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Services and global value chains: Some evidence on servicification of manufacturing and services networks

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World Trade Organization
Economic Research and Statistics Division

**SERVICES AND GLOBAL VALUE CHAINS – SOME EVIDENCE ON
SERVICIFICATION OF MANUFACTURING
AND SERVICES NETWORKS**

Rainer Lanz and Andreas Maurer,

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SERVICES AND GLOBAL VALUE CHAINS – SOME EVIDENCE ON SERVICIFICATION OF MANUFACTURING AND SERVICES NETWORKS

Rainer Lanz and Andreas Maurer¹

Abstract

This paper analyses the role of services in international trade through the lens of global value chains (GVCs). Services account for more than 70% of world GDP but only for around 20% of world trade in balance of payments terms. In value added terms, accounting for services embodied in exported goods, services account for 40% of world trade. However, the international supply of services is not only represented through cross-border transactions. Services are also traded through the movement of labour and capital. The latter contributes to the GDP of the domestic country. The services value added of foreign affiliates in selected EU countries account, on average, for a quarter of domestic services value added.

The role of services as input into manufacturing production often termed servicification of manufacturing, is substantial with services value added accounting for almost a third of manufacturing exports in developed countries and 26% in developing economies. While the share of foreign services content in manufacturing exports is close to 12% in both developed and developing countries, the latter add significantly less domestic services value to their manufacturing exports.

Services industries increasingly produce in networked or "fragmented" arrangements. The paper lays out conceptual and measurement issues related to services networks and provides evidence based on trade in value added statistics and on a case study on the film industry. In contrast to goods value chains, services networks appear less fragmented internationally based on trade in value added statistics and survey evidence. However, to better capture the international services fragmentation, advances in statistics by enterprise characteristics and by mode of supply, i.e. taking into account the movement of labour and capital, are required.

Keywords: Trade in value added, global value chains, services networks, trade in services

JEL codes: D57, F14, F23, L23, L80, L82

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1 INTRODUCTION

Services appear in the production cycle of products in different manners. They can be inputs to the production of goods (intermediate services) or can be outputs of networked production systems. "Modern services can now be unbundled and splintered into value chains just like goods and they can be electronically transported internationally through satellite and telecom networks"². These different purposes of services in a production context raise questions that are subject of this paper.

First, as "enablers" services contribute to the manufacturing production. How can this statistically be estimated? How important are services to the manufacturing process? Section 3 uses trade in value added statistics to show that the servicification of manufacturing is substantial, particularly in developed economies where services account for about a third of manufacturing exports. In contrast, the servicification of manufacturing is less pronounced in developing countries due to lower domestic services content. Section 3 further uses traditional trade statistics to assess services offshoring providing evidence of the increasing export competitiveness of developing countries, including India and the Philippines, in such services.

A second set of questions this paper tackles addresses fragmented services production: How can services value chains or networks be analysed and measured? What does available evidence reveal regarding the international fragmentation and importance of services networks? Section 4 starts with conceptual and measurement issues related to services networks highlighting the need for better statistics. It then continues by analysing services networks through the lens of trade in value added statistics, which shows a limited international fragmentation of services but an increasing tradability of business services as well as finance and insurance services. The third subsection of Section 4 uses the film industry as a case study to illustrate the role of different services in film making and how technological change and policy are shaping the film value chain.

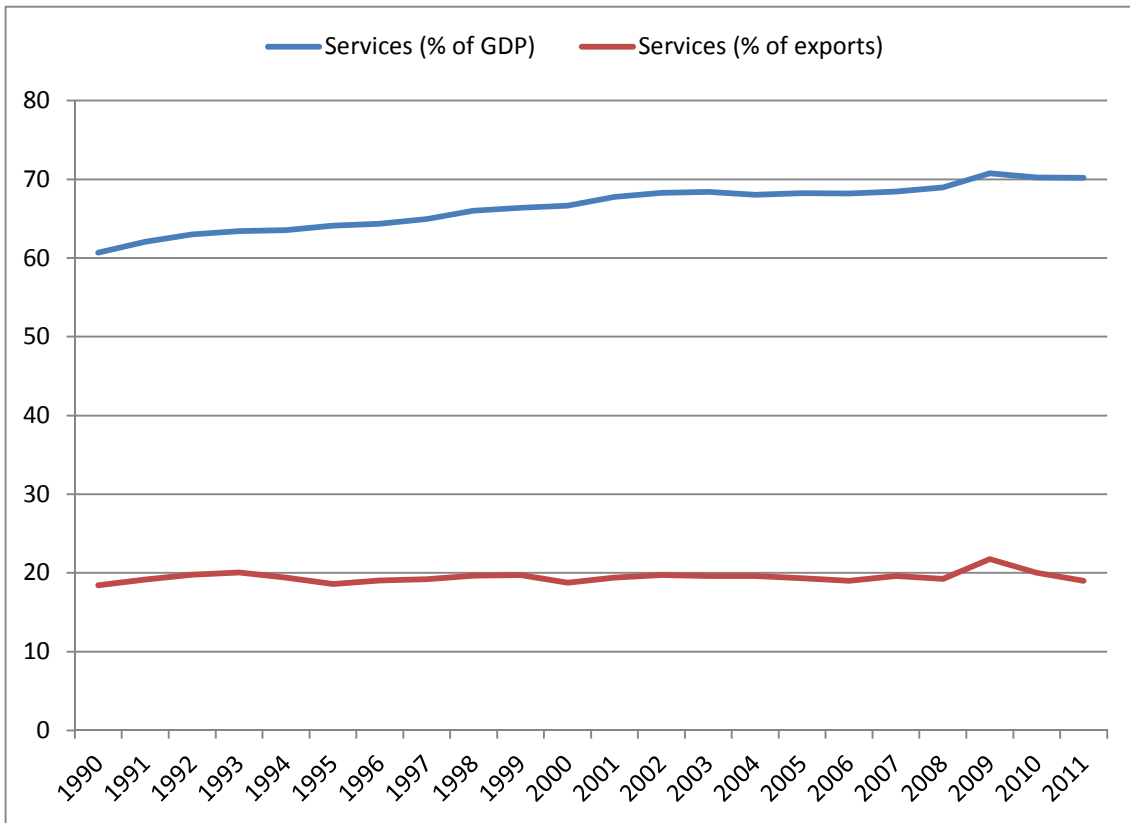
Before assessing services in the context of fragmented manufacturing and services production, Section 2 provides an overview of analytical and measurement issues related to the assessment of the role of services in GVCs. It explains that services embodied in goods and the movement of capital and labour help explain lower services share in cross-border trade than in GDP. Furthermore, it shows the sourcing strategies and resulting trade flows of services inputs into fragmented manufacturing and services production and where services tend to be positioned in the production process.

2 THE ROLE OF SERVICES IN GVCS – ANALYTICAL ISSUES AND MEASUREMENT

Statistics on international transactions in trade in services are drawn from the balance of payments (BOP) and reflect transactions between residents and non-residents. Figure 1 shows that the share of services in world trade has been oscillating around 20 per cent since the 1990s. However, in a national accounts context, the domestic services value added is taking a much higher importance worldwide, accounting for about 70% world GDP. Moreover, in contrast to services trade, the share of services value added in world GDP has increased by almost 10% since 1990. How can this discrepancy in size between domestic and international transactions as regards to the involvement of services be reconciled?

² Ghani, E., Grover, A., Kharas, H. (2011) based on Bhagwati, J.N. (1984). The authors distinguish modern services from traditional with the first being ICT-intensive. Modern technologies emphasized this characteristic.

