18	Netherlands	25.7	21.2
19	Norway	5.0	22.1
20	Poland	13.8	11.6
21	Portugal	17.6	17.6
22	Romania	12.8	16.3
23	Slovak Republic	9.9	14.5
24	Slovenia	13.3	15.7
25	Spain	24.8	22.6
26	Sweden	19.7	21.7
27	Turkey	36.7	11.6
28	United States of America	21.7*	22.1*
29	Canada	12.8	
30	Costa Rica	11.1	
31	Greece	21.9	
32	Israel	22.3	
33	Korea, Republic of	11.6	
34	Malta	27.8	
35	New Zealand	17.7	

Sources: OECD TEC data set (ext_tec03); Eurostat SBS (sbs_na_dt_r2)
* shares for the US sourced from (Michael Mann, 2017)

[19] Compared to the MSITS2010 complementary item *total trade-related transactions*, our aggregate does not include merchanting. Due to the net recording of merchanting transactions in the BOP, the distribution margins cannot be separately identified from the value of the traded goods. In addition, reported data for merchanting are scarce.

4.6 Simplified allocation

The procedures described in sections 4.1 to 4.6 result in a complete BOP data set, covering 200 countries and 66 sectors for the period 2005-2017, and the EU28 for the period 2010-2017. At this stage, an "enhanced" simplified approach is taken to allocate the values to modes of supply.

For the economies that conducted surveys or projects on their trade in services by mode of supply, specific allocation tables were built, where the allocation percentages of each service sector to the relevant mode reflect the results of the study. Ad hoc tables were thus created for the United States, France, Finland[20], Colombia and India; they are presented in ANNEX 2.

For all the other reporters, the BOP trade values are distributed among modes following the simplified allocations provided in ANNEX 1. The percentage shares mostly reflect the allocation table used in Eurostat's pilot model (see chapter 3). One notable exception is *audiovisual and related services*, for which TiSMoS contemplates a part of mode 2. This accounts for the consumption abroad of services that occurs when the production of motion pictures or television programs takes place abroad.

Following MSITS2010, construction is the only BOP item to be partly allocated to mode 3, as the establishment of a (temporary) local office is common in the economy where the construction project is taking place. Such foreign entities are considered non-residents, and thus the corresponding transactions are recorded in the BOP, although the service in those cases is considered as supplied via commercial presence.

The modes of the more aggregated service categories are not provided in the table, as the allocation takes a bottom-up approach (i.e. the final allocation by mode of supply of a parent item depends on the allocation of the sub-items). The provided distributions are used for both trade flows and for all years.

[20] Finland's allocation table was obtained through Eurostat's Task Force on trade in services by mode of supply.

5 Estimating commercial presence

5.1 Foreign AffiliaTes Statistics and commercial presence

Commercial presence, or mode 3, can be approximated using Foreign Affiliates Statistics (FATS).[21] This framework describes the activities of foreign-controlled affiliates in the reporting economy (inward FATS) and, conversely, the activities of majority-owned affiliates of resident enterprises established abroad (outward FATS). The FATS variable to measure mode 3 should be output (or production value). For most service sectors, this will be the same as sales (or turnover) because for most services there is no work-in-progress, nor stocks.

However, a number of considerations are necessary when estimating the value of mode 3:

i. FATS classifies companies by primary activity. For instance, the turnover of foreign affiliates is not broken down by product category but by activity, according to ISIC Rev. 4 Categories for Foreign Affiliates in Services (ICFA, Rev.1)[22]. If compilers were able to classify the turnover/output of foreign affiliates on a product basis, one could compare the value of a specific service supplied via commercial presence with the same service provided via a resident-non resident transaction.
ii. The FATS variable output is deemed to be the most pertinent measure of the international supply of services by mode. For most services this is equivalent to sales. However, for certain services such as wholesale and retail trade or financial intermediation, only output should be used. Wholesale and retail trade sales include the value of the goods that are sold, however, the output is only the trade margin realized on goods purchased for resale. Therefore, output is a better approximation of the value of the service supplied. Similarly, output is a preferred measure for financial intermediaries and insurance companies.
iii. In addition, one needs to distinguish between output sold locally and exported. Only the former should be considered asmode 3 supply of services in the host economy (i.e. the country of establishment of commercial presence). The exports of foreign affiliates are considered as mode 1 supply of the host economy to third economies.

This section outlines the estimation procedure followed to develop a worldwide datset of FATS inward and outward output for 200 economies, for 13 sectors from 2005 to 2017. First, all available statistics were collected from Eurostat, OECD and national sources. Secondly, the information contained in the source data is exploited to derive as many missing values as possible (by using zero derivations and mirror values). Thirdly, for the countries available in the source data, the missing values within a time series are estimated by back and forecasting, as well as interpolation techniques. Non-reported sectors (i.e. completely empty time series) and countries outside the initial data set are estimated through regressions. 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 data set using the correspondence table presented in ANNEX 6.

[21] In the past, because of the lack of data on foreign affiliates' activities, researchers used FDI stocks as a proxy to measure GATS mode 3. However, FDI and foreign affiliate activity statistics reflect different facets of the role of multinationals in the world economy.

[22] For the sectoral breakdown covered in TiSMoS, ICFA rev. 1 and ISIC rev. 4 are equivalent.

5.2 Description of the initial FATS dataset

FATS data are obtained from three sources: (i) Eurostat (foreign-controlled EU enterprises – inward FATS; and foreign affiliates of EU enterprises – outward FATS)[23]; (ii) OECD (activities of multinationals data sets)[24]; (iii) national sources when available.

Although the primary objective of this exercise is to build a complete worldwide data set with partner world, all available bilateral information is collected from the sources listed above and used in subsequent estimation steps.

Thirteen service sectors are included in the analysis, corresponding to ISIC Rev. 4 Sections F to S, excluding O (see Table 9). The aggregated sectoral breakdown (as compared to the relatively detailed BOP classification) is motivated by the very scarce availability of hard data in the FATS domain.

An important difficulty encountered when dealing with these statistics is the coexistence, across the time span considered, of two versions of the ISIC classification: Revision 3 and Revision 4 (or NACE Rev. 1 and NACE Rev. 2 for countries sourced from Eurostat database). This entailed further analysis and manual adjustments to build, for each country, the longest possible time series according to the ISIC Rev. 4 classification.

Other methodological changes that affected the comparability of data over time were the introduction of the UCI (Ultimate Controlling Institution) principle or major changes in compilation methodology. In those cases, the identified breaks in series were dealt with by removing the figures before the break and replacing them with estimates.

Output is considered a superior measure of the service supply (see MSITS 2010, para. 5.65). For most service sectors sales, however, sales are more easily available. Although sales are used for most sectors (i.e. as an equivalent to output), there are some exceptions as listed below:

i. For *wholesale and retail trade; repair of motor vehicles and motorcycles*, the variable output (or production)[25] is used, as the sales would considerably overestimate the supply of services via mode 3 by including the value of the intermediated goods. The output variable is reported for 41 economies, on the inward side only. Consequently, the average share between output and sales is used to estimate the variable output when the information is missing.

ii. *Financial and insurance activities* need a specific treatment. For this sector, although output would better quantify the service provision[26], it was decided to use sales due to data availability. Nevertheless, the sales of this activity are not available for Eurostat reporters on the inward side at the aggregate level (ISIC Rev. 4, Section K). In order to overcome this, the subsectors of K are taken into account. The following approach is followed:

[23] The Eurostat data sets 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: 01.2019

[24] Only reporters not available in Eurostat are sourced from the OECD, namely Costa Rica, Japan, Republic of Korea, Norway and the United States, from the tables:"Inward activity of mutinationals by investing country – ISIC Rev 4", "Outward activity of mutinationals by country of location – ISIC Rev 4", "Inward activity of mutinationals in ISIC Rev 3", "Outward activity of mutinationals in ISIC Rev 3". (Data received from OECD in March 2019).

[25] Output excludes the value of the goods that are sold and includes, for example, changes in stocks of finished goods and work-in-progress.

[26] For the financial intermediaries, output also covers all implicit margins, whereas sales only encompass services that are explicitly charged for; for the insurance sector, sales measures the total premiums earned, while output takes into account the income earned from technical reserves and excludes the indemnities paid (output = premiums + investment income – indemnities).

a) For division K64 *(financial service activities, except insurance and pension funding*) the variable output was taken, when available.

b) For divisions K65 and K66 (*insurance, reinsurance and pension funding, except compulsory social security*; *activities auxiliary to financial service and insurance activities*), the variable sales was used.

c) Finally, the total value for division K was calculated by adding (a) and (b).

This procedure allowed us to fill the reported data gap for about 17 economies in Eurostat's sample on the inward side.

The estimation follows a bottom-up approach beginning with completing the lowest level of aggregation to reconstruct the total services sector. The sectors considered and their coverage are presented in Table 9.

