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Services and Manufacturing: Patterns of Linkages

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Services provide many modern day conveniences which determine our quality of life. In many cities around the world living without electricity or potable drinking water direct from the tap are now unimaginable. Access to healthcare, availability of hotel and travel services, education, finance, transport, supermarket services, and others – all these services contribute to modern living as we know it today.

Besides as final demand, services also figure as important inputs for manufacturing, and very often determine its competitiveness. Comparative advantage derived from low wages, for example, can be undermined by high cost of transport services. Particularly in the context of global value chains (GVCs), services play a critical role as 'enabler' of GVCs, acting as the glue and facilitator among the different production hubs and spokes, both domestic and off-shored. Logistics services, management and human resources services, computer services, to cite just a few, play important roles in GVC operations.

This policy brief first discusses the nature of services-manufacturing linkage. It then discusses how services' role in manufacturing had increased. Business services, it appears, is a dominant services input in manufacturing and is discussed next in greater length, including the various regulations in the sector that can act as barriers to trade. The policy brief concludes with implications for trade policy.

Producer or consumer services, embodied and embedded: what's in a name?

Services enter GVCs either before, during, or after the production stage. Some services are called 'consumer' services because they enter the final stage of GVC, usually as a service offer packaged with the product. Some of the customer care services like maintenance and repair, are considered consumer services. Everything else before the final stage are considered 'producer' services.

Others characterize a similar dichotomy of services into 'embodied' and 'embedded' service[1]. Embodied services, according to this dichotomy, are services delivered within the product, for example, energy, transport, design, accountancy, and other professional services. Embedded services are services offered at the point of merchandise sale, for example financing services, maintenance, product insurance, leasing and other after-sales services[2].

Regardless of how they are named, producer or consumer services, embodied or embedded, the fact is that services' presence in manufacturing is pervasive. Previously, the value of services for manufacturing went unnoticed because they were mostly provided in-house (hence without separately available contract price and value); most were even considered cost centers (compared to revenue centers) with the corresponding undervaluation of its contribution to overall corporate profitability.

But modularization of production and outsourcing of some of the services 'tasks' made possible the emergence of more data on services contribution to the value chain, and this turned out to be quite significant.

What we see now is that services, with the support of technology, help lower cost and increase manufacturing efficiency. For example, design, R&D and prototyping services help decrease the cost of production failure and shorten product development cycle. For sourcing of intermediate inputs, logistics and transportation services as well as supply chain management services make possible the geographic dispersion of GVC operations. In the manufacturing and assembly phase, IT services, management services, testing services, inventory tracking services, network communications services,

[1] For example, see Brockman and Stephenson (2012).
[2] Ibid., Brockman and Stephenson (2012).

data analytics and processing services, as well as utilities like telecommunications and electricity all contribute to making manufacturing processes efficient, cut production times and improve process quality. In the overall running of the company, human capital management services, IT services, financial and treasury services, legal, accounting, and other professional services help lower financing and overhead costs. For warehousing and distribution, inventory management services and logistics and transportation services are again crucial to lower cost[3].

Services also contribute significantly to product differentiation and competitive product positioning. In marketing, branding and sales, financial services, especially customer finance or equipment leasing services, help clinch sales especially of big-ticket items such as ships or aircraft or even of very expensive machines like hospital or specialized factory equipment. Maintenance and repair services, IT services, customer relationship management services, digital services, help companies develop brand loyalty among its customers and elicit customer insights and collaboration in subsequent product upgrade and (re)development[4].

