

## Changing Landscape of Global Value Chains: Redefining role of Asian Economies

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### *Abstract*

The paper looks at changing nature and pattern of global value chains (GVCs) integration in Asian economies, mainly East, South-East and South Asian ones. GVCs began as regional chains from Japan and then flourished to other countries, and so the theories explaining GVCs also changed according to the trade and industrial patterns in such economies. Changes in theories have moved from flying geese to fragmentation and agglomeration theory to upgrading in GVCs the pattern of snakes and spiders, which are all now further undergoing transformations in some of their predications due to widespread interplay of digital technologies, fourth industrial revolution (with more adoption of standards in intellectual property and artificial intelligence). The paper studies Asian countries' changing foreign trade and investment policies as well as industrial strategies to understand how well they are equipped to deal with such changing patterns. There are now movements to promote domestic manufacturing to move up value chains rather than purely relying on imported contents (viz. 'Made in China 2025' initiative in China, 'Make in India' initiative in India). In fact, since 2013-14, some Asian countries are now experiencing more decline in foreign value content share of gross exports or backward linkages, as compared to some European countries, using TiVA Database. For example, the share has declined for China from 21% in 2012 to 17% in 2016, and for India from 25% to 16% over the same period, suggesting more rise in domestic value added content. The paper estimates changes in Asian GVCs in terms of backward and forward linkages in comparison to European and American economies. Although China-centered GVCs is slowing down, but due to digitalization and use of smart manufacturing and changes in trade policies, many developing countries of Asia mainly China is all set to emerge with different look in GVCs. US and EU value chains have matured much leaving much ground for Asia to take over and build new paradigms even in manufacturing. The paper suggests way of how policies of some Asian countries should be adjusted so that they can place themselves in their most promising sectors in global/regional value chains.

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## 1. Introduction

It was agreed by some policy makers that there would be greater yet speedy consolidation of global value chains (GVCs) post 2009-crisis which may prompt shifting of major powers from Developed North to emerging South (Cattaneo, Gereffi and Staritz, 2010), along with more trade challenges for latter. This will urge all the countries to restructure their policies and better manage their value chains. In fact, post-crisis, as per WTO (2019), developing countries have in fact have become equally integrated into GVCs as the developed ones (i.e., GVC participation for both groups was found to be around 41 per cent in their exports for the year 2015). However, the struggle for LDCs and less developing economies would be more in Asia while competing with those who rise up the value chains in terms of investments in infrastructure, innovation, R&D activities and use of digitalised technologies with easy purchase and sale of goods and services at just one-click to catch up with advanced countries in these fields. Specifically, the Fourth Industrial Revolution/ Industry 4.0 is growing exponentially with level of complexities varying across industries and countries. As the scale and speed of new digital-cum-technological transformation are much advanced, rapid and full of uncertainties with growing cross-linkages (UNCTAD, 2018; Park, 2017), these are likely to have tremendous effect on the growth of international trade. WTO (2018a) presents how digital technologies (DT) such as Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, etc. are fast developing and how they can lead to a decline in trade costs. That is, as per this report, global trade is projected to grow by additional 34 percentage points during the period 2016-30.

After quick spread of GVCs since mid-50s, it has no longer been sufficient to have comparative advantages in some particular kind of finished products and to export them at lower costs for achieving favourable trade balance and gains. Even if any country has large quantitative values of exports, this does not necessarily imply an equivalent rise in its production. In fact, countries have increasingly developed comparative advantages in different production processes or tasks, carried out in various geographical locations, to propel ample transactions in intermediate goods and services which accounted for almost 60% of world's trade (UNCTAD, 2013). This trend was mainly popularized after the rise of China in GVCs which was further fuelled by continuous liberalization of trade and foreign direct investments (FDI), and gradual advancements made in the field of information, communication and technologies (ICT), along with fall in transportation and logistics costs. But in the coming years, country's comparative advantages would eventually be traced in terms of data flows, privacy, IPR regulation powers, and progression of digitalisation (WTO, 2018a). It would be thus interesting to review how GVCs theories have progressed over the years and whether they have been modelled as per changing AI/robotics and digital economy aspects, which is one of the main objectives of this paper.