Table 9: Coverage of the initial FATS dataset

Sector description	Sector code	ISIC rev. 4 code	Number of reporters					
			INWARD			OUTWARD		
			Eurostat	OECD	Nat. source	Eurostat	OECD	Nat. source
Construction	CONST	F	30	4	10	25	4	2
Wholesale and retail trade; repair of motor vehicles and motorcycles	WHOREP	G	30	4	11	24	4	3
Transportation and storage	TPST	H	30	4	11	26	4	3
Accommodation and food service activities	FOOD	I	30	4	9	26	4	-
Information and communication	INFCOM	J	30	2	7	23	3	2
Financial and insurance activities	FIN	K	17*	3	9	25	3	3
Real estate activities	REA	L	29	4	9	25	4	1
Professional, scientific and technical activities	PROF	M	30	2	7	25	3	3
Administrative and support service activities	ADMIN	N	30	2	7	26	3	1
Education	EDUC	P	-	3	4	24	3	-
Human health and social work	HEALTH	Q	-	2	3	24	3	-
Arts, entertainment and recreation	ARTS	R	-	2	2	22	2	1
Other service activities	OSERA	S	-	2	6	26	2	2

** Note: see section 5.2 , paragraphs (i), (ii) and (iii) for the treatment of these sectors.*

5.3 Dataset preparation, imputation and estimations

The original data contain about 68% of reported zeros. This number increases when deriving zeros from reported data. When the total sales (for all activities) is reported as zero, all its subitems are imputed with zeros.

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 estimates.

Impute zeros using FDI data or FATS variable number of enterprises

Bilateral FDI data are used to fill in some additional data gaps. This step was carried out using FDI stocks data sourced from: (i) the IMF Coordinated Direct Investment Survey (CDIS) database[27] and (ii) from the bilateral Eurostat database[28] and (iii) FDI stocks data with partner world were added from the OECD database for a few countries[29]. Based on the assumption that there cannot be FATS sales without investment, we attributed zero values in the bilateral FATS data set when the FDI stock between two countries is reported as zero. The resulting estimations are coded Z0.1, Z0.2 and Z0.4.

Finally, if a country reports a zero in the number of enterprises variable, the output is also estimated zero (estimation code Z0.3).

Develop a complete data set for economies with some available data (partner world)

The objective of this step is to complete the information for the countries that report some FATS, which are presented in ANNEX 3.

In those cases, gaps in the time series need to be filled. For this purpose, the following econometric model is used:

$$\ln(FATS_{rit}) = \alpha_0 + \beta_0 poly_t + \beta_1 ln(gdps_{rit}) + \beta_2 ln(BoP_{rit}) + \gamma_i ln(gdps_{rit}) + \gamma_i ln(BoP_{rit}) + \delta_f ln(gdps_{rit}) + \delta_f ln(BoP_{rit}) + \gamma_i + \delta_f + \varepsilon_{rit}$$

where $\mathbf{FATS_{irt}}$ describes foreign affiliates sales for partner world, for flow **f**, in sector **i**, reporter **r** in year **t**.

Two main prediction variables are used in this model: (i) the sectoral value added[30], $\boldsymbol{gdps_{rit}}$, and (ii) the balance of payments trade in the relevant service sector, $\boldsymbol{BoP_{rit}}$. It is expected that, on the inward side, the size of the local market in the host country will be positively correlated with the affilates's sales; on the outward side, a bigger sector in the investing country will be also positively correlated with the establishment of foreign affiliates, and thus with their sales. Resident to non-resident trade is used to capture the complementarities of the different modes of supply. The choice of the two main variables is motivated by their predictive power and by their availability for the entire sample of countries considered in TiSMoS. As expected, the estimated coefficients for the two variables are positive and significant. Policy variables have been intentionally excluded. Country (γ_i) and flow (δ_f) fixed effects are used, but no time fixed effect is introduced because predictions are needed for years outside the sample. Instead, a time trend is modelled by a first order polynomial ($\boldsymbol{poly_t}$). Finally, interaction terms are introduced to account for differential impact of value added and BOP trade across sectors and flows. The model is estimated with an Ordinary Least Squares (OLS) method.

Data gaps in the reported time series are extrapolated using the growth rate obtained by the model predictions. These estimates are assigned a code E8.

[27] The variable Inward/Outward Direct Investment Positions in US Dollars is used. Latest access date: 24/07/2018.

[28] FDI stock, direct investment abroad and direct investment in the reporting economy. Latest access date 28/03/2018.

[29] Namely Czech Republic, Finland, Ireland, Israel, Iceland, Italy, Netherlands, Poland and Turkey. Latest access date 28/03/2018.

[30] UN National Accounts, Eurostat, OECD and various national sources. For the few countries where the sectoral value added was missing, average shares of countries that report these figures where applied to total GDP figures.

Develop a complete data set of FATS sales for countries with no data

After completing the data set for the countries that report some FATS, the next step is to predict sales for the economies with no reported data at all or to fill in completely missing time series for the countries with incomplete reported data (e.g. non-reported sectors). In order to take advantage of all available FATS information, bilateral FATS are used to predict information by partner and by sector. Then, predicted bilateral transactions are summed up to obtain partner world.

As a first step, the gaps in the bilateral data set are filled in as much as possible through interpolation, back- and forecasting techniques using a three-year moving average of the growth rates. Then the figures in the bilateral data set are used as dependent variables in a set of gravity equations. The estimated coefficients are then used to extrapolate the missing values.

In building the models two major issues arise: (i) the difficulty to identify drivers of affiliates' output/sales which have a good predictive power and at the same time a wide coverage (i.e. explanatory variables that impact the sales/output and at the same time are available for about 200 countries); (ii) large proportion fo zeros and missing values in the bilateral data set.

The exercise of building a complete FATS dataset was already performed by Lakatos and Fukui (2012). Following their approach and, more generally, the current best practices in the gravity literature, the models are fitted using the Poisson Pseudo Maximum Likelihood (PPML) estimator as proposed by Santos Silva and Tenreyro (2006)[31]. However, unlike Lakatos and Fukui, no explicit policy-related variables are used in TiSMoS. The reasons for this are twofold: incomplete coverage and, more importantly, limit endogeneity problems when the dataset is used for analytical applications.

After testing for different specifications, the set of gravity equations which showed the highest predictive power is specified as:

$$\begin{aligned} FATS_{rst} = \ & \alpha_0 + \beta_1 year_t + \beta_2 ln(BoP_{rt}) + \beta_3 ln(gdps_{rt}) + \beta_4 ln(gdps_{st}) \\ & + \beta_5 ln(GDPpc_{rt}) + \beta_6 ln(GDPpc_{st}) + \beta_7 ln(dist_{rs}) + \beta_8 colony_{rs} \\ & + \beta_9 contig_{rs} + \beta_{10} comlang_{rs} + \varepsilon_{rst} \end{aligned}$$

where $FATS_{rst}$ describes foreign affiliates sales, source country $\boldsymbol{r}$, of destination country $\boldsymbol{s}$ in year $\boldsymbol{t}$, and $\boldsymbol{\varepsilon_{rst}}$ is the error term. Separate regressions are fit for inward and outward and for each sector, for a total of 26 regressions. The source of the explanatory variables, their definition, and their abbreviation as well as their interpretation are described below.

Trade costs: These time-invariant variables are sourced from the CEPII website, in the GeoDist section[32]:

i. $\boldsymbol{dist_{rs}}$ 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;

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

[31] In their paper, Lakatos and Fukui (2012) compare the Poisson Pseudo Maximum Likelihood (PPML), the Zero Inflated Poisson (ZIP) and Zero Inflated Negative Binomial (ZINB). The PPML is retained because it produces a data set with heterogeneity across sources, host and sectors consistent with actual data.

[32] Complemented with manual imputations for a handful of countries not covered by CEPII.

iii. $\boldsymbol{contig_{rs}}$ is a binary variable that takes the value of 1 if the pair of countries share a common border;

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

Size of the service sector: similarly to what was described for the previous model, a larger size of the service sector in both home and host country is expected to have a positive impact on the affiliates' sales for both the inward and the outward side (possibly larger on inward).

v. $\boldsymbol{gdps_{sit}}$ and $\boldsymbol{gdps_{rit}}$ represent the sectoral value added for the source and host countries, respectively.

Unobserved country characteristics: ideally, reporter and partner country fixed effects could capture any omitted variable correlated with the characteristics of the individual countries. However, this option is not viable as the objective is to derive out-of-sample predictions. As an alternative, per capita GDP is used (sourced from the World Bank's Development Indicators):

vi. $\boldsymbol{GDPpc_{rt}}$ and $\boldsymbol{GDPpc_{st}}$ are the GDPs per capita for the origin and the destination countries, respectively.

Trade: as for the model described in the previous section, the rationale behind using residents to non-residents trade is that a certain degree of supplementarity or substitutability is expected between the supply of services via an affiliate (mode 3) and the other modes.

vii. $\boldsymbol{BOP_{rit}}$ represents the full data set of the Balance of Payment with partner world, estimated in chapter 0. Imports (and exports) are used for the estimation of inward (and outward) FATS using the EBOPS-ISIC correspondence presented ANNEX 6.

Only the reported values, the mirror values and the simple derivations are used in the samples of the regressions to derive the sets of coefficients. The results are not sensitive to the mirror values and simple derivations.[33] The estimations derived from the models' predictions are flagged E9 and E9.1 (the latter code is used when the predictions are rescaled to fit some reported parent items).

The econometric results are presented by flow and by sector in ANNEX 4. As expected, the size of the service sector in the origin and host country ($\boldsymbol{gdps_{sit}}$ and $\boldsymbol{gdps_{rit}}$**)** impacts positively (almost always significantly) the FATS output/sales for both inward and outward. Likewise, the per capita GDP of the reporter and partner ($\boldsymbol{GDPpc_{rt}}$ and $\boldsymbol{GDPpc_{st}}$) seem to have a strong positive effect, especially on on the inward side for the reporter's one. Among the traditional gravity variables, distance has a negative and significant beta for virtually all sectors and flows. The presence of a colonial relationship, geographich contiguity and common language, instead, have a more hetereogeneous impact and are not always significant. Lastly, balance of payments trade ($\boldsymbol{BOP_{rit}}$) is significant only for some sectors. It was however kept in the final specification as it seems to improve the predictive power of the models, as measured by the out-of-sample mean square error (MSE)[34].

