

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

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ABSTRACT

This paper describes the approach for creating an analytical data set on trade in services by mode of supply (TiSMoS) at global level for the period of 2005 to 2017. The sector data follow the Extended Balance of Payments Classification (EBOPS 2010) in the Manual on Statistics on International Trade in Services 2010 edition (MSITS 2010). The countries' balance of payments data are complemented by estimates on the size of commercial presence (mode 3) for which a FATS database is constructed.

As the data set is built in modular form with a transparent methodology, it is hoped that the data set will develop into an international benchmark incorporating gradually any new available information.

1 Introduction

Trade in services is considered the new trade frontier as new technologies improve the tradability of services and at the same time expand the array of services products. However, the information base on trade in services does not keep pace with the extension of the international supply of services trade.

The WTO Secretariat, in close cooperation with other organizations, is working on addressing the issues above with the objective of expanding the information base on trade in services available to the public. It approaches the issue at different but complementary levels to leverage resources and seek synergies with other international organizations, data compilers and academics:

1. The WTO-UNCTAD-ITC trade in services data set 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). This experimental data set, which consists in a complete matrix of bilateral trade in services flows for the period 1995-2012, was created in response to the need for complete and consistent trade in services data at bilateral level and can serve a number of analytical purposes. Work on compiling a data set for 2005 to 2017 in BPM6 is ongoing.

¹ The authors work at the World Trade Organization, however, results of this paper do not represent any of the organization's Members opinion. Thanks go to the European Commission, DG Trade, for financing this project.

3. WTO trade in services data by mode of supply (TiSMoS). The WTO runs this EU-funded project in cooperation with other international organizations, selected data compilers and academics. The objective is to establish an experimental data set by end 2018.
4. On regulatory issues, the WTO runs a project with World Bank, the Integrated Trade Intelligence Portal (I-TIP). It includes four modules: the GATS commitments, provisions in regional trade agreements, applied regimes and statistics. Services restrictiveness indices will be included and released in the first half of 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 - in international services flows. 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 used in building the data set. The resulting experimental data set is released online in April 2019.

The work lines above establish a complete spectre for the analysis of the service sector, albeit of experimental nature. For the experimental data sets (2) and (3), on trade by partner developed with OECD and by mode of supply (developed with an expert group), three traits highlight their frame: (i) the baseline, (ii) the modularity, and (iii) transparency.

Baseline means that both data sets – on bilateral and on modes of supply -- are starting points with an agreed and established methodology. Their aim is to develop through additional input of data compilers, academics, and users in general.

Modularity means that estimates are replaced by hard data as and when they become available. The data sets, from total by sector, by partner, and by mode of supply could be exposed to restrictions of trade in services and thus the idea is to provide a complete analytical string to analyse trade in services.

Transparency is understood as not only documenting the methodology that was used to develop the data set, but also to provide for each single data point the relevant metadata, for users to understand how each figure is built.

The data set on trade in services by mode of supply is an analytical and not a statistical data set. As it is for research and economic modelling, care has been taken of not to use policy-oriented variables in regressions to predict missing values.

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

The definition of modes of supply is provided by the General Agreement on Trade in Services (GATS), one of the landmark achievements of the Uruguay Round, entered into force in January 1995. The GATS defines four ways (or “modes”) of trading services:

- **Cross-border supply (mode 1):** services supplied from the territory of one country into the territory of any another country. This may include any service provided by electronic means, such as phone, fax, email, or online 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. This covers visits to museums or theatres, visit to doctors, language courses, ship repair abroad, etc.
- **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 directly to a customer of another country or a self-employed lawyer delivering legal advice to foreign consumers.

The sectors included in TiSMoS follow the GATS coverage. The agreement includes all services excluding those supplied in the exercise of governmental authority (i.e. any service which is supplied neither on a commercial basis nor in competition with other suppliers) and air traffic rights and services directly related to the exercise of such rights. The allocation of trade values to the different modes is carried out following the recommendations of the Manual on Statistics of International Trade in Services 2010 (MSITS 2010). As a first approximation, trade values are allocated to their dominant mode of supply or, where there is no single dominant mode, to the most significant mode of supply (see MSITS2010, p. 122). This approach is called "simplified approach" and is described in more detail in chapter 3.

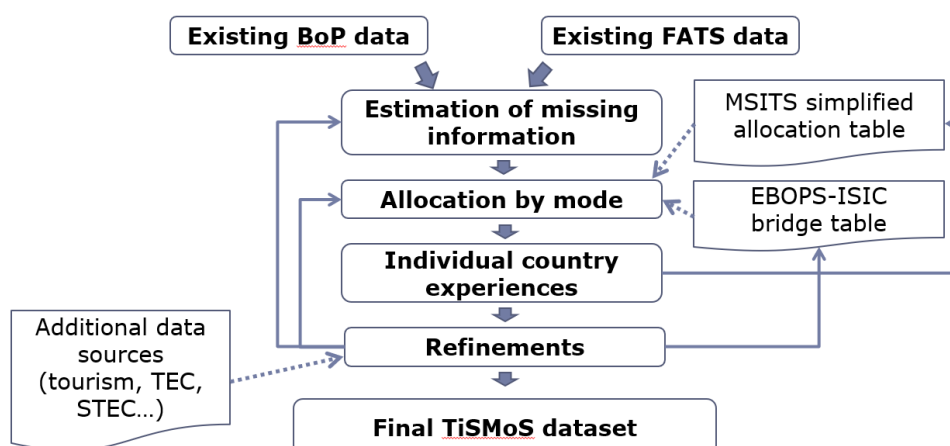
In practice, however, many types of services are produced, distributed, marketed, sold and internationally delivered through a combination of modes, for instance mode 1 and 4, mode 2 and 4, mode 3 and 4 or mode 1, 2 and 4. Even a combination of all modes is possible.

