THE OECD-WTO BALANCED TRADE IN SERVICES DATABASE

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Complete, consistent and balanced bilateral trade in services statistics are vital for the empirical analysis of international trade as well as for policy making and trade negotiations. Unfortunately, such data are not readily available. This paper presents the work of OECD and WTO to build a complete services dataset to serve as input for the compilation of the TiVA Inter-Country Input-Output Tables, and as a tool for policy analysis in general. The first edition of the Balanced Trade in Services (BaTIS) dataset provides annual data from 1995-2012, covering 191 economies, broken down for the 11 main EBOPS 2002 service categories. This paper accompanies the dataset and describes its compilation methodology in detail, including the collection and cleaning of the reported data, the different methodologies used to estimate missing information, and the final balancing of the exports and imports flows.

[1] This contribution reflects a description of a methodology and does not represent the position or opinions of OECD, WTO or their respective Members, nor the official position of any staff members. The contact details for the authors are fabienne.fortanier@oecd.org, antonella.liberatore@wto.org, andreas.maurer@wto.org and graham.pilgrim@oecd.org

Table of contents

1. Introduction

High quality data on international trade in services that provide insights into the types of services that are traded, and with which partners, are vital for economic analysis and policy making. However, for many OECD and non-OECD economies, currently available trade in services statistics lack the necessary level of detail. In addition, for those countries where data are available, internal inconsistencies and in particular bilateral trade asymmetries – whereby the exports of country A to country B do not align with the imports of country B from country A – hamper the analytical and policy use of services trade statistics.

There are many reasons why the availability, quality and cross-country comparability of trade in services data are unsatisfactory, especially when compared to merchandise trade statistics. Unlike goods, which can be measured as they cross borders, services can be delivered via a variety of modes, including electronically, with typically only the financial flows relating to those transactions observable. Countries also use a variety of data sources and estimation techniques to develop trade in services statistics, and these may vary by country despite the presence of international methodological guidelines. Data confidentiality, which generates additional missing values, adds another layer of complexity.

To mitigate all these problems, OECD and WTO have developed a transparent methodology to create a global dataset of coherent bilateral trade in services statistics by main services categories. The approach leverages all available official data, and combines these with estimates using derivations, backcasting techniques, interpolation, and predictions derived from regression models. Exports and imports are subsequently reconciled by calculating a symmetry-index weighted average between the two, following similar approaches that have been developed in the area of merchandise trade statistics (see Fortanier and Sarrazin (2016), building on Gehlhar (1996), Feenstra et al. (2005) and Gaulier and Zignado (2010)). The OECD-WTO methodology augments earlier efforts in this area (e.g. Francois and Pindyuk, 2013), which – though bringing together and cleaning available statistics – did not include estimations except for using mirror flows to fill missing observations, nor explicitly balanced exports and imports when the two sources were available, and were hence unable to geographically classify large parts of international trade.

The ultimate goal of the OECD-WTO work is to develop a dataset that forms the international benchmark for trade in services statistics and is constantly improved as new data become available. This dataset can serve a number of analytical purposes, especially as an input to the OECD-WTO Trade in Value Added (TiVA) project. TiVA combines national Supply and Use (SUT) and Input-Output (IO) tables with international trade in goods and services statistics in order to provide new insights into how the value added in each country's industry, within a value chain, is embodied in international trade flows. Internationally coherent and detailed bilateral trade in services statistics therefore form an essential input to TiVA.

The first edition of the Balanced Trade in Services (BaTIS) dataset provides annual data from 1995-2012, covering 191 economies, broken down for the 11 main EBOPS 2002 service categories. This paper accompanies the dataset and describes its compilation methodology in detail.

In the remainder of this paper, we detail the various steps followed in constructing the dataset:

- Step A: Collection of reported information and assessment of data availability (section 2);
- Step B: Estimation of missing trade in services statistics through a variety of methods (section 3);
- Step C: Balancing imports and exports flows (section 4).

The results are presented and discussed in section 5. Finally, section 6 concludes and outlines the next steps, including (i) the conversion of EBOPS to CPA categories to facilitate integration into Supply and Use Tables, using country specific conversion coefficients, (ii) the development of non-mechanistic balancing approaches based on trade asymmetry meetings and expert opinions and (iii) the development of the balanced trade in services dataset on an EBOPS 2010 basis.

2. Step A: Data collection and assessment of data availability

2.1. Data collection and cleaning

The first step in establishing the BaTIS dataset involved the collection of official statistics on international trade in services. The main data sources include the OECD Trade in Services by Partner Country statistics; Eurostat International Trade in Services statistics; UN Services Trade and the IMF. Additional data were incorporated from a number of complementary national sources as is detailed further in section 3.3. A number of small economies were excluded due to limited data availability, and as such the final dataset contains 191 reporters.

The data preparation phase also involved deleting certain reported observations, when in-depth analysis revealed methodological problems. This was the case for Norway (all geographical breakdowns prior to 2010), Hungary (all bilateral data prior to 2004), and Croatia (bilateral imports for 2006). Finally, for Israel, Latvia and Russia, reported zeros were removed when these could not reliably be distinguished from missing values.

A final issue in the collected data was the occurrence of negative values. Such negative values may occur in Insurance Services (S253), when (bilateral) insurance claims are larger than premiums in a given time period, and in Other Business Services (S268), particularly in the presence of large merchanting transactions (recorded as negative exports). While these do not happen frequently, the negative values are occasionally large enough (notably in France and Japan) that Total trade in services (S200) with a certain partner is negative. Given that one of the main aims of this project is to develop a dataset that can easily be integrated into Supply and Use tables, where no such negative trade is reported, and given that there is also no reliable way to predict in which years these negative transactions occur (making estimations for missing values impossible), data with negative values were removed. For negative trade values with partner World, adjustments were made manually (for a total of 111 out of 94500 observations): firstly, the negative values were removed; secondly, they were replaced with estimates based on the EBOPS structure of adjacent years without negatives; finally, any remaining discrepancy was distributed proportionally across one or more of the other services categories (the least distorting solution). For bilateral negative values, the data were deleted and subsequently treated as missing (i.e. estimated following the methods in section 3.3), and later rescaled (as described in section 3.5) to ensure consistency. This approach allows the suppression of the unwanted negative values without altering the reported totals, and at the same time maintaining the relative importance of each partner.

The collected and cleaned data were subsequently organised in two separate (but related) datasets. The first contains all data with partner world for Total Services (S200) and the eleven main services categories, as well as for services not elsewhere specified (S982) and the aggregate Other services (S981), as shown below (Table 1). The second includes all bilateral data by services categories, for the 53 countries that report bilateral data.

Table 1. EBOPS 2002 categories classification: code names and hierarchy

Code	EBOPS Category Name
S200	Total services
S205	Transportation
S236	Travel
S981	Other services
S245	Communications services
S249	Construction
S253	Insurance services
S260	Financial services
S262	Computer and information services
S266	Royalties and licence fees
S268	Other business services
S287	Personal, cultural and recreational services
S291	Government services n.i.e
S982	Services not specified elsewhere

In a few cases, the internal consistency between reported total services and the sum of the 11 main EBOPS categories did not hold, and some adjustments were needed. In most of the cases the differences were minor and probably due to rounding; they were eliminated by proportionally distributing the discrepancies across the underlying service sectors. In other cases, instead, the inconsistencies were due to the presence of unallocated trade (reported in the category S982 – Services not specified elsewhere). Again, the differences were distributed proportionally across the EBOPS subcomponents. The same approach to solve internal consistency problems was used for the bilateral dataset.

2.2. Assessment of initial data availability

Total services trade broken down by main EBOPS categories, with partner world

Annex 1 gives an overview of the data availability for total services trade (S200), in the original BPM5 classification. It shows that for 109 out of 191 countries, total services export data are available for the full target period of 1995 until 2012 (108 for imports). For the remaining countries, the series are incomplete with data starting only in later years, ending earlier, or both[2].

Annex 2 displays the availability of total services trade, with partner world, broken down by the eleven main EBOPS 2002 categories. A fully dark circle in the table indicates that

[2] It should be noted that in some instances, this reflects the fact that the countries themselves did not exist for the full period.

all of the 12 categories, including total services, are available for the year under consideration; the larger the proportion of white in the circle, the greater the number of service categories missing. The changeover to BPM6 means that for many countries, data from 2009 onwards are not available in EBOPS 2002 standards.

Bilateral trade in services data for all main EBOPS categories

Whereas the dataset of services trade with partner world covers nearly all countries worldwide, fewer countries report trade in services data broken down by partner country. The total OECD-WTO dataset with reporters specifying their trade with bilateral partners includes 53 individual country reporters. Annex 3 gives an overview of the data availability, indicating the average number of partner countries per reporter, per year.

Table 2 gives an overview of the proportion of total world exports of services by EBOPS category that can be bilaterally specified. The tables exhibit two distinct features, firstly it can be seen there is a significant improvement in coverage between 1995 and 2008, with around two-thirds of total world services trade (S200) attributed to a bilateral country pair by the end of the period, however from 2009 onwards there is a reduction in availability due to the changeover from BPM5 to BPM6. Secondly, the coverage is significantly lower for some of the more detailed service categories.

Table 2. Percentage of World services exports that are bilaterally specified in official statistics, by year and EBOPS category

	S200	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291	S981
1995	27	27	29	8	12	24	24	18	54	11	11	21	25
1996	32	35	31	13	24	34	29	21	58	21	13	22	33
1997	33	35	32	15	27	35	27	20	59	23	12	21	34
1998	34	36	33	14	34	29	28	20	57	24	11	21	35
1999	50	45	44	20	37	37	29	23	64	29	21	26	43
2000	54	53	47	24	44	36	34	26	68	32	30	27	48
2001	59	56	51	25	40	31	33	25	68	35	37	28	53
2002	64	63	58	21	34	50	25	21	67	33	32	27	65
2003	66	62	61	20	34	32	16	21	65	27	27	30	66
2004	68	64	63	39	54	47	31	48	72	44	47	36	67
2005	69	67	63	43	51	49	31	47	72	48	47	29	67
2006	68	67	63	43	49	49	49	52	78	46	46	28	65
2007	68	65	63	40	42	48	47	53	78	45	45	27	65
2008	70	66	62	39	39	49	47	52	79	46	40	25	64
2009	64	60	55	33	35	43	45	51	73	44	41	26	60
2010	63	60	55	36	35	42	44	46	72	42	41	28	60
2011	64	60	54	36	36	41	45	43	77	42	39	23	61
2012	61	55	52	36	34	40	45	47	69	38	39	24	60

3. Step B: Estimating missing trade in services statistics

It is clear that to develop a complete dataset of bilateral trade in services statistics by main EBOPS categories, estimations have to be produced for a large number of bilateral

trade observations. The OECD-WTO BaTIS dataset uses a 'top-down' approach, which starts with completing the highest levels of aggregation (total services, with partner world) before detailing the subcomponents. This approach reflects that the greatest amount and best quality data is available at the highest levels of aggregation, and ensures full consistency of the lower level estimates. More specifically, the work is organised in five distinct sub-steps:

- Step B.1: Develop a complete dataset of trade in services (S200) data with partner world;
- Step B.2: Develop a complete dataset of all main EBOPS categories with partner world;
- Step B.3: Estimating partner country breakdowns if some partner data are reported
- Step B.4: Estimating partner country breakdowns if no official data are available
- Step B.5: Ensuring the consistency of the datasets

3.1. Step B.1: Completing the S200 series with partner World for all countries

Although the large majority of reporters in the database publish total trade in services data (S200) for the entire period of interest (1995–2012, see Annex 1), some gaps needed to be filled by estimations. For the remaining countries, there are a variety of reasons that explain the lack of data. One important reason reflects the fact that many countries have already moved to BPM6, meaning that data have to be transformed back to BPM5 for developing the dataset presented here. Another reason is that several countries supply the underlying EBOPS components but not a value for total trade in services; although by and large these can be assumed to align with the underlying total, and indeed is the approach used to estimate totals when they are not available. The different methodologies used for estimating the missing information are listed below.

Derivations

Total trade in services was derived as the sum of all EBOPS components when all main EBOPS categories were available but total trade was not reported. These calculations of S200 were assigned an estimation code "E1", applicable to 132 individual observations in total (covering 16 different reporters).

Incorporating BPM6 information

S200 data for 44 countries, were converted from BPM6 to BPM5 (mainly for the 1999-2012 period) following the IMF guidelines, and were assigned an estimation code "E2" in the dataset. This applied to 381 observations in the S200 Partner World dataset.

Integrating more recent national data

An important part of the data is collected from other international organisations, such as Eurostat and the IMF. However, frequently more recent data are available from national sources. To ensure that no break in series would occur, these additional national data were incorporated by applying the growth rates calculated from the more recent national data to the data available from international organisations. This method is only used for the three latest years of information (t-1, t-2, and t-3). The current dataset assigns a code of "E3" to these cases, and contains 12 observations for S200 with this code.

Use of regional information for most recent years

In a few cases (4), data for the most recent period (2012) were not available, and the growth rate of S200 as reported by countries in the geographical region was used to estimate this value. These observations were coded as "E4".

Correcting obvious errors in the data

Obvious transmission errors, such as typos or values reported in thousands rather than millions, were corrected. This happened for only 11 observations in the dataset for S200 values. These values were assigned a code of "E6".