[33] Regressions were run with and without the additional derivations to check the robustness of the model.

[34] Different model specifications were tested to find the model with the best possible predictive power. 50 simulations were performed, in which data were split into a training set, containing 90% of the observations, and a test set with the remaining 10%. Then, the accuracy of the out of sample predictions resulting from the training set were assessed against the reported values by computing the Mean Absolute Error (MAE) and the Mean Squared Error (MSE). In particular, one specification tested used the Baier and Bergstrand (2009) methodology to model the trade cost variables. It was however rejected as the its predictions were less accurate than expected.

5.4 The final FATS data set

After using the models above to fill in all the remaining gaps, the FATS dataset is complete for about 200 economies and 13 service sectors[35]. Table 10 below summarizes the different flags present in the final FATS dataset with partner world.

Table 10: Overview of reported and non-reported FATS data with partner world

	Code	*Description*	*% data points*		*% value*	
			IWA	*OWA*	*IWA*	*OWA*
Reported	EURO	Eurostat data source	6.6	6.0	28.7	17.6
	OECD	OECD data source	0.9	0.6	16.1	16.9
	NAT	National source	1.2	0.3	5.4	2.4
Estimated	Z0	Zero imputations	4.0	13.4	0.0	0.0
	E8	Interpolation, backasting and forecasting	7.4	8.2	20.6	21.0
	E9	predictions from regressions	80.0	71.4	29.3	42.1
		Total reported	8.7	6.9	50.2	36.9
		Total estimated	91.3	93.1	49.8	63.1

In value terms, 50% of the final data set come from the three sources of reported data in inward and 37% in outward.

In addition to some 200 individual economies, the EU28 is included in the dataset as a single reporter. In this case, like for BOP, the time series only starts in 2010. The FATS sales/output figures for the EU28 are mostly reported by Eurostat, with the exceptions and caveats explained below.

On the outward side, the figures for the years 2010, 2011 and 2012 refer to the output of affiliates that are established outside the EU(27) and are controlled by EU(28) entities.[36] Starting in 2013, they refer to the output of affiliates that are established outside the EU(28) and are controlled by EU(28) entities. Although on the outward side all the sectors and years of interest are made available by Eurostat, some reported data points are replaced by manual imputations as the published aggregates do not take into account the important breaks in series that occur for the United Kingdom before 2015. Ad hoc corrections were thus made only in the sectors where the weight of the UK is significant (*education*; *arts, entertainment and recreation*; *health*, and *other service activities*).

On the inward side, the figures for the years 2010, 2011 and 2012 refer to the output of affiliates that are established in the EU(28) and are controlled by EU(27) entities. Starting in 2013, they refer to the output of affiliates that are established in the EU(28) and are controlled by EU(28) entities. Most sectors of interest are reported by Eurostat for the entire time span considered. However, similarly to what happens for the individual EU members, *arts, entertainment and recreation*; *education*; *financial and insurance activities*; *health*; and *other service activities* are not covered by Eurostat. Those sectors are estimated via gravity models.

[35] The complete FATS output dataset, covering 200 economies, 13 sectors and the period 2005-2017, is separately available.

[36] This is linked to data availability, in relation to the inclusion of data for Croatia in the estimates.

5.5 Adjusting for output sold locally

Only the output recorded locally (i.e. in the economy where the affiliate is located) constitute supply of services via mode 3. The affiliates' exports are considered Mode 1, and are captured by international trade in services statistics.

The share of output sold locally is directly available in FATS published at national level for a few economies. Some other countries report the FATS variable *exports* to the OECD (at least for some sectors/years). Finally, additional information is derived from the Services Trade by Enterprise Characteristics (STEC) framework, as published by Eurostat.

Table 11: Available information on output sold locally

	Inward	***Outward***
FATS - national source	Canada, Estonia, Austria, Denmark, United States, Zambia	Estonia, United States
FATS - OECD	Germany, Israel, Italy, Japan, Sweden, Spain	Czech Republic, Italy, Slovenia, Japan
STEC	Austria, Belgium, Czech Republic, Estonia, Finland, Luxembourg, Netherlands	Not applicable

For all other economies (as well as to fill gaps in the reported information) averages are used. Four groups of similar economies are created on the inward side, and three on the outward side[37]. Results are presented in tables 12 and 13. Due to very limited available information, those shares do not vary over time.

Table 12: Shares of output sold locally, inward

Sector / Group	F CONST	G WHOREP	H TPST	I FOOD	J INFCOM	K FIN	L PROF	M ADMIN	N REA	P EDUC	Q HEALTH	R ARTS	S OSERA
1	99	89	87	98	92	98	84	91	97	98	100	98	95
2	100	90	55	97	100	100	93	93	100	100	100	100	100
3	95	92	65	87	79	92	72	86	98	99	100	100	98
4	86	87	57	87	81	99	62	82	92	100	80	92	30

Table 13: Shares of output sold locally, outward

Sector / Group	F CONST	G WHOREP	H TPST	I FOOD	J INFCOM	K FIN	L PROF	M ADMIN	N REA	P EDUC	Q HEALTH	R ARTS	S OSERA
1	95	73	73	98	65	84	81	74	68	96	96	95	83
2	94	83	65	90	72	93	89	83	72	93	93	100	80
3	94	78	69	94	69	89	85	78	70	95	95	98	82

[38] Education and health include the related transactions in *personal, cultural and recreational services* and correspond to the EBOPS 2010 complementary groupings "Total education services" and "Total health services".

5.6 Balancing of inward and outward flows

Two distinct FATS datasets are built for inward and outward. However, when the data are aggregated for all reporters (i.e. when the total "world" figures are built), large asymmetries arise between the two flows. While at the level of total services the inward figures are about 25 to 30% higher than the outward ones, there is substantial heterogeneity across sectors. *Construction* and *financial intermediation*, for instance, are surprisingly well balanced. Differences larger than 70%, instead, are shown for *information and communication activities*. These asymmetries are balanced in TiSMoS (as well as in the accompanying FATS dataset) by benchmarking the final values to the outward "world" totals for *education*; *health and social work*; *arts, entertainment and recreation* and *other service activities*, and to the inward "world" totals for all the remaining sectors. It has to be noted, however, that only the estimated values are rescaled to fit the benchmark values, meaning that no reported figure has been changed.

The reason for using (mostly) inward as benchmark relies on the overall better quality of those figures, which are in general easier to collect (hence the greater availability of hard data on that side, see Table 11). Exceptions are ISIC rev. 4 sectors P to S (*education*; *health and social work*; *arts, entertainment and recreation* and *other service activities*), for which the proportion of hard data is higher on the outward side (inward figures for those sectors are not available for any Eurostat reporters).

6 The final TiSMoS dataset

6.1 EBOPS-ISIC bridge table

As mentioned in section 5.1, FATS variables follow a breakdown by activity, namely the ISIC Rev.4, whereas EBOPS is mostly a product-based classification. A bridge table is therefore necessary to present the results by the four modes.

Due to the inherent differences in the nature of the two classifications, no clear-cut conversion table will ever exist between ISIC Rev.4 and EBOPS 2010. Nevertheless, for the purposes of TiSMoS and since trade agreements mostly refer to services as products, a product-based classification consistent with EBOPS 2010 has been developed to match, to the extent possible, the coverage of ISIC rev. 4. This is built using the ICFA Rev. 1 classification, and the correspondence table with EBOPS 2010.

The final correspondences used in TiSMoS are presented in Table 14. In some cases there is a one-to-one relationship: for instance, the EBOPS *transport* item approximately matches the scope of the ISIC rev.4 sector *transport and storage*. In some other cases, certain EBOPS (ISIC) categories were re-grouped to better fit the corresponding ISIC (EBOPS) sector (for instance, *audiovisual services* are grouped with *telecommunications, computer and information services* as the activities related to motion pictures, radio and television programmes are included in ISIC sector J, *information and communication*). There are also cases while there is no correspondence, like *charges for the use of intellectual property n.i.e.*, because IP products could be traded by enterprises classified in many different sectors, and level of detail available for the EBOPS itme does not enable us to cater for this. The EBOPS *travel* and *personal, cultural and recreational services* items are broken down into their subcomponents and are not presented as such in TiSMoS. Instead, *tourism and business travel*,

education and *health* are available as separate products[38]. For the *tourism and business travel* item, the data availability does not enable a finer identification of the services products actually consumed (e.g. domestic transport, consumption of cultural services). Finally, the aggregate *trade-related services*[39] includes the EBOPS 2010 subitem SJ34, *trade-related services*, and the distribution margins of wholesalers and retailers (as described in section 4.6); this approximately corresponds to ISIC rev. 4 sector G (*wholesale and retail trade; repair of motor vehicles and motorcycles*).

The results are presented for the four modes for the eleven broad sectors for wich a correspondence exists; more details are available for modes 1, 2 and 4 (55 sectors). The complete EBOPS-ISIC bridge table is presented in ANNEX 6.

Table 14: EBOPS 2010-ISIC Rev. 4 correspondence

Ebops-like code	Description	ISIC rev. 4 CODE	Isic description
SA	Manufacturing services on physical inputs owned by others		
SB	Maintenance and repair services not included elsewhere		
SC	Transport	H	Transport and Storage
SDB1SK21	Health services	Q	Human health and social work activities
SDB2SK22	Education services	P	Education
SDASDB3	Tourism and business travel	I	Accommodation and food service activities
SE	Construction	F	Construction
SFSG	Insurance and financial services	K	Financial and insurance activities
SH	Charges for the use of intellectual property n.i.e.		
SISK1	Telecommunications, computer, information and audiovisual services	J	Information and Communication
SJXSJ34	Other business services (excluding trade-related)	L+M+N	Real estate; Professional, scientific and technical activities; Administrative and support service activities.
SK23	Heritage and recreational services	R	Arts, entertainment and recreation
SK24	Other personal services	S	Other service activities
SWSJ34	Total trade-related services (Distribution)	G	Wholesale and retail trade; repair of motor vehicl. and motorcycl.