Figure 1. The importance of services in world GDP and world exports

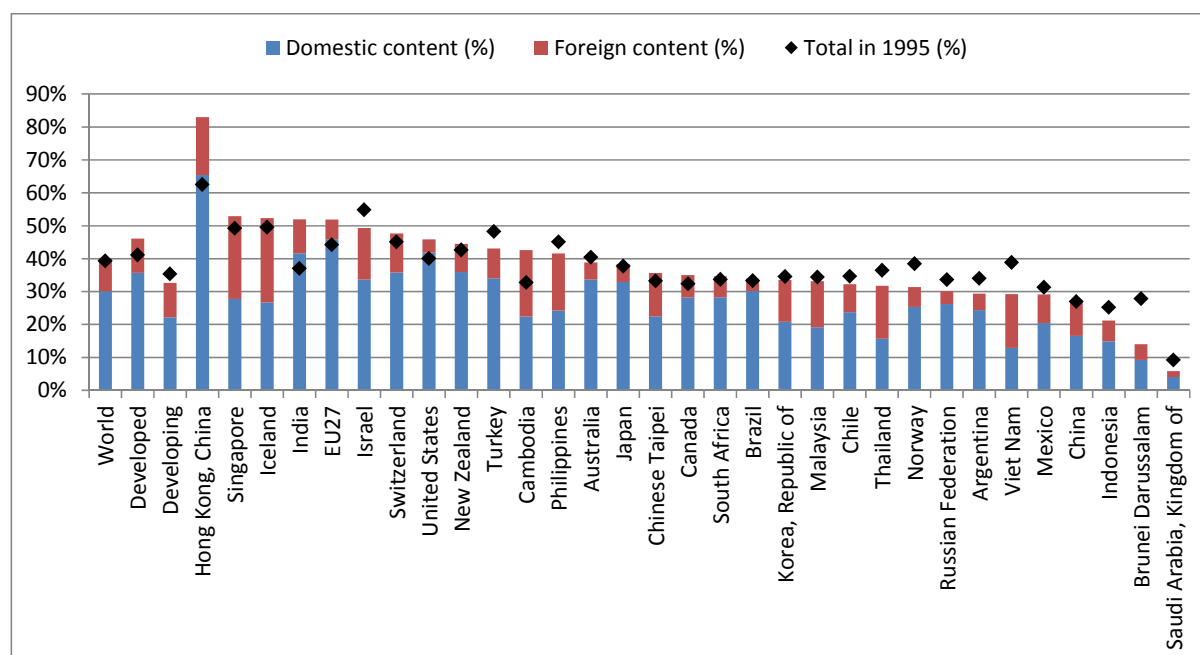


Source: WTO Statistics Database, WB World Development Indicators.

One major element for explaining this discrepancy is that many services are traded indirectly as being embodied in goods. BOP statistics measure the gross value of direct cross-border services trade but not the services value added included in goods traded across borders. International input-output tables such as the OECD-WTO Trade in Value Added (TiVA) project combine different national input-output tables to one consistent inter-country input-output table that allows measuring trade in value added terms. Value added exports of services consist therefore of the services content of direct services exports and of indirect services exports, i.e. the services content embodied in exported goods.

The fact that trade in cross-border services, as shown in Figure 1, accounts for about 20% of gross trade flows underestimates the importance of services for the global economy. In fact, using the OECD-WTO TiVA Database, Figure 2 shows that services account for 40% of world "cross-border" trade in value added terms. The services content of exports is significantly higher for developed (46%) than for developing countries (33%). The services content of exports is above 50% for five traders, i.e. Hong Kong, China, Singapore, Iceland, India and the EU27. In contrast, the services content of exports is the lowest for exporters of primary commodities such as Saudi Arabia, Brunei Darussalam and Indonesia whose export structure is focused on natural resources.

Figure 2. Services value added content of total exports, 1995 and 2008



Source: OECD-WTO TiVA Database.

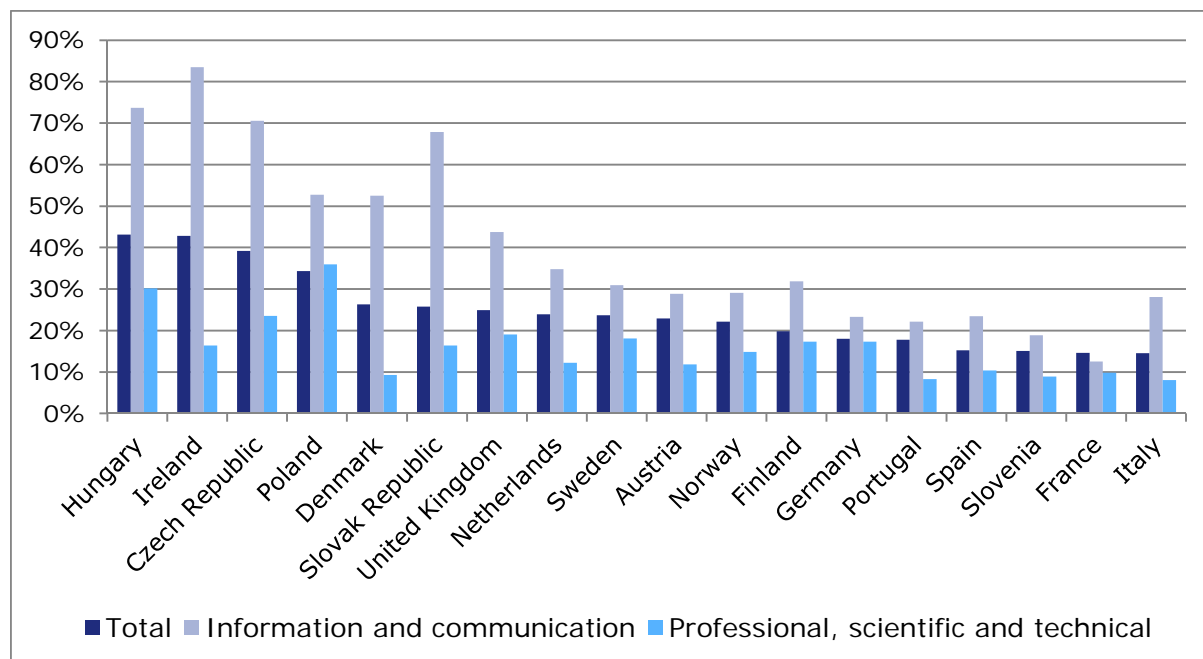
However, with 40%, the share of services content of exports is still significantly lower than the 70% share of services in world GDP. Why is the services share in exports still much lower than the services share in GDP even when it measures "cross-border" value added trade? Part of this remaining discrepancy can be explained by the fact that services are not only traded directly or indirectly through services and goods but also through the movement of labour and capital. The notion of international supply of services, as defined in the General Agreement on Trade in Services (GATS), illustrates this point.

The GATS identifies four modes of international services supply, i.e. the traditional cross-border supply (mode 1) comparable to goods crossing borders, the movement abroad of people to consume services (consumption abroad or mode 2) or to supply services (presence of natural persons or mode 4), and the international migration of capital (commercial presence or mode 3). While modes 1, 2 and 4 are measured within the BOP, mode 3 is measured in the Foreign Affiliates Statistics (FATS) framework.

The latter surveys the activities of foreign-owned companies in an economy, which are incorporated in this specific economy and whose activities consequently count towards the domestic value added or GDP. At present, available trade in value added statistics have no ownership dimension and therefore do not identify the mode 3 component in the domestic services content of exports. However, mode 3 imports are likely to be of key importance since they are considered as being the most important mode among the four modes accounting for more than half of the services trade (Magdeleine and Maurer, 2008).

For instance, Figure 3 shows that across 18 EU countries, total services value added of affiliates of foreign multinationals accounts, on average, for a quarter of domestic services value added. There are significant differences in the importance of foreign affiliates between countries. While in Hungary and Ireland foreign affiliates account for more than 40% of total services value added, in Italy, France, Slovenia and Spain the respective share is only 15%. Figure 3 illustrates also that sectors tend to be heterogeneous regarding mode 3 supply. The relative importance of foreign affiliates in domestic economies is consistently higher for information and communication services than for professional, scientific and technical services.

Figure 3. Value added share of foreign affiliates (FATS) by sector and selected EU Members, 2010



Source: OECD AMNE Database.

Note: Data for Denmark, Finland and Slovenia are for the year 2009.

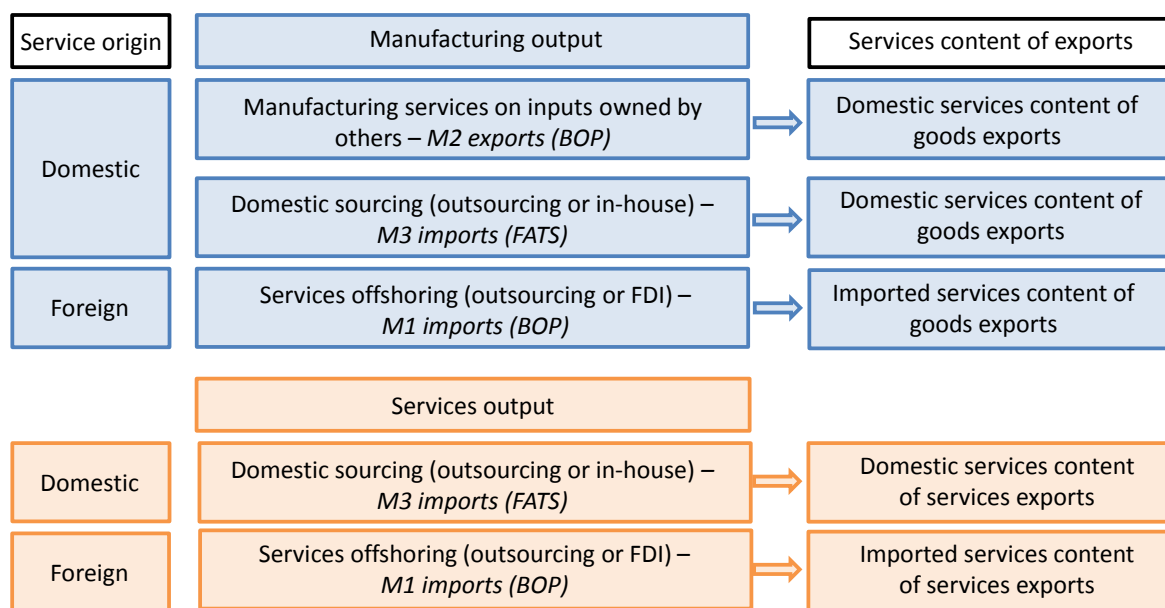
Beyond the categorization of services into modes of supply, there are a number of different analytical classifications of services. Jansson (2013) identifies the producer-side and the final user-side approach for the definition and the measurement of the services sector. Statistical frameworks distinguish transformation and margin services in addition to knowledge-based products. However, the distinction between goods and services is increasingly blurred while multilateral trade agreements distinguish and treat these products through different rules in the GATT for goods and in the GATS for services.³ Cernat and Kutlina-Dimitrova (2014) point to resulting complexities in trade rules, such as in the area of customs valuation, arising from domestic services embodied in traded goods.

