Decomposing International Trade in Commercial Services

Christopher Findlay

Xianjia He

Hein Roelfsema

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Christopher Findlay, Xianjia He, and Hein Roelfsema *

Abstract

To delve deeper into the rise of trade in commercial services as the most important determinant of the recent increase in digital trade, this paper offers a decomposition of international service trade using the latest release of the Inter-Country Input Output Tables (ICIO). The analysis decomposes international service trade into a split between (i) direct services exports and services embedded in goods, (ii) advanced economies and the major emerging markets, and (iii) the major commercial services industries. We show that overall direct service exports are becoming more important relative to services embedded in goods, especially in advanced economies (the 'unbundling' effect). Also, we show that for emerging markets the rise of the exports of services comes from the increase in volume export of goods which embed services and not because of an increased share of services embedded in domestic value of exported goods (the 'embedded volume' effect). Finally, we show that the increase in services trade can be attributed to the increase in traded IT services and not so much to that in financial and business services that are increasingly traded digitally cross borders (the 'plain vanilla digitalization' effect).

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1 Introduction

Both the stagnation of trade in industrial products and the gradual increase in trade in services are among the most significant trends in world trade over the last ten years. Another trend is the attention to trade through global value chains - see for example the World Development Report 2020 that focuses on this topic from a development perspective (WorldBank, 2020)- which so far has paid limited analytical attention to the increased role services in global value chains. The rise of cross border trade in services is especially observed in commercial services (Media, Telecom, IT, Finance, and Other Business Services, which mainly relates to business consultancy) in which digitalization plays an important role. As a case in point, the WTO World Trade Report 2019 focuses exclusively on the increased importance of trade in services (WTO, 2019). Also, digital operating platforms have enabled a further slicing up of the value chain over countries, increasing the number traded goods and services between affiliates and affiliated outsourcing partners (Hummels et al., 2018). Although such digitalization enables within the firm specialization in headquarter services in developed economies which are associated with knowledge capabilities, recently there is a significant 'Mathews effect' where firms in emerging markets link, leverage and learn to become leaders specialized services: India in business processes and China in AI are eye-catching examples.

In this paper, we analyse the drivers of the rise in trade in commercial services and thus comment on the underlying digitalization of international trade. To do so, we draw on three trends in the analysis of trade flows. The first is to look at the domestic value added components of trade, instead of its gross value. Since gross trade flows do not consider the real value created in a country or industry, a focus on value-added trade would more clearly isolate the elements of comparative advantage and the income effects of international trade (Johnson and Noguera, 2017). The second trend is to make a distinction between services that are directly exported and services that are embedded in traded products and services. The latter is central to the extensive literature on global sourcing which states that much of the trade we observe takes place within companies or is caused by the outsourcing of globally sliced production processes (Antras et al., 2017; Antras and Helpman, 2004; Grossman and Rossi-Hansberg, 2008). Not considering that

services are used as inputs abroad and possibly exported again embedded in goods would exaggerate the ultimate effect of trade flows in supply and demand because of double counting. Therefore, when analysing trends in services trade flows, it is interesting to look at the difference between services that are consumed as an end product and services that are used as input. The third trend is the increased role of firms from emerging markets in global services trade, especially from Asia. Although much of the policy attention is on service liberalization among developed economies, there are loud calls to action for emerging markets to open up for service industries. Such calls distract from the stylized fact documented in this paper that emerging markets have become major exporters of services in their own right, so that they increasingly share the objective of a long overdue liberalization of services trade and global coordination of regulatory harmonization in service industries.[1]

These trends have attracted the interest of researchers who, for example, try to explain the factors underlying overall trade-in services using the gravity model with a focus on quantifying trade restriction in services (Nordas and Rouzet, 2017). Still, there is a research agenda to extend such quantitative analysis to include domestic value added measures for trade in services and decompose the gravity effects across industries and country groupings. As noted, there is an emerging research agenda on embedded services (Los et al., 2015, 2016; Miroudot and Shepherd, 2016) but so far, there is scope to improve on the OECD focus of this research by including a wider set of emerging markets to generalize the stylized facts. As we will see that services are an increasingly important element for emerging market economies by being embedded in trade in goods, this also calls to the fore the larger share of services value added in traded goods (servicification) as the so called 'Mode 5' component of trade in services (Ariu et al., 2019; Cernat and Kutlina-Dimitrova, 2014). Moreover, there is an increased interest in documenting the policy restrictions on trade in services to support the international trade and services is an important two for global digital integration (OECD, 2020; Borchert et al., 2020; Ferencz, 2019). Increasingly exporting importing services is not something exclusively for developed economies but it is also increasingly important for

[1]Even stronger, some observers predict that services coming from emerging markets will play an increasingly important role when consumed in developed economies, putting considerable strain on labour markets especially in the mid-skill range leading to job polarization (Baldwin, 2019; Baldwin and Forslid, 2020).

emerging markets in Asia (ADB, 2017) and Latin America (Gonzalez et al., 2019). For Africa, the Aid for Trade agenda puts an increasing emphasis on services to increase the value added trade component of natural resources and agricultural products (Hoekman and Shingal, 2017; Roy, 2017; Shepherd, 2016). Much of this work is documented extensively in several surveys and there are available overviews for theoretical backgrounds (Hoekman and Kostecki, 2017; Sauve and Roy, 2016).

By combining value added data and bilateral trade flows at the country level over a substantial period of time, we provide stylized analytical facts on the trade in commercial services and thus on the dynamics of digital trade. We make use of the recent release of OECD's Inter-Country Input-Output dataset (ICIO, 2018 December Release). ICIO provides high-quality data on an annual basis based on official statistical sources and, compared to alternative input-output tables at a similar quality, the most recent release of ICIO has covered a relatively large set of developing countries which includes most major emerging economies in Central Europe, Southeast Asian and Latin America. ICIO documents not only the trade flows in goods and services that are used as final products, but also the sourcing structure of domestic and traded intermediate inputs at the industry-country level. This makes it possible to link services to industrial production and thus identify the services value-added embedded in the exports of goods. This level of analysis is especially important because services are an important cornerstone of the debate in the renewal of the WTO, where questions arise on how to deal with complex value chain issues. Because the OECD database combines the observed trade flows in both industrial products and services with input-output tables, it is possible to distinguish between value-added that is generated by different domestic sectors and the gross exports of goods and services products.