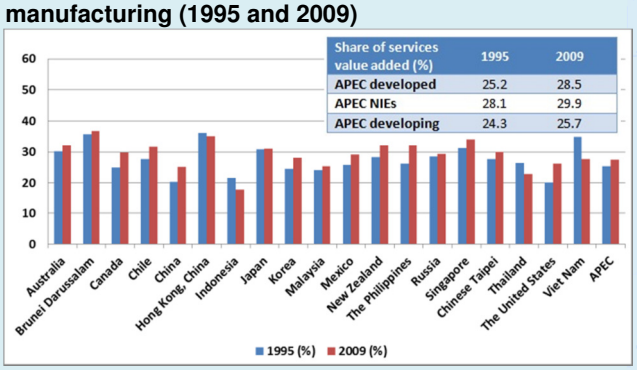
Services trade in GVCs: the data

There are different ways services contribution are captured in value added manufacturing exports. One is through direct services exports. Second is indirectly through services embodied in intermediate goods that are used in the exported product. Third is through services embodied in the exported goods which enter into the production of the imported intermediate goods of an industry[5]. Fourth is also indirectly through services supplied to other service sectors which also find its way into the export market. All these together comprise the domestic services value added of exports. Conversely, services get imported through similar ways, both directly and indirectly (either as inputs to manufacturing imports or inputs to other service sector imports).

Based on the WTO-OECD Trade in Value Added (TiVA) database, world exports of services, in gross terms, comprise about 22 percent of total world exports, manufacturing 71 percent and primary products 7 percent. But if services' value added contribution in manufacturing, as described above, is taken into account, services exports value added increase to 46 percent of world exports while manufacturing exports' share goes down to 43 percent, and primary products share increases to 11 percent[6].

The increasing use of services in manufacturing is shown in the growth of the share of services value added in manufacturing exports from 1995 to 2009 across APEC economies with the exception of Hong Kong, China; Indonesia; Thailand; and Viet Nam (see Figure 1)[7]. For APEC as a whole, services' share in manufacturing rose from 25.5 percent in 1995 to 27.5 percent in 2009, an increase of 702 billion dollars over fourteen years. The United States, Philippines, and Canada post the highest increases of share of services value added, but APEC developed economies as a group record a 3.4 percentage point increase of services value added compared to 1.9 and 1.3 percentage point increases for APEC Newly Industrialized Economies (NIEs) and APEC developing economies, respectively[8].

Figure 1. Share of services value added in manufacturing (1995 and 2009)



Source: APEC Policy Support Unit computation based on OECD-WTO Trade in Value Added (TiVA) database[9].

Services' value added share increased across all manufacturing sectors, except in textiles, textile products, leather and footwear (Figure 2).

[3] Above paragraph discussion paraphrases information summarized in Table 3.1 of ITC (2013).

[4] Ibid., ITC (2013).

[5] So-called re-imported domestic services value added.

[6] UNCTAD (2013).

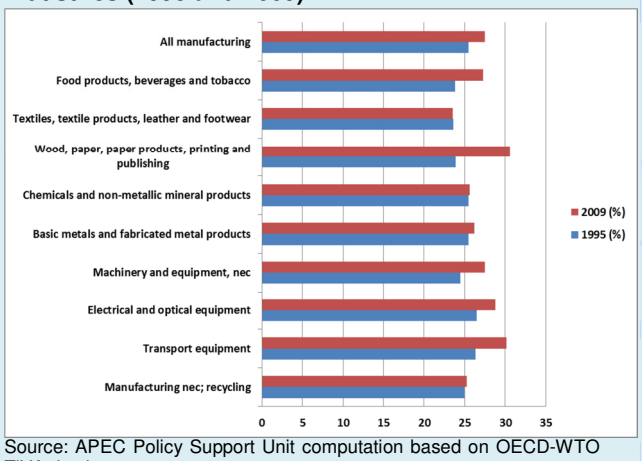
[7] Hong Kong, China also has a very slight decrease in services share in manufacturing value added, from 36.1 percent to 35.2 percent. Viet Nam, in contrast, registered 7.0 percentage point decrease in services share.

[8] APEC NIEs consist of the following economies: Hong Kong, China; Korea; Singapore; and Chinese Taipei. APEC developing economies are Brunei Darussalam; Chile; China; Indonesia; Malaysia; Mexico; The Philippines; Russia; Thailand; and Viet Nam. APEC developed economies are: Australia; Canada; Japan; New Zealand; and The United States.

[9] Throughout this policy brief, analysis of APEC data from WTO-OECD TiVA database refers to 19 APEC economies excluding two which are not in the database, namely Papua New Guinea and Peru.