6.2 Some aggregate results

For the first time, it is possible to have an overall picture of the international supply of services by the four modes for individual economies and service sectors, as well as for the "world" aggregate.

The aggregated results show that the global supply of services nearly doubled in the considered time span, reaching almost 13.5 tn USD in 2017 (see Figure 2). Mode 3 accounts for almost 60% of the total supply, while Mode 2 represents a bit over 10%. The share of Mode 1, which includes an estimation for distribution services, is close to 30%. Mode 4 represents around 3% of the total supply of services.

[38] Education and health include the related transactions in *personal, cultural and recreational services* and correspond to the EBOPS 2010 complementary groupings "Total education services" and "Total health services".

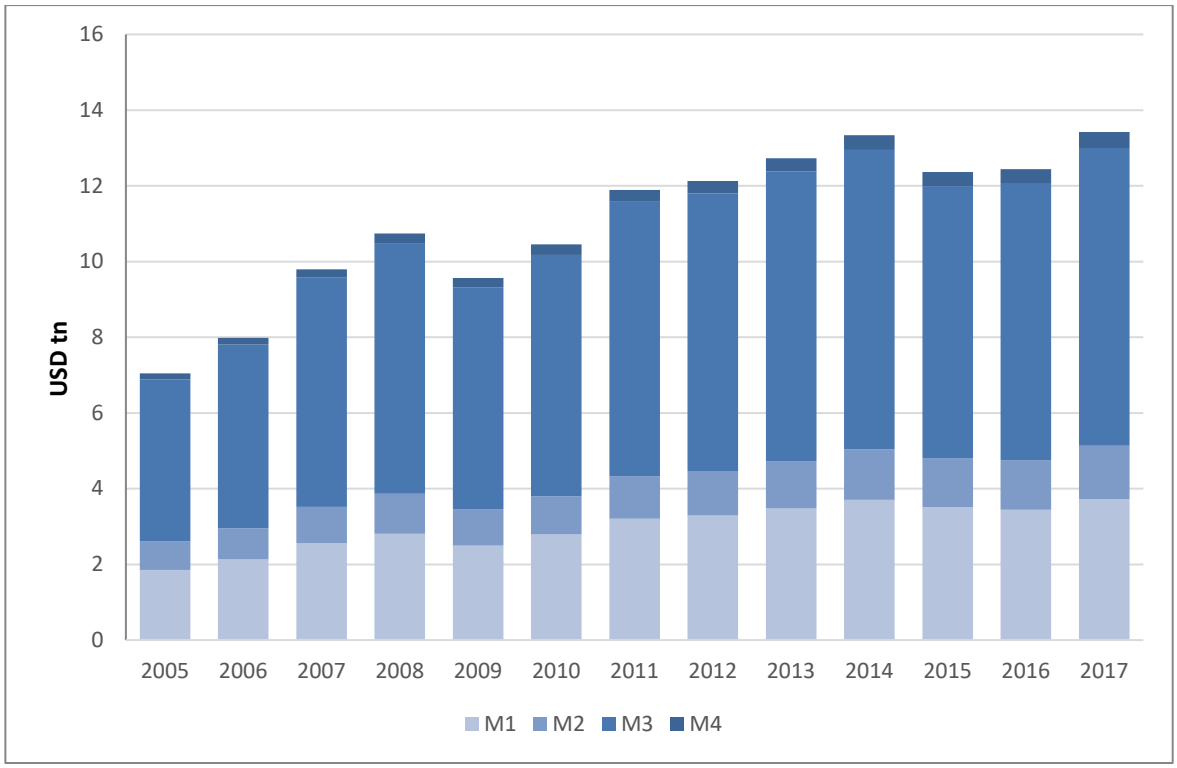
[39] Unlike the EBOPS 2010 complementary grouping "Total trade-related transactions", TiSMoS definition of *total trade-related services* does not include merchanting. This is due to the net recording of merchanting transactions in the BOP, which does not allow for the separate identification of the intermediation margins. In addition, the availability of data is limited for this item.

The figures in ANNEX 7. present the evolution of the modal shares over time for the different service categories. By construction, there is little variation of these shares over time, and fluctuations are mainly due to the variability of the underlying BOP data and FATS.

Mode 3 is the dominant mode in all sectors except for *Transport* which is supplied mainly through mode 1, *Education* that is mostly supplied via mode 2*, Tourism and business travel* that are delivered via mode 2, and *Trade-related services* which are are mostly supplied via mode 1.

The pictures shown reflect an aggregate view of in the supply of services by modes which is driven by big traders. Neverthless, an analysis by country, by level of income, by income group, by region, or by stage of development of the economies shows substantial hetherogeneity.

Figure 1: World trade in services by mode of supply
2005 - 2017



7 Conclusions and way forward

TiSMoS is an experimental dataset as it includes a number of assumptions and balancing. It is considered a starting point or baseline level dataset with a number of shortcomings, for example, the shares to break down balance of payments trade flows are kept constant over time. This can only be refined by information provided by compilers. Eurostat has created a task force on trade in services by mode of supply and the modularity of TiSMoS would allow to refine these estimates by country as soon as additional information is available. To this end, both Eurostat and WTO cooperate to document their current approaches and lessons learnt for guiding countries in their development of pilot studies.

Another aspect to take into account is that commercial presence in TisMoS is measured for enterprises classified in services based on their primary activity, although it is clear that services are not only supplied by services firms but also by manufacturing firms (and the other way round). However, it is not possible at this stage to overcome this issue as virtually no economy reports a breakdown of FATS sales by product.

This structural dataset does not require a regular update at a yearly frequency. This would be too resource intensive with a relatively low additional analytical value. More of interest would be to combine the trade in services dataset by partner and by mode of supply.

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9 Annex

ANNEX 1. 2010 BREAKDOWN AND DEFAULT ALLOCATION BY MODE OF SUPPLY

Indicator code	Item EBOPS 2010	M1	M2	M3	M4
1 SOXSW	*Services (including Distribution services)*				
2 ¦--SOX	*Commercial 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 ¦ ¦ ¦--SC1	*Sea transport*				
7 ¦ ¦ ¦ ¦-----SC11	*Passenger (Sea)*	100			
8 ¦ ¦ ¦ ¦-----SC12	*Freight (Sea)*	100			
9 ¦ ¦ ¦ °-----SC13	*Other (Sea)*		100		
10 ¦ ¦ ¦--SC2	*Air transport*				
11 ¦ ¦ ¦ ¦-----SC21	*Passenger (Air)*	100			
12 ¦ ¦ ¦ ¦-----SC22	*Freight (Air)*	100			
13 ¦ ¦ ¦ °-----SC23	*Other (Air)*		100		
14 ¦ ¦ ¦--SC3	*Other transport*				
15 ¦ ¦ ¦ ¦-----SC31	*Passenger (Other)*	100			
16 ¦ ¦ ¦ ¦-----SC32	*Freight (Other)*	100			
17 ¦ ¦ ¦ °-----SC33	*Other (Other)*		100		
18 ¦ ¦ °--SC4	*Postal and courier services*	100			
19 ¦ ¦---SD	*Travel*				
20 ¦ ¦ ¦--SDA	*Business travel*				
21 ¦ ¦ °--SDB	*Personal travel*				
22 ¦ ¦ ¦-----SDB1	*Health-related travel*		100		
23 ¦ ¦ ¦-----SDB2	*Education-related travel*		100		
24 ¦ ¦ °-----SDB3	*Other personal travel*		100		
25 ¦ ¦---SE	*Construction*				
26 ¦ ¦ ¦--SE1	*Construction abroad*			50	50
27 ¦ ¦ °--SE2	*Construction in the reporting economy*			50	50
28 ¦ ¦---SF	*Insurance and pension services*	100			
29 ¦ ¦---SG	*Financial services*	100			
30 ¦ ¦---SH	*Charges for the use of intellectual property n.i.e.*	100			
31 ¦ ¦---SI	*Telecommunications, computer, and information services*				
32 ¦ ¦ ¦--SI1	*Telecommunications services*	100			
33 ¦ ¦ ¦--SI2	*Computer services*	75			25
34 ¦ ¦ °--SI3	*Information services*	100			
35 ¦ ¦---SJ	*Other business services*				
36 ¦ ¦ ¦--SJ1	*Research and development services*	75			25
37 ¦ ¦ ¦--SJ2	*Professional and management consulting services*	75			25
38 ¦ ¦ ¦ ¦-----SJ21	*Legal, accounting, management, consulting and public relations*	75			25
39 ¦ ¦ ¦ °-----SJ22	*Advertising, market research, public opinion polling*	75			25
40 ¦ ¦ °--SJ3	*Technical, trade-related, and other business services*				
41 ¦ ¦ ¦-----SJ31	*Architectural, engineering, scientific and other technical services*				
42 ¦ ¦ ¦ ¦-----SJ311	*Architectural services*	75			25
43 ¦ ¦ ¦ ¦-----SJ312	*Engineering services*	75			25
44 ¦ ¦ ¦ °-----SJ313	*Scientific and other technical services*	75			25
45 ¦ ¦ ¦-----SJ32	*Waste treatment and de-pollution, agricultural and mining services*		50		50
46 ¦ ¦ ¦-----SJ33	*Operating leasing services*	100			
47 ¦ ¦ ¦-----SJ34	*Trade-related services*	100			
48 ¦ ¦ °-----SJ35	*Other business services n.i.e.*	75			25
49 ¦ °---SK	*Personal, cultural, and recreational services*				
50 ¦ ¦--SK1	*Audio-visual and related services*	70	10		20
51 ¦ °--SK2	*Other personal, cultural, and recreational services*				
52 ¦ ¦-----SK21	*Health services*	75			25
53 ¦ ¦-----SK22	*Education services*	75			25
54 ¦ ¦-----SK23	*Heritage and recreational services*	75			25
55 ¦ °-----SK24	*Other personal services*	75			25
56 °------SW*	*Distribution services*	100			