Statistical frameworks, be it national accounts or balance of payments, struggle increasingly with this distinction of products into goods or services, which causes conceptual issues around the operationalization of their measurement, i.e. classifying them in either goods or services.

Figure 4 illustrates the role of services in GVCs and respective trade patterns. In particular, it shows the possible sourcing strategies of services inputs when a firm produces either manufacturing output or services output. By doing so, it distinguishes between domestic and foreign services inputs and shows for each sourcing strategy potential services trade in GATS terms and which statistical framework measures the latter. Finally, on the export side, it shows how services value added is exported in either goods or services exports.

³ Intellectual property rights are treated in WTO's TRIPS.

Figure 4. The role of services in GVCs and services trade patterns



Notes: The diagram shows whether a services input is of domestic or foreign origin, what the respective sourcing strategies in manufacturing and services production are, and how the services input is exported. The sourcing strategies are furthermore associated with modes of supply of services imports and respective statistical frameworks (in italics).

Services inputs that are used in the manufacturing process can be grouped under the term "servicification of manufacturing" and can come in the form of manufacturing services on inputs owned by others, domestic sourcing or services offshoring (blue shaded elements of Figure 4). Similarly, the fragmentation of services production into services inputs can be termed as services network or services value chain (orange shaded elements of Figure 4). As in manufacturing, the firms operating in services networks can either engage in domestic sourcing or services offshoring.

Manufacturing services on inputs owned by others correspond to GATS Mode 2 (consumption abroad) exports, as the foreign firm moves their goods inputs to the domestic economy where the manufacturing services are "consumed". These services used to be called "goods for processing" and were recorded as goods trade, but starting with the sixth edition of the Balance of Payments Manual (BPM6), they are to be recorded as services trade in BOP statistics (IMF, 2009).

Domestic sourcing of services inputs within manufacturing GVCs or services networks can occur through independent suppliers (outsourcing) or within the boundaries of the firm, i.e. through arm's length trade or intra-firm transactions. Domestic sourcing can take the form of Mode 3 imports, that is, the service is supplied by a commercial presence of a foreign firm, which is then measured by the sales of foreign affiliates in FATS.⁴

Services offshoring denotes the relocation of service activities from the domestic to a foreign economy, often leading to the sourcing of foreign inputs. Services offshoring therefore covers both the activities of an independent supplier (arising from offshore outsourcing) and the in-house activities conducted by a foreign affiliate (arising from foreign direct investment). Services offshoring can be a sourcing strategy in both manufacturing value chains and services networks. Offshoring of services results in cross border services trade, or trade in tasks in more disaggregated (and fashionable) terms, which is captured by the statistical framework of the BOP in its services products categories.

On the export side, the development of trade in value added statistics allows the analysis of the servicification of manufacturing and services networks by measuring the contribution of the domestic and foreign services content in goods and services.

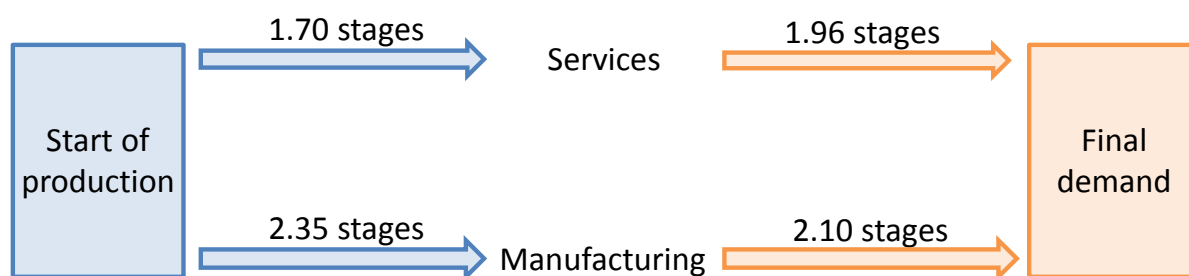
To better understand the fragmentation of value chains and the position of services therein, Figure 5 provides two indicators for the length of manufacturing and services value chains based on detailed US input-output tables. The indicator for production stages captures backward linkages by

⁴ However, data collected in FATS do not capture national intra-firm transactions.

measuring the average number of stages required to produce a good or service. Analogously, the indicator for distance to final demand captures forward linkages by measuring the average number of stages before the good or services reaches its final demand. While the indicators do not reveal the extent of international transactions, they help to better understand the position of services in productions chains.

Two main observations can be made. First, in contrast to manufacturing, services are characterised by fewer backward linkages. While the manufacturing of a good involves, on average, 2.35 production stages, the provision of a service requires, on average, only 1.7 production stages. Hence, services production is less fragmented than goods production. Second, services sectors have more forward than backward linkages with an average distance to final demand of 1.96 stages.

Figure 5. The position of services in the production process



Source: Data from Antras et al. (2012), based on US 2002 input-output tables.

Notes: The indicator for production stages measures the average number of stages required to produce a good or service and hence captures backward linkages. The indicator for distance to final demand measures the average number of production stages before the good or service reaches final demand and hence captures forward linkages. The minimum value of the indicators is 1 and increases with the number of required production stages and distance to final demand, respectively. The indices do not differentiate between domestic and international sourcing.

While services are closer to final demand than manufacturing activities, Table 1 shows that services sectors display significant heterogeneity in their distances to final demand. Business services, transportation and warehousing, and professional services undergo, on average, 2.56, 2.44 and 2.38 production stages before they reach their final demand. In contrast, an indicator value of 1.05 shows that education, health and social assistance services tend to be directly supplied to final consumers.

Table 1. Backward (production stages) and forward (distance to final demand) linkages by sector

Sector	Production stages	Distance to final demand
Agriculture, forestry and fishing	2.26	2.80
Mining	1.97	2.91
Utilities	1.83	1.99
Construction	1.98	1.42
Manufacturing	2.35	2.10
Services	1.70	1.96
Wholesale and retail	1.51	1.51
Transportation and warehousing	1.90	2.44
Information	1.80	2.12
Finance and insurance	1.75	2.06
Real estate, rental and leasing	1.59	2.15
Professional services	1.57	2.38
Business services	1.63	2.56
Education, health and social assistance	1.68	1.05
Arts, entertainment and recreation	1.71	1.66
Accommodation and food services	1.75	1.44
Other private services	1.70	1.52

Source: Data from Antras et al. (2012), based on US 2002 input-output tables.

Notes: The indicator for production stages measures the average number of stages required to produce a good or service and hence captures backward linkages. The indicator for distance to final demand measures the average number of production stages before the good or service reaches final demand and hence captures forward linkages. The minimum value of the indicators is 1 and increases with the number of required production stages and distance to final demand, respectively. The indices do not differentiate between domestic and international sourcing.

3 THE SERVICIFICATION OF MANUFACTURING

Services are often considered the "glue" in GVCs. For example, in the case of Sweden, input-output tables show that the share of services in producing a unit of food is in the range of a fifth while for producing a motor vehicle it can be up to a quarter. The increased use of services in manufacturing, both in terms of production processes and sales, has been described as the "servicification" of manufacturing, also termed "servicizing" or "manuservice" (Low, 2013).

The servicification of manufacturing can involve either domestic sourcing or international sourcing, i.e. offshoring, of services. Hence, as Figure 4 illustrates, the servicification of manufacturing will have different implications for trade patterns in GVCs depending on whether a manufacturing firm sources services inputs domestically or internationally. In the case of domestic sourcing, there will be no cross-border services trade. However, there might still be services trade in the form of Mode 3, if the manufacturing firm sources the services inputs locally from a commercial presence of a foreign company.

Another possibility is that the firm sources services from abroad to use in its manufacturing process. Such international sourcing is closely related to offshoring, i.e., the relocation of activities from home to abroad that results in direct cross-border services imports. If the manufactured good is subsequently exported, the domestic or imported services inputs are traded indirectly, i.e., embodied in the exported good.