In developing this data set the "simplified approach", as suggested in MSITS2010, is applied in a first stage. This means that fixed modal shares are allocated to individual services sectors; for instance, computer services are delivered 75% through mode 1 and 25% through mode 4 for all countries. This is an arbitrary assumption which can only be refined when information directly collected by individual countries becomes available. Amending existing national surveys however depends on the countries' priorities and resources allocated for such statistical work.

Existing studies carried out at individual country level are incorporated in our analysis. The modularity of the approach means that hard data on service trade by mode of supply can replace the default allocation as soon as it becomes available.

The rest of this paper describes the detailed steps followed to build TiSMoS. Chapter 3 describes the balance of payments data set and the refinements needed to align these data to the GATS needs for measuring modes 1, 2 and 4. Chapter 4 illustrates how the FATS framework is used to measure commercial presence, and the steps followed to build a worldwide data set of FATS sales. Chapter 5 presents the EBOPS-ISIC bridge table that is used to join the two data sets, and describes some aggregate results. Chapter 6 concludes.

Chart 1: Overview of the approach



3 Modes 1, 2 and 4: an "enhanced" simplified approach

3.1 Balance of payments and modes of supply

This chapter illustrates how resident to non-resident transactions are used to measure services supplied through modes 1, 2 and 4. It describes the default simplified allocation of MSITS2010 to attribute trade values to their relevant mode of supply, and how experiences of individual countries are integrated in the framework.

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

A number of adjustments are made to meet the GATS scope:

- i. The balance of payments *travel* item includes both the goods and the services acquired by non-residents in the economy they visit. The goods part is estimated 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. The latter does not constitute international trade under the GATS and is therefore excluded from TiSMoS.
- iii. The GATS services classification W/120 covers *distribution services* as a separate sector, while in the Balance of Payment (BOP) these services are included in the valuation of goods (cif/fob). This requires the separate estimation of these services, which will then be allocated to mode 1.

3.2 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 215 reporters from 2005 to 2017. 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, 56 EBOPS 2010 items are selected². 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 availability³.

Since the initial data set is not complete at the desired level of disaggregation (only about 40% of the cells are reported, representing about 80% of total trade), the missing data have to be estimated. The missing part is due to the fact that many economies (especially developing) do not report the detailed EBOPS breakdown required.

Data set preparation, imputations and estimations

The preliminary step towards a complete data set is to check for problems of reported data. Implausible negative values (flagged E6) 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 E7), have been detected⁴. Some unexpected "jumps" in the time series (not identified as breaks), 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 already complete in the initial data set, a "top-down" approach is followed to estimate any missing subitems in the list of selected sectors. 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 the missing information -- see Table 2. Table 2 and Table 3 are artificial numeric examples to illustrate steps 1, 2 and 3 described below (the shaded cells represent non-reported values).

Table 1: Estimating non-reported data in the BOP data set: Overview

Step	Code	Description	% data points	% in value terms
Step 0	E6	Correction of mistakes in source data	0.03	0.0
Step 1	E1	Simple derivation	9.7	0.04
	E7	Correction of mistakes in source data (parent – sum of children < 0)	0.3	0.0
Step 2	E8	Interpolation, backcasting and forecasting	4.1	3.98
	E1.2	Simple derivation after Step 1	9.3	0.0
Step 3	E4	Estimate completely missing information using mirror data	2.2	1.2
	E5	Estimate completely missing information using clusters	27.9	11.42
Sum			51.4	22.6

² Considering the lowest level of aggregation to avoid double-counting, the total number of individual sectors selected is 39. See Annex 1 for the complete list of sectors covered in TiSMoS.

³ 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

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

Step 1 : Simple derivations

The first estimation step exploits the hierarchical structure of EBOPS: a number of non-reported values can be derived by simple addition or subtraction from the reported data (within each column of Table 2 and Table 3). 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 2). 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 negative⁵;
- 1.2. if an item is reported as zero, the corresponding subitems are set to zero;
- 1.3. if the sum of the reported subitems is equal to the value of the item, and there are one or more additional subitems missing, these are set to zero.

In total, 9.7% of possible points in the data set are added after this step; 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 is reported for at least five years in the 2005-2017 time span, but there is at least one missing value in the middle, at the beginning or at the end of a time series, the missing information is respectively 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 time series 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 interpolation⁶ (see column 5 and 6 of Table 3).
- 2.2. The five-year moving average⁷ of differences of shares are used to backcast, and respectively, forecast missing shares at the beginning (see column 3 of Table 2) and the end of the series.
- 2.3. The shares are rescaled to ensure that they sum to 100%⁸.
- 2.4. Shares are transformed back into values .

In total, 4.1% of all data points are estimated through backcasting/forecasting and interpolation. These estimations are assigned "E8" code and represent about 4.0% of the values in dollar terms.

Since additional values can be calculated via simple derivations after step 2, step 1 is repeated at this stage. Simple derivation resulting from E8 estimations in step 2 are coded "E1.2" and represent 9.3% of the data set. However, in terms of values, these estimates represent less than 0.01% of the total value.

⁵ As the correction of these potential misreported values requires verifications and, if possible, comparison with other available sources, the data will be corrected before the final version of this draft.

⁶ Although the adjustments for claim volatility introduced with BPM6 should limit the occurrence of negatives.

⁷ 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.

⁸ If less than 5 years are available, averages are computed using the number of values reported until at least 5 years are available.

⁹ If, for a given item, both estimated and reported shares exist, only the estimated shares are rescaled.

Step 3 : Completely missing information

In some cases an item is never reported by a country, or it is reported only for a handful of years. This would correspond, in the tables below, to all cells being coloured in SK21, SK22, SK23 and SK24 (codes are available in 24ANNEX 1.).