**Note: Distribution services (SW) is not an EBOPS 2010 standard item. It was added for the purpose of TiSMoS.*

ANNEX 2. SPECIFIC SECTOR ALLOCATION PROVIDED BY COUNTRIES

COUNTRY-SPECIFIC DISTRIBUTION FOR EXPORTS

	ES				US				IN				FI				CO			
	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
SOXSW																				
¦--SOX																				
¦ ¦---SA																				
¦ ¦---SB		80		20		100								100						
¦ ¦---SC	85	15																		
¦ ¦ ¦--SC1																				
¦ ¦ ¦ ¦-----SC11																				
¦ ¦ ¦ ¦-----SC12																				
¦ ¦ ¦ °-----SC13																				
¦ ¦ ¦--SC2																				
¦ ¦ ¦ ¦-----SC21																				
¦ ¦ ¦ ¦-----SC22																				
¦ ¦ ¦ °-----SC23																				
¦ ¦ ¦--SC3																				
¦ ¦ ¦ ¦-----SC31																				
¦ ¦ ¦ ¦-----SC32																				
¦ ¦ ¦ °-----SC33																				
¦ ¦ °--SC4																				
¦ ¦---SD																				
¦ ¦ ¦--SDA																				
¦ ¦ °--SDB																				
¦ ¦ ¦-----SDB1																				
¦ ¦ ¦-----SDB2																				
¦ ¦ °-----SDB3																				
¦ ¦---SE			35	65											11	89				
¦ ¦ ¦--SE1																				
¦ ¦ °--SE2																				
¦ ¦---SF																				
¦ ¦---SG																				
¦ ¦---SH																				
¦ ¦---SI	98			2.5													97			3.5
¦ ¦ ¦--SI1																				
¦ ¦ ¦--SI2					80			20	81			19	95			5	77			23
¦ ¦ °--SI3																				
¦ ¦---SJ	90			10																
¦ ¦ ¦--SJ1	98			2	59			41	83			17								
¦ ¦ ¦--SJ2	92			7	77			23	97			3								
¦ ¦ ¦ ¦-----SJ21	92			7																
¦ ¦ ¦ °-----SJ22	92			7	78			22	100											
¦ ¦ °--SJ3	88			12																
¦ ¦ ¦-----SJ31																				
¦ ¦ ¦ ¦---SJ311					80			20												
¦ ¦ ¦ ¦---SJ312					59			41	83			17								
¦ ¦ ¦ °---SJ313																				
¦ ¦ ¦-----SJ32														75		25				
¦ ¦ ¦-----SJ33																				
¦ ¦ ¦-----SJ34									100											
¦ ¦ °-----SJ35																				
¦ °---SK	92			8													57	39		4
¦ ¦--SK1	92			8													57	39		4
¦ °--SK2																				
¦ ¦-----SK21	92			8																
¦ ¦-----SK22	92			8	37			63	93			7								
¦ ¦-----SK23	92			8																
¦ °-----SK24	92			8																
°------SW*																				

**Note: Distribution services (SW) is not an EBOPS 2010 standard item. It was added for the purpose of TiSMoS.*

COUNTRY SPECIFIC DISTRIBUTION FOR EXPORTS

	ES				US				FR				FI				CO			
	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
1 SOXSW																				
2 ¦--SOX																				
3 ¦ ¦---SA																				
4 ¦ ¦---SB	92			8		100								100				100		
5 ¦ ¦---SC	96	4															92	8		
6 ¦ ¦ ¦--SC1																				
7 ¦ ¦ ¦ ¦-----SC11																				
8 ¦ ¦ ¦ ¦-----SC12																				
9 ¦ ¦ ¦ °-----SC13																				
10 ¦ ¦ ¦--SC2																				
11 ¦ ¦ ¦ ¦-----SC21																				
12 ¦ ¦ ¦ ¦-----SC22																				
13 ¦ ¦ ¦ °-----SC23																				
14 ¦ ¦ ¦--SC3																				
15 ¦ ¦ ¦ ¦-----SC31																				
16 ¦ ¦ ¦ ¦-----SC32																				
17 ¦ ¦ ¦ °-----SC33																				
18 ¦ ¦ °--SC4																				
19 ¦ ¦---SD																				
20 ¦ ¦ ¦--SDA																				
21 ¦ ¦ °--SDB																				
22 ¦ ¦ ¦-----SDB1																				
23 ¦ ¦ ¦-----SDB2																				
24 ¦ ¦ °-----SDB3																				
25 ¦ ¦---SE			41	59											11	89				
26 ¦ ¦ ¦--SE1																				
27 ¦ ¦ °--SE2																				
28 ¦ ¦---SF																				
29 ¦ ¦---SG																				
30 ¦ ¦---SH																				
31 ¦ ¦---SI	99			1.4													97			3
32 ¦ ¦ ¦--SI1									100											
33 ¦ ¦ ¦--SI2	50			50	56			44	75			25	95			5	90			10
34 ¦ ¦ °--SI3																				
35 ¦ ¦---SJ	99			1.4																
36 ¦ ¦ ¦--SJ1	97			2.6	81			19												
37 ¦ ¦ ¦--SJ2	98			2																
38 ¦ ¦ ¦ ¦-----SJ21	98			2	69			31												
39 ¦ ¦ ¦ °-----SJ22	98			2	70			30												
40 ¦ ¦ °--SJ3	97			3																
41 ¦ ¦ ¦-----SJ31																				
42 ¦ ¦ ¦ ¦---SJ311					78			22												
43 ¦ ¦ ¦ ¦---SJ312					51			49												
44 ¦ ¦ ¦ °---SJ313																				
45 ¦ ¦ ¦-----SJ32														75		25				
46 ¦ ¦ ¦-----SJ33																				
47 ¦ ¦ ¦-----SJ34																				
48 ¦ ¦ °-----SJ35																				
49 ¦ °---SK	85			15													56	21		23
50 ¦ ¦--SK1	85			15					80			20					56	21		23
51 ¦ °--SK2																				
52 ¦ ¦-----SK21	85			15					50			50								
53 ¦ ¦-----SK22	85			15	32			68	50			50								
54 ¦ ¦-----SK23	85			15					75			25								
55 ¦ °-----SK24	85			15					25			75								
56 °------SW*																				

Note: Distribution services (SW) is not an EBOPS 2010 standard item. It was added for the purpose of TiSMoS.

ANNEX 3. FATS – REPORTED DATA

		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 4. RESULTS OF SECTORAL REGRESSIONS – INWARD (1)

	Construction	Wholesale and retail trade	Transport and Storage	Accommoda-tion and food service activities	Information and Communicati on	Financial and insurance activities	Real estate
Constant	-41.000***	86.000***	-70.000***	7.900	-26.000	50.000**	95.000***
	(0.000)	(0.000)	(0.001)	(0.750)	(0.320)	(0.023)	(0.004)
Time trend	0.009***	-0.063***	0.015	-0.027**	-0.003	-0.041***	-0.063***
	(0.004)	(0.000)	(0.170)	(0.036)	(0.800)	(0.001)	(0.000)
Sectorial BOP imports (reporter)	-0.022***	0.130	-0.120	0.460***	-0.079	0.140	0.028
	(0.001)	(0.160)	(0.460)	(0.002)	(0.490)	(0.140)	-0.840
Sectorial VA (partner)	0.760***	0.730***	0.940***	0.640***	0.830***	0.640***	0.730***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sectorial VA (reporter)	0.770***	1.100***	1.000***	1.100***	0.000***	0.890***	0.650***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita (partner)	0.160***	0.430***	0.380***	0.140	0.200	0.390***	0.100
	(0.000)	(0.000)	(0.000)	(0.390)	(0.210)	(0.001)	(0.330)
GDP per capita (reporter)	1.000***	1.200***	1.500***	1.600***	1.100***	1.100***	1.800***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance	-0.960***	-0.550***	-0.920***	-0.860***	-0.610***	-0.560***	-0.800***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	1.200***	0.008	0.190	0.850***	0.200	0.790***	0.850***
	(0.000)	(0.960)	(0.360)	(0.006)	(0.580)	(0.002)	(0.001)
Contiguity	0.470***	0.170	-0.006	-0.200	-0.550	0.170	0.470**
	(0.000)	(0.300)	(0.980)	(0.490)	(0.140)	(0.540)	(0.029)
Common language	0.001	0.130	0.130	0.320	0.610*	0.150	-0.094
	(0.958)	(0.450)	(0.430)	(0.260)	(0.095)	(0.510)	(0.710)
Adjusted R2	0.41	0.664	0.576	0.541	0.618	0.616	0.411
N zeros	5,4213	49,738	52,939	58,507	49,690	51,030	51,361
N mirror	8,790	10,935	10,219	11,410	9,186	11,941	9,897
N observations	57,534	58,190	56,640	60,932	53,464	54,061	55,045