Interpolation and backcasting

The net result of the adjustments above is that only a handful of missing observations remain. The remaining observations are estimated through a combination of linear interpolation and backcasting. Simple linear interpolations were used for those observations where there was a gap in the series, and back-casting techniques for those series that started after 1995 (using the 3-year average growth rate, calculated from the first three years of available data). In three cases, each with special circumstances, (namely Iraq, Bermuda and Zimbabwe), the obtained estimates were not considered satisfactory, and were therefore replaced by estimates based on the growth rates of total trade of these countries (i.e. including goods). Table 3 below gives the data including interpolated and back-cast values (in grey). In total, 150 estimated values were obtained using this method. These interpolated and backcast data were coded "E8".

Table 3. Total trade in services (S200): estimated values in grey

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	note
IMPORTS																			
Afghanistan	6	8	12	17	24	34	49	70	100	142	202	288	410	583	831	1248	1288	2239	
Bermuda	474	501	529	558	589	622	657	694	732	773	816	862	1105	1042	982	1010	962	981	
Bosnia & Herz.	270	270	270	270	285	263	269	305	384	432	436	467	579	692	657	533	540	470	
Brunei Dar.	479	556	832	847	818	768	1054	876	1034	1076	1110	1214	1317	1403	1434	1612	1825	1739	
Comoros	50	49	44	41	38	35	32	23	36	41	46	55	63	79	84	94	107	105	
FYR Macedonia	335	309	273	209	234	268	264	275	390	509	555	579	778	1003	835	853	974	993	
Georgia	200	224	250	345	224	295	310	365	397	485	631	727	933	1239	974	1085	1261	1443	
Guinea-Bissau	30	29	26	27	28	29	30	27	36	44	42	40	68	85	87	103	100	71	
Iraq	2062	2298	2562	2855	3181	3545	3951	4403	4907	5469	6095	5490	4866	7572	8563	9864	11124	13291	
Lebanese Rep.	339	470	653	905	1256	1743	2418	3354	6488	8230	7895	8734	9988	13464	14051	13137	12913	12266	
Liberia, Rep. of	164	195	232	276	328	390	464	552	656	780	855	1275	1249	1411	1145	1079	1243	941	
Qatar	1396	1447	1501	1556	1613	1640	1714	1796	2341	2906	4144	6957	7459	7222	5918	8780	16867	23906	
Serbia & Mon.	281	277	362	421	243	293	323	537	795	1192	1478	-	-	-	-	-	-	-	
Uganda	563	675	669	728	419	459	479	503	496	490	609	770	977	1257	1393	1803	2404	2451	
Zambia	251	266	282	282	306	335	367	375	403	447	471	588	915	906	661	878	1104	1250	
Zimbabwe	848	955	928	737	736	842	723	604	563	621	636	541	560	550	614	864	1153	968	1

EXPORTS																			
Afghanistan	124	151	183	223	271	329	399	485	589	716	870	1057	1283	1559	1894	3140	3476	3056	
Bermuda	876	925	977	1031	1089	1149	1213	1281	1353	1428	1508	1592	1651	1580	1327	1400	1428	1402	2
Bosnia & Herz.	424	436	448	460	464	450	497	524	721	864	989	1140	1458	1672	1334	1201	1208	1135	
Brunei Dar.	722	602	477	282	316	198	482	427	436	544	616	745	813	867	915	1054	1209	1113	
Comoros	35	36	42	49	49	48	36	23	30	36	43	47	55	64	59	65	74	68	
FYR Macedonia	121	154	128	149	273	317	245	253	379	452	519	601	817	1017	858	902	1108	1052	
Georgia	106	145	198	365	217	360	370	408	459	555	715	885	1094	1260	1314	1599	2008	2544	
Guinea-Bissau	6	7	8	7	6	5	4	6	6	8	5	3	33	44	33	44	45	21	
Iraq	120	134	149	166	185	207	230	257	286	319	355	357	868	1496	2193	2834	2822	2833	2
Lebanese Rep.	368	525	749	1068	1525	2175	3104	4429	9462	9704	10858	11581	12755	17574	16889	15902	19601	22139	
Liberia, Rep. of	40	48	58	70	84	101	122	147	176	212	213	336	346	510	274	158	604	374	
Oman	211	237	269	388	413	452	606	606	655	736	939	1311	1683	1826	1620	1899	2148	2874	
Qatar	50	74	109	161	238	363	685	707	1138	1679	3221	4193	3592	3425	2002	3011	7394	9922	
Serbia & Mon.	647	688	818	914	471	624	740	829	1130	1678	1909	-	-	-	-	-	-	-	
Uganda	104	145	165	176	196	213	217	225	262	373	525	526	593	799	1027	1303	1774	2094	
Zambia	109	111	112	102	107	115	144	115	165	232	273	229	273	300	241	311	375	467	
Zimbabwe	430	484	470	374	373	427	330	282	269	401	362	320	274	231	286	333	390	387	1

Note:
1: used total trade (Goods+Services) growth rate
2: used import growth rate

3.2. Step B.2: Completing the dataset of EBOPS categories with partner world

Derivations, BPM6 data, national sources and corrections

The second step in the completion of the matrices involves the estimation of services exports and imports by main EBOPS category, with partner world, for all 191 reporters in the database. Many of the reasons that explain why data are missing for S200 also apply for these series, such as the move to BPM6 data. As such the same approaches as described above were used. Simple derivations however often resulted in zeros, and these were given a special code ("E7"). Table 4 describes the number of observations with respective E1, E2, E3, E6 and E7 codes.

Table 4. Number of estimates, by estimation code

Estimation code	E1 (derivations)	E2 (from BPM6)	E3 (national data)	E6 (errors corrected)	E7 (derived as 0)
# of estimations	257	3596	115	221	426

Estimations using structural information over time

In spite of the various basic estimations as explained above, a substantial number of empty cells remained. For many countries, complete information by EBOPS category is available for at least one or more (recent) years, but not for the entire period. These missing cells were estimated using back-casting, now-casting and interpolation techniques.

The backcasting and nowcasting procedures use a 3-year moving average percentage share of each of the EBOPS categories in total trade. An example is provided in Table 5 below, which shows data for a selection of EBOPS categories from 1999 onwards, but missing in the earlier years. By calculating (in the right-hand side of the table) the 3-year

backward moving average share of each of these categories in total trade, (rescaling to ensure the sum for each year is 100%), missing values can be estimated (in grey in the left-hand side of the table). Table 6 shows a similar example for interpolated and nowcast estimates.

For the EBOPS categories a total of 4708 values were estimated in this way, of which around 60% were backcast values, 30% nowcast values, and the remainder interpolated values. All these observations were coded E8. These estimations completed the data for these services categories for all years and all countries in the dataset, with the exception of three countries (Cuba, Uzbekistan and former Serbia and Montenegro) for which no EBOPS information was available at all at any point in time.

Table 5. Example of backcasting S205, S236 and other services: estimated values in grey

	Original values				Three-year backward moving average share in S200		
	S200	S205	S236	Sum of other services	S205	S236	Sum of other services
1995	6,054	3,192	2,165	697	52.6%	36.1%	11.4%
1996	7,130	3,754	2,552	824	52.5%	36.2%	11.3%
1997	7,846	4,131	2,804	911	52.6%	36.0%	11.4%
1998	7,872	4,168	2,783	922	52.6%	36.0%	11.5%
1999	8,003	4,180	2,943	879	52.2%	36.8%	11.0%
2000	8,574	4,557	3,017	1,000	53.2%	35.2%	11.7%
2001	9,235	4,828	3,319	1,088	52.3%	35.9%	11.8%
2002	10,311	5,429	3,651	1,230	52.7%	35.4%	11.9%
2003	11,843	6,442	3,956	1,444	54.4%	33.4%	12.2%
…	…	…	…	…	…	…	…

Table 6. An example of nowcasting and interpolation S205, S236 and other services: estimated values in grey

	Original values				Three year forward moving average share in S200		
	S200	S205	S236	Sum of other services	S205	S236	Sum of other services
1995	49.85	23.61	6.58	19.65	47.4%	13.2%	39.4%
1996	49.06	22.52	5.03	21.5	45.9%	10.3%	43.8%
1997	44.34	19.67	4.63	20.04	44.4%	10.4%	45.2%
1998	41.19	16.85	5.25	19.08	40.9%	12.7%	46.3%
1999	38.08	15.97	4.61	17.5	41.9%	12.1%	45.9%
2000	34.97	15.03	4.01	15.93	43.0%	11.5%	45.6%
…	…	…	…	…	…	…	…
2009	84.03	52.18	17.13	14.72	62.1%	20.4%	17.5%
2010	93.98	57.46	19.1	17.42	61.1%	20.3%	18.5%
2011	106.68	67.19	20.22	19.27	63.0%	19.0%	18.1%
2012	105.01	65.18	20.88	18.94	62.1%	19.9%	18.0%

Estimations using structural information over time: breaking down 'other business services'

The data also demonstrates inconsistencies in definitions: many countries aggregate several services categories into 'other business services', or even just only report 'other business services'. Hence backcasting, nowcasting and interpolation techniques described in the previous subsection were used only in those cases when all services categories were reported in at least one year. Table 7 provides a clear example of such a situation for India, showing how before 2000, the category 'other business services' (S268) is more than twice as high as compared to the later data, incorporating a variety of other services that are not further specified. In addition, in 2000, the sum of S268 and the values of the categories that are missing in earlier years is virtually identical to the total value of S268 in 1999. In these cases 'other business services' are split and distributed proportionally (using shares from the closest year where splits were available) across the missing categories (including 'Other business services'), to complete the data. This added an additional 5303 observations to the dataset, coded 'E11'.

Table 7. Example of aggregated reporting of 'other business services' (excerpt of imports of India)

	S200	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291
Original data, with aggregated reporting of 'other business services' in 1995-1999												
1995	6,775	1,890	2,582			170			1	2,120		11
1996	7,238	1,989	2,831			210			7	2,142		59
1997	9,111	1,942	2,890			229			12	3,852		185
1998	11,691	1,773	2,949			230			19	6,096		624
1999	14,509	1,844	3,010			238			23	8,892		503
2000	16,685	1,979	3,460	599	502	257	276	4,048	83	4,811	18	654
2001	17,337	2,050	3,198	110	65	282	306	5,941	37	3,790	19	538
2002	19,478	2,473	3,102	779	231	332	598	6,582	20	4,984	23	353
2003	23,902	3,022	4,463	969	276	408	367	8,562	24	5,516	27	269
2004	38,281	4,373	6,170	1,094	516	842	341	12,133	53	12,364	46	350
…	…	…	…	…	…	…	…	…	…	…	…	…
Estimated data, where other business services are redistributed across the missing services categories												
1995	6,775	1,890	2,582	124	104	170	57	837	1	995	4	11
1996	7,238	1,989	2,831	125	105	210	58	846	7	1,005	4	59
1997	9,111	1,942	2,890	225	189	229	104	1,521	12	1,807	7	185
1998	11,691	1,773	2,949	356	298	230	164	2,407	19	2,860	11	624
1999	14,509	1,844	3,010	519	435	238	239	3,510	23	4,172	16	503
2000	16,685	1,979	3,460	599	502	257	276	4,048	83	4,811	18	654
2001	17,337	2,050	3,198	110	65	282	306	5,941	37	3,790	19	538
2002	19,478	2,473	3,102	779	231	332	598	6,582	20	4,984	23	353
2003	23,902	3,022	4,463	969	276	408	367	8,562	24	5,516	27	269
2004	38,281	4,373	6,170	1,094	516	842	341	12,133	53	12,364	46	350
…	…	…	…	…	…	…	…	…	…	…	…	…

Use of mirror data

When data for multiple EBOPS categories across all time periods are missing, the estimation techniques identified above cannot be used to generate estimates. In these instances, the EBOPS structure of mirror partner data is used. The mirror data by EBOPS category of between 10 to 20 large trading partners are added up (selecting only those trading partners that provide (near) complete EBOPS breakdowns for trade with a particular country), and the shares of the different EBOPS categories are calculated. For the largest services trading countries for which this technique is applied (including e.g. Switzerland, to break out S249 and S262 from S268, as well as Australia), these calculations were made annually, after which the estimates were smoothed using a 3-year moving average. For smaller countries, where year-on-year variations in the mirror data can be substantial, the EBOPS structure was determined by pooling the partner information over time. These estimates have been made for a total of 11129 observations. Table 8 identifies the services categories and trade flows involved, highlighting that the use of mirror data was more important for estimations of exports than for imports, and that especially services categories Construction (S249), Other business services (S268) and Personal, cultural and recreational services (S287) were affected. The estimates based on mirror data affected 75 out of 191 reporters for at least 2 EBOPS categories. Examples of countries for which these estimates are most prominent include Uzbekistan, Cuba, Haiti, Chad, Equatorial Guinea, and the United Arab Emirates. Those estimates were coded "E9".

Table 8. Number of observations where mirror data were used to produce estimates, by service category and trade flow

	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291	**Total**
Imports	47	47	211	645	160	552	557	515	965	714	137	**4597**
Exports	74	38	359	1010	390	732	825	881	1025	911	334	**6635**
Total	**121**	**85**	**570**	**1655**	**550**	**1284**	**1382**	**1396**	**1990**	**1625**	**471**	**11232**

3.3. Step B.3: Estimating partner country breakdowns if *some* partner data are reported

Steps B.3 involves the estimation of partner country breakdowns of total trade in services (S200) and all other EBOPS services categories. Very similar estimation procedures were used, although total services were always estimated first. Importantly, the estimation procedures differ between those countries where at least a limited amount of partner country data is available (53, see also Annex 3), and those countries where no partner information is available at all (the remaining 138).