We present three main findings. The first is that especially for advanced economies services are exported directly both to other developed economies and to emerging markets. Second, we find that direct export of services is increasing in emerging markets but that it is complemented by a strong rise in exports of embedded services in goods. The first of two effects we call an 'unbundling effect' where more services are treated directly as separate (digital) service tasks and are less exported as embedded in goods. Second, there is an 'embedded volume effect' for emerging markets, where the strong rise in exports of manufacturing goods

with embedded services increases the exports of commercial services. Third, we find that, although all commercial services sectors report rising exports, the IT sector has had the most spectacular increase, so that the 'plain vanilla digitalization' effect of services through the IT sector has contributed most to the increase in trade in services globally. Although recently more data on services trade have been made available on the sectoral level, it is interesting to note that only a few comparative statistical analyses at the industry level are available.

The remainder of the paper is organized as follows. In the next section, we introduce the Input-Output methods used for the service trade analytics, after which we introduce the data. Following on, we will look specifically at added value trade and trade in intermediate products. Special attention is paid to the contrast with gross service trade, and the results are broken down for advanced economies and emerging markets. Then we look in more detail at the differences between advanced economies and emerging markets, after which we split out exports for different sectors of commercial services. We conclude the paper by reflecting on the policy relevance of our findings.

2 Using Input-Output tables to focus on domestic value added trade in services

We derive DVA by tracing the production process of a country's export flow using input-output analysis. Assume there are n industries in each country. The export flow of a country is denoted by a column vector E, with total n elements standing for the gross export from each industry.[2] This can be the total gross export to the world, or bilateral gross export to a specific destination. The domestic input output structure is denoted by a so-called technical matrix A with the dimension of n x n. Each element A_{ij} on row i column j stands for the value of intermediate inputs from domestic industry i that are directly needed to produce \$1 of gross output of industry j. To produce the gross export of E_j by an industry j, the intermediates demanded by each industry is given by $A_{1j}E_j, A_{2j}E_j, ...A_{nj}E_j$ respectively. In a

[2]Since the same procedure is applied each year and the derivation of DVA uses the domestic blocks of input-output matrix, we omit the year and country (region) subscripts in the equations for simplicity.

matrix form, the intermediate inputs in producing the export flow is found by the matrix multiplication AE. The production process of these direct intermediate inputs will need other intermediates from upstream sources. Following the same logic it can be seen that the required second tier upstream inputs is given by $A(AE) = A^2E$, and third tier A^3E, so on so forth. We are interested in the total of gross production by each industry that delivers the export flow of E, denoted by an n-element column vector y^E. Summing up the last stage of production (i.e. E) and all production with regards to intermediates, we have:

$$yE = E + AE + A^2E + ... = (\sum_{k=0}^{\infty} A^k)E$$

Under weak conditions, it can be shown that the infinite sum of a matrix series converges to $(I - A)^{-1}$, in which I is the identity matrix with the dimension of n x n. This is the famous Leontief Inverse (Leontief, 1953), and a sufficient condition for the summation to converge is roughly that the economic system does not need more intermediate inputs to produce outputs, which is safely satisfied for well behaving input-output databases.

We denote the value-added to gross output ratio in each industry i by v_i, which is the direct value-added by the industry itself in producing $1 gross output. The domestic value-added created by sector in gross export of is given by:

$$DVA_i = v_i y_i^E,$$

and the total domestic value-added in gross export by the country is the sum of DVA_i over all i. When the summation is taken over industries i that belong to the category of commercial business services, we obtain the service content in DVA. DVA from goods sectors and other services (like electricity and water supply, domestic transportation, etc.) can be derived in the same manner. Services DVA embedded in the export of goods can be derived in the same approach: Instead of considering the gross export E by all industries, we consider only the gross export of goods sectors, E^G, which has an element E_i^G equal to E_i if an industry i is a goods producer, and zero otherwise.

Note that there is another concept of value-added exports (VAE, see e.g. John-

son and Noguera 2017 which is different from DVA. Instead of tracing the production process in gross export flows as in DVA, VAE investigates the exchange of value-added across countries and regions. That is, VAE from country a to b is defined as the value-added created by country a that ends up in the final use of country b. We choose to investigate DVA over VAE in this paper for ease of interpretation, and also due to its ability to provide a straightforward decomposition of exported service value-added content into a direct share and the share via the export of goods.

VAE and DVA are usually similar when considering the exports from a country to the rest of the world; the difference between the two is due to the so-called "returning value-added". To give an example, some of US gross exports to China are intermediates that will be processed and then shipped back to the US. The domestic values embedded in these gross exports will be counted in DVA, but following the definition of VAE it will not be credited as "exports". Koopman et al. (2014) show that such a difference is in most cases small. However, when looking at the DVA and VAE between bilateral country pairs, the difference may be large if the importing party is a 'hub of transit'. For example, the DVA of UK's financial services into Luxembourg is substantially larger than VAE, since most of the value is passed on to the third-party ultimate user via Luxembourg and not much is used by Luxembourg residents. In the analyses we will show service and manufacturing DVAs of broad country groups, and for such aggregated statistics we do not expect any artificial disparities as illustrated by this example would notably bias our conclusion. But due to the reason above, although the disparity on most (regular) country pairs is not extreme, we refrain from a too-detailed investigation of bilateral DVAs.