Notes: Standard errors are robust for ppml (not shown)
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

ANNEX 4. RESULTS OF SECTORAL REGRESSIONS – INWARD (2)

	Professional, scientific and technical activities	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Constant	-25.000	11.000	-32.000*	-326.000***	-211.000**	-63.000
	(0.160)	(0.580)	(0.062)	(0.002)	(0.047)	(0.470)
Time trend	-0.005	-0.025**	0.020**	0.140**	0.088	0.012
	(0.560)	(0.010)	(0.019)	(0.011)	(0.120)	(0.780)
Sectorial BOP imports (reporter)	0.100	-0.130	.077*	0.022	-0.110	-0.180***
	(0.340)	(0.170)	(0.073)	(0.880)	(0.490)	(0.008)
Sectorial VA (partner)	0.710***	0.860***	0.490***	0.700***	0.920***	1.100***
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)
Sectorial VA (reporter)	0.930***	0.890***	0.650***	0.810***	0.760***	1.700***
	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
GDP per capita (partner)	0.220	0.290**	0.023	0.630	0.910	0.039
	(0.130)	(0.022)	(0.620)	(0.460)	(0.130)	(0.820)
GDP per capita (reporter)	1.300***	2.100***	-1.200***	1.400**	0.720***	0.690***
	(0.000)	(0.000)	(0.000)	(0.030)	(0.001)	(0.001)
Distance	-0.630***	-0.750***	-1.700***	0.370	-0.520*	-1.800***
	(0.000)	(0.000)	(0.000)	(0.690)	(0.054)	(0.000)
Colony	0.830***	0.740***	1.700***	2.100**	0.380	3.100***
	(0.001)	(0.000)	(0.000)	(0.014)	(0.620)	(0.000)
Contiguity	-0.140	-0.160	-1.300***	2.300	1.100*	-2.400***
	(0.540)	(0.390)	(0.000)	(0.210)	(0.074)	(0.000)
Common language	0.150	0.094	0.790***	2.100***	1.200**	0.980**
	(0.500)	(0.540)	(0.000)	(0.000)	(0.012)	(0.014)
Adjusted R2	0.627	0.713	-0.023	0.451	0.078	0.208
N zeros	49,514	48,877	50,519	49,902	49,437	40,493
N mirror	9,457	9,360	11,378	11,153	9,542	8,869
N observations	54,112	52,167	50,567	50,032	49,587	40,618

Notes: Standard errors are robust for ppml (not shown)
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

ANNEX 5. RESULTS OF SECTORAL REGRESSIONS – OUTWARD (1)

	Construction	Wholesale and retail trade	Transport and Storage	Accommoda-tion and food service activities	Information and Communicati on	Financial and insurance activities	Real estate
Constant	-39.000***	104.000***	-34.000	23.000	-5.100	42.000	147.000***
	(0.000)	(0.000)	(0.160)	(0.520)	(0.850)	(0.120)	(0.002)
Time trend	0.005	-0.072***	-0.007	-0.036*	-0.015	-0.038**	-0.090***
	(0.291)	(0.000)	(0.600)	(0.060)	(0.260)	(0.010)	(0.000)
Sectorial BOP exports (reporter)	-0.005***	0.410***	0.660***	0.098	0.270**	0.078	-0.003
	(0.009)	(0.000)	(0.000)	(0.560)	(0.033)	(0.430)	(0.980)
Sectorial VA (reporter)	0.820***	0.760***	0.780***	1.200***	0.880***	0.900***	0.730***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sectorial VA (partner)	0.720***	0.740***	0.860***	0.860***	0.780***	0.850***	0.780***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita (reporter)	1.000***	1.000***	1.300***	1.700***	0.900***	0.840***	1.800***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita (partner)	0.390***	0.540***	0.400***	0.380	0.260**	0.520***	0.110
	(0.000)	(0.000)	(0.000)	(0.100)	(0.034)	(0.000)	(0.260)
Distance	-0.720***	-0.400***	-0.920***	-0.840***	-0.440***	-0.690***	-0.850***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	0.900***	-0.150	-0.048	0.570	0.064	0.600*	0.780***
	(0.000)	(0.500)	(0.830)	(0.100)	(0.880)	(0.050)	(0.003)
Contiguity	0.480***	0.220	-0.180	0.049	-0.340	0.023	0.480*
	(0.000)	(0.160)	(0.500)	(0.890)	(0.410)	(0.940)	(0.054)
Common language	0.011	0.370**	0.079	0.170	0.590	0.007	-0.120
	(0.773)	(0.049)	(0.650)	(0.550)	(0.160)	(0.980)	(0.690)
Adjusted R2	0.281	0.666	0.556	0.601	0.587	0.595	0.426
N zeros	45,605	40,258	42,407	47,412	40,985	42,844	43,423
N mirror	3,639	3,696	2,969	3,127	3,065	2,098	4,889
N observations	48,105	47,577	45,469	49,083	44,132	45,786	46,207

Notes: Standard errors are robust for ppml (not shown)
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

ANNEX 5. RESULTS OF SECTORAL REGRESSIONS – OUTWARD (2)

	Professional, scientific and technical activities	Administrative and support service activities	Education	Human health and social work activities	Arts, entertainment and recreation	Other service activities
Constant	34.000	79.000**	-609.000***	-295.000**	-296.000***	-559.000***
	(0.240)	(0.030)	(0.001)	(0.012)	(0.001)	(0.001)
Time trend	-0.037**	-0.061***	0.270***	0.110*	0.130***	0.250***
	(0.011)	(0.001)	(0.005)	(0.073)	(0.003)	(0.003)
Sectorial BOP exports (reporter)	0.370***	0.003	0.280	0.096	-0.029	-0.005
	(0.010)	(0.980)	(0.220)	(0.100)	(0.390)	(0.860)
Sectorial VA (reporter)	0.700***	0.900***	-0.360	1.600***	0.950***	1.000***
	(0.000)	(0.000)	(0.310)	(0.000)	(0.000)	(0.000)
Sectorial VA (partner)	0.780***	0.810***	0.910***	1.800***	0.720***	0.480**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.014)
GDP per capita (reporter)	1.500***	2.400***	1.200***	1.700*	0.510	1.900***
	(0.000)	(0.000)	(0.000)	(0.098)	(0.190)	(0.000)
GDP per capita (partner)	0.200**	0.280***	4.500***	-0.680*	0.920**	1.500***
	(0.012)	(0.003)	(0.000)	(0.076)	(0.038)	(0.003)
Distance	-0.420***	-0.670***	-0.680	-1.700***	-0.340	-0.970**
	(0.000)	(0.000)	(0.130)	(0.000)	(0.210)	(0.017)
Colony	0.550***	0.640***	1.100	1.400**	0.090	1.900***
	(0.008)	(0.000)	(0.250)	(0.022)	(0.940)	(0.008)
Contiguity	0.059	-0.230	0.310	-0.450	1.000*	1.200
	(0.760)	(0.220)	(0.810)	(0.550)	(0.091)	(0.240)
Common language	0.380**	0.220	2.000***	2.200***	1.000**	0.150
	(0.026)	(0.110)	(0.004)	(0.000)	(0.027)	(0.820)
Adjusted R2	0.706	0.686	0.02	0.846	0.062	0.091
N zeros	40,450	40,672	42,656	42,675	43,037	42,113
N mirror	3,248	3,496	76	100	76	76
N observations	44,053	43,237	42,688	42,794	43,211	42,192

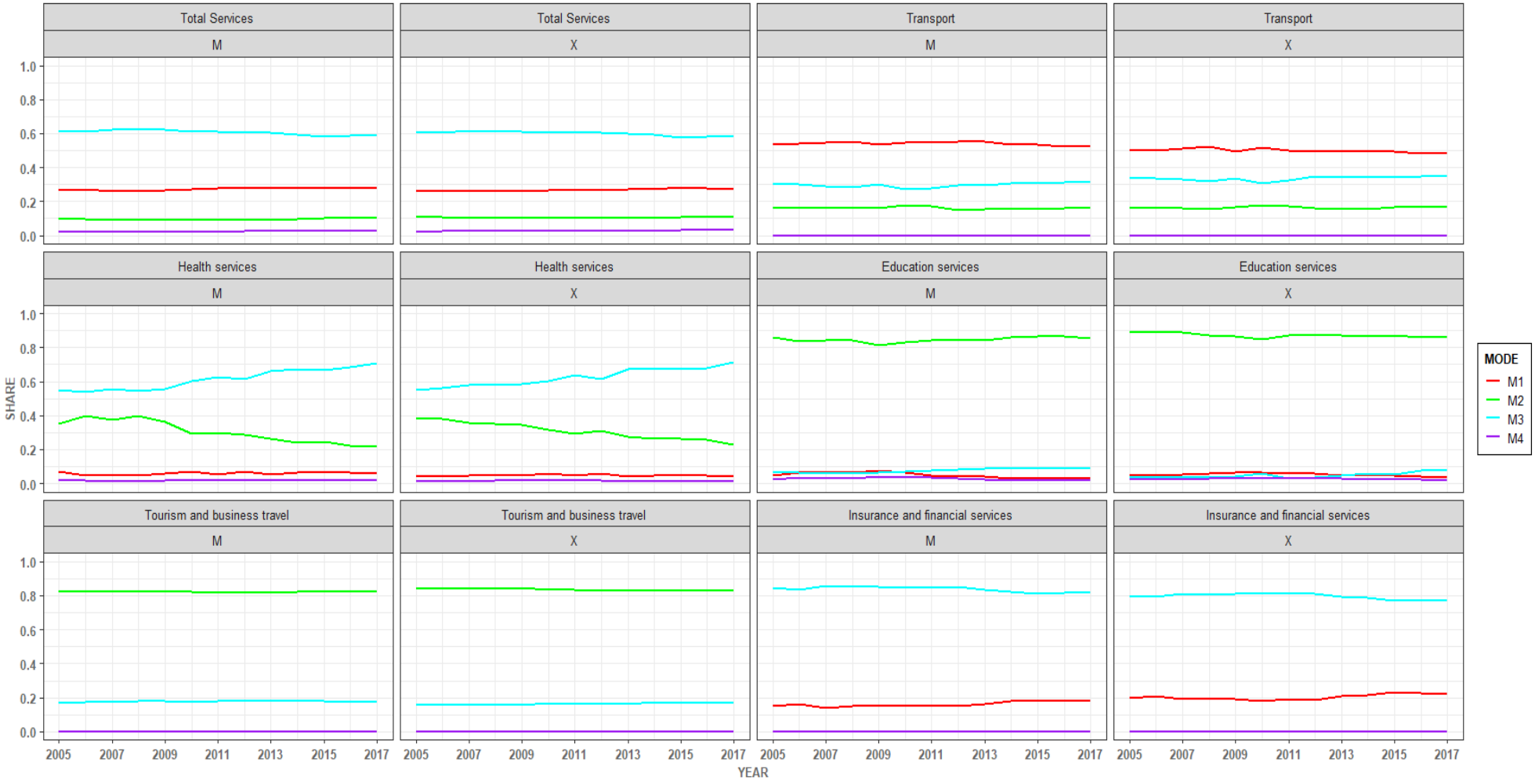
Notes: Standard errors are robust for ppml (not shown)
p-values in parenthesis
* p<.1, ** p<.05, ***<.01