For those countries where at least some bilateral data is available, estimates can be made for bilateral trade relations following the methods and techniques used for the trade statistics with partner world, although additional techniques are used to leverage the information available in the bilateral dataset to a maximum.

Integrating additional national data sources

As mentioned in section 2.1, several countries publish additional bilateral data (e.g. ministries), or have made available unpublished information to the OECD and WTO for

the specific purpose of this study. These data were integrated before generating any further estimations. While overall these data tied in well with the reported totals, estimations had to be made as the data did not match perfectly. These estimations were flagged as "E10". The following procedures were performed:

- Belgium and Luxembourg: National Banks provided data for years prior to 2001 which were not included in the Eurostat statistics. This information was used to build partner shares, which were then applied to the reported Eurostat totals.
- Brazil: Preliminary partner information was made available by the ministry of Development, Industry and Commerce. This information was used to build partner shares, which were then applied to the reported IMF (i.e., Central Bank of Brazil) totals.
- Germany: Additional information has been provided to help derive estimates for the partners missing from S236 (travel services) and S200 (total services) in the Eurostat dataset. The data were smoothed using five-year moving averages. The percentage shares of the missing partner countries in the total geographically unspecified trade for Travel were used to complete these series. Total trade by partner was subsequently derived by adding the Travel estimates to the other reported EBOPS categories.
- Italy: Additional bilateral information for all trade in services categories was made available for the years 1997 and 1998, which were missing from the Eurostat data. These data were used to build partner shares, which were then applied to the reported Eurostat totals.
- Sweden: Additional data for S200 covering the period 1998 to 2003 were provided by Statistics Sweden and the Swedish central bank. The data were again used to build shares that were then applied to the reported totals.

BPM6 information and simple derivations

Similarly as for the world dataset, data reported in EBOPS 2010 were converted back to EBOPS 2002 according to the IMF guidelines and coded "E2", and simple derivations were included as coded "E1" (values) or "E7" (zeros), the latter broken down into "E7_3" when the zero resulted from a null value with partner world for the relevant service item, and "E7_4" when the zero resulted from null total services trade (S200).

Backcasting, nowcasting and interpolation

Zero values were interpolated when the value preceding and following the missing data point(s) were reported as zero, these values were coded "M1_1" in the dataset. Furthermore, when the most historic data point was zero this data point was backcast, and similarly when the most recent value was zero this data point was nowcast (coded "M1_2").

Backcasting, nowcasting and interpolating non-zero values is however more complex, especially for the total trade in services (S200) by partner. The methods described above for back-casting the structure of EBOPS categories cannot be simply applied to the geographical breakdowns as well, because even in those years where most country detail is available, many partners are often missing. To address this issue, for the years in which the largest number of partners was available, an auxiliary "unallocated" partner was created before using the techniques described above to calculate partner shares of those

partners where data were reported in at least one year, and for the "unallocated" partner. These shares were then backcast (and nowcast and interpolated) using a 3-year moving average, and rescaled to ensure consistency with the World level, and finally applied to the reported total trade in services values. These estimates were coded "M2_1" and "M2_2".

The same approach was then applied to the bilateral breakdowns of individual EBOPS categories, following the same procedures outlined in section 3.2. These data were subsequently rescaled to preserve the sum of total trade in services.

Other estimates

The OECD-WTO estimations generally follow a top-down approach to estimating the data, meaning that estimates for S200 are normally completed prior to the detailed EBOPS categories. However, some countries have reported bilateral data for certain EBOPS categories, but not for S200 (whether due to unavailability or confidentiality). In such cases, if the values concerned were substantial, the partner data were summed across the available categories and scaled-up to produce first estimates for the breakdown of S200 (again always scaling to the reported total values). The countries concerned are Chile, Finland, Greece, Mexico and Turkey. These estimates are coded "E10" (i.e., as OECD-WTO estimates based on official data).

3.4. Step B.4: Estimating partner country breakdowns if *no* official data are available

The majority of countries worldwide do not, at present, publish any partner details for their trade in services statistics, which means that the approaches described in section 3.3 cannot be applied. In addition, even the 53 countries that do provide bilateral breakdowns do not do so for all 191 partner countries in the OECD-WTO BaTIS dataset. In all these cases, the estimates are derived from an econometric gravity model. Gravity models have been used in applied international trade studies for decades, and in general perform very well in explaining bilateral trade flows. Generally, they work on the principle that a number of factors determine the size of trade between two partners, including the importer's total demand (e.g. related to its economic size (GDP)); the exporter's total supply (again, GDP); and factors that represent the "ease" (or difficulty) with which the exporter can access the importer's market (e.g. distance, sharing a common language).

Less frequent in the empirical literature is the use of gravity models with the aim of predicting bilateral trade flows. Since this is the ultimate objective of our models, several gravity specifications were tested in order to find the one that generates the best possible and the most complete predictions for the exports and imports of total services, and of the individual service items in a second stage. Three elements in particular were taken into account in the model selection: (i) the plausibility of the estimated coefficients; (ii) the predictive power of the model, measured by the correlation coefficient between the reported data and the predictions generated by a model estimated on a training dataset, and calculated on a test dataset; (iii) a discretional, qualitative assessment of the plausibility of the results obtained. In addition, the models were defined as parsimoniously as possible, and by explicit design do not include any policy variables. This should facilitate the subsequent use of the estimated values for analytical purposes, as it avoids, as much as possible, the problem of circular causality whereby the data that are used to test particular hypotheses (e.g. of the impact of certain policy measures on trade flows) are developed exactly based on that premise.

Total Services (S200)

All regression models that were tested followed the same generic specification (for exports (X) and for imports (M):

$$X_{ijt} = \exp(\beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3\ distance\ variables_{ij} + \beta_4\ other\ regressors_{ijt} + \varepsilon_{ijt})$$
$$M_{ijt} = \exp(\beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3\ distance\ variables_{ij} + \beta_4\ other\ regressors_{ijt} + \varepsilon_{ijt})$$

where X_{ijt} (M_{ijt}) reflects the exports (imports) of total services by country *i* to (from) country *j* in year *t*, and GDP_{it} and GDP_{jt} reflect the nominal GDP of the reporting country *i* and partner country *j* (sourced from the World Bank World Development Indicators or from national sources). The distance variables include the geographical distance and dummies for contiguity, common language and the presence of a colonial relationship, all sourced from the CEPII GeoDist dataset[3].

Two other independent variables (other $regressors_{ijt}$) were included, with the objective of improving the predictive power of the model. First, bilateral merchandise exports (imports) were added (sourced from UN Comtrade), given that bilateral relationships for trade in goods and services are generally highly correlated (especially for certain services such as transport). The second variable is the number of total tourist arrivals in a country (sourced from UNWTO), which given the importance of travel in total trade services (~25% at world level) is also expected to be a good predictor for exports of travel.

The models were fitted on the dataset that resulted from the estimations in step B.3[4] above, using the Poisson Pseudo-Maximum Likelihood estimator (PPML). PPML is generally considered superior to a log-linearised Ordinary Least Squares model (OLS), as it avoids biases in the parameter estimates in the presence of heteroscedasticity, does not require a Poisson distribution and allows for the presence of zero trade flows (see e.g. Santos Silva and Tenreyro, 2006).

Table 9 summarises the results for the bilateral exports of total services (S200) for each model. Model 1 includes the basic specification and includes year, reporter and partner fixed effects to capture any omitted variable correlated with the characteristics of the time period, reporter and partner. However, since the model will be used for out-of-sample predictions (for reporters, partners and years not currently covered), it is important to find an alternative that performs well without such fixed effects.

In Model 2, the year fixed effects were replaced with a linear time trend, with virtually no effect on the parameter estimates for the remaining regressors. In Model 3 the reporter fixed effects were removed, which only marginally reduced the explanatory power of the model (as seen in the small decline in pseudo R-squared), but did change some of the estimated coefficients, suggesting a possible missing variable bias. For instance, the language and colony betas are much higher than those in Model 1.

Model 4 therefore introduced the reporter's GDP per capita as a proxy for (some) of the unobservable characteristics of the reporter. As expected, the parameter for this variable is statistically significant. The results on the remaining parameters are also encouraging: the betas for the GDPs, distance, merchandise exports and tourist arrivals are very similar to the ones estimated in Model 2, although some changes remain in the coefficients for contiguity (which even changes signs) and common language.

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

[4] The equations were estimated also on a dataset containing reported data only; there was no substantial difference in the results.

Table 9. Results of PPML regressions (exports of total services) used for model selection

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Constant	-4.07 ***	-4.33 ***	-3.759 ***	-6.597 ***	-0.146
	(0.255)	(0.228)	(0.196)	-0.189)	(0.202)
GDP of reporter	0.276 ***	0.295 ***	0.335 ***	0.227 ***	0.023 ***
	(0.014)	(0.012)	(0.004)	-0.004)	-0.005)
GDP of partner	0.224 ***	0.241 ***	0.301 ***	0.222 ***	-0.023
	(0.012)	(0.012)	(0.015)	-0.014)	-0.016)
Distance	-0.251 ***	-0.254 ***	-0.275 ***	-0.217 ***	-0.029 ***
	(0.005)	(0.005)	(0.005)	-0.005)	-0.005)
Contiguity	0.099 ***	0.101 ***	-0.076 ***	-0.055 ***	0.162 ***
	(0.009)	(0.009)	(0.010)	-0.01)	-0.01)
Common language	0.192 ***	0.193 ***	0.456 ***	0.348 ***	0.014
	(0.008)	(0.008)	(0.008)	-0.008)	-0.009)
Colony	0.184 ***	0.185 ***	0.327 ***	0.312 ***	0.093 ***
	(0.008)	(0.008)	(0.009)	-0.008)	-0.009)
Merchandise trade	0.525 ***	0.522 ***	0.452* **	0.483 ***	0.14 ***
	(0.004)	(0.004)	(0.004)	-0.004)	-0.005)
Tourist Arrivals	0.15 ***	0.142 ***	0.039 ***	0.13 ***	0.008 **
	(0.012)	(0.012)	(0.003)	-0.003)	-0.004)
GDP/Capita of reporter				0.348 ***	0.069 ***
				(0.004)	(0.005)
t		0.014 ***	0.011* **	0.004 ***	0.016 ***
		(0.001)	-0.001	(0.001)	(0.001)
Mirror data (S200)					0.724 ***
					(0.005)
Year FE	Y	N	N	N	N
Reporter FE	Y	Y	N	N	N
Partner FE	Y	Y	Y	Y	Y
Observations	96,501	96,501	96,501	96,501	24,584
Pseudo R2	0.949	0.948	0.915	0.923	0.956

Note: *** = p < 0.001, ** = p < 0.01, * = p < 0.05

As a final test, the last model in Table 9 contains information on mirror flows (i.e., the total services imports of j from i). The coefficient associated with this variable is – as expected - very large and highly significant, reducing some of the explanatory power of the other variables. However, given the limited availability of mirror data, this model would again have only limited predictive use (as already indicated by the substantially lower number of usable observations), meaning that for the purposes of constructing the BaTIS dataset, Model 4 is superior.

Out of sample predictions

To further examine the predictive power of the various models, all models were estimated on a subsample of the original dataset, after which the predicted values for the remaining observations were calculated and compared with the real observed values. The training dataset consisted of 60% of the observations (randomly selected) and the test dataset

consisted of the remaining 40%. Table 10 shows the correlations between the predictions and the real data for all five models[5], illustrating that the predictive power of Model 4 is very high and equal to that of Model 1, further confirming its suitability for prediction.

Table 10. S200 model selection: correlations between model predictions and observed values, exports (out of sample)

Model	Characteristics	Correlation
Model 1	Reporter FE, partner FE, year FE	0.841
Model 2	Reporter FE, partner FE, time trend	0.841
Model 3	Partner FE, time trend	0.824
Model 4	Reporter GDP/Capita, partner FE, time trend	0.85
Model 5	Reporter GDP/Capita, partner FE, time trend, mirror exports	0.899

Also a qualitative assessment of the predicted values indicated that overall, the estimations appear reasonable from an economic point of view: economies trade more with their neighbours, and big players like the US and the United Kingdom appear as top partners for virtually all estimated reporters. As illustration, Table 11 shows the estimated Top 15 partners for a selection of reporters where bilateral trade data are currently missing (Switzerland, Peru, Egypt, Philippines).

Table 11. Top 15 export partners estimated by Model 4 (percentage share), for selected reporters, 2010-2012

Switzerland				Peru				Egypt				Philippines			
	2010	2011	2012		2010	2011	2012		2010	2011	2012		2010	2011	2012
Germany	18	18	16	US	25	22	23	US	12	12	13	US	24	24	24
UK	8	8	11	Switzerland	8	9	8	UK	12	12	12	Japan	12	13	13
US	10	10	9	China	7	7	7	Japan	2	3	5	Hong Kong	8	8	8
France	8	8	8	Japan	6	6	7	Italy	5	5	5	Singapore	9	7	7
Italy	6	6	5	Germany	6	6	5	Saudi Arabia	4	4	4	China	6	7	7
Japan	4	4	4	Spain	4	4	4	Germany	4	5	4	Germany	5	4	4
Hong Kong	2	3	3	Canada	5	5	4	India	3	4	4	UK	3	3	4
India	1	1	3	UK	3	3	4	France	4	4	4	Korea	3	3	4
China	3	3	3	Brazil	3	3	3	Switzerland	3	3	3	Ch. Taipei	3	3	3
Netherlands	3	3	3	Netherlands	3	3	2	China	2	3	3	Netherlands	3	3	2
Belgium	3	3	2	Italy	3	3	2	Netherlands	3	3	2	Australia	2	2	2
Austria	2	2	2	Venezuela	2	2	2	UAE	2	2	2	Switzerland	1	2	2
Singapore	1	2	2	Chile	2	2	2	Turkey	2	2	2	Thailand	2	2	2
Canada	2	2	2	Korea	2	2	2	Spain	3	2	2	Canada	1	1	2
Spain	2	2	2	Mexico	2	2	2	Belgium	1	2	1	France	1	1	1

[5] The coefficients of the models derived from the training dataset were very similar to those in table 9 and are available from the authors on request.