Figure 6 provides more detail regarding the significance of the servicification of manufacturing by showing the services value added content of exports of manufacturing industries. Several facts are

worth highlighting. First, the servicification of manufacturing is substantial. Services value added accounts for almost a third of gross exports of manufacturing industries in developed countries. In contrast, the services content in developing countries' manufacturing exports is only 26%. This lower services content in manufacturing exports in developing countries is due to a lower domestic content.

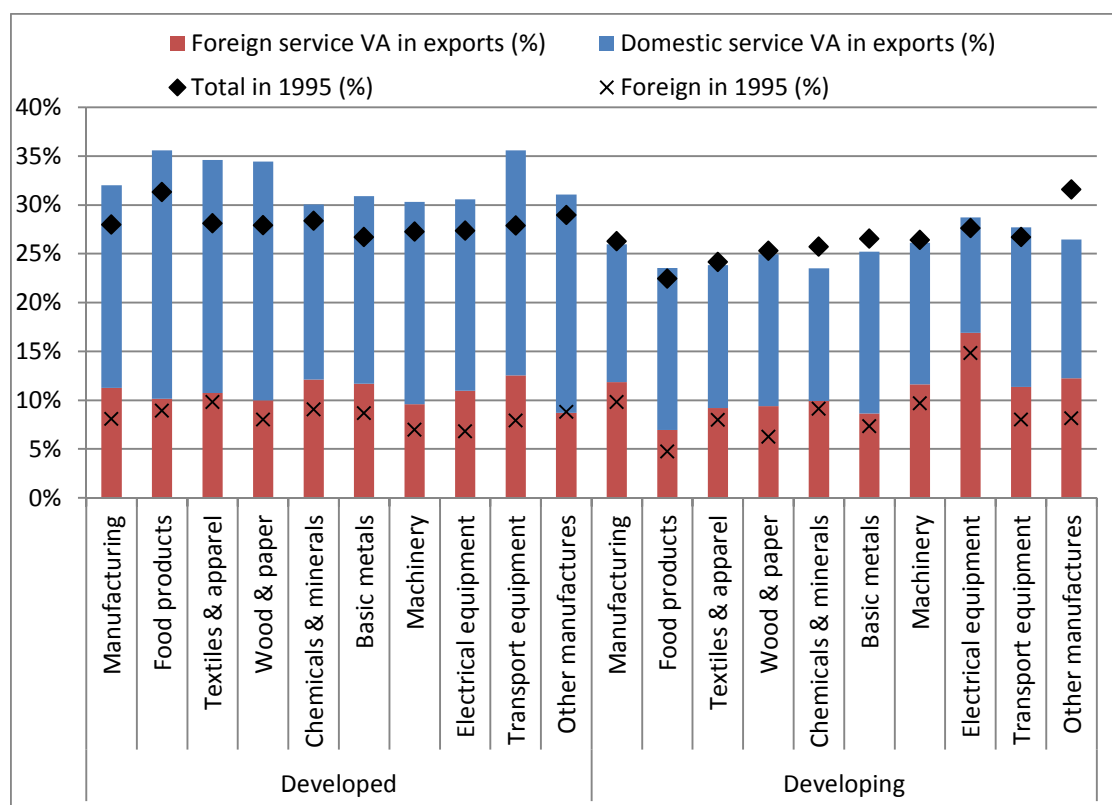
Second, the servicification of manufacturing exports has increased by more than 4% in developed countries since 1995, but has slightly declined in developing countries. In developed countries, the services content of exports has increased across all sectors and with the increase being largest for the manufacturing of transport equipment, textiles & apparel and wood & paper. In contrast, in developing countries, the servicification of manufacturing has remained constant or even decreased in certain sectors. In particular, while the foreign services content has increased in all manufacturing sectors of developing countries, the share of domestic content has either remained stable or declined.

Third, even though the domestic sourcing of services accounts for the majority of the servicification in manufacturing, the international sourcing of services, as captured by the foreign services value added content in exports, is significant accounting for close to 12% of manufacturing exports in both developed and developing countries. In developed countries, imported services value added constitutes, on average, about a third of the exported services content. In the case of developing countries, the international sourcing of services is even more important. For instance, imported services account for 17% of developing countries' electrical equipment exports, which is even higher than the 12% domestic services content.

The high share of foreign services value added content in manufacturing exports of developing countries relative to developed countries underscores the importance of imported services inputs, either imported directly or embodied in goods inputs, for the export competitiveness of manufacturing in developing countries. Reforms in services trade across all services is therefore important to improve strategies for enhancing firms' competitiveness (Arnold et al., 2011).

International input-output tables and respective trade in value added statistics are likely to underestimate the importance of services for manufacturing. In particular, service activities that are conducted in-house by manufacturing firms and where consequently no arm's length transaction exists are likely to be allocated to goods value added and trade (Low, 2013). The extent of this underestimation depends on the economies' possibility of analysing enterprises or establishments.

Figure 6. Services value added content of manufacturing industry exports, 1995 and 2008

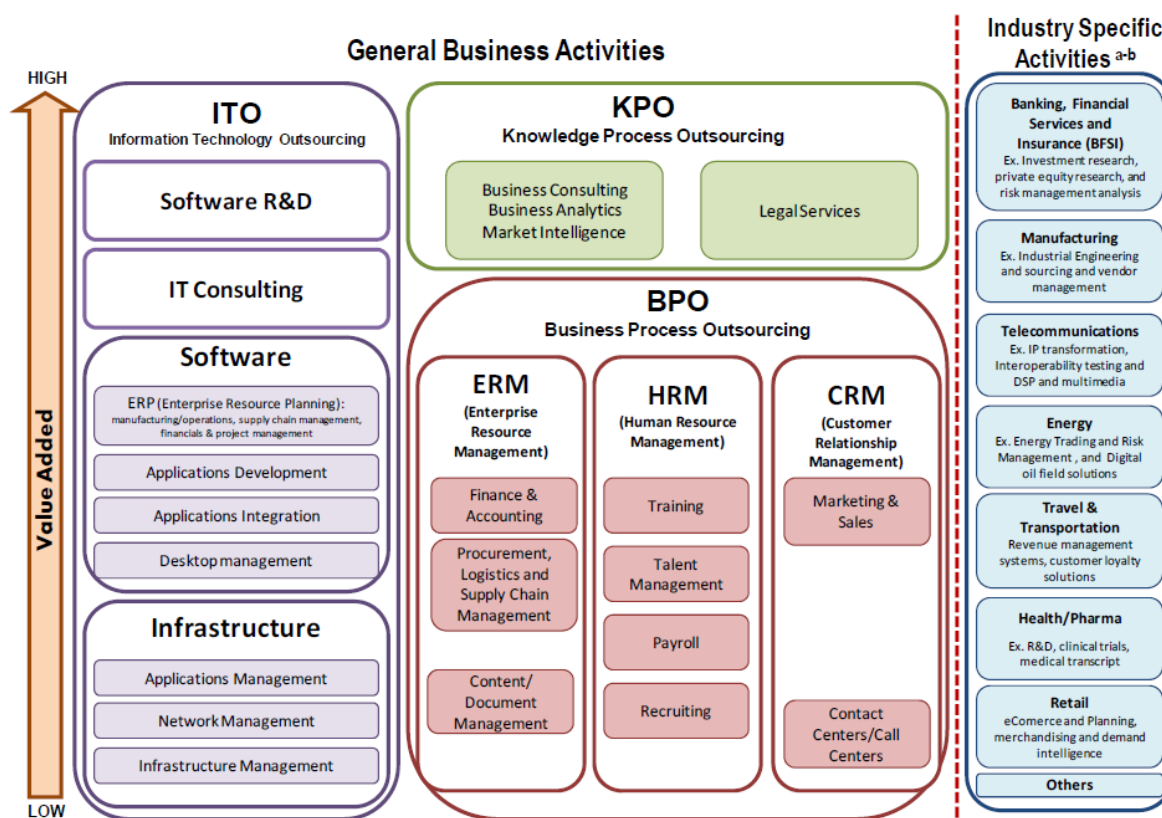


Source: OECD-WTO TiVA Database.

As discussed above, the foreign services content in manufacturing exports captures international sourcing and services offshoring. However, besides international input-output tables, there are more ways to conceptualise and measure services offshoring.

From a conceptual point of view, Figure 7 illustrates industry-specific offshore services and three groupings of offshore services that can be adapted to a number of industries, i.e. information technology outsourcing (ITO), business process outsourcing (BPO), or knowledge process outsourcing (KPO) (Gereffi and Fernandez-Stark, 2010).

Figure 7. The offshore services value chain



Notes: ^aIndustry specific: Each industry has its own value chain. Within each of these chains, there are associated services that can be offshored. This diagram captures the industries with the highest demand for offshore services.

^bThis graphical depiction of industry specific services does not imply value levels. Each industry may include ITO, BPO and advanced activities.