In those cases the missing shares are estimated using the two methods outlined below.

- 3.1.** When at least 8 major trading partners report the missing item in their mirror flows, this information is used to estimate the share of this item in the total trade for that specific reporter. These estimates are coded "E4" and are applied for 19 countries representing 2.2% of the data points and 1.2% of the trade in dollar terms.
- 3.2.** For all the other countries, 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 clusters⁹ are retained. These estimates are categorized as "E5" and represent the 28% of the total number of cells, corresponding to 11.4% of total trade.

Table 2: 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 3: 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%

3.3 Removing goods in travel

Being a transactor-based item in the balance of payments, travel includes both goods and services acquired by non-residents in the economy they visit. For the purpose of this project, however, only the services are of relevance.

The ideal way to isolate the goods component from the rest of travel would be to use the alternative presentation, i.e. the breakdown of the total value into *goods, local transportation*

⁹ Different ways of creating the clusters have been investigated. In the end, using the shares of the main items give the best results in terms of coverage and economic interpretation. Five clusters are retained in order to have enough data to compute the shares at the most detailed levels. For both flows, the five clusters may be interpreted as follows:

- 1) specialized in SD > 50% to 90%;
- 2) corresponds to similar shares between SC, SD and SOX1 (~30% each);
- 3) Smallest 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, within 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.

services, accommodation services, food-service services, and other services (SD1 to SD5). However, very few economies report this breakdown; for this reason, it was decided to use the standard breakdown of travel in this study, and to remove the goods component proportionally from *business* and *personal travel*, as well as from their subitems.

For the handful of economies that report the alternative breakdown as non-zero¹⁰, the share of goods on the total value of travel exports (imports) could be calculated directly and subsequently subtracted from *business* and *personal travel* (and their subitems). Those economies are listed in Table 4.

For the remaining economies (the vast majority), estimations have to be made. The following methods are applied:

- a. For Italy, Poland, Spain and Austria the proportions of goods in the total travel expenditure were provided in the Questionnaire of the Eurostat Modes of Supply Task Force and are presented in Table 6.
- b. For the rest of the OECD countries as well as some non-OECD economies (listed in Table 8), the proportion of goods is estimated on the exports side by using information on inbound tourism expenditure, published by the OECD¹¹. First, the ratio of *other consumption products* and *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 5 for each country).¹² Indeed, using the 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 the BOP; moreover, the tourism statistics are only available on the inbound (exports) side. Nevertheless, the same ratios are used on the import side, 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 using averages of the reported information by cluster and coded E5 (see section 4.3, step 3).

After removing the goods component, travel is reduced by around 30% on average.

¹⁰ For the countries that report this item as zero the given information is discarded as considered not plausible.

¹¹ See the Internal Tourism Consumption data set at [Stats.oecd.org](https://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.

¹² Slovenia, Sweden and Czech Republic report SD1 and, therefore, the reported values are used.

Table 4: Economies that report the product breakdown of travel

	<i>Economy</i>	<i>Imports</i>		<i>Exports</i>	
		<i>Number SD1</i>	<i>% Average share</i>	<i>Number SD1</i>	<i>% Average share</i>
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
15	Tuvalu	1	1.2	1	2.13
16	UNMIK/Kosovo			4	0.92

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

Table 5: Expenditure on goods as % of total tourism expenditure average between 2007 and 2016

	<i>Economy</i>	<i>% Average Share</i>
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 6: Share reported to the Eurostat Task Force on MoS

	<i>Economy</i>	<i>Imports</i>	<i>Exports</i>
		<i>% Average share</i>	<i>% Average share</i>
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 in the Modes of Supply Task Force Meeting of February 2018

3.4 Construction in balance of payments

The BOP item *construction* (SE) is reported on a gross basis, allowing for the separate 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 (being goods or services) from residents of the host economy does not constitute international trade under the GATS definition, as it is not covered by any of the four modes of supply. For this reason total exports and imports of construction are recalculated to include only the actual construction work undertaken:

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

This correction reduces total construction flows by around 35% in exports and 17% in imports, on average. It is important to stress, however, that even after the correction SE^* this item could still include some goods (the material inputs that, for instance, are brought by the foreign constructors from their economy of residence). The separate identification of the pure service component for construction is not possible based on the current data availability.

3.5 Estimation of distribution services

The final adjustment needed in the Balance of Payments data to align the scope of TiSMoS to the GATS 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 the services sectoral classification list used in GATS negotiations (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 part 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 economies¹³. 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.

¹³ Data gaps in reported series are filled in with countries' averages. For economies not in the OECD sample, average values presented in Table 8 are applied.

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 7. This ratio is used for both flows. For the economies not in the Eurostat sample, an average trade margin of 0.198 is applied for both flows.
4. Lastly, the distribution services (in dollar terms) are calculated as the ratio estimated in step 3 multiplied the exports (imports) by wholesalers and retailers, as estimated in step 2:

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*¹⁴ is allocated to Mode 1.

Table 7: Ratio of goods exported by the wholesale and retail industry
Estimated trade margin of the wholesalers and retailers

	<i>Export</i>		
	<i>Economy</i>	<i>% Average share traded by wholesalers</i>	<i>% Gross margin to turnover ratio</i>
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	

¹⁴ Compared to the MSITS2010 complementary item total trade related transactions, our aggregate does not include merchanting.

36	United Kingdom	24.9	
37	Bosnia and Herzegovina		14.0
38	Switzerland		11.1

Source: -OECD TEC data set (ext_tec03); -Eurostat SBS (sbs_na_dt_r2)

* shares for the US sourced from (Michael Mann, 2017)

3.6 Simplified allocation for modes 1, 2 and 4

The procedures described in sections 3.1 to 3.6 result in a complete BOP data set, covering 203 countries and 56 sectors for the period 2005-2017. At this stage, an "enhanced" simplified approach is taken to allocate the values to modes 1, 2 or 4.