Final predicted values

Using Model 4 for the predictions was feasible for virtually all trade flows. However, as data for some of the independent variables (bilateral merchandise exports or tourist arrivals) were not always available for some small countries, reduced forms of Model 4 (i.e., excluding one or more of the missing independent variables) were used to predict these remaining gaps in the data. In order to maintain consistency over time of the predicted series, only one model was used to predict a specific reporter-partner series. Table 12 summarises the characteristics of the models used to predict the missing S200 flows, together with the percentage of observations and trade value predicted by each. Any final remaining gaps were filled using the same backcasting and interpolation techniques as described in section 3.1, and coded in the final dataset as M5_1 and M5_2.

Table 12. Summary of the model specifications for the prediction of total services (S200) flows

			Exports		Imports	
	Merchandise exports/imports included?	Tourist arrivals/departures included?	% of total estimated obs.	% of total estimated value	% of total estimated obs.	% of total estimated value
Full model	YES	YES	52.54	20.72	6.78	6.93
Reduced model (a)	YES	NO	2.52	0.19	48.53	17.97
Reduced model (b)	NO	YES	22.51	0.2	1.28	0.04
Reduced model (c)	NO	NO	2.66	0.04	23.76	0.29
Reduced model (d)	NO	NO	0.18	0.02	0.19	0.02
Sum of S200 trade estimated by gravity models			***80.41***	***21.18***	***80.53***	***25.25***

Note: The full model and reduced models a-c include gravity variables, reporter GDP per capita and partner fixed effects; reduced model d is the same as c but excludes the partner fixed effects, to allow the estimation of those partner economies for which partners for which none of the reporters indicated a trade flow.

Models for individual EBOPS items

To estimate the bilateral trade flows for the detailed EBOPS categories, the same approach as for Total services was used. Slightly different specifications were developed however for Transport (S205), Travel (S236) and all other services categories (S245-S291), in order to include service category-specific independent variables that optimised the models' predictive power.

First, for *Transport services* (S205), in addition to the standard gravity variables, the World Bank Logistic Performance Index (LPI, aimed at measuring the quality of logistics services) of the reporter, and bilateral merchandise trade flows were included.

A total of five models were developed[6], the characteristics of which are summarised in Table 13. The table includes the correlation coefficients between the predicted and the real values that were derived from a training dataset consisting of 75% of the total observations (randomly selected) and a test set (containing the remaining 25%).

[6] [6] Detailed tables with regression equations are available from the authors on request.

Table 13. S205 model selection: correlations between model predictions and observed values, exports

Model	Characteristics	Correlation
Model 1	LPI, Merchandise exports, gravity variables, Reporter GDP/Cap, partner FE, time trend	0.769
Model 2	Merchandise exports, Transport exports to world, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.922
Model 3	Transport exports to world, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.849
Model 4	Gravity variables, Reporter GDP/Cap, partner FE, time trend	0.577
Model 5	Transport exports to world, gravity variables, Reporter GDP/Capita, time trend	0.855

Table 13 shows that, while the predictive power of the LPI is not very strong (partly due to a high correlation with the GDP per capita of the reporter), the inclusion of total exports of Transport to the world strongly increases the predictive power of the model (for example, Model 5 performs significantly better than Model 4 even without partner fixed effects). Based on these results, Model 2 was deemed the most appropriate choice for the prediction of transport flows. Similarly as for Total Services, additional reduced form models were necessary to complete the predictions for those country pairs where information from the independent variables was incomplete[7].

Subsequently, for *Travel services* (S236), in addition to the standard gravity variables, three service category-specific variables were considered in different combinations, including total tourist arrivals, bilateral merchandise trade, and Travel exports to the world. Table 14 summarises the different specifications tested, together with the correlation coefficient between the predictions and the real values, again calculated on a test set covering 25% of the total observations.

Table 14. S236 model selection: correlations between model predictions and observed values, exports

Model	Characteristics	Correlation
Model 1	Tourist arrivals, merchandise exports, Travel exports to world, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.797
Model 2	Tourist arrivals, merchandise exports, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.731
Model 3	Merchandise exports, Travel exports to world, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.804
Model 4	Travel exports to world, gravity variables, Reporter GDP/Capita, partner FE, time trend	0.766
Model 5	Travel exports to world, gravity variables, Reporter GDP/Capita, time trend	0.751

Somewhat surprisingly, the predictive power of models 1 and 3 is virtually identical; once Travel exports to world and the bilateral merchandise flows are included, tourist arrivals does not improve the accuracy of the predictions. Given their superior predictive power, both Model 1 and Model 3 (depending on the data availability for tourism arrivals) were used in the final estimations, as well as reduced models to cover observations with missing data for independent variables.

[7] Estimations available from the authors on request.

Finally, for each of the Other Services items (S245-S291), separate sets of four models were also estimated considering the heterogeneity across service sectors, as follows:

- Model 1: Merchandise exports, gravity variables, reporter GDP/capita, partner FE, time trend
- Model 2: Merchandise exports, exports of relevant service item to the world, gravity variables, reporter GDP/Capita, partner FE, time trend
- Model 3: Exports of relevant service item to the world, gravity variables, reporter GDP/Capita, partner FE, time trend
- Model 4: Exports of relevant service item to the world, gravity variables, reporter GDP/Capita, time trend

Similarly to Transport and Travel, the addition of exports of the service item to the world (Model 2) significantly improved the predictions for all sectors, and in particular for computer and information, financial and government services. Merchandise exports are also effective to improve the predictions, particularly for construction, other business services and government services. Overall, the models perform relatively well in the prediction of bilateral exports, as shown in Table 15, although some sectors appeared particularly difficult to predict (insurance and financial services). Models 2, 3 and 4 were selected for all items except S262, for which the inclusion of merchandise exports (i.e. Model 3 in comparison with Model 2) did not improve the accuracy of the predictions. For this particular item only Model 2 (preferred) and Model 4 were used on the export side.

Table 15. Other Services model selection: correlations between model predictions and observed values, exports

	Service item								
	S245	S249	S253	S260	S262	S266	S268	S287	S291
Model 1	0.892	0.727	0.391	0.589	0.372	0.756	0.820	0.545	0.465
Model 2	0.938	0.791	0.733	0.730	0.834	0.811	0.891	0.753	0.545
Model 3	0.914	0.689	0.722	0.704	0.834	0.720	0.855	0.756	0.498
Model 4	0.844	0.704	0.598	0.759	0.820	0.813	0.800	0.723	0.879

Again, in order to maintain the coherence of the series only one model was used to estimate any given reporter-partner series; the first choice model was used on the condition that it predicted at least five data points for that reporter-partner combination, otherwise the next best model was used (on the same condition). Again, as for S200, S205 and S236, in a few cases this procedure left gaps in the series, when data for a particular independent variable was missing in certain years. These gaps were subsequently filled using the same methodology for backcasting, nowcasting and interpolation as described in section 3.1.

3.5. Step B.5: Ensuring the internal consistency of the datasets

Rescaling of regression estimates to officially reported totals

The final step to complete the datasets of services exports and services imports by EBOPS and partner country is the rescaling of the model-based estimates to each country's reported trade with the world. For those countries that did not publish any

geographical detail, or only identified bilateral trade flows for a very limited set of partner countries, this process involved a relatively straightforward proportional scaling of the model based estimates to the total value of geographically unspecified services traded (by EBOPS category). However, several countries provided geographical breakdowns for a very large number of trading partners while at the same time reporting a significant proportion of geographically unspecified trade (10-20%, for example). It is improbable that this portion of trade could be accounted for only by only the handful of very small partner countries included in the model but not in the reported data. Instead, it appeared that for those countries, trade with all partners was underestimated. Based on these considerations, three groups of reporters were identified for which different rescaling strategies were applied:

- ***Group 1. Countries that do not report any geographical detail and for which all bilateral flows are derived from model estimate***

  For each reporter, 1% of trade was allocated to the rest of the world (ROW), i.e. countries outside the 191 in the matrix . The bilateral estimates for the 191 were rescaled to the world total less 1%.

- ***Group 2. Countries that report many geographical partners and a substantive part of non-geographically specified trade or unspecified trade is negative***

  For each reporter, any reported partners outside the 191 in the dataset were aggregated to ROW. The reported data, the ROW estimate, and the 'raw' model based estimates were then combined and rescaled to the reported total (this essentially proportionally distributes all non-geographically specified trade across partners). If no ROW countries were reported, 1% of trade was allocated to ROW and the remaining reported and estimated data were rescaled to the world total less 1%.

- ***Group 3. Countries where data consist of a mixture of reported partners (generally between 40-80 partners) and model-based estimates, and the amount of unspecified trade is similar to the total amount of trade estimated by the model for the missing partners.***

  If ROW countries were included in the reported data, the model estimates were rescaled to the value of the unspecified trade (and aggregate ROW). If no ROW countries were reported, 1% of trade was allocated to ROW, and all other partners scaled to the value of unspecified trade less ROW.

The attribution of countries to each group was determined manually for S200, and automatically for the individual EBOPS categories (using in particular the ratio between the amount of unspecified trade and the sum of the unscaled model estimates to decide between group 2 and 3).

Final bi-proportional scaling

While the previous step ensured a fully consistent bilateral breakdown of total trade in services and for each individual EBOPS category, it is also necessary to guarantee that for each partner, the sum of EBOPS categories adds up to total services trade (S200) with that partner. Since these differences were not substantive – for example, the trade weighted average difference between the reported S200 values by partner and the sum of the estimated EBOPS values by partner is 9.1% – and not the result of improbable

estimates, a bi-proportional adjustment procedure (RAS) was applied to ensure the final simultaneous consistency between the bilateral data and the EBOPS and partner totals.

3.6. Results of the estimates made for bilateral exports and imports by EBOPS and partner

The process described in sections 2 and 3 resulted in a fully consistent dataset of export and import of trade in services by EBOPS category for 191 reporters and partners, from 1995 to 2012. Table 16 provides a summary overview of all the different types of estimates that were used, showing that 96% of the data points and nearly half of the trade value in the final bilateral database are estimated.

Table 16. Summary of estimates in the dataset at partner level, for imports and exports, for all years and all main EBOPS categories

	All		S200		Other EBOPS	
	% Count	% Value	% Count	% Value	% Count	% Value
Reported EBOPS 2002 data (no estimations)	4	53	9	59	4	48
Derivations, corrections, conversions to BPM5	9	7	1	8	10	6
Interpolations, back-casting, forecasting, nowcasting	5	11	9	10	5	13
Gravity estimations	82	28	80	23	82	34
Total estimates	96	47	91	41	96	52
Grand Total	***100***	***100***	***100***	***100***	***100***	***100***

4. Step C. Balancing imports and exports of trade in services

With complete datasets for bilateral exports and bilateral imports by EBOPS category, the final step is to produce the balanced matrix in which trade asymmetries are reconciled. At the moment, this reconciliation is still entirely mechanical. It is however important to flag that in future versions of the dataset, the largest asymmetries will be dealt with individually (manually), incorporating information from Bilateral Trade Asymmetry meetings (such as those facilitated by the OECD, but also those by other International Organisations, such as Eurostat) or bilateral (or trilateral) reconciliation exercises by countries.

The balancing process takes place in two stages: first, the asymmetries for Total Services (S200) exports and imports are reconciled, to arrive at a balanced matrix of total bilateral trade in services flows. The more detailed services categories are added subsequently, by first calculating the share of the individual EBOPS items in the unbalanced S200 flows, then balancing those shares at bilateral level, and finally applying, for each bilateral relationship, those shares to the S200 balanced value. This top-down approach is again taken to ensure consistency, but also to recognise that the bilateral data at the higher level of aggregation (totals) are often of higher quality than those at the level of individual EBOPS items.

The balancing process uses the same methodology as set out in Fortanier and Sarrazin (2016) for international merchandise trade. It involves the calculation of a weighted

average of the reported trade flow and its mirror (i.e. as reported by the partner), whereby the weights are based on a symmetry index. This reporter and EBOPS-category specific symmetry index (SI) is defined as the share of bilateral trade for which the absolute difference with the mirror trade data is less or equal than 30%[8] of the sum of these two values flows. More formally, for each reporter i, partner j, services category k, and year t, the symmetry index is defined as:

$$SI^{x}_{ikt} = \sum_{j} \frac{X^{r}_{ijkt}}{X_{ijkt}} \qquad and \qquad SI^{m}_{ikt} = \sum_{j} \frac{M^{r}_{ijkt}}{M_{ijkt}}$$

where X^r and M^r reflect retained exports and retained imports, i.e. those bilateral flows that meet the mentioned 30% criterion.

Overall, the symmetry indices that are calculated for all countries and all EBOPS categories in this way are relatively stable over time – i.e. countries' trade in services statistics are relatively constant in their (dis)similarity to other countries' data. This is indeed to be expected if methodological differences are the most important drivers of trade in services asymmetries (since methodologies tend not to change over time). Such stability is important in the process of balancing trade statistics as it avoids introducing potential disruptions in time series solely due to strong variance in the symmetry indices. Table 17 illustrates this by providing further details for a selection of main services exporting economies (that also report bilateral breakdowns of their trade statistics).