Source: Gereffi and Fernandez-Stark (2010).

Traditional trade statistics do not measure trade flows relating to services offshoring also because, in contrast to goods, no classification is available to distinguish between intermediate and final products.⁵ However, many so-called offshore services fall into the balance of payments items for computer and information and other business services. Exports of computer and information services have grown at an annual rate of 14% since 2005 reaching US\$285 billion in 2013 outperforming the export growth of transportation services (6%), travel services (7%) and other commercial services (9%). Exports of other business services have grown at an annualized rate of 9% since 2005 reaching US\$1,245 billion in 2013.

In the aggregate exports of both of these items, the developing countries' share increased from around 25% to more than 31% between 2005 and 2012, illustrating the relative competitiveness of developing countries and their increasing participation in GVCs.

A number of developing countries have become successful offshore destinations for IT and business process outsourcing. For instance, India's software services exports have increased 11-fold between 2000 and 2011 (WTO, 2012) and India has become the predominant player in IT services offshoring, accounting for almost 60% of the global offshoring market (UNCTAD, 2012).

⁵ As a consequence of the increased use of services as input into manufacturing, statisticians are planning to include (intermediate) services in the revision of the Broad Economic Categories classification, which is currently used to define intermediate goods. This inclusion would help define intermediate inputs in a broader context.

Table 2 provides further evidence on the positive trade performance of India and other developing economies such as the Philippines, Malaysia and Costa Rica in the computer services industry. India exported US\$ 33 billion of computer services in 2009, accounting for about 20% of world exports. India is also highly specialized in the export of computer services. The revealed comparative advantage (RCA) measure indicates that its world market share in the export of computer services is 5.49 times higher than its share in total exports of services.

Table 2 also shows that exports of computer services in several developing and emerging economies have been growing at higher rates than in developed economies. Growth has been particularly high in the Philippines, with exports rising from US\$ 89 million in 2005 to US\$ 1.9 billion in 2010 (an annual rate of 85%), suggesting emergence of a comparative advantage for the country in computer services. Similar positive developments can be observed for its Asian neighbours, Malaysia and Hong Kong (China), as well as two Latin American economies, Argentina and Costa Rica.

Table 2. Top exporters of computer services by economy grouping, 2005-2010

	Exports					Imports				
	Value ('000 USD)		Growth	Share	RCA	Value ('000 USD)		Growth	Share	RCA
	2005	2010	p.a. (%)	2010		2010	2010	p.a. (%)	2010	
Least developed countries (LDCs)										
Bangladesh	18,557	37,440	15	0.02	0.61	3,792	4,873	5	0.01	0.04
Uganda	32,825	37,407	3	0.02	0.70	22,191	32,579	8	0.04	0.54
Mozambique	121	5,237	112	0.00	0.18	2,659	691	-24	0.00	0.02
Tanzania	265	4,634	77	0.00	0.04	4,597	9,561	16	0.01	0.16
Samoa	n.a.	972	n.a.	0.00	0.12	n.a.	n.a.	n.a.	n.a.	n.a.
Gambia	n.a.	949	n.a.	0.00	0.15	685	2,307	35	0.00	0.85
Ethiopia	87	320	38	0.00	0.00	1,308	2	-80	0.00	0.00
Developing economies										
India	n.a.	33,383,179	n.a.	19.89	5.76	1,048,870	2,175,840	16	2.59	0.58
Israel	4,528,500	7,699,500	11	4.59	6.24	n.a.	n.a.	n.a.	n.a.	n.a.
Philippines	89,000	1,928,000	85	1.15	2.69	62,000	109,000	12	0.13	0.30
Malaysia	435,260	1,453,770	35	0.87	0.81	379,295	1,206,030	34	1.44	1.34
Russian Federation	374,570	1,273,280	28	0.76	0.56	378,620	1,637,450	34	1.95	0.71
Argentina	235,210	1,237,340	39	0.74	1.88	190,730	445,356	18	0.53	1.00
Costa Rica	254,378	1,216,190	37	0.72	5.56	10,721	20,844	14	0.02	0.36
Developed economies										
Ireland	19,369,000	37,196,458	14	22.17	7.51	378,053	752,273	15	0.90	0.22
Germany	8,415,411	16,304,988	14	9.72	1.37	8,587,027	14,066,711	10	16.76	1.66
United Kingdom	8,476,394	9,952,424	3	5.93	0.79	3,330,921	5,256,661	10	6.26	1.01
United States	3,554,000	8,771,000	20	5.23	0.32	2,000,000	18,394,000	56	21.91	1.54
Sweden	2,608,025	6,813,995	21	4.06	2.04	1,384,166	2,341,998	11	2.79	1.50

Source: WTO Trade in Services Database, adapted from the World Trade Report 2014.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in computer services exports (imports) to its world market share in total services exports (imports). China was not included due to lack of disaggregated data.

To analyse the business strategy of sourcing services internationally, Eurostat launched a survey which divides so-called business functions into core (the production of final goods and services, which in most cases reflects the primary activity of the enterprise) and support functions (distribution, marketing, information, communication and technology services, etc.). Results show that enterprises in the manufacturing sector source 17% of their core functions and 13% of their support functions internationally. These breakdowns are lower for industries in the non-manufacturing (services) sector, suggesting that the trend of offshoring services is not yet as well developed in this sector as it is in manufacturing (Maurer and Tschang, 2011).

4 SERVICES NETWORKS

4.1 Conceptual and measurement issues

Porter's value chain approach has been at the centre of discussions on manufacturing. Can these reflexions be translated into the service sector? Is it possible to supply services in a kind of supply

chain adding value at each step? There are different approaches to classify services analytically, from production services to consumption services or in statistical frameworks from transformation to margin services. Transformation services include services that refer to changes in the condition of consumer's goods (e.g. repair), to the physical condition of persons (medical surgery) or mental condition of persons (education). However, these services normally become "embodied" in the consumer or person. Margin services relate to wholesaling or retailing, merchanting or also to financial institutions.

In all cases the borderline between goods and services becomes increasingly blurred. The business case of IBM, moving from a goods producer to a service supplier, is an intriguing example of a company switching its product characteristics, thus showing that innovation helps a company to stay on the market by adapting its products to users' needs. This blurriness adds to the need of analysing services production in a value chain context. According to Noteboom (2007), a generalization of Porter's notion of a value chain "entails that the flows and the physical transformation of goods that are characteristics of manufacturing are generalized into flows and transformation of data and flows and transformation of the physical and mental condition of people that are characteristic of many service industries".

The issue then is, what kind of "supply chain" is in question for producing final services? Can the notion of intermediate inputs into a value chain be considered for services, i.e. intermediate services that are used to produce final services (see Box 1)? In terms of network navigation, would these refer more to a direct line link or to a hub and spoke network as for example often appearing in logistics?

Box 1: Intermediate services -- the revision of the BEC classification

Estimating GVC trade requires tracking and identifying intermediate trade in goods and services. The Broad Economic Categories classification is used to identify imported goods for their end-use, i.e. intermediate consumption or final use. A revised version extends this classification to include services. However, the identification of whether a services product is used for intermediate consumption or final use poses an even greater challenge to data compilers as for goods.

The GATS does not only take cross-border supply into account but also the international supply of services through movements of capital and labour. This can reflect the production of services in a networked environment and may be considered a services supply through fragmentation (or a "supply chain") that adds value at each stage of the networked-produced service. To measure this requires an idea of domestic and international transactions that, linked together, produce a service that is supplied to consumers. Statistics on trade in services by mode of supply could allow for a better measurement of such networked-produced services. At the global level, estimates on the relative importance of services trade indicate that the movement of capital and the resulting services supply through a commercial presence (mode 3) is the most important mode (Figure 8).

Figure 8. Relative importance of services by mode of supply, 2011 approximation

Mode of Supply	Estimated share
1 - cross-border supply	30 %
2 - consumption abroad	10 %
3 - commercial presence	55 %
4 – presence of natural persons	less than 5% <small>(Approx. 220 billion U SD)</small>

Source: WTO Secretariat.

Ideally, linking import flows, domestic transactions, and export flows would allow tracing transactions throughout a production process detailing what is produced and used in a country and what share is exported. Statistically, this requires combining trade flows with information on the production process. Such services statistics by enterprise characteristics are currently developed in some advanced economies.