Services' value added share in 2009 range from as low as 23.6 percent for the latter sector to 30.6 percent for wood, paper, paper products, printing and publishing. The top three manufacturing sectors that exhibit the largest increase in services value added shares are: wood, paper, paper products, printing and publishing; transport equipment; and food products, beverages and tobacco, posting 6.7, 3.8, and 3.5 percentage points increase, respectively.

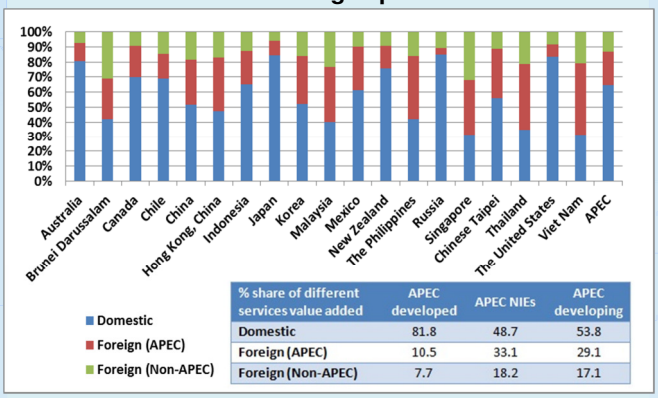
Figure 2. Services' contribution in manufacturing industries (1995 and 2009)



Source: APEC Policy Support Unit computation based on OECD-WTO TiVA database.

How much of services inputs in manufacturing exports are domestic and how much are from foreign sources? Figure 3 shows that indirect services inputs in manufacturing in APEC as a whole is 65 percent domestic and 35 percent foreign, of which 22 percent are from other APEC economies while 13 percent come from non-APEC economies. Russia has the largest domestic services input share (85.1 percent) while Singapore has the least domestic share (31.3 percent). APEC developed economies source 82 percent of indirect services value added share in manufacturing domestically which possibly reflects the strong competitiveness of these economies' service sectors. APEC NIEs use only half of services manufacturing inputs from domestic sources with the remaining half from abroad, with about a third from other APEC economies. APEC developing economies' use of domestic services inputs for manufacturing are similar to that of APEC NIEs.

Figure 3. Domestic and foreign share of services value added in manufacturing exports in 2009

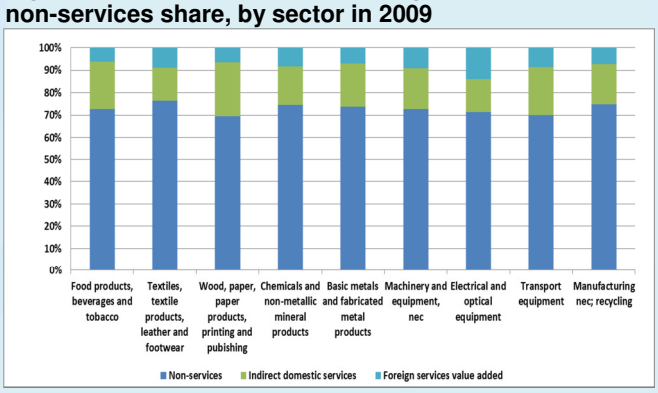


% share of different services value added	APEC developed	APEC NIEs	APEC developing
Domestic	81.8	48.7	53.8
Foreign (APEC)	10.5	33.1	29.1
Foreign (Non-APEC)	7.7	18.2	17.1

Source: APEC Policy Support Unit computation based on OECD-WTO TiVA database.

On a per manufacturing industry basis, Figure 4 shows that wood, paper, paper products, printing and publishing contain the largest indirect domestic services value added with 24 percent share, while electrical and optical equipment sector has the largest foreign services value added with 14 percent share. Domestic services value added shares range from 15 percent (textiles, textile products, leather and footwear) to 24 percent, while foreign services value added shares range from 6 percent (food products, beverages and tobacco) to 14 percent. Figure 4 also shows that even as services value added share in manufacturing exports had increased, the non-services inputs remain highly significant and range between 69 percent and 76 percent. Significantly, when compared with values in 1995, foreign services value added share increased across all manufacturing sectors, both as a percentage of gross exports and of total services value added.