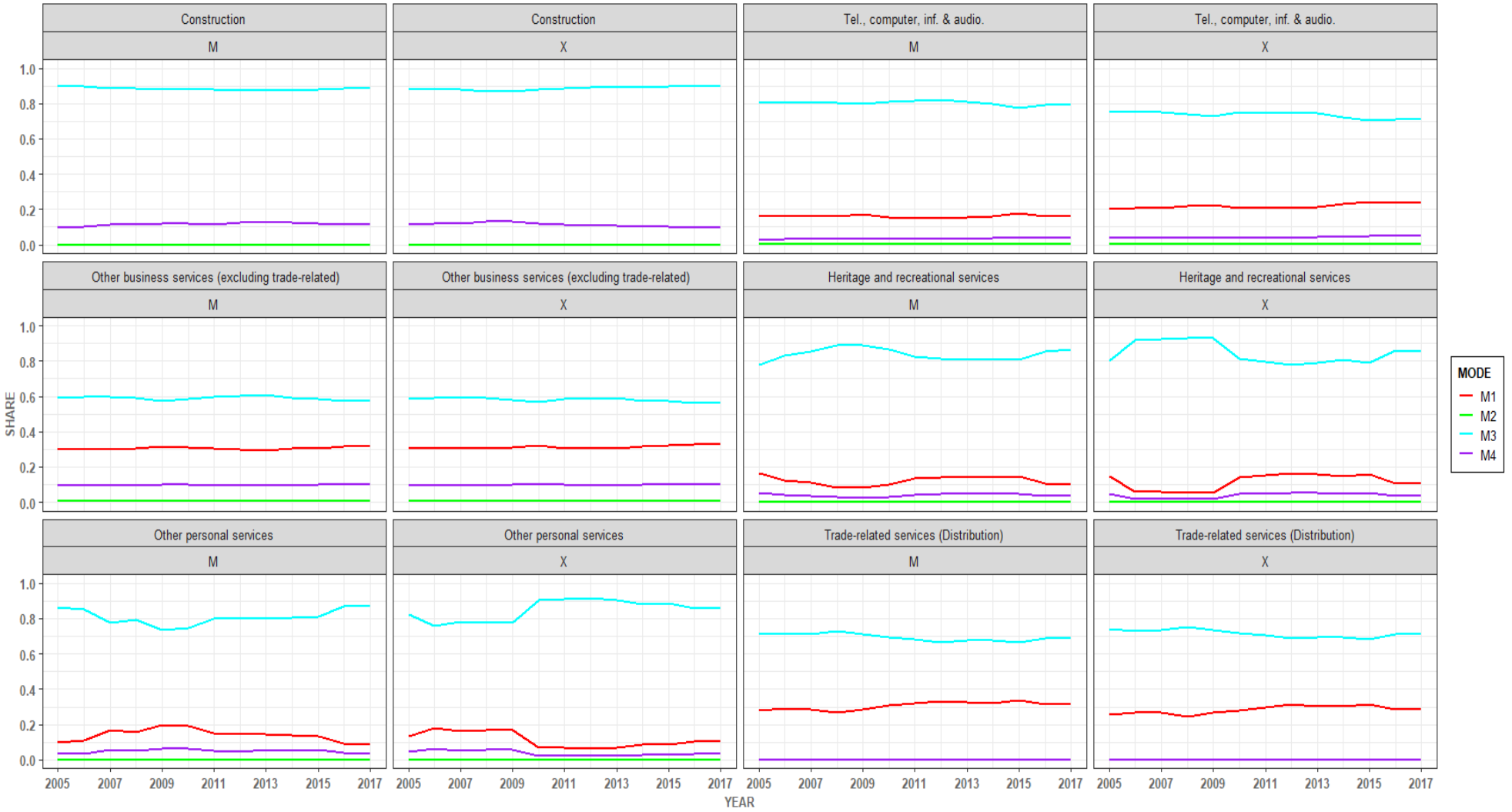
ANNEX 6. EBOPS-ISIC BRIDGE TABLE

Correspondence table between ISIC services sectors and EBOPS product based classification

EBOPS-like code	level	Description of EBOPS-like code	ISIC code	Isic description
SOXSW	**0**	**Total Services (sum of level 1 items below)**	**F-S_X-O**	**Total Services (sum of level 1 items below)**
SA	**1**	**Manufacturing services on physical inputs owned by others**		
SB	**1**	**Maintenance and repair services not included elsewhere**		
SC	**1**	**Transport**	**H**	**Transportation and storage**
SC1	2	Sea transport		
SC11	3	Passenger (Sea)		
SC12	3	Freight (Sea)		
SC13	3	Other (Sea)		
SC2	2	Air transport		
SC21	3	Passenger (Air)		
SC22	3	Freight (Air)		
SC23	3	Other (Air)		
SC3	2	Other transport		
SC31	3	Passenger (Other)		
SC32	3	Freight (Other)		
SC33	3	Other (Other)		
SC4	2	Postal and courier services		
SDASDB3	**1**	**Tourism and business travel**	**I**	**Accommodation and food service activities**
SDA	2	Business travel		
SDB3	2	Other personal travel		
SDB1SK21	**1**	**Health services**	**Q**	**Human health and social work activities**
SDB1	2	Health-related travel		
SK21	2	Health services (personal)		
SDB2SK22	**1**	**Education services**	**P**	**Education**
SDB2	2	Education-related travel		
SK22	2	Education services (personal)		
SE	**1**	**Construction**	**F**	**Construction**
SFSG	**1**	**Insurance and financial services**	**K**	**Financial and insurance activities**
SF	2	Insurance and pension services		
SG	2	Financial services		
SH	**1**	**Charges for the use of intellectual property n.i.e.**		
SISK1	**1**	**Telecommunications, computer, information and audiovisual services**	**J**	**Information and communication**
SI	2	Telecommunications, computer, and information services		
SI1	3	Telecommunications services		
SI2	3	Computer services		
SI3	3	Information services		
SK1	2	Audio-visual and related services		
SJXSJ34	**1**	**Other business services (excluding trade-related)**	**L+M+N**	**Real estate activities; Professional, scientific and technical activities; Administrative and support service activities**
SJ1	2	Research and development services		
SJ2	2	Professional and management consulting services		
SJ21	3	Legal, accounting, management, consulting and public relations		
SJ22	3	Advertising, market research, public opinion polling		
SJ3	2	Technical, trade-related, and other business services		
SJ31	3	Architectural, engineering, scientific and other technical services		
SJ311	4	Architectural services		
SJ312	4	Engineering services		
SJ313	4	Scientific and other technical services		
SJ32	3	Waste treatment and de-pollution, agricultural and mining services		
SJ33	3	Operating leasing services		
SJ35	3	Other business services n.i.e.		
SK23	**1**	**Heritage and recreational services**	**R**	**Arts, entertainment and recreation**
SK24	**1**	**Other personal services**	**S**	**Other service activities**
SWSJ34	**1**	**Total trade-related services (Distribution)**	**G**	**Wholesale and retail trade; repair of motor vehicles and motorcycles**
SW	2	Trade margins of wholesalers and retailers		
SJ34	2	Trade-related services		

ANNEX 7. AGGREGATED RESULTS BY SECTOR, FLOW AND MODE OF SUPPLY




Construction
M
Construction
X
Tel., computer, inf. & audio.
M
Tel., computer, inf. & audio.
X
Other business services (excluding trade-related)
M
Other business services (excluding trade-related)
X
Heritage and recreational services
M
Heritage and recreational services
X
Other personal services
M
Other personal services
X
Trade-related services (Distribution)
M
Trade-related services (Distribution)
X
SHARE
0.0
0.2
0.4
0.6
0.8
1.0
2005
2007
2009
2011
2013
2015
2017
YEAR
MODE
M1
M2
M3
M4