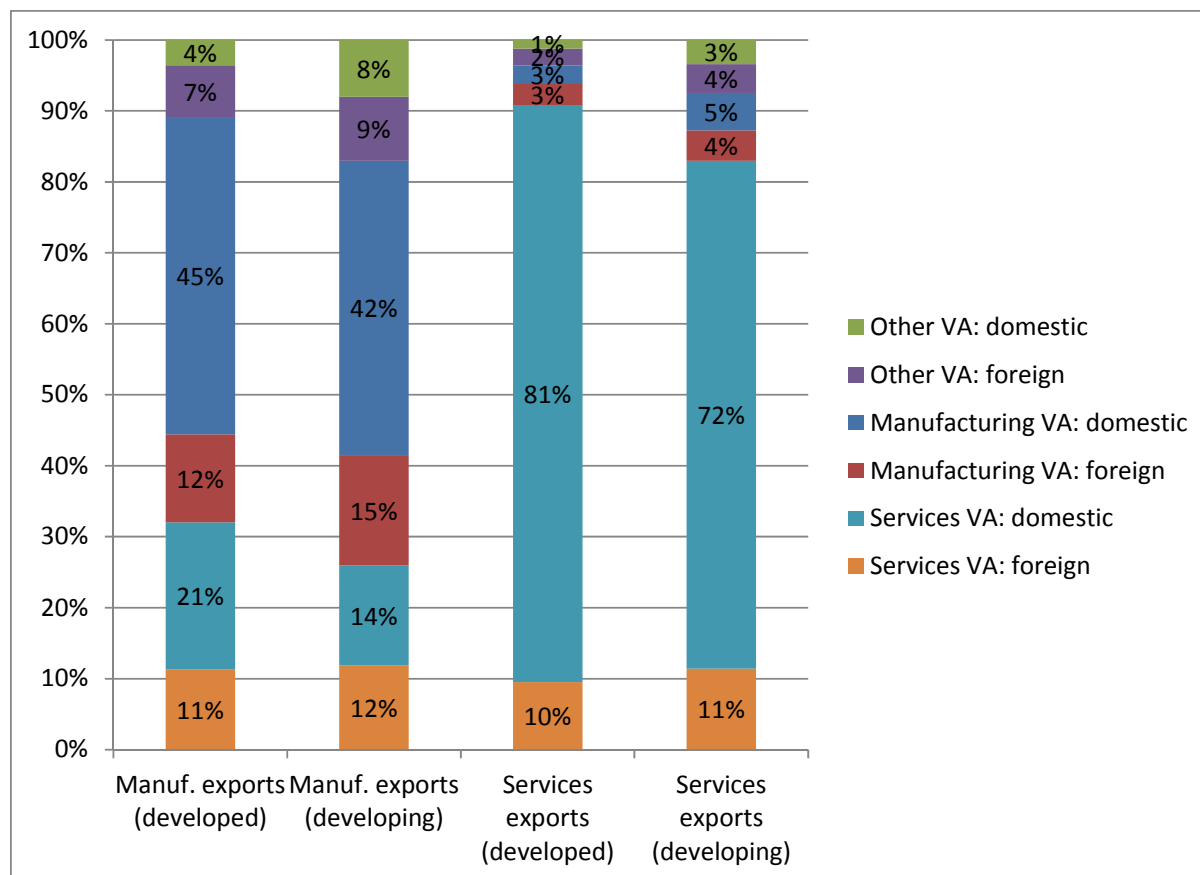
In the following subsection, services networks are analysed through the lens of trade in value added statistics and an industry case study. In particular, trade in value added statistics are used to shed light on the international fragmentation of services networks. Thereafter, the film industry is used as a case study to illustrate the role of different services in film making and how technological change and policy are shaping the film value chain.

4.2 Evidence from trade in value added

Figure 6 in Section 3 showed that services account for close to a third of manufacturing exports in developed countries and 26% in developing countries and that the share of foreign services value added in manufacturing exports is above 11% for both country groups. Figures 9 and 10 provide similar value added decompositions.

Figure 9 provides a full value added decomposition of aggregate manufacturing and services exports. It shows that the services value added content of exports is higher in services industries than in manufacturing industries, accounting for 91% in developed countries and 83% in developing countries. However, the main takeaway of Figure 9 is that the international fragmentation of services is less pronounced as compared to goods, which can be derived from two facts. First, foreign services value added accounts for only 10% of services exports, which is slightly less than for manufacturing exports. Second, the share of foreign services value added (10%) in services exports is substantially smaller than domestic services value added (81%). In contrast, the share of foreign manufacturing value added (12%) in manufacturing exports is smaller than domestic manufacturing value added (45%), but less so.

Figure 9. Value added decomposition of manufacturing and services industry exports of developed and developing countries 2008



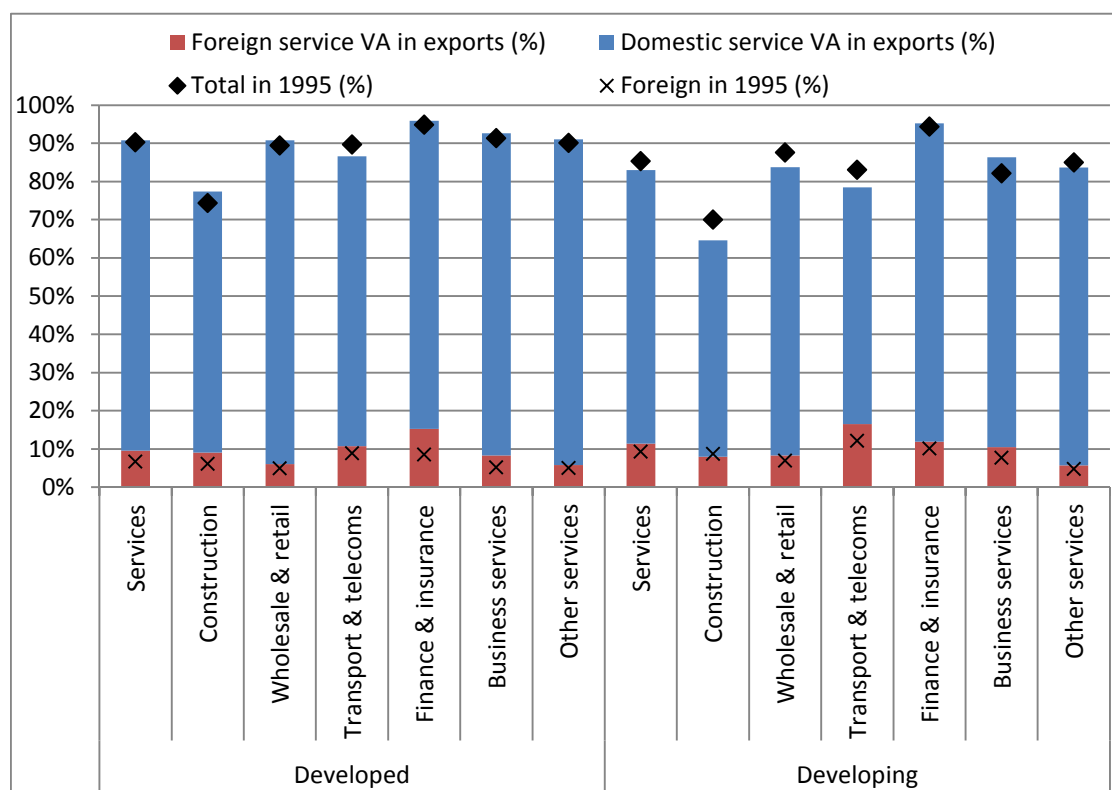
Source: OECD-WTO TiVA Database.

Note: Other value added covers agriculture, mining and utilities.

Figure 10 is analogous to Figure 6 but shows the services content of services exports. Finance and insurance and business services are the two sectors where the share of services value added in services exports is highest. Furthermore, in developed countries, the foreign content is highest in finance and insurance, which indicates the integration of the financial sector.

Between 1995 and 2008, the services content of services exports has remained constant in developed countries, while it has decreased in developing countries. However, the share of foreign content in services exports has slightly increased in almost all sectors in both developed and developing countries. Hence, the decrease in services content in developing country services exports was due to a decrease in domestic value added, mainly in the sectors transport and telecoms, wholesale and retail, and construction.