When using IO-based methods it is essential to consider the so-called proportionality assumption, and the inability to distinguish the different technology in the productions for domestic sales and export between countries. For most countries, when constructing the IO dataset the exact usage of imported intermediate inputs is not observed, but is estimated based on the aggregates in total intermediate inputs usage and import structures. That is, if in Germany 20% steel are imported, of which half are from Poland, the German car industry is assumed to source 20% of their steel from abroad, and Polish steel has a share of 10% in

all steel used by German cars regardless where they are sold to. The exceptions in ICIO are China and Mexico, in which regular production and processing exports are separately accounted for. Although the method is not without critics, we are confident that the analysis can be used to provide valuable guidance for the analysis of trade in services and to inform policy making at an early stage.[3]

3 Data: The ICIO database

As mentioned in the introduction of this article, we use the latest Inter Country Input Output Table (ICIO) from the OECD released in December 2018, covering 64 countries/regions as well as the estimates for the trade with the rest of the world (RoW) over the period of 2005 to 2015. The database contains most advanced economies and the important emerging markets, like the BRIC countries, all Central and Eastern European (CEE) of the EU, and many of the South and Southeast Asian countries; a full list can be found in the data appendix. Such an extensive number of countries enables us to investigate the trends in trade in services from advanced to emerging economies and vice versa.

The databases that use the IO tables apply a classification of international trade by country and industry. Included is trade flows on the level of the country and industries are classified according to the ISIC4 classification, rev. 4. The industries are classified at the 2-digit level but in some case ISIC codes are pooled. For instance, the "Other Business Sector Services" sector in ICIO includes the whole range of professional services from ISIC codes 69 to 82. The method does not identify the exact imports and exports as use the input-output table at an aggregate level. The main aim of using IO tables is to derive the domestic value-added embedded in exports (DVA) of each country following the standard approach as in Koopman et al. (2014). DVA can be more informative than gross export flows since the latter contains the value of imported intermediates. Therefore, based on

[3]Some scholars, like doubt that the proportionality is a major drawback, and he showed that the imported content from the US is substantially higher in Mexican cars that are exported to the US than to Germany (De Gortari, 2019). However, the problem might be considerable when tracing the exact origin of foreign content in exports, say the banking services by Ireland in Hungary's exports of cars to Germany and to the UK, but it should not have a major impact on the estimates of domestic service content and foreign service content at an aggregated level.

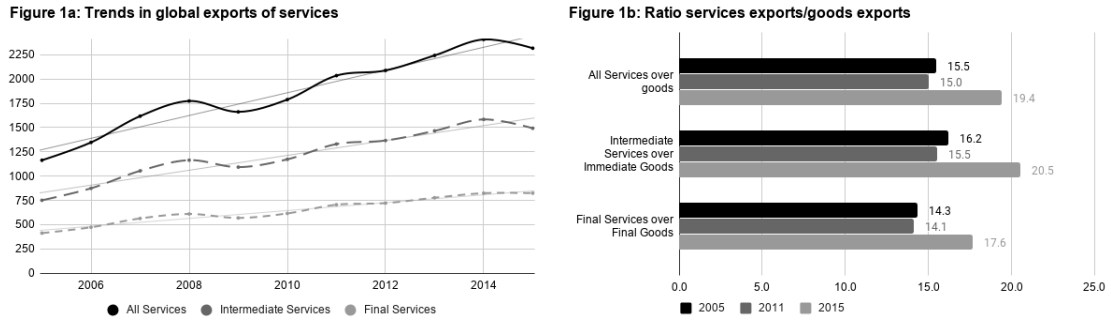
gross exports only one cannot distinguish between two countries where one creates a substantial share of value-added on its own when exporting, and another does only minimum processing on imported intermediates. Another advantage of the use of DVA is that we may identify the sector that created value-added in gross exports. This is especially relevant for this paper on services trade, since a share of services is not exported directly, but are embedded in the exports of goods. An example is the value of software inside the exported electronics devices which was created by domestic ICT services firms. Others are business consulting and financing services which facilitate the business of a manufacturing exporter.

4 Global trade in services in gross value and in domestic value added

We start by examining the services trade of all countries in our sample in terms of export value, which given the country coverage is close to the world trends. The left panel of Figure 1 analyses trends in trade in services in general and the decomposition of trade in final services (consumed directly on foreign markets) and intermediate services as used in further production processes abroad. The top line shows that in overall services trade between 2005 and 2015,allowing for the hiccups of the financial crisis in 2008 and 2009, the trend is upwards. Decomposing all services trade, services exported directly are much lower than intermediate services used in other production processes, signalling the importance of services in global value chains.

This finding of the importance of intermediate services is mirrored in the right-hand side of Figure 1. This bar chart is used to analyse whether services increase over time relative to trade in goods. The left-hand graph picks up a general time trend in expanding trade. On the right of the figure, the bar chart documents, in the top set of bars, trade in services as a ratio (%) to trade in goods in each of 2005, 2011 and 2015. To begin with, we see that trade in services is declining slightly in relative terms compared to the period 2005-2011, so we can conclude that overall trade in goods is growing faster than trade in services. The increased relative importance of trade in services worldwide is, therefore, a relatively recent

Figure 1: Trends in commercial services trade



Note: Author's own calculation based on the ICIO 2018 dataset. The right panel reports the annualized growth rates in the service DVA from different country groups between 2005 and 2015; the bar chart is for comparing the growth of each industry and the numbers are not addable.