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, Colombia and India.

For all the other reporters, the BOP trade values are distributed among modes 1, 2 and 4 following the simplified allocations provided in ANNEX 1. 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.

4 Estimation of mode 3

4.1 Foreign Affiliates Statistics and mode 3

Commercial presence, or mode 3 in the GATS parlance, is not measured by resident/non-resident BOP trade statistics, but it can be approximated using the Foreign Affiliates Statistics (FATS).¹⁵ 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). For most service sectors, the FATS variable to be used for measuring the supply of services through commercial presence is sales (or turnover).

However, the coverage of the FATS framework is not fully aligned with the GATS scope:

- i. GATS refers to majority ownership or control, while FATS data are based on majority ownership alone.
- ii. GATS covers services whether produced by a service company or a company classified in the manufacturing sector, whereas FATS statistics classifies companies by primary activity.
- iii. The FATS variable sales is deemed to be the most pertinent measure of the international supply of services by mode. However, for certain service industries such as wholesale and retail trade or financial intermediation, output would be a more appropriate measure.
- iv. In addition, from a statistical point of view, there exists the possibility of double counting when using total sales of the affiliates to measure commercial presence, because some affiliates' exports might be captured by international trade in services statistics (see

¹⁵ 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 (FATS) reflect different facets of the role of multinationals in the world economy.

MSITS 2010 par. 4.49 and 5.74). Therefore, distinguishing between "local sales" or "domestic turnover", and "exports", is essential to avoid this duplication.

This section outlines the estimation procedure followed to develop a worldwide dataset of FATS inward and outward sales for 203 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. Time series completely empty 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 Table 11.

4.2 Description of the initial FATS data set

Data sources

FATS data are obtained from three sources: (i) Eurostat (Foreign controlled EU enterprises – inward FATS; and Foreign affiliates of EU enterprises – outward FATS)¹⁶; (ii) OECD (Activities of multinationals data sets)¹⁷; (iii) national sources when available.

Partner breakdown

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.

Sectoral breakdown

Thirteen service sectors are included in the analysis, corresponding to ISIC rev. 4 sections F to S, excluding O (see Table 8). 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 with dealing with these statistics is the coexistence, across the time span considered, of two versions of the ISIC classification: the revision 3 and the revision 4 (or NACE rev. 1 and NACE rev. 2 for Eurostat's reporters). This entailed careful analysis and manual adjustments in order to build, for each country, the longest time series possible according to the ISIC rev. 4 classification.

In addition to the move to a newer activity classification, other methodological changes affect the comparability of data over time for a number of economies, like for example, the introduction of the UCI (Ultimate Controlling Institution) principle or other major changes in compilation

¹⁶ 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

¹⁷ 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 multinationals by investing country– ISIC Rev 4", "Outward activity of multinationals by country of location– ISIC Rev 4", "Inward activity of multinationals in ISIC Rev 3", "Outward activity of multinationals in ISIC Rev 3". Latest accessed date 03.2018

methodology. In those cases, the identified breaks in series are dealt with by removing the figures before the break and replacing them with estimates.

FATS Variables

While output is generally considered a superior measure of the service supply (see MSITS 2010, para. 5.65), in most service sectors sales is equivalent to output and, importantly, more easily available. Therefore, the variable sales is used for most sectors, with the exceptions listed below:

- i. For *wholesale and retail trade; repair of motor vehicles and motorcycles*, the variable output (or production)¹⁸ 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 only. The average share between output and sales is used to estimate the variable output.
- ii. For *Financial and insurance activities*, although output would better quantify the service provision¹⁹, 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 (section K). In order to overcome this, the subsectors of K are taken into account. The following approach is followed:
 - 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*), sales was used.
 - c) Finally, the total value for division K was calculated by adding (a) and (b).

This procedure allowed us to fill in the reported data gap for about 17 economies 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 8.

Table 8: Coverage of the initial FATS data set

Sector description	Variable	Sector code	ISIC rev. 4 code	Number of reporters					
				INWARD			OUTWARD		
				Eurostat	OECD	Nat. source	Eurostat	OECD	Nat. source
Construction	Value added.	CONST	F	30	4	10	25	4	2
Wholesale and retail trade; repair of motor vehicles and motorcycles	Output*	WHOREP	G	30	4	11	24	4	3
Transportation and storage	Sales	TPST	H	30	4	11	26	4	3
Accommodation and food service activities	Sales	FOOD	I	30	4	9	26	4	-
Information and communication	Sales	INFCOM	J	30	2	7	23	3	2

¹⁸ Output excludes the value of the goods that are sold and includes, for example, changes in stocks of finished goods and work-in-progress.

¹⁹ 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).

Financial and insurance activities	Sales	FIN	K	17*	3	9	25	3	3
Real estate activities	Sales	REA	L	29	4	9	25	4	1
Professional, scientific and technical activities	Sales	PROF	M	30	2	7	25	3	3
Administrative and support service activities	Sales	ADMIN	N	30	2	7	26	3	1
Education	Sales	EDUC	P	-	3	4	24	3	-
Human health and social work	Sales	HEALTH	Q	-	2	3	24	3	-
Arts, entertainment and recreation	Sales	ARTS	R	-	2	2	22	2	1
Other service activities	Sales	OSERA	S	-	2	6	26	2	2

4.3 Data set preparation, imputation and estimations

Derive zero values from original data set

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.