Figure 10. Services value added content of services industry exports, 1995 and 2008



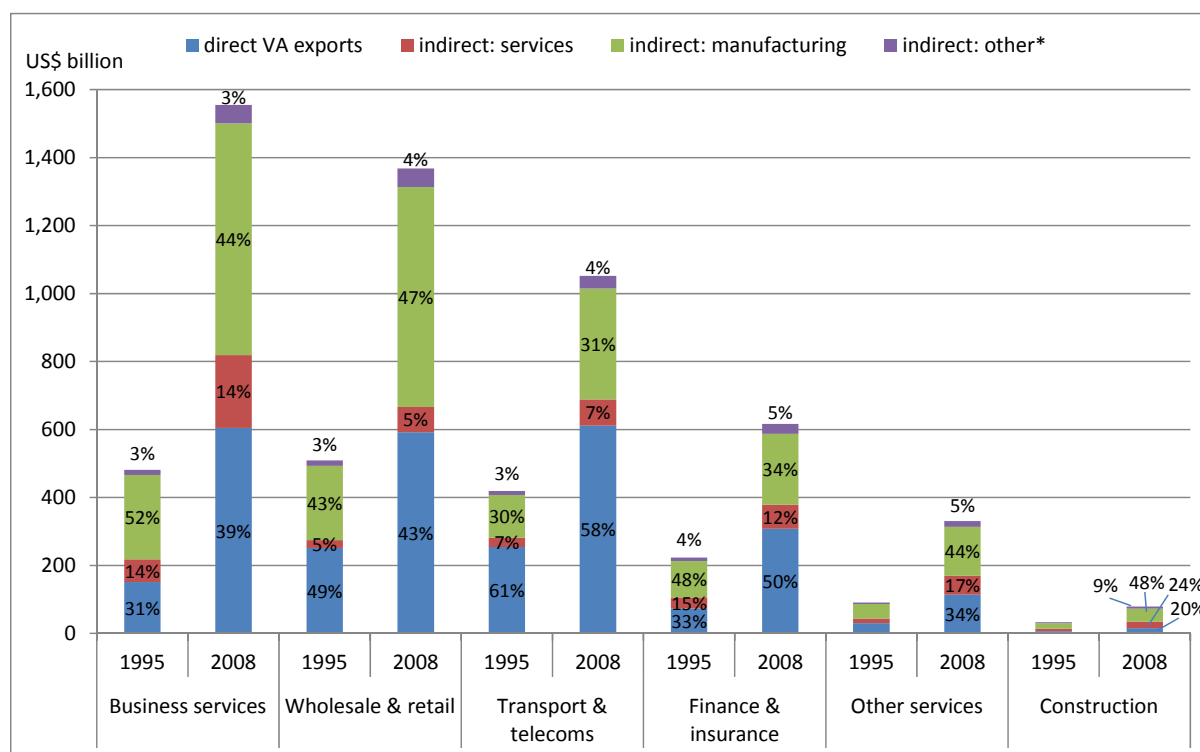
Source: OECD-WTO TiVA Database.

Figure 11 takes a different perspective and shows the exports of domestic services value added by industry in 1995 and 2008 broken down by direct and indirect exports. For instance, in the case of business services, direct exports measure the business services value added exported by the business services sector, while indirect exports comprise the business services value added integrated in the products exported by other services sectors, manufacturing sectors and other sectors (mining, agriculture and utilities).

Exports in services value added in 2008 were highest for business services. However, out of US\$1,555 billion of business services value added exports, only US\$ 605 billion or 39% were exported by the business services sector, while the remaining 61% were exported indirectly, i.e. 14% by other services sectors, 44% by manufacturing sectors and 3% by other sectors. Hence, business services constitute significant inputs to services and goods that are then subsequently exported. These numbers complement the finding of Table 1 in the introduction that business services have the most forward linkages among all services sectors.

The comparison between 1995 and 2008 reveals that direct value added trade is increasing in importance for finance & insurance, business services and other services. In particular, the share of direct exports in value added exports increased from 33% to 50% for finance & insurance and from 31% to 39% for business services. In these sectors, the faster growth of direct value added exports as compared to indirect exports through goods suggests an increasing relevance of services networks. Reduced trade costs caused by liberalization and advances in information and communication technology (ICT) as well as services innovation have likely facilitated this trend.

Figure 11. Direct and indirect exports of services value added, 1995 and 2008



Source: OECD-WTO TIVA Database.

Note: *other covers agriculture, mining and utilities.

4.3 Evidence from case studies: the film industry

The film industry is an excellent example for trends and characteristics of services networks such as decentralization of production, increasing homogenization due to regulation, the movement of people and new forms of value appropriation such as copyrights, brands, exclusivity agreements (Martínez Piva et al., 2011).

The film industry has been undergoing significant changes due to technological progress and globalization. To illustrate the internationalisation and the fragmentation of film-making, the value chain of the movie *Life of Pi* is discussed⁶. *Life of Pi*, directed by Ang Lee and released in 2012, tells the story of a young Indian man, who, after surviving a shipwreck, experiences an adventurous journey on a lifeboat with a Bengal tiger. *Life of Pi* was successfully received by both audience and critiques, bringing in US\$609 million of box office revenues (estimated budget US\$120 million) and winning four Oscars (Directing, Cinematography, Original Music Score and Visual Effects).

While the main producing company was Fox 2000 Pictures from the United States, the movie was an international co-production using capital of eight production companies from four WTO Members, i.e. United States, United Kingdom, Chinese Taipei and Canada. The production involved both private and public capital, which is common in filmmaking. In particular, Canada provided tax incentives through the British Columbia Production Services Tax Credit and Québec Production Services Tax Credit.

The movie was shot in different locations in India, Canada, Chinese Taipei and New Zealand. Around 100 firms and public entities were directly or indirectly involved in the production. The special and visual effects were created by 18 firms in six Members. Further 84 firms and public entities provided, amongst others, production services, security, catering, automatic dialog recording (ADR), titles, score recording, photographs, transportation and logistics, insurance, travel and accommodation.

⁶ The Internet Movie Database (IMDb) was the principal source regarding the information on the movie *Life of Pi*: <http://www.imdb.com>

Figure 12 illustrates the film industry value chain and shows the number of services professionals contributing to the production of Life of Pi. The film value chain consists of two broad stages, that is, production and distribution. The production phase can be further divided into activities relating to pre-production, production and post-production, all of which involve a large variety of different services inputs.

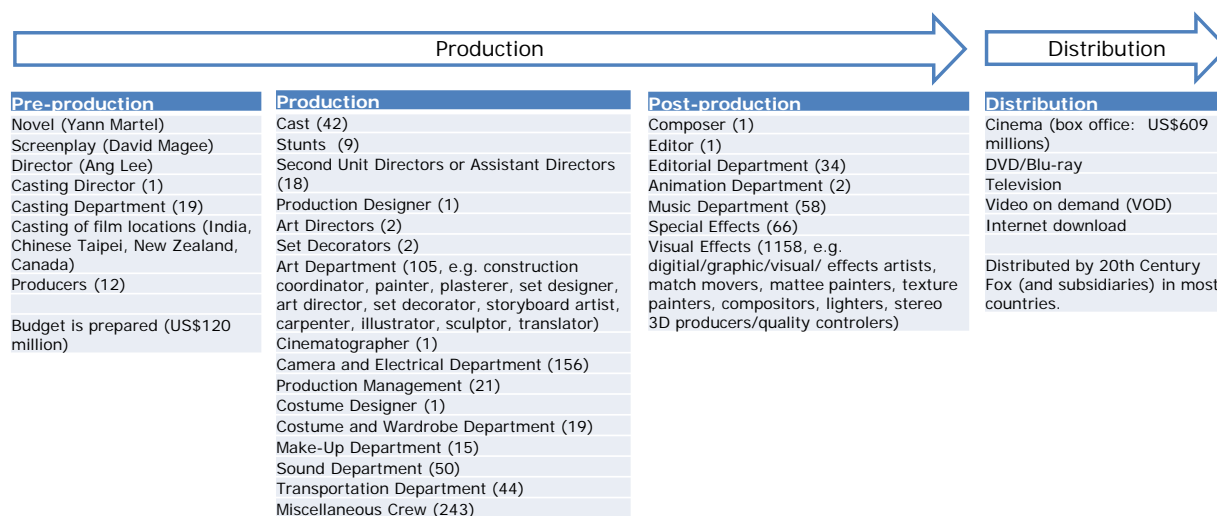
For instance, during the development and pre-production phase the production company Fox 2000 Pictures first acquired the rights to turn the novel of Yann Martel into a film in 2001. The director Ang Lee and the screenplay writer David Magee then turned the novel into a script for the film. Furthermore, a budget was prepared and the crew and film locations were casted.

The production phase brings together a number of services professionals such as the director, actors, cameramen, technicians, make-up artists, decorators and others to shoot the movie. For Life of Pi, for instance, 42 actors were standing in front of the camera and 156 professionals of the camera and electrical department were responsible for shooting the movie. Since Life of Pi was filmed in four different countries, a significant number of staff needed to travel to the different filming locations, while certain staff was only hired to work in specific locations.

In the post-production stage, the film is edited, visual effects are created and the film music is composed. In the creation of the Life of Pi's Oscar-winning visual effects, 1,158 professionals were involved including digital and visual effects artists, composers and stereo 3D quality controllers.

The distribution of movies is becoming increasingly digitized, which helps reduce costs. Rather than shipping expensive reels of film around, venues now get small hard drives or stream films directly on to servers. Furthermore, films are less consumed on DVDs or Blue Ray discs but rather streamed on demand on the internet. The move from physical to online distribution of films has implications for trade policy as tariffs on products related to film production and distribution loose relevance.