ANNEX 8. SOURCE CODES IN THE DATA SETS

Methodology Code	Definition
R_EURO	Reported: EUROSTAT International Trade in Services statistics or Eurostat FATS data.
R_EUEQ	Reported: EUROSTAT Quarterly Balance of Payments statistics.
R_IBP	Reported: IMF Balance of Payments statistics.
R_NAT	Reported: National source.
R_OECD	Reported: OECD International Trade in Services Statistics or OECD FATS data.
A	Aggregation. Used to calculate parent items based on subitems or country aggregations based member countries' figures.
E0	Estimated as negligible/zero.
E1	Simple derivation from reported figures.
E1.2	Simple derivation - after backcasting/forecasting/interpolation.
E2	Estimation of most recent year(s) missing in primary source by using the national BOP growth rate.
E2.1	Estimation of most recent year(s) missing in primary source by using the national BOP growth rate. Past shares used to estimate subitems.
E3	Estimated using past or future structure (shares).
E3.1	FATS: E28 extra trade estimated using the ratio extra/world obtained from the gravity model predictions. Used for sectors non reported by Eurostat on the inward side.
E4	Correction of mistakes in source data, such as implausible negative values, definition not in line with international recommendations, etc.
E4.1	Correction of mistakes in source data. Reported as negative value. Estimated as zero.
E4.2	Correction of mistakes in source data (parent item - sum of subitems < 0). Estimated as zero.
E5	Estimates based on regional growth rates.
E6	Completely missing time series information. Estimated using mirror data from past or future years. If more than 8 countries report some mirror flows, the available mirror trade is used to estimate an average share which is then applied.
E7	Completely missing time series information. Estimated using reported shares within a cluster of similar economies for a given year.
E7.1	Completely missing time series information. Estimated using reported shares within a cluster of similar economies, using past or future years.
E7.2	Completely missing time series information. Estimated using average shares computed using all countries that report information (when there is not enough information within a cluster to compute the required shares, the "world" average is used).
E8	Gaps in reported time series: estimated by back/forecasting or interpolation.
E8.1	FATS: Gaps in reported time series: estimated by back/forecasting or interpolation and rescaled to fit reported parent items.
E9	FATS: Missing values estimated through gravity model. The estimated value is an aggregation of the bilateral predictions.
E9.1	FATS: Missing values estimated through gravity model. The estimated value is an aggregation of the bilateral predictions, rescaled to fit reported parent items.
I	FATS: Missing values estimated through manual imputation.
Z0	FATS: Estimated as zero because corresponding balance of payments transactions are zero.
Z0.1	FATS: Imputation of zero FATS sales if the FDI stock reported by Eurostat in the relevant sector are zero.
Z0.2	FATS: Imputation of zero FATS sales if the FDI stock reported by OECD in the relevant sector are zero.
Z0.3	FATS: Imputation of zero FATS sales if the number of enterprises is reported as zero in the relevant sector.
Z0.4	FATS: Imputation of zero FATS sales in all sectors if the total FDI stock reported in the IMF Coordinated Direct Investment Survey (CDIS) database is zero.
Z0.5	FATS: Manual imputation of zero FATS sales for small islands.

ANNEX 9. CLUSTERS USED IN THE ESTIMATION OF OUPUT LOCALLY SOLD - INWARD

Group A					
Bulgaria	Czech Republic	Denmark	Estonia	Hong Kong China	Ireland
Latvia	Lithuania	Luxembourg	Malta	Singapore	Slovenia
Switzerland	United Arab Emirates				
Group B					
Australia	Brazil	Canada	China	France	Germany
Hungary	India	Japan	Korea Republic of	United Kingdom	United States of America
Group C					
Albania	Anguilla	Antigua and Barbuda	Argentina	Armenia	Aruba the Netherlands with respect to
Austria	Azerbaijan	Bahamas	Bahrain Kingdom of	Barbados	Belarus
Belgium	Belize	Bermuda	Bolivia Plurinational State of	Bosnia and Herzegovina	Brunei Darussalam
Cayman Islands	Chile	Chinese Taipei	Colombia	Costa Rica	Croatia
Cuba	Cyprus	Dominica	Dominican Republic	Ecuador	El Salvador
Faeroe Islands	Fiji	Finland	Georgia	Greece	Grenada
Guatemala	Guyana	Honduras	Iceland	Indonesia	Iran
Iraq	Israel	Italy	Jamaica	Jordan	Kazakhstan
Korea Democratic People's Republic of	Kuwait the State of	Kyrgyz Republic	Lebanese Republic	Macao	Malaysia
Maldives	Mexico	Moldova Republic of	Mongolia	Montserrat	Netherlands
Netherlands Antilles	New Zealand	Nicaragua	North Macedonia	Norway	Oman
Pakistan	Palestine	Panama	Papua New Guinea	Paraguay	Peru
Philippines	Poland	Portugal	Qatar	Romania	Russian Federation
Saint Kitts and Nevis	Saint Lucia	Saint Vincent and the Grenadines	Samoa	Saudi Arabia Kingdom of	Slovak Republic
Spain	Sri Lanka	Suriname	Sweden	Tajikistan	Thailand
Tonga	Trinidad and Tobago	Turkey	Turkmenistan	Ukraine	Uruguay
Uzbekistan	Venezuela Bolivarian Republic of	Viet Nam			
Group D					
Afghanistan	Algeria	Angola	Bangladesh	Benin	Bhutan
Botswana	Burkina Faso	Burundi	Cabo Verde	Cambodia	Cameroon
Central African Republic	Chad	Comoros	Congo	Côte d'Ivoire	Democratic Republic of the Congo
Djibouti	Egypt	Equatorial Guinea	Eritrea	Eswatini	Ethiopia
Gabon	Ghana	Guinea	Guinea-Bissau	Haiti	Kenya
Kiribati	Lao People's Democratic Republic	Lesotho	Liberia	Libya	Madagascar
Malawi	Mali	Mauritania	Mauritius	Morocco	Mozambique
Myanmar	Nepal	Niger	Nigeria	Rwanda	Sao Tomé and Principe
Senegal	Seychelles	Sierra Leone	Solomon Islands	Somalia	South Africa
Sudan	Syrian Arab Republic	Tanzania	The Gambia	Togo	Tunisia
Uganda	Vanuatu	Yemen	Zambia	Zimbabwe	

ANNEX 9. CLUSTERS USED IN THE ESTIMATION OF OUPUT LOCALLY SOLD - OUTWARD

Group A						
Bulgaria	Czech Republic	Denmark	Estonia	Hong Kong China	Ireland	Latvia
Lithuania	Luxembourg	Malta	Singapore	Slovenia	Switzerland	United Arab Emirates
Group B						
Australia	Brazil	Canada	China	France	Germany	Hungary
India	Japan	Korea Republic of	United Kingdom	United States of America		
Group C						
Afghanistan	Albania	Algeria	Angola	Anguilla	Antigua and Barbuda	Argentina
Armenia	Aruba the Netherlands with respect to	Austria	Azerbaijan	Bahamas	Bahrain Kingdom of	Bangladesh
Barbados	Belarus	Belgium	Belize	Benin	Bermuda	Bhutan
Bolivia Plurinational State of	Bosnia and Herzegovina	Botswana	Brunei Darussalam	Burkina Faso	Burundi	Cabo Verde
Cambodia	Cameroon	Cayman Islands	Central African Republic	Chad	Chile	Chinese Taipei
Colombia	Comoros	Congo	Costa Rica	Côte d'Ivoire	Croatia	Cuba
Cyprus	Democratic Republic of the Congo		Djibouti	Dominica	Dominican Republic	Ecuador
Egypt	El Salvador	Equatorial Guinea	Eritrea	Eswatini	Ethiopia	Faeroe Islands
Fiji	Finland	Gabon	Georgia	Ghana	Greece	Grenada
Guatemala	Guinea	Guinea-Bissau	Guyana	Haiti	Honduras	Iceland
Indonesia	Iran	Iraq	Israel	Italy	Jamaica	Jordan
Kazakhstan	Kenya	Kiribati	Korea Democratic People's Republic of	Kuwait the State of	Kyrgyz Republic	Lao People's Democratic Republic
Lebanese Republic	Lesotho	Liberia	Libya	Macao	Madagascar	Malawi
Malaysia	Maldives	Mali	Mauritania	Mauritius	Mexico	Moldova Republic of
Mongolia	Montserrat	Morocco	Mozambique	Myanmar	Nepal	Netherlands
Netherlands Antilles	New Zealand	Nicaragua	Niger	Nigeria	North Macedonia	Norway
Oman	Pakistan	Palestine	Panama	Papua New Guinea	Paraguay	Peru
Portugal	Philippines	Poland	Qatar	Romania	Russian Federation	Rwanda
Saint Kitts and Nevis	Saint Lucia	Saint Vincent and the Grenadines	Samoa	Sao Tomé and Principe	Saudi Arabia Kingdom of	Senegal
Seychelles	Sierra Leone	Slovak Republic	Solomon Islands	Somalia	South Africa	Spain
Sri Lanka	Sudan	Suriname	Sweden	Syrian Arab Republic	Tajikistan	Tanzania
Thailand	The Gambia	Togo	Tonga	Trinidad and Tobago	Tunisia	Turkey
Turkmenistan	Uganda	Ukraine	Uruguay	Uzbekistan	Vanuatu	Venezuela Bolivarian Republic of
Viet Nam	Yemen	Zambia	Zimbabwe			