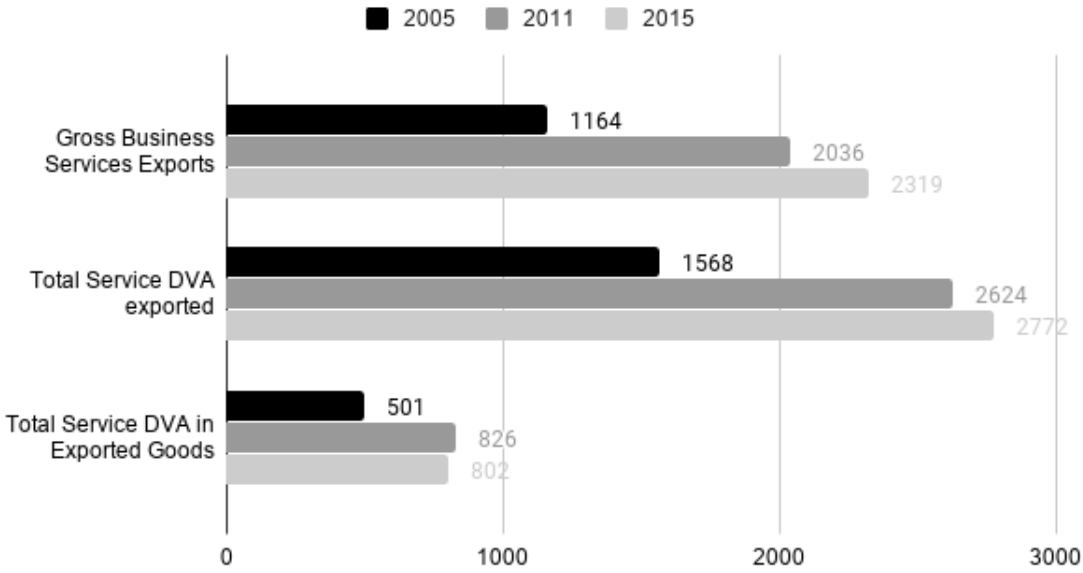
phenomenon, shown in the substantial increase in the ratio between 2011 and 2015.[4] Interestingly, in the second and third sets of bars, we observe that the trends of intermediate services over intermediate goods and final services over final goods have a similar pattern. This reflects opposite movements of trade in goods as well. For intermediate services they go together with the rise in intermediate trade goods, both reflecting the increased importance of global supply chains. Relative low growth in direct service exports used as final services goes together with low growth in world trade in goods. But for both sub categories the relative importance of services over goods trade increases in the more recent period. .

In addition to the fact that we observe in the database the prevailing trend of the increasing importance in trade in services, our data enables us to distinguish between the trade value of services, as observed as transactions recorded in balance of payments statistics that are captured by the analysis in Figure 1, and the trade flows in terms of added value by using the IO tables. By analysing service DVA we can distinguish between the growth of trade in services, as final products or intermediates, and the growth of trade in services as inputs in other export products.

It is instructive to contrast the value of commercial services DVA exported in any form with the gross value of transaction accounts of services exports taken from the Balance of Payments. The former could be the services value-added in

[4]As in our data in general it has been noted that the financial crisis of 2008 and 2009 hit trade in goods more heavily than trade in services (Ariu, 2016).

Figure 2: Evolution of services exports DVA



Source: Author calculations based on the ICIO 2018 database: units shown are billions of US dollars at current prices.

the direct exports of final or intermediate services, but also services embedded in other goods and services being exported.[5]

Figure 2 shows three trends, of which two go against popular opinion. The first well recognized trend is that, in reference to the top trio of bars, exports of services are increasing, as in Figure 1. Note that these service exports may be used as intermediate inputs in industries in foreign countries. The second bar trio shows the total services domestic value added which is exported, of which some is exported directly as shown in the top bar trio. Because services are also embedded in the value chain in other exports, the value of domestic value added is higher than services exported directly. What is interesting to observe is that domestic value added of services between 2005 and 2015 is not rising as fast(from \$1568 to \$2772 billion) as commercial services exported (\$1164 to \$2319 billion). This

[5]BoP service exports are service transactions which may contain value-added from domestic manufacturing sectors that contributes to the service export, for instance the value of computers (manufactures) used for ICT service exports. However, we believe the change of the ratio of service DVA over the gross export flow of service trade gives a rough overview of the evolution in the embeddedness of service trade.

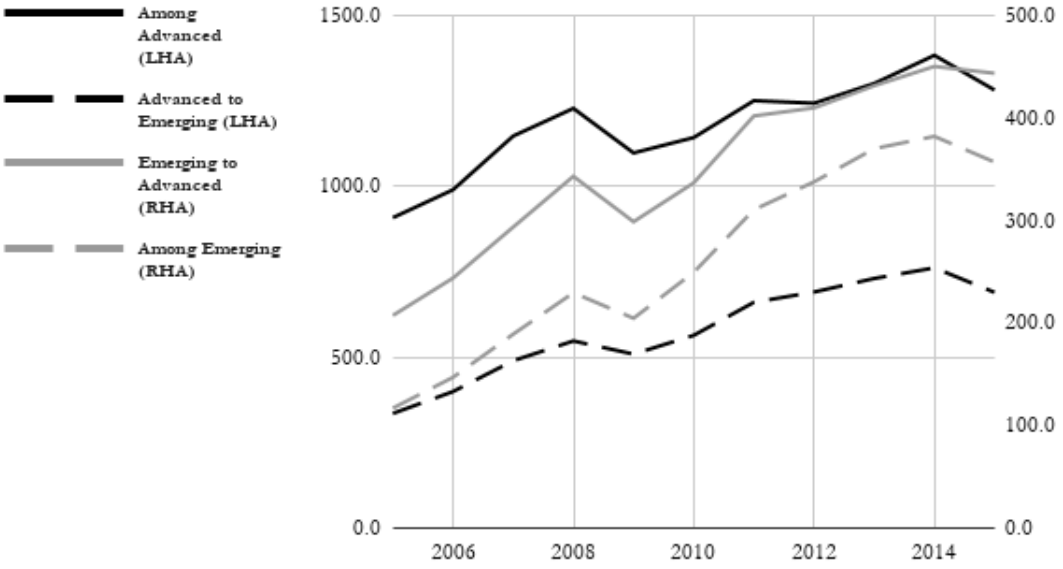
means that globally a lower share of exported services is embedded in other goods and services and a higher share of services is exported directly. The bottom trio of bars shows the services that are embedded in goods exported. Between 2005 and 2011 the increase mirrors that of the increase in total DVA exported in the middle bars. However, for the years 2011 to 2015 domestic value added in exported goods is declining. Hence, embedded domestic value added in services has shifted globally from embeddedness in goods to direct exports and services embeddedness in other services and other products like agriculture and natural resources. In the next section we will see that these results are very different for advanced economies and emerging markets.