Figure 12. The film value chain - professions involved in production of the film Life of Pi

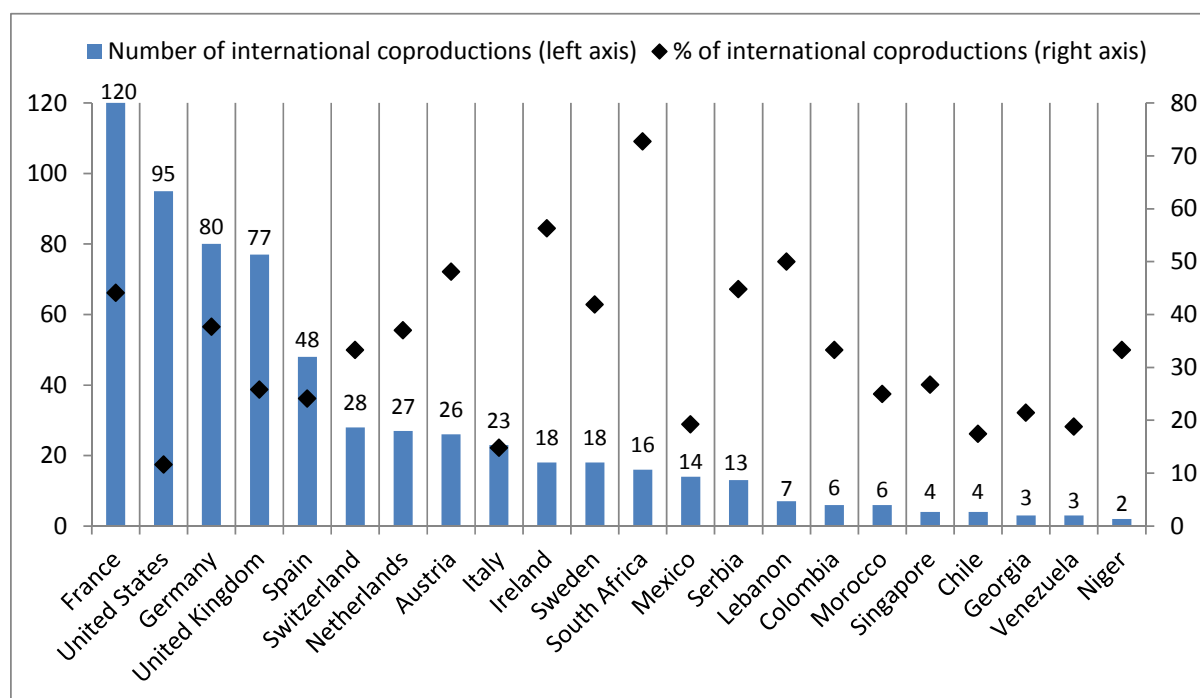


Source: IMDB.

Note: Numbers in brackets indicate the number of crew by profession.

As mentioned above, Life of Pi is an international coproduction involving production companies from four economies. Figure 13 shows the number of international coproductions for selected countries in 2011 and their respective share in a country's overall number of feature films. France, the United States, Germany and the United Kingdom are by far involved in most international coproductions. However, international coproductions are relatively more frequent in Europe than in the United States. For instance, in France 44% of feature films in 2011 were international coproductions compared to only 12% in the United States. Furthermore, also developing countries engage in international coproductions such as South Africa and Morocco in Africa, or Mexico and Colombia in Latin America.

Figure 13. Number and share of international coproductions in selected countries (2011)



Source: UNCTAD

Given its international production process and consumption patterns, the film industry involves several modes of services supply. The cast and the crew that move between countries to produce the movies fall under mode 4. Furthermore, services such as editing, visual effects and music recording can be supplied cross-border (mode 1). For instance, in the case of *Life of Pi*, the Rhythm and Hues Studios, headquartered in the United States, produced visual effects involving branches in India, Malaysia and Chinese Taipei.

The film production industry is significantly impacted by a myriad of bilateral audiovisual coproduction treaties and MOUs that regulate, for example, the sharing of benefits and cost, financial incentives, approval procedures, language and location requirements, nationality and residency requirements of technical and artistic personnel as well as facilitated temporary movement of the latter. For instance, Canada has signed such agreements with more than 50 countries, the United Kingdom has currently 10 active bilateral treaties and in August 2014, India and China signed a film-coproduction treaty. The European Convention on Cinematographic Co-Production has currently 43 parties and governs multilateral co-productions involving at least three parties of the convention and potentially more co-producers not established in the parties of the convention.

Developing countries can have different motivations to enter the film industry. First, countries often want to be a filming location as a means for destination marketing and to increase tourism. For instance, New Zealand experienced a boom in tourism with international arrivals increasing by 40% between 2000 and 2006, part of which was driven by the *Lord of the Rings* trilogy, released (2001, 2002 and 2003), which was filmed in the country.⁷ More broadly, films produced by industries such as Hollywood in the US, Bollywood in India and Nollywood in Nigeria prominently feature their own country and act thereby as a marketing tool.

Second, countries want to be filming locations in order to create jobs and foster economic activity. In order to attract film productions, many countries and regions provide tax incentives. However, this development can also be seen critical as the respective regions will need people with suitable skills for film production so that the employment created warrants the tax credits given.⁸

⁷ The Economist: <http://www.economist.com/blogs/gulliver/2014/01/popular-cities>

⁸ For instance, the U.S. state Georgia has been successful in attracting film productions by providing tax credits of up to 30% of the costs. However, Georgia is facing difficulties to produce workers who can build the

Furthermore, the sustainability of such interventions is questionable given the mobility of film productions. If local governments are required to provide financial incentives to most productions, this might be justified to reach cultural objectives, but is unlikely to result in significant economic benefits.

Thirdly, besides trying to attract film production, countries might enter the film value chain without necessarily being a film location through specific activities such as dubbing, visual effects or other IT related services. For instance, in the case of *Life of Pi*, the Rhythm and Hues Studios from the United States produced visual effects involving branches in India, Malaysia and Chinese Taipei.

5 CONCLUSION

This study analyses the role of services in global value chains. It gives particular attention to the analysis of the international fragmentation of services production, as services value chains or services networks. This area lacks economic research and it is measured only to a limited extent by existing statistical frameworks.

Services enter value chains either as inputs or "enablers" in manufacturing production, or as inputs in fragmented services production. Firms' source services inputs either domestically or internationally, at arm's length or inside the boundaries of the firm. However, both domestic sourcing and international sourcing can involve services trade. In fact, services are not only traded cross-border, but also through the movement of people, capital or goods. The four modes of international service supply in the WTO GATS Agreement cover the international supply of services through cross-border trade (mode 1) and the movement of consumers (mode 2), labour (mode 4) and capital (mode 3). Services that are traded as being embodied in goods have become measurable through trade in value added statistics derived from international input-output tables such as the OECD-WTO TiVA project.

Services have become increasingly important in manufacturing production coining the term servicification of manufacturing. Services value added accounts for almost a third of gross exports of manufacturing industries in developed countries and 26% in developing countries. The share of imported (foreign) services value added in manufacturing exports is close to 12% for both country groups. However, developing countries add significantly less domestic services value to their exports. Trade policies and investment promotion can help close this gap by attracting commercial presences, i.e. investment, from multinational companies. Such investment or mode 3 imports can increase the competition and quality in domestic business services as well as backbone services such as telecommunications, energy, finance or transport, resulting in increased productivity and export competitiveness of domestic manufacturing firms.

Both manufacturing value chains and services networks rely on the international sourcing of services or services offshoring. Traditional trade statistics show that computer and information services have grown at an annual rate of 14% since 2005, clearly outperforming other categories of services exports. The increased importance of India and the Philippines as offshore services providers further indicate the increased participation of certain developing countries in GVCs through such services.

The conceptualisation of the fragmentation of services production raises questions regarding the analytical definition of services, the extent to what the notion of intermediate inputs is applicable to services and whether it is best described through a direct line link or hub and spoke network structure. In terms of measurement, advances in statistics by enterprise characteristics and by mode of supply, i.e. taking into account the movement of labour and capital, are required to better capture international services networks.

Trade in value added statistics show that the international fragmentation of services is less pronounced as compared to goods. While services industry exports of developed countries include more than 80% of domestic services value added, only 10% of value added stem from imported

sets, run the wires or manage the sound for such films, so that they are "imported" from other states such as Florida or New York.

<http://www.economist.com/news/united-states/21610337-what-shortage-workers-film-sets-georgia-says-about-america-behind-scenes>

services. The foreign content of services exports is highest in the industries finance & insurance as well as transport & telecoms. Large increases in direct value added exports of finance and insurance services as well as business services since 1995 reflect the improved tradability of these services and their augmented importance in internationally fragmented production.

The film industry provides an illustrative example of a service network where production and post-production can be scattered across more countries and involve a variety of different services that are supplied through all four GATS modes of supply. The film value chain has been significantly affected by technological change such as the increasing importance of visual effects or the digitization of film making and distribution, as well as policy such as bilateral audio-visual coproduction treaties. Motivations for countries to enter the film industry include job creation through film production or specialization in specific activities such as dubbing or visual effects, as well as destination marketing by being a filming location.

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