Exploit mirror data to fill in some data gaps

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

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) database²⁰ and (ii) from the bilateral Eurostat database²¹ and (iii) FDI stocks data with partner world were added from the OECD database for a few countries.²²

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. This imputation is applied only if the number of enterprises reported in the FATS framework is not greater than zero.

Develop a complete data set of FATS sales for countries with available data (partner world)

The first step towards a full matrix of FATS sales is to complete the information for the countries that report some FATS data (economies sourced from Eurostat and OECD, as well as from national sources).

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

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

²⁰ The variable Inward/Outward Direct Investment Positions in US Dollars is used. Latest access date: 24/07/2018.

²¹ FDI stock, direct investment abroad and direct investment in the reporting economy. Latest access date 28/03/2018.

²² Namely Czech Republic, Finland, Ireland, Israel, Iceland, Italy, Netherlands, Poland and Turkey. Latest access date 28/03/2018.

where $FATS_{irtf}$ describes foreign affiliates sales for partner world, in sector i , host country r in year t and flow f .

Two main prediction variables are used in this model: (i) the sectoral value added²³, $gdps_{rit}$, and (ii) the balance of payments trade in the relevant service sector, BoP_{ritf} . It is expected that, on the one hand, the size of the local market in the host country will be positively correlated with the likelihood of establishing and serve the local market via an affiliate

Table 9: Results of regressions (IWA and OWA) with partner world

Total services estimation by sector and flow		
	Panel linear	OLS
	(1)	(2)
Constant		-13.800
T	.046***	.005
Flow (OWA =1)	-18.900***	-17.900***
Log(GDP of reporter)	.309	.714***
Log(Trade of reporter)	-.145	.274***
OWA:lnGDP	.307***	.253***
OWA:lnVALUEBOP	.275**	.286***
Reporter FE	YES	NO
Observations	4,029	4,029
R-squared	.719	.780
Adjusted R-squared	.713	.778

Standard errors are robust for plm

Notes : * $p < .1$, ** $p < .05$, *** $p < .01$

No dummies shown to ease the presentation

This model is used for two purposes to fill in data gaps in reported time series. In this case, values are extrapolated using the growth rate obtained by the model predictions. Missing values are predicted by the gravity models presented below.

The analysis follows a bottom-up approach by completing all missing services sectors with partner world. Subsequently, the individual services sectors are summed up to create the total services category.

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

After completing the data set for the European and the remaining OECD countries, the next step is to predict sales for the remaining 145 economies with partner world. In order to take advantage of all available FATS information, reported bilateral statistics are used to predict sales by partner and by sector. Predicted bilateral sales are summed up to obtain partner world.

First, each time series completed by means of interpolation, back- and forecasting techniques using a three-year moving average of the growth rates.

²³ UN National Accounts, Eurostat, OECD and various national sources.

For all remaining missing cells, values are predicted using bilateral regressions. First, a gravity model is fit on the sample to estimate a set of coefficients of the main drivers of the commercial presence. Then, these coefficients are used to extrapolate missing values.

In this case, two major issues occur: (1) it is difficult to find drivers of the FATS sales that have a wide coverage, i.e. explanatory variables that impact the FATS sales and at the same time are available for all 196 countries and all years at the sector level; (2) A particularity presented by the bilateral FATS data by sector is the large number of zeros and missing values (due to confidentiality, rounding values, non-reported and constrained by the limited number of countries available).

To overcome these problems, the estimation procedure uses the Poisson Pseudo Maximum Likelihood (PPML) method proposed by Silva and Tenreyro (2006) and used by Lakatos and Fukui (2012) in their FATS estimation²⁴. The policy-related variables used by Lakatos and Fukui T. (2012) have been discarded from the analysis because: (1) they do not have a wide coverage and; (2) the users may want to combine the final data with these trade policy variables.

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

$$FATS_{rst} = \alpha_0 + \beta_1 year_t + \beta_2 \ln(BoP_{rt}) + \beta_3 \ln(gdps_{rt}) + \beta_4 \ln(gdps_{st}) + \beta_5 \ln(GDPpc_{rt}) + \beta_6 \ln(GDPpc_{st}) + \beta_7 \ln(dist_{rs}) + \beta_8 colony_{rs} + \beta_9 contig_{rs} + \beta_{10} comlang_{rs} + \varepsilon_{rst} \quad (Eq. 4-1)$$

where $FATS_{rst}$ describes foreign affiliates sales, host country r of affiliates in country s in year t , and ε_{rst} is the error term. Each regression is run in sector i and flow f . The source of the explanatory variables, their definition, and their abbreviation as well as their econometric interpretation are described below. In total, there are 10 variables included in the regressions.

Trade costs: These time-invariant variables are sourced from the CEPII website, in the GeoDist section²⁵:

- i. **$dist_{rs}$** 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. **$colony_{rs}$** is a binary variable taking the value of 1 if the country is a colonial relationship with its trading partner and 0 otherwise. The sign is expected to be positive;
- iii. **$Contig_{rs}$** is a binary variable that takes the value of 1 if the pair of countries share a common border;
- iv. **$comlang_{rs}$** , a binary variable that takes the value of 1 if at least 9% of the residents of both countries share at least one language.

Gross domestic product: The most commonly used variables in trade models are GDP, GDP per capita and growth rates of GDP. A larger size of home and host country raises affiliate sales with

²⁴ In their paper, Lakatos and Fukui (2012) compare the 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.

²⁵ Complemented with manual imputations for a handful of countries not covered by CEPII.

the former having a larger impact. The measures of GDP for the rest of the world and GDP per capita are directly pulled out from the World Bank's Development Indicators (WDI).