The general conclusion of this section is that, as in other studies, trade in services is increasing in both absolute and relative terms in total trade flows. We note that especially intermediate services used in production processes abroad are growing, but that this is especially the case before the financial crisis of 2008 and 2009. After the crisis, the importance of final services trade increased, in particular, due to the export of advanced economies. Although services embedded in goods are an important phenomenon when analysing the export of services that amount to almost a third of all service DVA trade in the world, the importance of services embedded in goods for world exports is declining overall.

5 Splitting Advanced Economies and Emerging Markets

While the previous section analyses the dynamics of trade in services at a global level there are substantial differences between advanced economies and emerging markets. It is therefore essential to break down the overall trends in trade in services as reported in the previous section into the statistics for advanced economies and emerging markets. In the appendix, we give an overview of the advanced economies consisting mainly of countries in Western Europe and North America (and some in the Asia-Pacific) and emerging markets, mostly in Central Europe, Asia-Pacific, and Latin America. As the database is bilateral at the country level over industries, we can generate trade flows at the level of country groupings while

Figure 3: DVA Services Exports for Advanced Economies and Emerging Markets



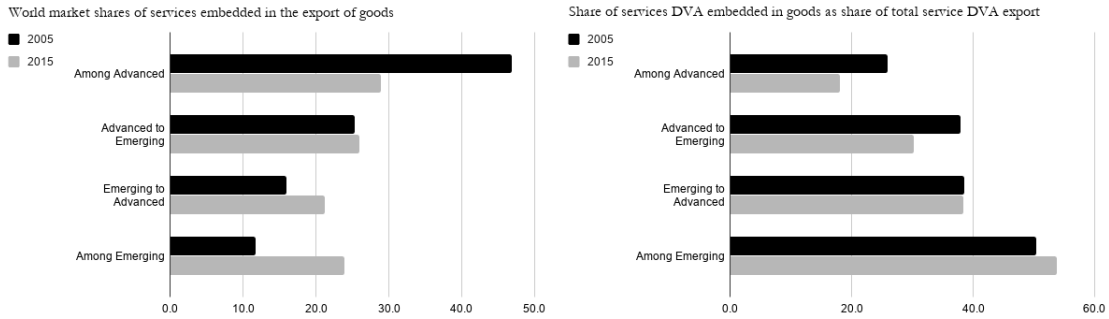
Notes: Authors own calculation based on ICIO 2018 dataset. Unit: billions of US dollars at current prices. Left-hand axis (LHA) for values of service DVA exported by advanced economies and right-hand axis (RHA) by emerging markets.

keeping track of bilateral flows at the level of industries to disentangle value-added and intermediate services.

Figure 3 analyses the bilateral DVA service trade flows between the two country groups, advanced economies on the left-hand axis and emerging markets at the right-hand axis. As we can see, at first sight, trade flows between advanced economies are particularly large in current value terms, but they are also increasing significantly over the period 2005-2015. A second observation is that trade flows from emerging markets are increasing rapidly, both to advanced economies and to emerging markets. Trade flows to advanced economies are the most important, both from other advanced economies as from emerging markets. A final observation is that, although still small in current value terms, trade in commercial services between emerging markets is rapidly growing in importance.

In the previous section, we documented that the difference between final and intermediate services is important when analysing trade in service flows. Moreover,

Figure 4: Commercial services DVA embedded in goods



Source: Author calculations based on the ICIO 2018 database.

when assessing Service DVAs, it is essential to distinguish between components of domestic trade in services that are directly exported and components of value-added that are exported as domestic inputs embedded in exported goods. In fact, we find that the levels and the trends of the service DVA embedded in goods documented in the previous section differs significantly between advanced economies and emerging markets, analysed in Figure 4.

On the left side of Figure 4, we have mapped the dynamics in the world market shares of services embedded in the export of goods. In 2005, the trade between advanced economies dominated world trade of embedded service DVA. However, we see that this share has declined rapidly over time. In contrast, the importance of the indirect channel of services exports embedded in trade in goods is increasing in the trade flows from emerging markets to advanced economies, and an even stronger growth is reported in the trade between emerging markets. We can say that services embedded in goods from emerging markets to advanced economies have replaced services embedded in goods in trade between advanced economies and this is arguably the second most important driver of growth in world service DVA over the period under review. Through a decomposition analysis we will show later that both the growth in the volume of goods exports and servicification, i.e. an increasing share of services content in the value of exported goods, has contributed to the growth of embedded services exports from developing countries.

To further illustrate these differences between country groups, Figure 4 on the

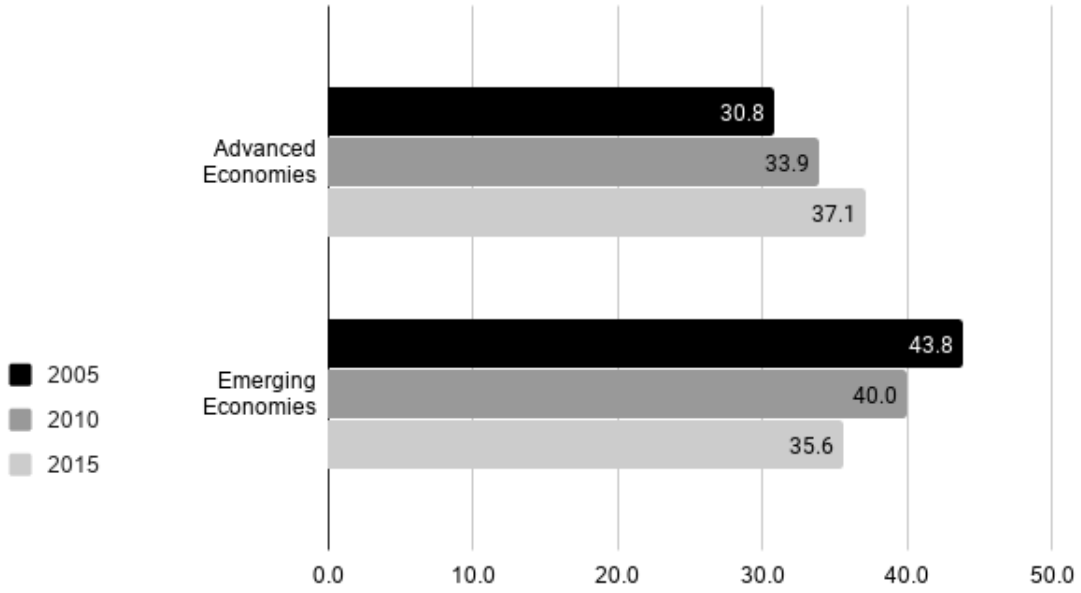
right shows the shares of service DVA in total service export DVA that are embedded in the gross exports of goods. We note that service exports through the channel of goods is particularly important for the emerging markets, while the importance of these indirect service trade flows are less important for the advanced economies. Looking at the changes over time, we see that the embedded services component has become even less important for the export of services between advanced economies and from advanced economies to emerging markets. Embedded services have become less important for trade among emerging economies and have remained constant in the trade flows from emerging economies to advanced economies.