Table 17. Symmetry indices for total services trade by country, 1995-2012, for selected economies (that report bilateral data)

	Average	St.Dev	COV		Average	St.Dev	COV
Australia	0.803	0.062	0.077	Japan	0.678	0.088	0.130
Belgium	0.540	0.055	0.101	Korea	0.741	0.098	0.132
Canada	0.849	0.029	0.034	Netherlands	0.694	0.069	0.100
China	0.342	0.112	0.328	New Zealand	0.766	0.035	0.046
Czech Rep.	0.710	0.234	0.330	Poland	0.624	0.214	0.342
France	0.768	0.060	0.078	Russia	0.527	0.077	0.146
Germany	0.821	0.057	0.069	Singapore	0.538	0.039	0.073
Hong Kong	0.543	0.076	0.141	Spain	0.798	0.052	0.065
Ireland	0.484	0.142	0.293	United Kingdom	0.806	0.025	0.031
Italy	0.762	0.121	0.158	United States	0.835	0.042	0.050

The statistics in Table 17 provide the average symmetry index for total services trade (1995-2012), for a selection of services exporters, as well the variation of this symmetry index over time, measured via the indicators' standard deviation and coefficient of variation (COV). Overall, the symmetry indices of large services exporting economies like the United States, the United Kingdom, Germany and Japan are both relatively high, with very low standard deviations. Non-OECD countries typically report lower symmetry

[8] Note that this percentage is set higher than in the case of merchandise trade. This higher threshold was applied to ensure sufficient trade was retained to develop meaningful symmetry indices, in light of the substantively larger relative asymmetries in services trade as compared to merchandise trade statistics.

indices – partly as a reflection of the more frequent use of ITRS as principal data source in these countries, which is less suited for correctly attributing the partner country in cross-border services transactions, as well as having greater variability over time.

The highest levels of variation (as measured by the standard deviation) were recorded in the Czech Republic and in Poland. These values were however strongly influenced by the much lower symmetry indices in the early years covered in the dataset (1995-1999), and have since greatly improved in levels and stability over time.

In addition to weighing the bilateral flows by the symmetry index of each reporter, the balancing procedure also takes into account the varying levels of confidence surrounding the different estimation methodologies. Hence three additional weights were introduced, including a weight of 1 for reported data or very high quality estimates (EBOPS 2010 conversions, simple derivations), a weight of 0.75 for estimates based on data from other years or other data sources (e.g. backcasting, nowcasting and interpolation), and finally a weight of 0.5 for gravity model estimates.

5. Results

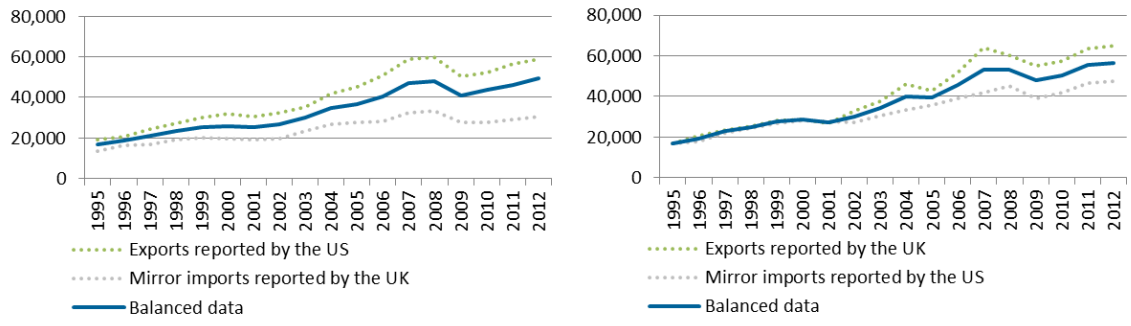
5.1 Descriptive findings

The balancing procedure implies that the final figure that is included in the OECD-WTO BaTIS database that describes a bilateral trade flow is different from the statistics reported by both countries involved. The size of these differences is a direct function of the asymmetry between both countries. Figures 1a to 1g below illustrate for some of the largest bilateral trade relationships how the balanced bilateral trade in services relate to the statistics by both partners involved.

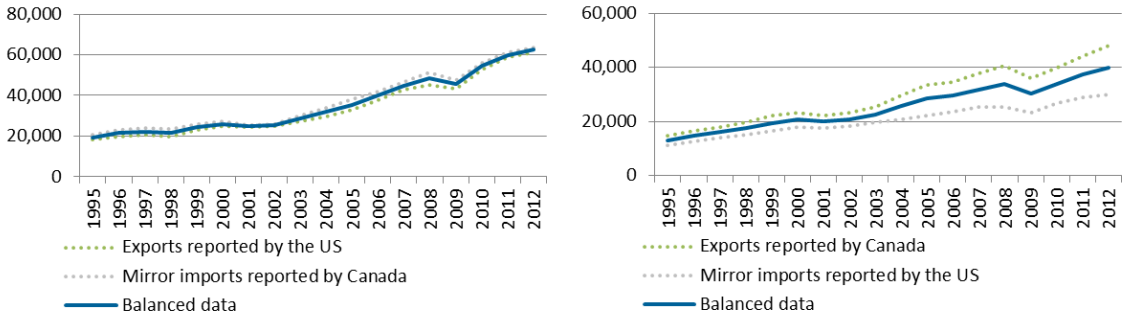
Figures 1a to 1g also illustrate that – by definition – the balanced trade values are always a 'middle ground' between the two reported figures, and reflect the trends of both. The relatively lower symmetry index for trade reported by the People's Republic of China (hereafter 'China') for example implies that the balanced values for this country are more in line with what is reported by partners. Overall, and rather worryingly, Figure 1 also illustrate that asymmetries seem to grow over time, in parallel with the growth in trade in services overall.