Figure 4. Domestic services, foreign services and non-services share, by sector in 2009



Source: APEC Policy Support Unit computation based on OECD-WTO TiVA database.

Importance of business services

Within services, different sectors show varying export growth. Table 1 shows that business services exhibit the largest compounded annual growth of direct export of 8.5 percent while construction services grew only by 2.3 percent. However indirect exports growth through value added share in manufacturing exports range from 5.8 percent for construction services to 8.1 percent for 'other services' sector[10]. Among the service sectors, business services have, the highest share amounting to 33 percent of total services value added share in manufacturing in 2009, of which 20 percent are domestic and 13 percent are foreign, outpacing 'wholesale and retail trade; hotels and restaurants' sector which has a share of 30 percent[11].

Table 1. Growth of service exports

	Direct exports			Indirect through manufacturing		
	1995 (USD billion)	2009 (USD billion)	CAGR (%)	1995 (USD billion)	2009 (USD billion)	CAGR (%)
Construction	1.39	1.91	2.31	8.52	18.84	5.83
Wholesale and retail trade; hotels and restaurants	103.27	265.16	6.97	157.80	356.37	5.99
Transport and storage, post and telecommunication	102.31	197.21	4.80	82.01	195.78	6.41
Financial intermediation	26.94	73.50	7.43	58.68	150.99	6.98
Business services	55.77	173.85	8.46	142.62	387.32	7.40
Other services	10.95	28.63	7.10	21.70	64.24	8.06

Source: APEC Policy Support Unit computation based on OECD-WTO TiVA and OECD Structural Analysis (STAN) database.

Table 2 summarizes the importance of business services across different manufacturing sectors. It increased its value added share from 1995 to 2009 in all manufacturing sectors except electrical and optical equipment. It is also the service sector with the highest share of export value added in 6 out of 9 manufacturing sectors, and the highest across all manufacturing sectors.

Table 2. Importance of business services

	Increase in share of business services within total services from 1995 to 2009	Top service sector value added, by manufacturing sector (2009)
All manufacturing	✓	Business services
Food products, beverages and tobacco	✓	Wholesale and retail trade; Hotels and restaurants
Textiles, textile products, leather and footwear	✓	Wholesale and retail trade; Hotels and restaurants
Wood, paper, paper products, printing and publishing	✓	Business services
Chemicals and non-metallic mineral products	✓	Business services
Basic metals and fabricated metal products	✓	Wholesale and retail trade; Hotels and restaurants
Machinery and equipment, not elsewhere classified (nec)	✓	Business services
Electrical and optical equipment	×	Business services
Transport equipment	✓	Business services
Manufacturing nec; recycling	✓	Business services

Source: APEC Policy Support Unit computation based on OECD-WTO TiVA database.

What are business services and what are its components? Accompanying notes on the TiVA database by the OECD-WTO indicate that the following sub-service sectors are within business services: a) real estate activities; b) renting activities for machines and equipment; c) computer related activities; d) research and development; and e) other business activities. In the latter are included all the professional services, namely legal, accounting, bookkeeping and auditing activities; tax consultancy; market research and public opinion polling; business management consultancy; architectural, engineering and other technical activities; advertising; and other business activities, not elsewhere classified. While no further disaggregated information can be obtained from the TiVA database, the OECD Structural Analysis (STAN) [12] input-output tables which gives the manufacturing sectors' usage of various inputs including services inputs show that 'other business activities' (presumably various professional services) and 'research and development' are the most used business services activities (see Table 3). Of these two, research and development exhibit the highest growth in input share within business services[13], from 24.2 percent in mid-1990s to 37.1 percent in mid-2000s. The share of 'other business activities' has fallen by 2.9 percentage points over the same period but its input share of 40.3 percent makes it

[10] 'Other services', according to TiVA database, comprise of public services, education, health and social work, other community, social and personal services.

[11] Not shown in Table 1.