- v. $gdps_{sit}$ and $gdps_{rit}$ are the GDPs broken down by sector of the source and host countries, respectively. This data set was gathered and processed internally by the WTO staff for previous uses. The greater the size of the countries, the higher the chances to establish and serve the local markets via an affiliate. The missing GDPs by sector are estimated using average shares of countries that report these figures.
- vi. $GDPpc_{rt}$ and $GDPpc_{rt}$ are the gross domestic products divided by midyear population for both the origin and the destination countries. According to Lakatos and Fukui (2012), GDP per capita enables regressions to produce results that are less biased by the size of country.

Trade: The rationale is that it exists a degree of complementarity – though we do not know much about it – between providing the services via an affiliate (mode 3) and the other modes. This relationship differ across sectors and flows.

- vii. BOP_{rit} represents the full data set of the Balance of Payment with partner world, estimated in chapter 3.1. Imports (and exports) are used for the estimation of inward (and outward) FATS using the EBOPS-ISIC correspondence presented Table 11.

Econometric results

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.²⁶

The econometric results are presented by flow and by sector in ANNEX 2. and 3. As expected, $gdps_{sit}$, $gdps_{rit}$, $GDPpc_{rt}$ and $GDPpc_{rt}$ impact positively (almost always significantly) the FATS sales in both flows. BOP_{rit} exports and BOP_{rit} imports seem to have a positive impact in the majority of sectors but the magnitude seem to be weak and generally not significant.

$dist_{rs}$ has an expected negative and significant coefficient. This confirms that foreign affiliate sales are less of a conduit if the two countries are farther away. $colony_{rs}$ has a positive expected sign (except for the sector of health and arts) and $Contig_{rs}$ has (mixed sign and not positive and negative) impact on FATS sales.

4.4 Final FATS data set

The econometric model estimated in the previous step is used to fill all missing cells for the 145 remaining economies. These predictions by partner are summed up to obtain estimates with partner world. These data points are flagged with the code 'agr' and combined with the sample of countries that report values with partner world. The Table 10 below summarizes the different flags present in the final FATS data set with partner world.

²⁶ Regressions were run with and without the additional derivation to check the robustness.

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

	Code	Description	% data points		% in value terms	
			IWA	OWA	IWA	OWA
Reported	EU	Eurostat data source	5.3	4.5	21.9	24.6
	OECD	OECD data source	0.5	0.5	11.7	18.3
	NAT	National source	1.2	0.3	5.8	4.8
Estimated	E6f	Correction of reported data	0.0	0.2	0.0	0.0
	E8	Interpolation, backcasting and forecasting	6.4	6.4	25.3	34.3
	agr	bilateral predictions from Model aggregated	86.5	88.0	35.3	17.9

In value terms, 39% of the final data set come from the 3 sources of reported data in inward and 48% in outward. The final step in the construction of the FATS data set is to assess the accuracy of the predictions. Validating the results is a challenging task.

4.5 Adjusting for local sales

GATS commitments on commercial presence refer to sales in the territory of the host country of the affiliate. To comply with this scope, local sales are estimated against hard data for selected countries and information derived from the services trade by enterprise characteristics (STEC) database. Countries are clustered and averages are applied.

5 Discussion of results at total level and by mode

5.1 EBOPS-ISIC bridge table

Countries that report FATS follow a breakdown by activity, namely the ICFA, whereas the BOPS is classified as product. A unique classification is necessary to present the results by mode. However, no clear-cut correspondence exists between ICFA and EBOPS (BPM6). It should be noted that the way the correspondence is made directly impacts the results by sector. Because the GATS refer to services as products, it was decided to present the results as products in order to better meet the GATS needs. To this end, the EBOP items referring to health, to education services, or to business travel (and tourism) are grouped together. The ISIC services sectors of the final FATS data set with partner world is converted into EBOPS categories following the correspondence table presented in Table 11.

Table 11: EBOPS-ISIC correspondence table

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	Trade-related services (Distribution)	G	Wholesale and retail trade; repair of motor vehicl. and motorcycl.