Figure 1. Balanced bilateral trade in services trade

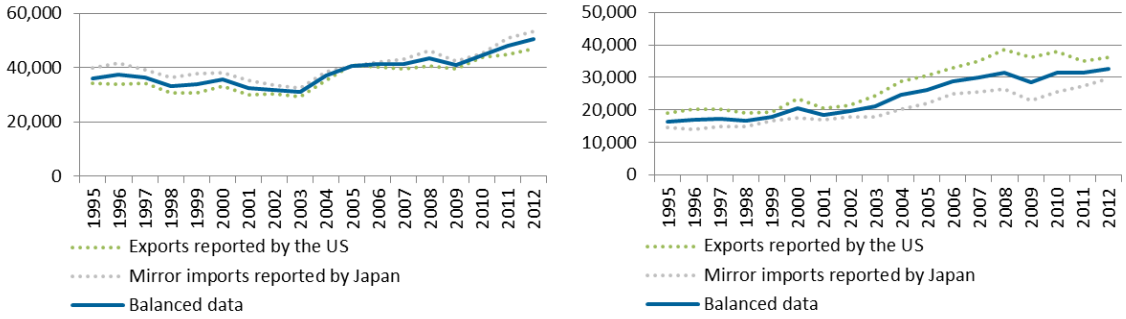
1a. United States and United Kingdom



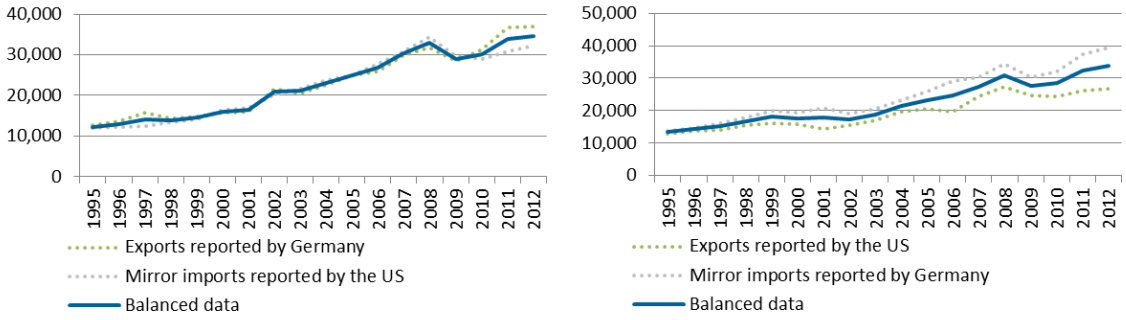
1b. United States and Canada



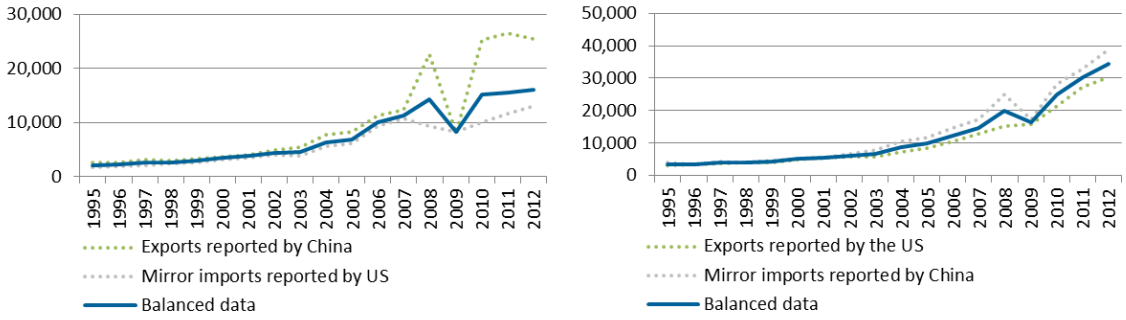
1c. United States and Japan



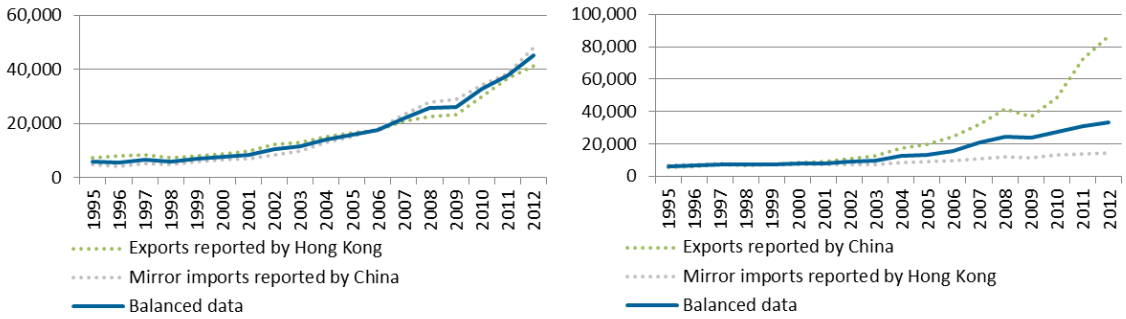
1d. Germany and United States



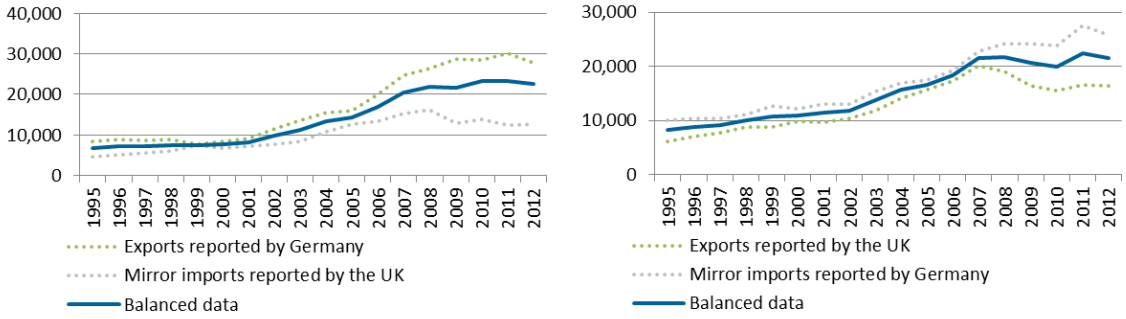
1e. China and United States



1f. China and Hong Kong, China



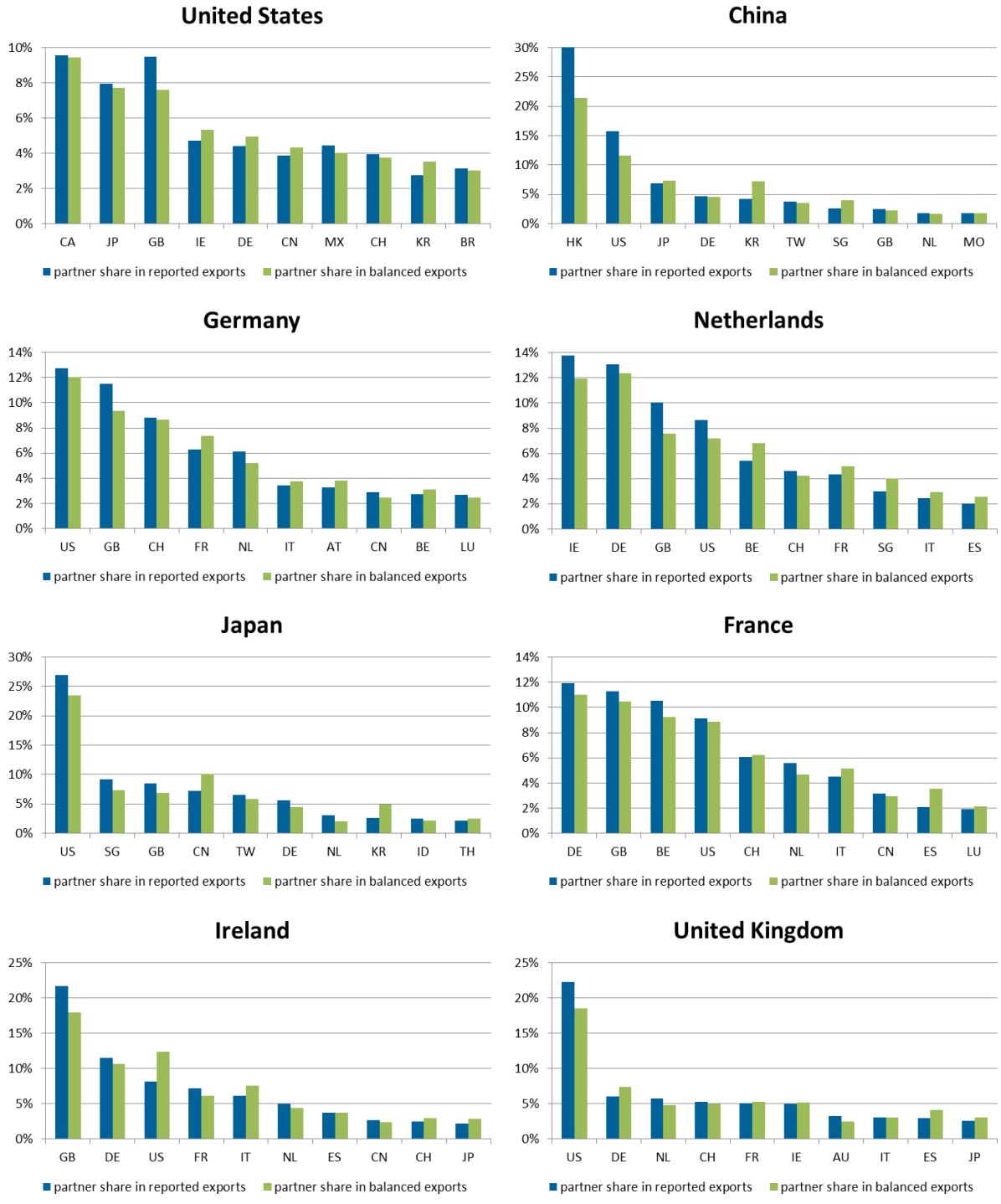
1g. Germany and United Kingdom



Since the balanced bilateral trade figure is influenced not only by data by the reporting country but also by each of its mirror partner countries, the balancing of large asymmetries may result in changes in the relative importance of trading partners of countries, as compared to within reported figures. Figure 2 illustrates this, again focusing on some of the largest services exporting countries (for total trade in services). While the partner distribution of trade changes somewhat, very large shifts within the Top 10 trading partners do not typically occur.

Figure 2 shows that (as already illustrated above in Figure 1) balanced exports for the United States to the United Kingdom are lower than reported, while Ireland, Denmark and China gain a bit in importance as US trading partners. For China, the exports to Hong Kong are substantively less important from a balanced trade view than in Chinese statistics. The share of the United Kingdom in balanced German exports is smaller than originally reported, while those of France, Italy and Austria are slightly higher. Balanced Irish exports give more prominence to the United States as a trading partner, while in particularly exports to the United Kingdom are smaller than in Irish statistics.

Figure 2. Top 10 partner countries for selected large services exporting countries, 2010, reported versus balanced trade data (partner share in total exports)



5.2 Differences in balanced and reported trade in services statistics

Overall, the results presented in Figures 1 and 2 indicate that for each of the partners involved in a bilateral trade relationship, the balanced trade value may be (quite) different from the values reported by the country itself. If a country systematically under-reports or over-reports its trade flows with many partners, significant differences between the sum of the balanced trade figures and the original reported totals can occur. Such differences will need to be treated explicitly in the process of constructing Global Supply and Use and Input-Output tables, these differences will be removed in the process of benchmarking the detailed statistics to the National Accounts totals .

To provide insights into the size of such differences, Table 18 provides an overview of the average differences between the sum of balanced bilateral trade and the sum of reported partners (for those countries that reported bilateral data), for total services trade and for each EBOPS category. Overall, at a Total Services (S200) level, the differences are quite small, with simple average absolute differences of 13% (exports) and 14% (imports), and the trade-weighted average absolute differences even lower (11% and 7% respectively).

For the individual services categories, roughly similar average absolute differences between reported data and the final balanced estimates are established for Transportation (S205) and Travel (S236). For the other services categories (S245 to S291), discrepancies are much wider, especially for S266 (Royalties and licence fees), S260 (Financial services), and to a slightly lesser extent S253 (Insurance) and S287 (personal, cultural and recreational services). However, as Table 18 also shows, extreme observations strongly influence these figures, and high percentage differences are often also driven by rather small differences in absolute value terms. For example, especially the small values for Royalties and Licence fees reported by Malta, Iceland, Azerbaijan and Cyprus, in the early 2000s differ from what their partners recorded in mirror statistics, driving the very high numbers in table 18, while the total trade values (both reported and mirror) in these cases were very small (less than 130 million USD).

Table 19 presents the same differences between reported and balanced values for a set of selected individual countries (that report bilateral statistics). The Table confirms that the balanced total trade in services data for most countries is indeed relatively close to the reported figures. Some important exceptions exist however. For Ireland for example, the total imports are 13% lower in the balanced trade figures than reported, while total exports are over 35% higher in the balanced trade figures. In reverse, for Hong Kong, imports derived from the balanced data are 19% higher than reported, while exports are lower (6%). The United Kingdom and the United States seem to under report both their trade in services flows – the United Kingdom more severely so – with balanced trade figures higher than those in official trade statistics, especially for imports.

Table 18. Average differences between the sum of balanced bilateral trade and reported trade, by EBOPS category, for countries reporting bilateral trade statistics

		S200	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291
Imports	Simple average abs. diff.	14%	23%	27%	41%	236%	52%	272%	90%	782%	33%	130%	107%
	Standard Deviation	18%	25%	50%	101%	831%	104%	2680%	298%	12545%	70%	600%	388%
	Trade-weighted average	11%	15%	11%	20%	124%	32%	103%	56%	50%	29%	261%	29%
Exports	Simple average abs. diff	13%	23%	25%	66%	83%	247%	418%	111%	2560%	22%	208%	262%
	Standard Deviation	15%	35%	48%	670%	186%	2447%	3850%	709%	21406%	47%	1523%	1254%
	Trade-weighted average	7%	15%	12%	25%	46%	36%	35%	26%	134%	17%	532%	59%
Excluding 0.5% most extreme observations (across all services categories)													
Imports	Simple average abs.diff.	14%	23%	27%	41%	182%	52%	131%	83%	102%	33%	110%	94%
	Standard Deviation	18%	25%	50%	101%	506%	104%	229%	241%	373%	70%	307%	298%
	Trade-weighted average	11%	15%	11%	20%	109%	32%	101%	56%	18%	29%	260%	29%
Exports	Simple average abs.diff.	13%	23%	25%	42%	83%	97%	72%	72%	207%	22%	129%	137%
	Standard Deviation	15%	35%	48%	137%	186%	237%	245%	255%	530%	47%	400%	381%
	Trade-weighted average	7%	15%	12%	25%	46%	29%	31%	26%	63%	17%	531%	51%
Excluding 0.5% most extreme observations within each services category													
Imports	Simple average abs.diff.	13%	22%	25%	34%	171%	52%	138%	79%	212%	29%	110%	107%
	Standard Deviation	16%	24%	39%	60%	464%	104%	298%	216%	1071%	51%	307%	388%
	Trade-weighted average	11%	15%	11%	19%	102%	32%	101%	56%	25%	29%	260%	29%
Exports	Simple average abs.diff.	13%	21%	22%	37%	83%	88%	117%	64%	1028%	20%	117%	160%
	Standard Deviation	15%	26%	33%	61%	186%	169%	767%	198%	6507%	23%	337%	522%
	Trade-weighted average	7%	14%	12%	25%	46%	28%	32%	26%	121%	17%	401%	52%

Table 19. Absolute percentage difference between the sum of balanced bilateral trade and reported total trade (S200), selected countries reporting bilateral trade statistics

	Imports	Exports		Imports	Exports
Australia	5.40% (+)	7.30% (+)	Japan	8.30% (-)	7.10% (-)
Belgium	2.00% (+)	10.30% (-)	Korea	16.80% (-)	11.40% (-)
Canada	4.10% (-)	7.00% (-)	Netherlands	6.80% (+)	4.50% (-)
China	5.80% (-)	8.00% (-)	New Zealand	2.90% (-)	2.80% (-)
Czech Rep.	6.00% (-)	11.00% (-)	Poland	6.80% (-)	11.70% (-)
France	4.30% (+)	4.70% (-)	Russia	8.30% (-)	2.90% (-)
Germany	1.80% (-)	3.10% (+)	Singapore	8.50% (-)	10.60% (-)
Hong Kong	19.30% (+)	6.40% (-)	Spain	12.70% (-)	6.40% (-)
Ireland	13.50% (-)	35.30% (+)	United Kingdom	32.20% (+)	6.60% (+)
Italy	9.50% (-)	6.20% (-)	United States	11.60% (+)	3.20% (+)

Note: (+) and (-) denote the respectively overall positive or negative difference during the 1995-2012 period, with [+] noting that balanced trade values were on average higher than reported statistics, and [-] indicating that balanced trade figures are on average lower than the sum of reported values.

5.3 Extreme cases

Overall, and certainly among countries that produce bilateral trade statistics (often a sign of well-developed statistical systems for TIS statistics), the total balanced trade value is roughly in line with reported statistics (even if the partner distribution may be quite different). In other cases however, including also for countries that do not provide

geographical breakdowns in their reported figures, asymmetries can be so strong that the total balanced trade figures are very different from the reported figures.

Table 20 provides an overview of the most extreme cases in the Balanced Trade in Services dataset where such differences occur. The prime example is Bermuda, which reports only very limited exports (1.4 bn USD in 2012), while imports from Bermuda by the United States alone are reported at 26 bn USD, followed by imports reported by the Netherlands (14 bn USD) and Ireland (5 bn USD). As the symmetry indices for these last countries are much higher, the sum of the balanced services exports by Bermuda stands at 64 bn USD (45 times higher than reported, even if this figure may arguably be more in line with reality). On average in the 1995-2012 period, as illustrated in Table 20, balanced exports for Bermuda are 21 times higher than reported exports, with an average annual value of around 35 bn USD.

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	Imports			Exports	
	Average % difference ('95-'12)	Average balanced trade value ('95-'12)		Average % difference ('95-'12)	Average balanced trade value ('95-'12)
Bermuda	1844%	19,490	Bermuda	2124%	35,654
Uzbekistan	520%	2,902	Angola	1342%	4,620
Barbados	358%	2,908	Barbados	241%	4,464
Switzerland	293%	88,951	UAE	186%	15,514
Bahamas	232%	4,420	Nigeria	122%	5,291
Panama	156%	4,778	Kazakhstan	57%	3,982
Liberia	132%	2,685	Oman	54%	3,165
Cyprus	92%	5,044	Philippines	48%	6,042
Afghanistan	90%	2,821	Cyprus	43%	8,675
Uruguay	75%	2,971	Panama	37%	5,613
…			…		
Jordan	-24%	3,168	Luxembourg	-25%	26,660
Indonesia	-26%	15,521	Israel	-28%	12,216
India	-27%	22,903	Chile	-28%	4,153
Oman	-31%	4,130	India	-30%	20,345
Malaysia	-35%	12,600	Malaysia	-34%	11,402
Iran	-36%	5,260	Iran	-37%	4,356
Thailand	-36%	14,093	Costa Rica	-38%	3,032
Iraq	-37%	3,216	Cuba	-38%	4,578
Saudi Arabia	-43%	17,331	Syria	-53%	2,614
Lebanon	-59%	4,806	Lebanon	-59%	5,444

While large differences between balanced and reported data also occur in other countries, such as Uzbekistan, Angola, Barbados, Panama and Cyprus, where balanced trade is higher than reported, as well as in Lebanon, Iraq, or Cuba, where balanced trade values are much lower than reported, it is clear that in most of these cases this involves countries with relatively underdeveloped statistical systems and data sources, with also relatively small trade in services transactions. However, a few cases do stand out from Table 20.

Most importantly, Swiss balanced imports are three times higher than reported figures (and Switzerland also takes 11th place on list of largest export differences). Especially in the more recent years covered by the balanced dataset, Swiss data have been very different from those reported by all its major trading partners. In 2011 for example, Swiss imports from Germany were reported as nearly 9 bn USD (while Germany reported 24 bn USD exports), from the United States at 5 bn USD (The United States reported 24 bn USD), from France at 5 bn USD (France reporting 14 bn USD), and from the United Kingdom at 4 bn USD (while the United Kingdom reported 14 bn USD).[9]

In reverse, exports reported by Luxembourg are typically much higher than reported imports by partner countries, including for example for Belgium, the United States and the Netherlands. Some potential for partner country misattribution (by either or all trading partners involved) seems present in exports from Luxembourg to the United Kingdom and Ireland: while Luxembourg reports, in 2011, 1 bn USD of exports to Ireland and nearly 10 bn USD to the United Kingdom, these countries in return report imports of respectively 8 bn USD and 3 bn USD.