[12] The OECD Structural Analysis (STAN) (ISIC Rev. 3 version) database include measures of input-output in a standard industry list, allowing comparisons to be made across economies and also across related OECD databases such as the Trade in Value Added (TiVA) database.

[13] This result is based on only 8 APEC economies' input-output tables namely Australia; Canada; Chile; China; Indonesia; Japan; Chinese Taipei; and The United States.

the most important sector within business service[14]. This has important implications for trade policy considering that 'other business activities', according to the ISIC classification are mostly constituted by professional services such as accounting, legal services, engineering, architecture and other technical services (see footnote 15) and where plenty of restrictions can be found.

Table 3. Detailed contribution of business services

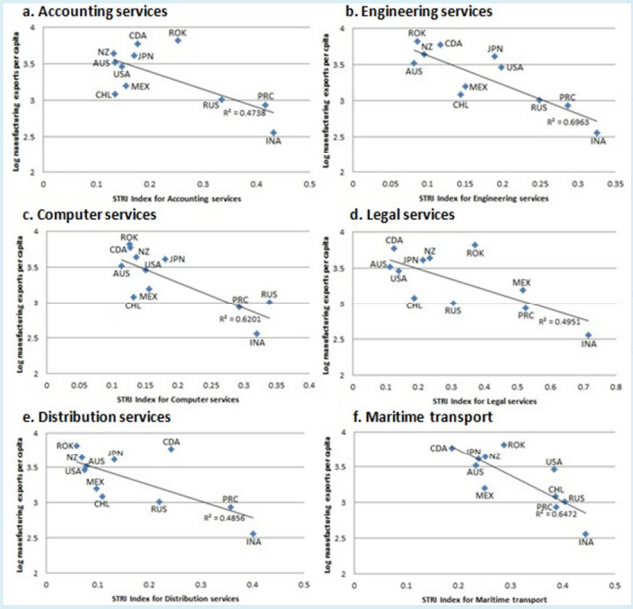
	Top business services in terms of share in mid-2000s	Business services with the highest increase in share between mid-1990s and mid-2000s
All manufacturing	Other Business Activities[15]	Research and development
Food products, beverages and tobacco	Other Business Activities	Research and development
Textiles, textile products, leather and footwear	Other Business Activities	Research and development
Wood and products of wood and cork	Other Business Activities	Research and development
Pulp, paper, paper products, printing and publishing	Other Business Activities	Research and development
Coke, refined petroleum products and nuclear fuel	Research and development[16]	Research and development
Chemicals and chemical products	Other Business Activities	Research and development
Rubber and plastics products	Other Business Activities	Research and development
Other non-metallic mineral products	Other Business Activities	Research and development
Basic metals	Research and development	Research and development
Fabricated metal products except machinery and equipment	Other Business Activities	Research and development
Machinery and equipment not elsewhere classified (n.e.c)	Other Business Activities	Research and development
Office, accounting and computing machinery	Other Business Activities	Other Business Activities
Electrical machinery and apparatus n.e.c	Research and development	Research and development
Radio, television and communication equipment	Research and development	Other Business Activities
Medical, precision and optical instruments	Research and development	Research and development
Motor vehicles, trailers and semi-trailers	Research and development	Research and development
Other transport equipment	Research and development	Research and development
Manufacturing n.e.c; recycling	Other Business Activities	Research and development

Source: APEC Policy Support Unit computation based on OECD STAN database.

Restrictiveness indices in services

The discussions above show that services share in manufacturing exports value added has increased, and note the important role of business services as well as wholesale and retail distribution services. We ask then if restrictions on services, especially on these two sectors, have an impact on manufacturing exports, that is, if these correlate with economies' ability to compete in exporting manufactured goods. Figure 5 provide indications of negative correlations between gross manufacturing exports by APEC economies in 2009 (controlled for market size) and the various OECD index of restrictiveness[17]. The picture supports the idea that higher restrictions on services affect negatively the competitiveness of downstream sectors that make use of them.