Interesting conclusions emerge when we combine the insights from Figure 3 and 4. Figure 3 shows that for advanced economies commercial services exported domestic value added is increasing over time. However, Figure 4 shows that the share of commercial services DVA embedded in goods for advanced economies is falling, resulting in the conclusion that advanced economies in relative terms have started to focus on exporting commercial services DVA directly. This rise in directly exported services DVA from advanced economies is the first most important driver of the overall increase in global exported services DVA. Figure 3 also shows a sharp increase in services export DVA from emerging markets both towards advanced economies and among themselves. In figure 4 we see that the share of services embedded in goods is increasing in emerging markets, especially because of the sharp increase in the volume of goods exports. This is the second engine of the exports of services, that service DVA from emerging markets are increasing by being embedded in the rising volume of goods exports.

A potential caveat when analysing services embedded in export goods in emerging markets is whether these services are provided by domestic producers or whether they are from foreign affiliates operating domestically. However, it is possible to estimate the imported service content in the exports of goods to asses the importance of global value chains in services.[6] To be more specific, we slice

[6]The definition of a global value chain is that value addition in imported goods takes place in more than two foreign countries, so that these industries are linked through the input output table across countries to domestic consumption. Forward linkages arise when exports of goods and services are used in the production of exported goods and services abroad. Backward linkages is when imports from other countries are used in the domestic exports of goods and services.

Figure 5: Backward Linkages: Share of foreign service inputs in services embedded in the exports of goods.



Source: Authors' own calculation based on the ICIO 2018 dataset. Note: Share of imported service value-added content in all commercial services value-added embedded in exported goods (%).

up the global production chain of exported goods by emerging market following (Beverelli et al., 2017) and trace not only the domestic content but also the value-added contributions by foreign countries and industries where the value-added is created. Figure 5 shows the dynamics of foreign commercial service content in the export of goods in both advanced and emerging economies.

A remarkable result of this decomposition is that the share of foreign service inputs in the total of commercial services which is embedded in the export of goods from emerging markets decreases over time. While this may lead to the quick conclusion that over time domestic service producers become more important than imports of services in the goods export engine of emerging markets, it should be taken into account that the input-output dataset is constructed on a territory basis, such that foreign-owned subsidiaries are in fact counted as domestic service producers. The replacement of imports of services by the establishment of subsidiaries for the localised production of services can be substantial in countries like China. In contrast to the pattern of the emerging markets, the increase in

services supplied from abroad in trade flows coming from advanced economies is noteworthy. It relates to a combined effect of a diversification of service as inputs among the advanced economies, and an increasing service offshoring to emerging markets or the foreign owned subsidiaries there.

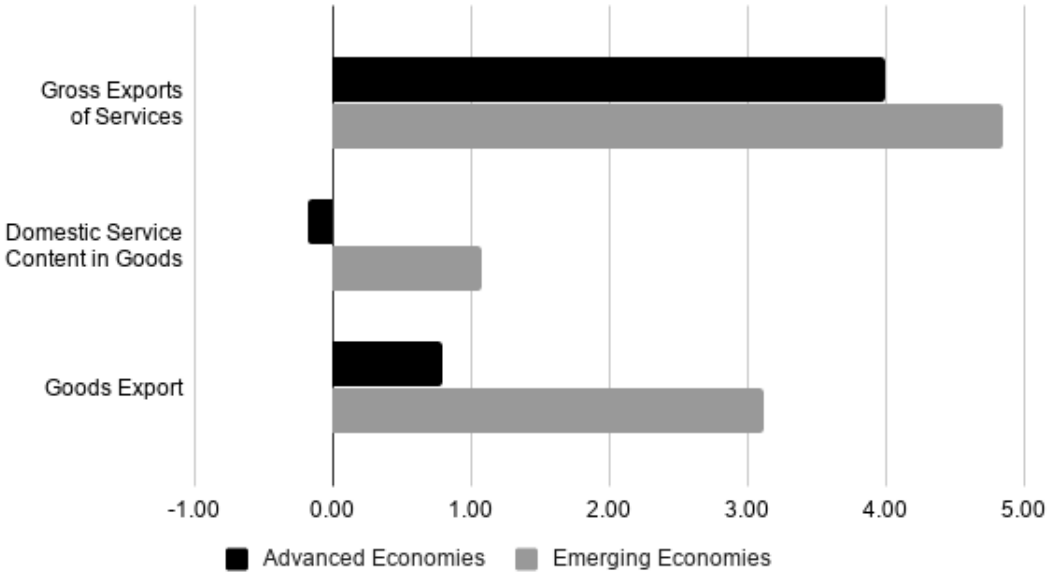
The advantage of using input-output tables and thus value-added components of international trade in services is that the sources of growth in commercial services can be broken down for the two groups of countries. So far, there is evidence that services consumed and used as intermediate inputs directly abroad, in particular, are the main driver of the growth of services trade for advanced economies. For emerging markets, trade in services is growing mainly through its embedded components in the export of goods. The latter embedded element has two subcomponents. The first is that exports of these services will increase as exports of manufactured goods increase, especially in intermediate products. The second component is that domestic services are a more substantial component of the inputs of exported goods than other inputs.