It is therefore important to consider that while the OECD–WTO BaTIS methodology and database provides a transparent and replicable solution to reconcile asymmetries, more work is clearly needed in collaboration with national central banks and statistics offices to make sure that these kinds of trade asymmetries are resolved prior to applying automatic balancing procedures.

6. Conclusions and next steps

Building a global matrix of international services trade by EBOPS category from existing official data sources, in a transparent manner, is a substantive and ongoing project. While the first version of the OECD-WTO BaTIS dataset has been completed, further work remains necessary in order to improve future editions of the database. In particular, an important improvement is the development of non-mathematical solutions for trade asymmetries, which reconcile bilateral trade flows based on for example more in-depth analyses of compilation methodologies, and discussions with and between the countries involved. OECD and WTO are currently working with other international organisations, such as Eurostat, as well as the other regional TiVA initiatives within for example APEC and NAFTA, to ensure a consistent and shared recording of such improvements.

The second area where additional work is currently ongoing involves the conversion of the EBOPS categories to CPA equivalents, providing the important link to national Supply and Use Tables and TiVA. Given the many-to-many nature of this conversion, this is a relatively complex problem. However, at a national level, such conversions are commonly made in the context of constructing the National Accounts and several countries have already made available their internal conversion tables. OECD and WTO, again in collaboration with other international organisations and regional TiVA initiatives, are currently developing a generic conversion table based on these inputs, before also being combined with the 'target distribution' of services in SUTs, using the RACE methodology developed by Eurostat and the EU Joint Research Center (Rueda-

[9] It has to be noted, however, that the Swiss National Bank has since improved the coverage of the trade in services data collection (with the changeover to BPM6). As a consequence, both reported exports and imports are substantially higher and we expect this to reflect in much lower asymmetries in the future releases of this dataset.

Cantuche et al., 2017), which proposes an iterative 'RAS-like' procedure to identify a conversion matrix.

The development of the Balanced Trade in Services dataset, its methodology, and the current ongoing work, is ultimately driven by need to develop high quality and transparently developed detailed trade in services statistics for the purposes of constructing global Supply and Use and Input-Output tables. As such it is difficult to overstress the importance of international collaboration in order to achieve a common view of internationally coherent trade in services statistics – in other words a public good and an international benchmark. In addition however to its use for TiVA, the dataset serves as a standalone product, serving the development of new insights on trends in international trade in services and supporting the development trade in services policies. Finally, it is also hoped that the dataset will in itself create a virtuous circle that helps countries in compiling trade in services data, for example though the identification of important trade in services partners that in turn will help to improve the quality of the global dataset.

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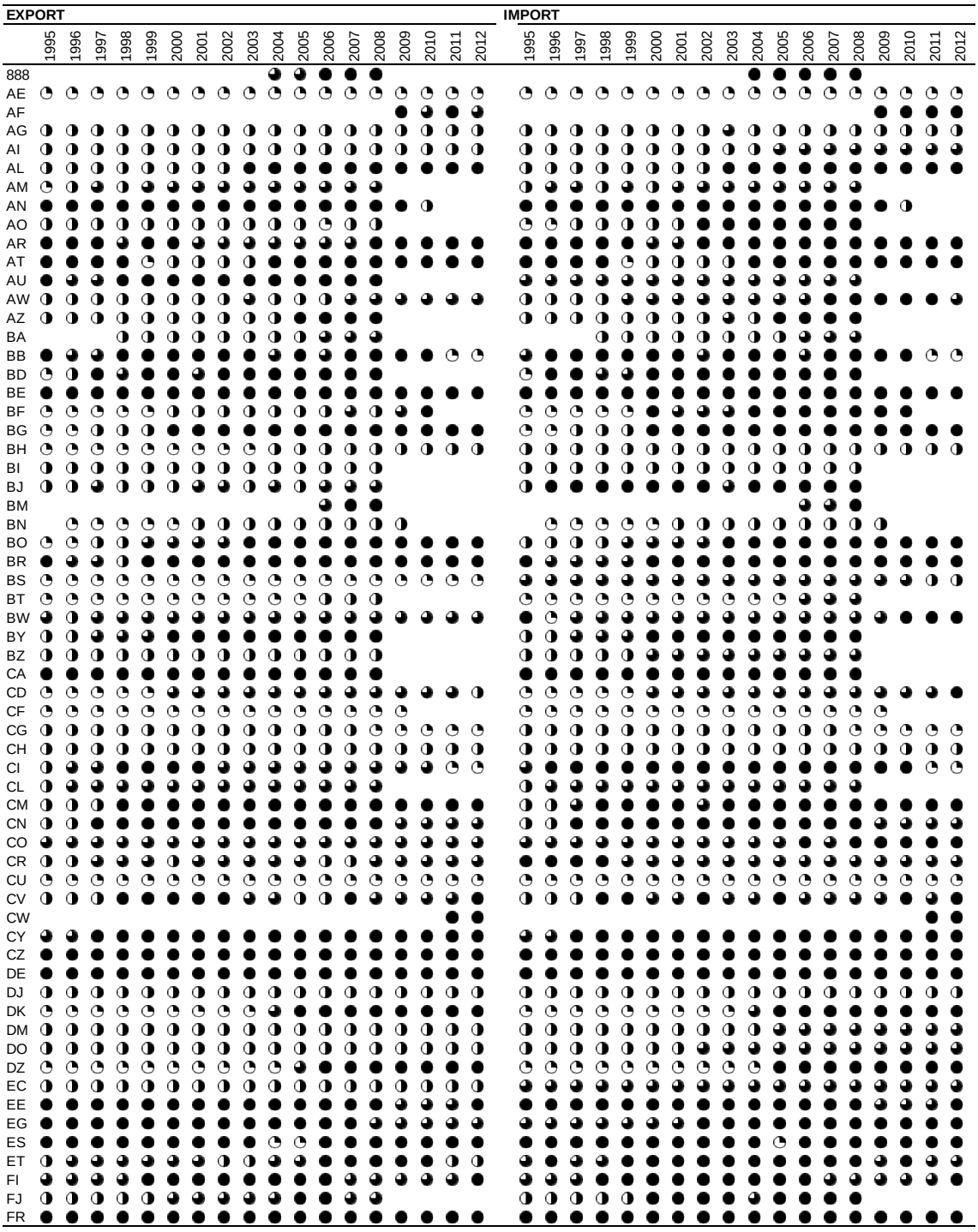
Annex A. Reported Data Availability – Total Services

Available years for total trade in service (export and imports, S200)

	Imports		Exports
1995-2012	AE, AG, AI, AL, AR, AW, BE, BG, BH, BO, BR, BS, BW, CD, CG, CH, CM, CO, CR, CU, CV, CY, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, ET, FI, FR, GA, GB, GD, GH, GM, GN, GQ, GR, GY, HN, HT, HU, ID, IE, IL, IR, IS, IT, JO, JP, KE, KG, KH, KN, LC, LS, LT, LU, LV, LY, MA, MD, MN, MR, MS, MT, MU, MV, MX, MZ, NG, NL, NP, OM, PA, PAL, PE, PG, PL, PT, PY, RO, RW, SD, SE, SI, SK, SL, SR, ST, SZ, TN, TO, TR, TW, TZ, US, UY, VC, VE, VN and ZA, AT*, HR*, LA*, NO*,KM*	1995-2012	AE, AG, AI, AL, AR, AW, BE, BG, BH, BO, BR, BS, BW, CD, CG, CH, CM, CO, CR, CU, CV, CY, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, ET, FI, FR, GA, GB, GD, GH, GM, GN, GQ, GR, GY, HN, HR, HT, HU, ID, IE, IL, IR, IS, IT, JO, JP, KE, KH, KN, LA, LC, LS, LT, LU, LV, LY, MA, MD, MN, MR, MS, MU, MV, MX, MZ, NG, NL, NO, NP, OM, PA, PAL, PE, PG, PL, PT, PY, RO, RW, SD, SE, SI, SK, SL, SR, ST, SZ, TN, TO, TR, TW, TZ, US, UY, VC, VE, VN and ZA, AT*, MT*,KM*
1995-1997	NZ	1995-1997	NZ
1995-2002	ER	1995-2002	ER
1995-2008	AM, AO, AU, AZ, BD, BI, BJ, BT, BY, BZ, CA, CL, CN, FJ, GT, HK, IN, JM, KW, LK,ML, MO, MW, MY, NI, PH, PK SA, SB, SC, SG, SN, SV, TH, UG*, VU, WS	1995-2008	AM, AO*, AU, AZ, BD, BI, BJ, BT, BY, BZ, CA, CL, CN, FJ, GT,HK,IN, JM, KW, LK,ML, MO,MW, MY,NI, PH, PK, SA,SB, SC,SG, SN,SV, TH,UG, VU, WS
1995-2009	CF, KI, TD	1995-2009	CF,KI, TD
1995-2010	AN**, BB, CI, GW*, NE, SY, TG, TT	1995-2010	AN**, BB, CI, GW*, NE, SY, TG, TT
1995-2011	KR, MG, MM, NA, UZ, YE	1995-2011	KR, MG, MM, NA, UZ, YE*
1996-2005	YU**	1996-2005	YU**
1996-2009	BN	1996-2009	BN
1996-2012	MK	1996-2012	MK
1997-2008	GE	1997-2008	GE
1997-2012	ZM	1997-2012	KG,ZM
1998-2008	BA	1998-2008	BA
1999-2012	QA	1999-2012	QA
2000-2008	KZ, UA	2000-2008	KZ
2000-2010	BF	2000-2010	BF
2000-2012	ZW	2000-2012	ZW
2001-2008	RU*	2001-2008	RU,UA
2002-2012	LB,TJ	2002-2012	LB,TJ
2004-2008	888	2004-2008	888
2004-2011	LR	2004-2011	LR
2005-2007	IQ	2005-2007	IQ
2006-2008	BM	2006-2008	BM
2006-2012	ME**, RS**	2006-2012	ME**,RS**
2009-2012	AF	2009-2012	AF
2011-2012	CW**, SX**	2011-2012	CW**,SX**

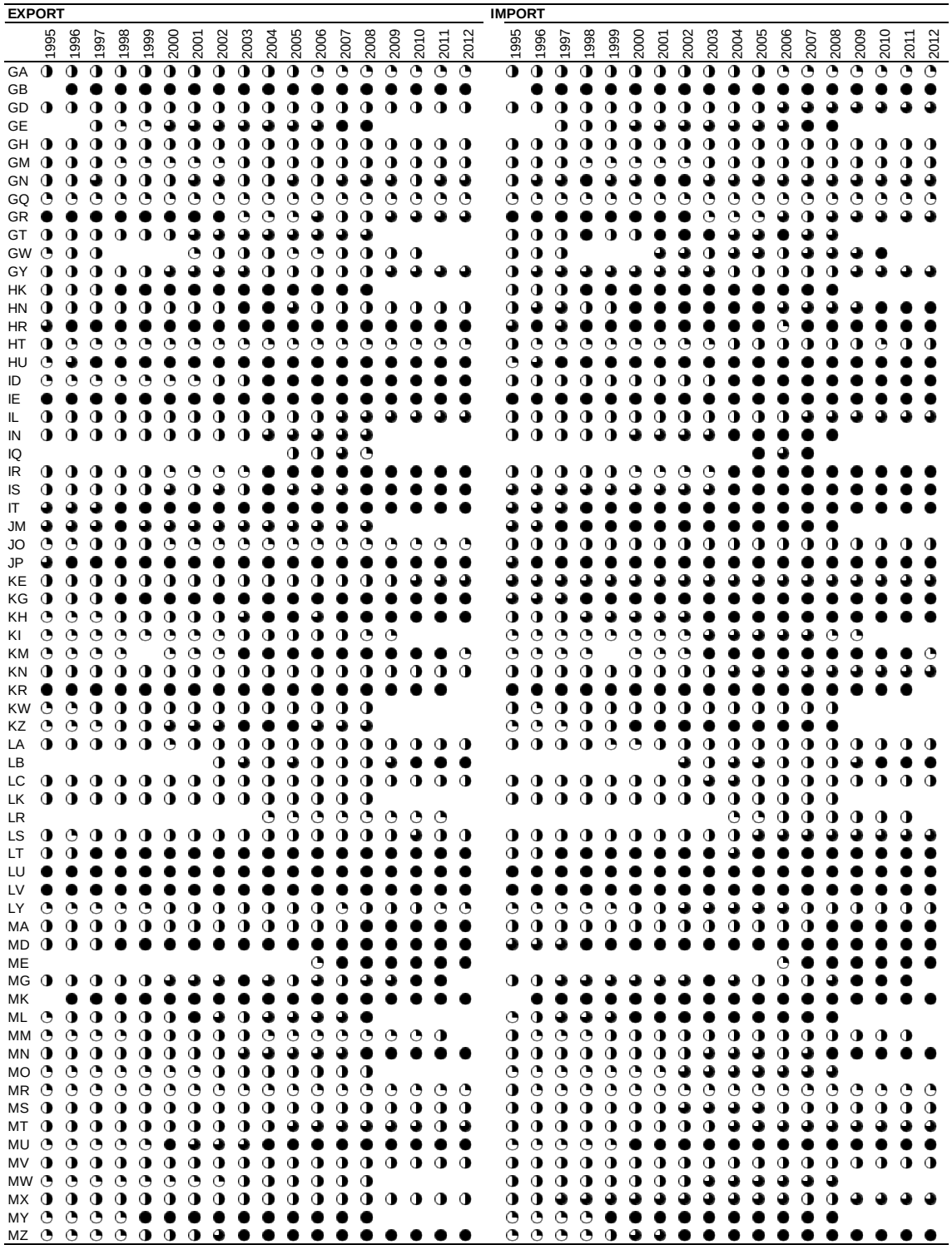
Note:. * with a gap in series. ** It is correct that these countries are only included for part of the period of interest, due to the breakup of YU into ME and RS, and of AN into CW and SX