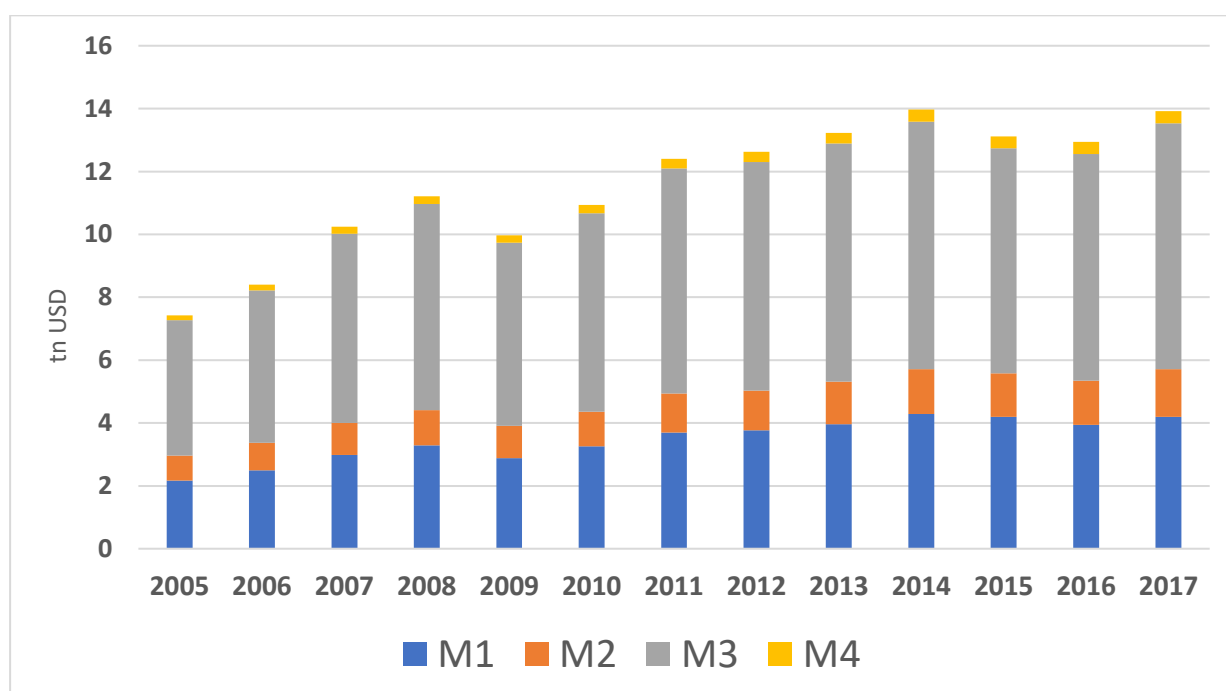
5.2 Some aggregate results

At the aggregated level, the distribution of modes is somewhat constant over time as the shares for splitting transactions are time invariant. Fluctuations are only dependent on the variability of trade values. Chart 2 shows that mode 1 is estimated around 33%, mode 2 around 10%, mode 3 around 50% and mode 4 between 3 and 5%. The similarity between the export and import flow reflect the use of the same allocation of mode for both flows.

Mode 3 is the dominant mode in all sectors except in Transport which is traded mainly through mode 1, Education that is mostly supplied via mode 2, Business travel and tourism that is delivered via mode 2, and trade-related services which are mostly supplied via mode 1.

The picture shown reflect an aggregate view of trade in services by modes of supply which is driven by big traders. It will be interesting to further break down the analysis by country, by level of income, by income group, by region, or by stage of development of the economies to see how the modal allocation changes for these criteria.

Chart 2: Total trade in services by mode of supply, 2005-2017



6 Conclusion

This experimental data set confirms the importance of "commercial presence" as an international mode of supply for services, and the relatively low importance of mode 4 at global level.

However, the latter can be more important for disaggregated data at individual country or sector level. While this is a structural data set, it does not require a regular update at a yearly level as this would be resource intensive with a relatively low additional analytical value. More of interest would be to combine the trade in services data set by partner and by mode of supply, and further investigate the impact of digitalisation on these trade flows.

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8 Annex

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

Indicator code	Item EBOPS	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 is added

ANNEX 2. RESULTS OF SECTORAL REGRESSIONS IN INWARD

Inward - regression by sector (1)

	WHOREP	TPST	FOOD	INFCOM	FIN	REA
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	84.000*** (.0005)	-68.000*** (.002)	3.400 (.890)	-24.000 (.340)	49.000** (.025)	93.000*** (.004)
t	-.063*** (0.000000)	.015 (.180)	-.028** (.030)	-.004 (.760)	-.041*** (.001)	-.062*** (.0002)
Log(Imports of reporter)	.130 (.150)	-.085 (.590)	.430*** (.002)	-.066 (.530)	.150 (.110)	.0003 (.000)
Log(GDP of partner)	.730*** (0.000)	.910*** (0.000)	.670*** (.000002)	.820*** (0.000)	.640*** (0.000)	.750*** (0.000000)
Log(GDP of reporter)	1.100*** (0.000)	1.000*** (0.000)	1.100*** (0.000)	.000*** (0.000)	.890*** (0.000)	.650*** (0.000)
Log(GDP/capita of partner)	.430*** (.00002)	.370*** (.0001)	.180 (.240)	.190 (.210)	.380*** (.001)	.120 (.290)
Log(GDP/capita of reporter)	1.200*** (0.000)	1.500*** (0.000)	1.600*** (0.000)	1.100*** (0.000)	1.100*** (0.000)	1.800*** (0.000)
Log(Distance)	-.550*** (0.000)	-.920*** (0.000)	-.870*** (0.000)	-.600*** (0.000)	-.560*** (0.000)	-.810*** (0.000)
COLONY	.008 (.970)	.190 (.360)	.860*** (.005)	.190 (.590)	.780*** (.002)	.850*** (.001)
Colony	.160 (.300)	-.008 (.970)	-.190 (.500)	-.550 (.140)	.170 (.540)	.470** (.029)
Common language	.130 (.450)	.140 (.420)	.320 (.270)	.620* (.094)	.150 (.510)	-.095 (.710)
R ²	0.664	0.574	0.544	0.617	0.617	0.411
# Zeros	49683	52939	58507	49689	51030	51306
# of mirror	10880	10219	11410	9185	11941	9842
Observations	58,135	56,640	60,932	53,463	54,061	54,990

Standard errors are robust for ppml

Notes :

p-values in parenthesis

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

Inward - regression by sector (2)