Figure 6 decomposes the growth of the exports of commercial services DVA by advanced economies and emerging markets into separated components to provide a picture of the importance of the above drivers. We decompose the total growth of service DVA into three components: the growth due to the increase in the gross exports of services, and the services content embedded in the exports of goods. The later embedded service DVA growth is further decomposed into two parts: the growth in service intensity, i.e. the share of domestic service content in the value of exported goods, and the growth in the volume of goods exports.

Denote the gross export of good i as E_i^G, the share of commercial service value-added embedded in every dollar of good i as s_i, and commercial service DVA embedded in service exports as SV; service exports include the gross export of the five commercial services, and also other categories of services like transportation. The total commercial service DVA is equal to:

$$\text{DVA} = \text{SV} + \sum_i s_i E_i^G.$$

Figure 6: Average services export growth decomposition 2005-2015



Source: Authors' own calculation based on the ICIO 2018 dataset. Notes: The first channel refers to the growth in the volume of trade in service industries, including both the commercial services highlighted in the paper and the other services trade like international transportation and logistics. The second and the third channels relate to the embedded services DVA in goods. The second refers to the increase (decrease) in the service intensity in goods export, i.e. share of domestic services content embedded in the goods export, and the third the growth of goods trade. Details of the decomposition method can be found in the appendix.

To obtain growth rates, we log-linearize the above expression into:

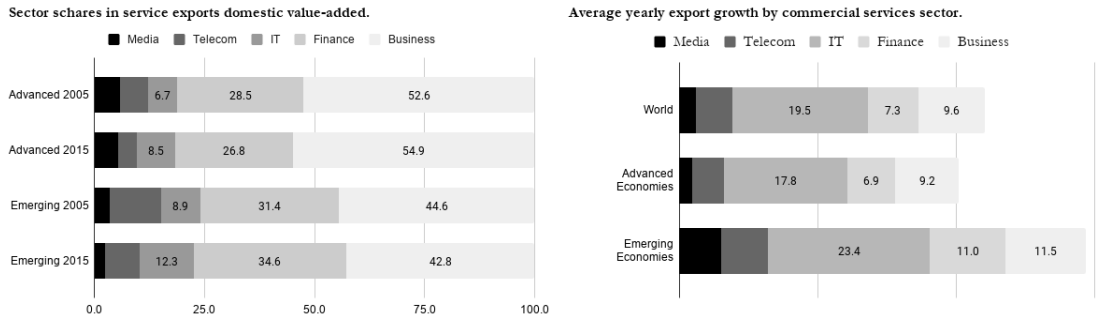
$$\begin{aligned}\frac{d\text{DVA}}{\text{DVA}} &= a\frac{d\text{SV}}{\text{SV}} + b\sum_i \left[c_i\left(\frac{ds_i}{s_i} + \frac{dE_i^G}{E_i^G}\right)\right] \\ &= a\frac{d\text{SV}}{\text{SV}} + \sum_i bc_i\frac{ds_i}{s_i} + \sum_i bc_i\frac{dE_i^G}{E_i^G},\end{aligned}$$

in which $a = \text{SV/DVA}$, $b = (\sum_i s_i E_i^G)/\text{DVA} = 1 - a$, and $c_i = s_i E_i^G / \sum_j (s_j E_j^G)$. The growth rates are calculated using a Törnqvist index. The shares a, b and c are the average of two periods, and dx/x is approximated by $\ln(x_t/x_{t-1})$. The index is calculated between every two years, and the reported decomposition is the annualized growth rate based on the chained aggregation of the changes from 2005 to 2015.

For advanced economies, the average annual growth rate of services exports is around 4.5%, of which the lion's share of 4 percentage points is accounted for by the direct exports of services (i.e. $a\frac{d\text{SV}}{\text{SV}}$). Slightly less than 1 percentage point of the growth can be attributed to the growth in the volume of goods exports ($\sum_i bc_i\frac{dE_i^G}{E_i^G}$). However, the intensity of domestic service value-added in exported goods is declining, and this has a slightly negative effect on the growth of exports in commercial services DVA ($\sum_i bc_i\frac{ds_i}{s_i}$).

For emerging markets, on the other hand, all three components contribute positively to the overall average annual growth rate of 9%. The direct exports of services are the largest part contributing to this growth, of which we know that the exports of intermediate services play an important role. In contrast to advanced economies, close to half of the increase in the exports of commercial services DVA stems from the embedded services content in exported goods. This is mainly because of a rapid increase in the volume of goods exports by the developing countries, but also we find that the domestic service intensity is increasing. The goods exported by developing countries contain a higher share of domestic service content, it may originates from an increasing degree of servitification in the domestic supply chain of the emerging markets, but it is also likely that foreign services inputs are being replaced by foreign owned affliates in the domestic country. A deepening of domestic service and the substitution effect both con-

Figure 7: Trade in services by industry



Note: Author's own calculation based on the ICIO 2018 dataset. The right panel reports the annualized growth rates in the service DVA from different country groups between 2005 and 2015; the bar chart is for comparing the growth of each industry and the numbers are not addable.

tributes to the positive growth in exports of commercial services from emerging markets, but the data limit us in showing the magnitudes of the two (input-output data is constructed on a territory-basis, hence it does not tell the nationality of the ownership for domestic service suppliers).

6 Commercial Services Industries

The subtheme in this section is to break down total trade in commercial services into five sectors representing the two-digit ISIC codes for trade in ICT services, finance and insurance, business services (including management consulting, accounting and legal services), telecommunications, and media. Figure 7 on the left-hand side zooms in on the breakdown of services DVA in the world trade by industry and country of origin, and the right-hand side shows the average yearly growth rates. We have chosen to present the data by giving an index for the year 2005 and 2015, showing that trade in financial and business services is much higher in absolute terms than the other three sectors.