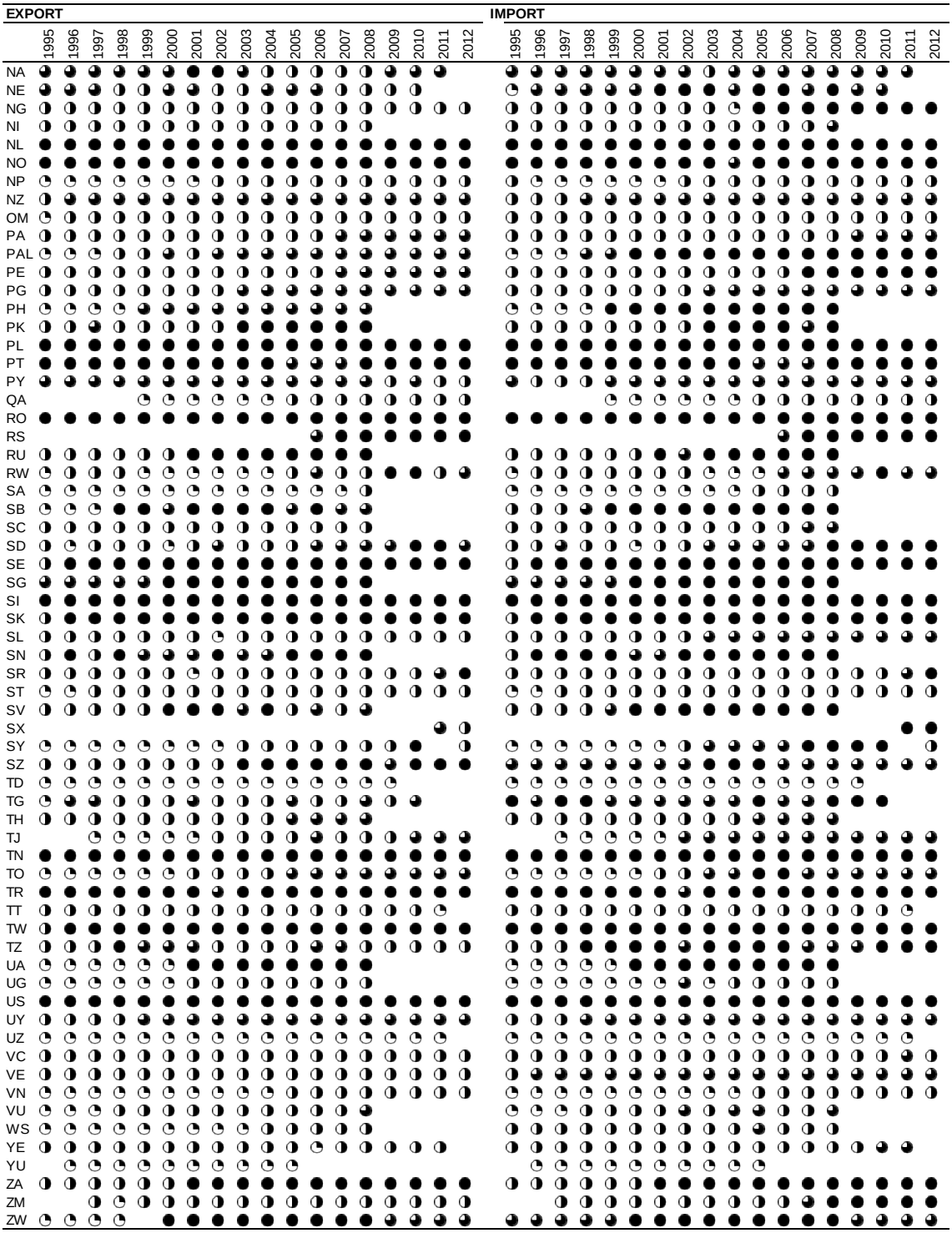
Annex B. Reported data availability – by EBOPS 2002 category



● All 11 EBOPS categories available; ◕ 10-11 EBOPS categories available;

◑ 6-9 EBOPS categories available; ◔ 1-5 EBOPS categories available. No circle = no data available.


EXPORT
IMPORT
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
GA GB GD GE GH 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 KZ LA LB LC LK LR LS LT LU LV LY MA MD ME MG MK ML MM MN MO MR MS MT MU MV MW MX MY MZ


EXPORT
IMPORT
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
NA NE NG NI NL NO NP NZ OM PA PAL PE PG PH PK PL PT PY QA RO RS RU RW SA SB SC SD SE SG SI SK SL SN SR ST SV SX SY SZ TD TG TH TJ TN TO TR TT TW TZ UA UG US UY UZ VC VE VN VU WS YE YU ZA ZM ZW

Annex C. Reported data availability – bilateral flows by EBOPS 2002

	Average number of TiVA partner countries per year													Average number of non-TiVA partner countries per year										
	S200	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291	S981	S200	S205	S236	S245	S249	S253	S260	S262	S266	S268	S287	S291	S981
by reporter																										
AT	55	51	51	42	42	42	45	42	42	45	42	42	51	110	8	8	7	7	7	9	7	7	9	7	7	8
AU	30	24	30	17	23	28	30	22	22	24	21	30	24	3	2	3	1	2	3	3	3	2	3	1	3	2
AZ	19	13	11	9	8									14	11	12	6	4								
BE	50	52	53	39	35	46	48	40	33	45	35	44	45	100	54	47	37	23	36	69	29	23	58	17	26	6
BG	61	54	54	54	54	54	54	54	54	54	54	54	54	171	8	8	8	8	8	8	8	8	8	8	8	8
BY	26	20	20									11	26	15	15	15									13	15
CA	43	22	41	1	1	1	1	1	1	1	1	22	22	16	15	16									15	15
CL		23	9												7	2										
CN	8	9	9										9	1	1	1										1
CY	60	45	53	35	40	39	48	39	46	46	37	43	48	158	4	6	5	5	5	5	5	6	5	4	6	5
CZ	55	49	49	44	44	44	44	44	44	44	44	44	49	145	8	8	8	8	8	8	8	8	8	8	8	8
DE	40	44	19	44	44	44	44	44	44	44	44	44	44	92	6	1	6	6	6	6	6	6	6	6	6	6
DK	54	50	50	48	48	49	49	49	49	42	48	49	49	102	8	8	8	9	9	9	8	8	8	8	8	9
EE	32	29	26	22	24	21	22	22	22	26	22	15	26	129	3	6	2	6	5	5	5	6	4	6	5	4
ES	30	17	18										39	9	2	2	1	1	1	1	1	1	1	1	1	7
FI	40	30	43	22	26	36	29	26	27	30	25	34	38	65	4	6	4	5	6	4	5	4	5	5	6	5
FR	43	39	39	37	37	37	37	37	37	37	37	37	39	102	6	6	6	6	6	6	6	6	6	6	6	6
GB	50	40	40	3	3	20	20	3	3	20	20	38	40	95	8	9			9	9			9	9	9	8
GR	34	35	27	38	34	31	32	36	35	32	35	26	22	73	5	3	6	5	5	4	6	5	5	5	4	3
HK	39	38	23	16		29	36	17	17	10	15		23	10	10	1	1		9	9	2	1	1	2		1
HR	49	51	43	52	40	50	51	50	47	51	49	28	34	108	6	4	5	4	8	6	5	4	6	5	7	8
HU	53	45	44	42	42	42	42	42	42	42	42	42	45	118	8	8	8	8	8	8	8	8	8	8	8	8
IE	40	40	40	32	37	30	30	20	25	31	30	26	39	121	8	7	6	8	5	4	3	7	4	6	5	7
IL				52	51		48	51	51	54	51						68	50		31	54	54	84	54		
IS	60	53	53							53			53	171	6	6							6			6
IT	44	40	40	36	36	36	36	36	36	36	36	36	40	105	6	6	6	6	6	6	6	6	6	6	6	6
JP	30	30	30	30	30	30	30	30	30	30	29	30	30	3	3	3	3	3	3	3	3	3	3	3	3	3
KR	20	20	20	20		20			20	20		20	20	4	4	4	4		4			4	4		4	4
LT	38	33	34	31	31	31	31	31	31	32	31	31	34	155	7	8	7	7	7	7	7	8	7	7	7	8
LU	39	50	50				32			48			50	171	8	8				8			8			8
LV	60	54	54	46	46	46	46	46	46	46	46	46	54	146	7	7	7	7	7	7	7	7	7	7	7	7
MD	3	3	3	3	3	2	3	3	3	3	1	3	3	2	2	2	2	1	1	1	1	1	2	1	2	2
MT	46	23	20	14	45	46	24	22	38	31		38	36	85	6	1	4	10	10	7	4	10	5		7	8
MX			2																							
NL	44	39	42	31	32	32	29	32	31	36	34	36	39	93	5	6	4	5	5	5	5	4	6	5	6	6
NO	30	27	24	25	27	24	27	25	25	24	25	25	27	24	2	2	2	2	2	2	2	2	2	2	2	2
NZ	17	14	17	5	2	9	8	14	13	17	8	17	2	1	1	1			1		1	1	1		1	
PK		40	44	47	18	32	43	46	29	56	21	41			29	35	29	8	17	30	41	6	72	6	35	
PL	55	49	49	49	49	49	49	49	49	49	49	49	49	172	9	9	9	9	9	9	9	9	9	9	9	9
PT	38	9	37	7	7	7	7	7	7	7	7	7	41	8	1	4	1	1	1	1	1	1	1	1	1	5
RO	61	54	54	54	54	54	54	54	54	54	54	54	54	172	8	8	8	8	8	8	8	8	8	8	8	8
RU	56	55	54	54	52	56	55	54	53	57	54	51	51	85	71	77	67	91	106	115	49	87	110	88	85	19
SE	51	47	47	43	43	44	42	44	43	44	43	42	47	113	8	8	8	8	8	8	8	8	8	8	8	8
SG	20	7			4	7	7	7	7		2			3												
SI	50	46	46	43	43	43	43	43	43	43	43	43	46	114	9	9	9	9	9	9	9	9	9	9	9	9
SK	49	46	46	45	45	45	45	45	45	45	45	45	46	88	11	11	11	11	11	11	11	11	11	11	11	11
SZ	1	1	1	1	1	1	1	1	1	1	1	1	1													
TN	24	23	24									20	31	18	16	16									11	19
TR			26			23				26						8			2				3			
US	18	31	31			31	32	31	31			20	17	1	2	2			2	2	2	2			1	1

Annex D. Methodology codes in balanced trade in services statistics

Code	Description
blank	No calculation/estimation/adjustment/correction/addition.
E1	Simple derivation from existing items.
E1_2	EBOPS item derived when total services are available and only one main category is missing.
E10	Estimate based on (national) non-official sources.
E11	Estimated breakdown of 'other business services' across EBOPS categories, using structure from other years.
E13	Reported zeros replaced based on values of S200.
E2	Conversion of BPM6 data to BPM5 presentation.
E3	Calculation through national BOP growth rate. In these cases, the growth rate of the national BOP is applied item by item to the relevant primary source (IMF, EURO, OECD, UNSD). This method could only be used for the 3 latest years (i.e. t-1, t-2 and t-3). The rationale behind is that normally the national source releases the figures earlier that than Eurostat, OECD, IMF of UNSD; those estimates are thus in principle provisional and substituted with the relevant primary source when it becomes available. Only applies to partner World.
E4	Derived from regional growth rates. In these cases, a regional growth rate applied to S205, S236, S291, S981 (S200 derived). Only used if nothing else is available. Regions are defined as North America, Central and South America, Europe, CIS, Asia. It could only be used for the last 3 years, and with partner world. Sub-items (eg. S245) are filled in based on the item's share in the last year available and have source code E8.
E6	Correction of mistakes in source data, such as implausible negative values, definition not in line with international recommendations, etc.
E7	Derived to be negligible/zero.
E7_3	Derived as zero, as partner world is zero.
E7_4	Derived as zero, as S200 is zero.
E8	Estimated using past or future structure (interpolation, backcasting, nowcasting). Partner world only.
E9	Estimated based on mirror data.
M1_1	Estimated as zero using interpolation.
M1_2	Estimated as zero using backcasting.
M2_1	Estimated value using interpolation.
M2_2	Estimated value using back/nowcasting.
M3_1	Total services model: merchandise trade, tourist arrivals/departures, basic gravity variables, partner FE.
M3_2	Total services model: merchandise trade, basic gravity variables, partner FE.
M3_3	Total services model: tourist arrivals/departures, basic gravity variables, partner FE.
M3_4	Total services model: basic gravity variables, partner FE.
M3_5	Total services model: basic gravity variables.
M4_1	Sectoral model: merchandise trade, trade of relevant item with world, basic gravity variables, partner FE.
M4_2	Sectoral model: trade of relevant item with world, basic gravity variables, partner FE.
M4_3	Sectoral model: trade of relevant item with world, basic gravity variables.
M4_4	Sectoral model: merchandise trade, tourist arrivals, trade of relevant item with world, basic gravity variables, partner FE (exports of S236 only).
M5_1	Interpolation of gravity model estimates.
M5_2	Back/now casting of gravity model estimates.