	PROF	ADMIN	EDUC	HEALTH	ARTS	OSERA
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-27.000 (.120)	12.000 (.530)	-40.000** (.017)	-320.000*** (.003)	-209.000** (.045)	-79.000 (.340)
t	-.005 (.590)	-.025** (.012)	.024*** (.006)	.130** (.016)	.088 (.110)	.020 (.630)
Log(Imports of reporter)	.086 (.420)	-.150 (.140)	.140*** (.001)	.049 (.760)	-.150 (.380)	-.190** (.028)
Log(GDP of partner)	.720*** (0.000)	.860*** (0.000)	.440*** (0.000)	.670*** (.007)	.940*** (.0001)	1.100*** (0.000)
Log(GDP of reporter)	.940*** (0.000)	.890*** (0.000)	.650*** (0.000)	.810*** (.004)	.760*** (0.000)	1.600*** (0.000)
Log(GDP/capita of partner)	.230 (.120)	.300** (.020)	.062 (.180)	.650 (.440)	.940 (.120)	.140 (.420)
Log(GDP/capita of reporter)	1.300*** (0.000)	2.100*** (0.000)	-1.200*** (0.000)	1.400** (.034)	.710*** (.001)	.730*** (.001)
Log(Distance)	-.630*** (0.000)	-.750*** (0.000)	-1.700*** (0.000)	.370 (.700)	-.530** (.046)	-1.700*** (0.000)
COLONY	.830*** (.001)	.750*** (.000001)	1.700*** (0.000)	2.100** (.014)	.370 (.630)	3.300*** (0.000)
Colony	-.140 (.530)	-.160 (.390)	-1.300*** (.0001)	2.300 (.220)	1.100* (.076)	-2.400*** (.00005)
Common language	.140 (.500)	.092 (.550)	.770*** (.0003)	2.100*** (.00001)	1.200** (.013)	1.000*** (.009)
R ²	0.627	0.712	-0.027	0.452	0.078	0.201
# Zeros	49459	48822	50508	49902	49216	38693
# of mirror	9402	9305	11367	11153	9321	8690
Observations	54,057	52,112	50,556	50,032	49,366	38,818

Standard errors are robust for ppml

Notes :

p-values in parenthesis

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

ANNEX 3. RESULTS OF SECTORAL REGRESSIONS IN OUTWARD

Outward - regression by sector (1)

	WHOREP	TPST	FOOD	INFCOM	FIN	REA
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	98.000*** (0.000000)	-46.000** (.045)	21.000 (.560)	-14.000 (.590)	41.000 (.120)	147.000*** (.002)
t	-.072*** (0.000)	-.005 (.680)	-.036* (.062)	-.012 (.340)	-.038** (.011)	-.090*** (.0002)
Log(Exports of reporter)	.400*** (.0001)	.640*** (.0002)	.076 (.640)	.240** (.027)	.073 (.500)	-.012 (.920)
Log(GDP of reporter)	.770*** (0.000)	.790*** (0.000)	1.200*** (0.000)	.880*** (0.000)	.910*** (0.000)	.740*** (0.000)
Log(GDP of partner)	.740*** (0.000)	.860*** (0.000)	.860*** (0.000)	.780*** (0.000)	.850*** (0.000)	.780*** (0.000)
Log(GDP/capita of reporter)	1.000*** (0.000)	1.300*** (0.000)	1.700*** (0.000000)	.900*** (.0001)	.840*** (.000005)	1.800*** (0.000)
Log(GDP/capita of partner)	.540*** (0.000000)	.400*** (.000001)	.380 (.100)	.260** (.036)	.520*** (.00004)	.110 (.260)
Log(Distance)	-.400*** (0.000)	-.920*** (0.000)	-.840*** (.00001)	-.440*** (.0001)	-.690*** (0.000)	-.850*** (0.000)
COLONY	-.150 (.500)	-.046 (.830)	.570* (.098)	.069 (.870)	.600* (.050)	.780*** (.003)
Colony	.220 (.170)	-.180 (.510)	.047 (.890)	-.340 (.410)	.022 (.940)	.480* (.056)
Common language	.370* (.051)	.077 (.660)	.170 (.550)	.590 (.160)	.007 (.970)	-.120 (.690)
R ²	0.665	0.554	0.601	0.586	0.595	0.426
# Zeros	40258	42407	47412	40985	42844	43423
# of mirror	3696	2969	3127	3065	2098	4889
Observations	47,577	45,469	49,083	44,132	45,786	46,207

Standard errors are robust for ppml

Notes :

p-values in parenthesis

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

Outward - regression by sector (2)

	PROF	ADMIN	EDUC	HEALTH	ARTS	OSERA
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	29.000 (.300)	77.000** (.026)	-591.000*** (.004)	-305.000** (.014)	-296.000*** (.001)	-577.000*** (.001)
t	-.037** (.011)	-.061*** (.001)	.260** (.012)	.120* (.075)	.130*** (.003)	.260*** (.003)
Log(Exports of reporter)	.370** (.013)	-.012 (.920)	.250* (.052)	.260 (.150)	-.002 (.900)	-.007 (.640)
Log(GDP of reporter)	.700*** (0.000)	.900*** (0.000)	-.220 (.390)	1.400*** (0.000000)	.920*** (.0001)	1.000*** (0.000000)
Log(GDP of partner)	.780*** (0.000)	.810*** (0.000)	.980*** (.001)	1.800*** (0.000)	.720*** (.001)	.480** (.014)
Log(GDP/capita of reporter)	1.500*** (0.000)	2.400*** (0.000)	.990*** (.0001)	1.800** (.048)	.540 (.140)	1.900*** (0.000000)
Log(GDP/capita of partner)	.200** (.013)	.280*** (.003)	4.600*** (.0001)	-.710* (.065)	.930** (.039)	1.500*** (.003)
Log(Distance)	-.420*** (0.000000)	-.680*** (0.000000)	-.910* (.052)	-1.800*** (0.000)	-.320 (.240)	-.980** (.016)
COLONY	.550*** (.008)	.640*** (.0001)	.910 (.350)	1.400** (.022)	.077 (.950)	1.900*** (.009)
Colony	.056 (.770)	-.230 (.220)	.043 (.970)	-.460 (.540)	1.000* (.085)	1.200 (.240)
Common language	.380** (.026)	.220 (.110)	2.100** (.012)	2.300*** (.0002)	1.000** (.029)	.120 (.860)
R ²	0.705	0.686	0.013	0.848	0.061	0.087
# Zeros	40450	40672	42656	42675	43037	42113
# of mirror	3248	3496	76	100	76	76
Observations	44,053	43,237	42,688	42,794	43,211	42,192

Standard errors are robust for ppml

Notes :

p-values in parenthesis

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