The result that stands out most is the very substantial rise in international trade in IT services. Overall IT services exports increase by 19% on a yearly basis, and the growth is more substantial in emerging markets, with an annual growth of 23% compared to 17% increase in advanced economies. This comes from the effects

of digitalization over the time because IT services are substituting telecommunications services as internet services are replacing the more traditional coordination mechanisms between organization. Another explanation is the rapid increase in the offshoring in this period of the software industry, particularly to China and India. Also, it is interesting to note that for advanced economies the share of financial services export is falling relative to other business services, whereas for emerging markets the effect is the opposite. There is little growth in cross-border trade in telecommunication and media.[7] However, the time periods that we are analysing is pre-streaming so that the recent platform internationalization of companies like Netflix and Disney in media are not taken into account. We expect that if we look for the next 10 years we may see a spectacular increase in media services traded coming from advanced economies.

The substantial increase in the importance of the subcategory IT services in the total of traded commercial services we call the 'plain-vanilla effect' because IT services are the basic element of digital trade that is subsequently sourced into other forms of services. However, we can observe that 'software is eating all industries' and that it is difficult in the age of artificial intelligence to distinguish between IT services and management consultancy - see the likes of IBM and the increasing dominance of Accenture in management consulting - and probably also between IT services and financial services - the rise of Ant Financial and Alipay coming from Alibaba and Apple and Google Pay. And because media platforms like Netflix are run by deeply intelligent algorithms, it may be increasingly difficult to put walls around the IT sector when contrasting them with media services. So, it may be that many commercial service industries will become 'plain-vanilla plus' IT services, and if so the time frame up to 2016 that we are considering simply shows the first signs of the trend of things to come. In other words, the rise in IT services together with the moderate rise in other services simply shows that the

[7]Interestingly, it is hypothesized that the differences between the growth of IT services on the one hand and telecom and media services, on the other hand, may be related to differences in trade liberalisation. While all three services are today highly digitized, the cross-border provision of IT services in mode one has so far been relatively liberal in trade agreements. It is to be expected that future data privacy concerns will mitigate the dramatic increase in IT services. Trade of telecommunication services is significantly affected by domestic regulation and barriers to entry, while the media are hampered by significant barriers to trade in audiovisual services to counter the erosion of national culture.

digitalization of services trade will substantially increase the cross-border offerings of all commercial services.

7 Concluding comments

In this paper we have documented trade in commercial services domestic value added for the period 2005 to 2015. We are focused on domestic value added components of services to include the most recent discussions on the importance of services trade. It is not simply direct exports of services but also services embedded in goods that shape the dynamics of service trade globally, and we have seen different patterns of services trade across advanced economies and emerging markets. For both groups direct exports of services has increased dramatically, but more pronounced in the share of total service trade for advanced economies. For emerging markets services embedded in the exports of goods are an important component especially because exports of goods are rising fast. Not only towards advanced economies are these exports increasing, emerging markets are part of the trade web among themselves and towards developing economies. Also, we have documented the primacy of IT services trade that increases sharply over time, which we attribute to a 'software eating the world' phenomena in which others like financial services and business services are being consumed by IT services.

The findings of the paper connect well to recent policy discussions in the WTO. As we have documented, especially for advanced economies, direct service exports are becoming increasingly important and including exports towards emerging markets, so it is clear why advanced economies are putting so much emphasis on opening up emerging markets for trade in commercial services, especially finance and consultancy. Because it is also well documented that restrictions on trade in services cross-border are subject to stringent regulation and institutional voids , much is to be gained from the liberalization of barriers to trade in emerging markets from the perspective of advanced economies. We have also documented that services embedded in goods are an important engine for service exports from emerging markets. Although we have not shown direct evidence, there are some indications that the share of services in value added in the exports of goods coming from emerging markets is also increasing, which we may call servicification of

those goods. Hence, for emerging markets trade liberalization in goods remains quite important not only to exports these goods in terms of manufacturers but also indirectly because it increases exports in embedded services.

The finding that it is especially IT services that have increased dramatically in terms of exports share over time period considered is evidence that increasingly software is eating the world and more broadly that data are being used to run the world. We point to substantial difficulties in measuring and especially splitting IT services from other digitally traded services in finance and management accounting. And we may anticipate that in current times and even more in the near future the distinction between IT services and media will disappear. The result will be that data will drive almost everything and that accordingly the policy agenda on digital trade will be the most important element of future WTO negotiations. We already see that the digital trade component in current free-trade agreements creates most headaches and that especially issues such as how to deal with universal privacy considerations provide for substantial differences in opinion among the major trading blocs. These discussions on digitalization of financial services, consultancy and media, and especially the merging of those industries based on artificial intelligence, also create a lively debate about the international taxation of data flows. Although countries have different trajectories of development of digital trade in services this paper documents that the issue has gained increasing importance for all countries considered.

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8 Appendix

Advanced Markets

EU15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Republic of Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden,

Australia, Canada, Iceland, Israel, Japan, New Zealand, Norway, Singapore, Switzerland, United Kingdom, and United States.

Emerging Markets

New EU member states since 2004 enlargement: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Argentina, Brazil, Brunei, Cambodia, Chile, China (including Mainland, Taiwan, and Hong Kong SAR), Colombia, Costa Rica, India, Indonesia, Kazakhstan, Republic of Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Russian Federation, Saudi Arabia, South Africa, Thailand, Tunisia, Turkey, and Viet Nam.

The OECD ICIO database also includes the estimates of trade in intermediate and final goods and services with all the rest of the world (RoW). The trade with RoW is included in the aggregated flows such that the goods and service trade of the world are accounted for. RoW is counted in the emerging markets when making distinction between advanced and emerging markets. Excluding RoW from the analyses does not affect the main results of the paper.