Figure 5. Manufacturing exports and services restrictiveness



Source: APEC Policy Support Unit computation based on OECD-WTO TiVA, OECD Services Trade Restrictiveness Index (STRI) and World Bank World Development Indicators databases.

Majority of the restrictions that influence the OECD restrictiveness index actually refer to restrictions on movement of people, especially for the index on architecture, engineering, accounting, and computer services. Mostly these refer to recognition of qualifications, licensing requirements, limitations on the scope of professional services that foreign professionals can provide, sometimes economic needs test for stays of longer than 6 months. In accounting, computer, legal services as well as distribution services, restrictions on foreign entry is also a

[14] Authors' computation, not shown in Table 3.

[15] 'Other Business Activities' (based on ISIC Rev.3 Code) comprised of legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; architectural, engineering and other technical activities; advertising; and business activities n.e.c.

[16] 'Research and development' (based on ISIC Rev.3 Code) comprised of research and experimental development on natural sciences and engineering as well as on social sciences and humanities.

[17] The OECD only has restrictiveness indices for the following APEC member economies: Australia (AUS); Canada (CDA); Chile (CHL); Japan (JPN); Korea (ROK); Mexico (MEX); New Zealand (NZ); The United States (USA) (all OECD member economies) plus China (PRC); Indonesia (INA); and Russia (RUS).

significant contribution to overall restrictiveness. Foreign entry restriction often takes the form of nationality requirements or ownership restrictions or, in the case of distribution services, screening of investments, limitations on board members and managers or restrictions on land acquisition[18].

Implications for trade policy

This policy brief assesses the growing importance of services for manufacturing exports and finds that some service sectors like business services and distribution services have greater importance for manufacturing than other service sectors. Within business services, professional services and research and development have the most important contribution. The OECD restrictiveness index shows that restrictions on the movement of persons are the most important impediment in many service sectors, particularly in professional services. Foreign entry restrictions also contribute significantly to overall restrictiveness across service sectors. Restrictiveness in various professional services and other service sectors have negative correlation with exports of downstream industries like manufacturing which makes an increasing use of services throughout its value chain operations, beginning from pre-production phase (design and research and development) to production (logistics, management, professional services inputs) and post-production phases (marketing services, repairs and maintenance, customer support).

The industry and sector data, though already showing increasing trend in services remain limited in describing the breadth and depth of services penetration in manufacturing. The TiVA data, for example, cannot give further information on the importance of specific business services. Even if complemented by other economic tables like the input-output tables available in the OECD STAN database which are more disaggregated since industries are divided into 37 sectors instead of 18 sectors in TiVA, the picture we get remains aggregated. For example, we know that 'other business activities' are important for business services, but there is no further information on how 'other business activities' are further divided into contribution of the different professional services and other components of this sub-classification.

[18] See OECD notes on the restrictiveness indices per sector from http://www.oecd.org/tad/services-trade/sector-notes-services-trade-restrictiveness-index.htm

In this regard, various efforts to collect case studies that map out various manufacturing sector's value chain seeking to understand where and how various services come into play are a good complement to the WTO-OECD work on TiVA database. These research can enhance understanding of specialized services which might have evaded classification to date and will enrich our appreciation for the contribution of services in innovation and productivity.

The increasing linkage between services and manufacturing also has implications on 'traditional' trade policy discussion of goods separate from services. Policymakers should increasingly think in terms of value chains, and thus of both goods and services at the same time when designing trade and economic policies. Liberalization in goods without services can stymy effort to increase overall competitiveness. Policies that affect supply chain costs and that influence the organization of value chains are regulatory in nature, and regulations are generated by a multiplicity of agencies. Understanding the influence of regulations on value chains means that domestic policymaking should preferably not be done in 'silos' but should increasingly be collaborative and coordinated across government agencies[19].

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[19] See Hoekman (2014) for discussions of supply chains and the role of 'knowledge platforms' for deliberation, dialogue and learning, involving government, research and business sectors. His idea of knowledge platforms appears very similar to how APEC has gone about its policy dialogues over the years drawing from the expertise from business and research organizations and where ideas and policy issues discussed in the policy dialogues often find its way into various APEC agenda.

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