Despite the recovery of trade in 2017, global economy has been facing serious challenges in the form of increasing protectionism (viz. 39 new trade restrictive measures imposed by G20 during October 2017-May 2018 period<sup>2</sup>), questioning the functioning of WTO multilateralism, excessive using of non-tariff measures and practices such as licenses and quotas, growing anti-globalization tendencies especially post

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<sup>2</sup> For G20 measures, see [https://www.wto.org/english/news\\_e/news18\\_e/monit\\_04jul18\\_e.htm](https://www.wto.org/english/news_e/news18_e/monit_04jul18_e.htm)

Brexit, etc. All these have been fuelled by recent US withdrawal from Trans-Pacific Partnership (TPP) and imposing of additional tariffs on imports of China and other trading partners which is likely to create both new market access and opportunities especially with Asia along with challenges (UNESCAP, 2011). Further, there have been evidence of falling foreign value added share in gross exports of major developing countries of Asia after crisis mainly for China and its move towards enhancing domestic industrialization and supply chains (Kee and Tang, 2015). Although Gupta (2015) shows rising backward linkages for many manufacturing industries of another emerging Asian economy, that is India, but rise has been slower during 2009-11 mainly for its machinery industries (Gupta 2016). In fact, as per estimations from Goldar, Das, Sengupta, and Das (2007), it can be inferred that domestic value added share of merchandise exports declined only slightly during 2007-11 period in case of India. Further, 'Make in India' has been India's popular initiative since 2015 as part of its foreign trade policy. Thus, there seems to be some major policy changes in these Asian economies to become industrialized with more domestic value added content, along with usage of domestic supplies in exports. But the question rises whether the other Asian countries of South are also undergoing policy transformations after 2008-09 financial upheavals? If yes, do their policy documents reflect the changes in trade patterns and in industrial policies and digital economy aspects?

Further, it may be noted that, post-crisis, there has not only been the case of just GVCs' reorganization, but many countries also got plagued with number of uncertainties and doubts over continuing their integration with other economies. On one hand, the trade under GVCs or regional value chains (RVCs) appears to be slowing down for major developing economies such as China (see, Wingaraja, Tyson, Prizzon, & Velde, 2018), while on the other hand, there are instances of growing maturity of GVCs or stagnation in many advanced economies such as US, Japan and even some European countries. However, recent data in the case of manufacturing shows that the share of intermediate goods in total trade has remained more or less stable in both pre- and post-crisis period, except some slight downfall near the crisis. For instance, shares of merchandise intermediate exports and imports in total global exports and imports have increased from 42% in 2002 to 44% and 43%, respectively, in 2006, thereafter which there has been slight decline (although increased during 2010 with 43 in case of exports and 44 in case of imports). A decline was again seen during 2011-14 period where the shares remained in the range of 42% (exports) and 43% (imports). Both have risen after 2015 as the trade also revived from 2017, showing revival in GVCs trade also although at a slower pace (45% in case of imports and 44% in case of exports in 2017). Further, as per WTO (2019), "from 2011, developing economies' exports to other developing economies surpassed its exports to developed economies. "South-South" trade represented an estimated US\$ 4.28 trillion or 52% of total developing economies' exports in 2018." Thus, the trade trends are confusing for many countries particularly after crisis for developing countries mainly Asia, and also the rising protectionism has been the favourite playing card for many countries (mainly the advanced ones).

Thus, the need of the hour is not only to compare pre and post-crisis periods, but to study the period after crisis say, the 2011-12 to 2017-18 period, which needs to be observed with regard to changing landscape of GVCs (particularly in case of Asian economies). This is because Asia has registered highest level of regional trade during 2008-18 (WTO, 2019). This paper appropriately studies trends in Asian GVCs using international input-output tables from the OECD-WTO Trade in Value Added (TiVA) database of 2018 which provides data for the period 2005-16, and compares them with those of some European and American economies. Analysis has been mainly done for post crisis times, comparing the periods 2011 and 2015/16. Countries' integration into the GVCs has been studied from two angles: share of backward linkages or share of foreign value added (FVA) content in gross exports which is actually the respective country's imported content which it uses for production of its exports; and share of forward linkages which is presented in the database as Domestic Value Added (DVA) in exports of intermediates as share of total exports, which

estimates the exports of value added by exporting country for addition into the importing countries' exports as well as their final consumption. It may be noted that only the South East Asian (SEA), East Asian (EA) and South Asian (SA) countries have been considered for analysis in this paper, along with EU 28, North America, and South/Central America. It may also be noted that TiVA provides data only for India in case of SA.

Using the secondary sources, this paper reviews existing foreign trade and investment policies of Asian economies to understand how well they are equipped to deal with changes in the economy in terms of intermediate goods trade, more focus on domestic value added creation, usage of IT technologies and smart manufacturing. Rather than adopting empirical model estimations, this paper does ground work for future research by providing a much needed review paper to understand the changing landscape of Asian GVCs and their shifting role therein.

The paper is organised as follows: next section reviews trade and investment trends in Asia and other economies, followed by a section on understanding theoretical evolution of GVCs. The fourth section reviews the changes in Asian countries' policy announcements post-crisis, followed by a section on assessing the changing trends in backward and forward linkages. Sixth section provides main policy suggestions to strengthen Asian GVCs. The last section concludes the paper.

## **2. Trade and Investment Patterns between Asia and others**

Overall, the global exports and imports declined from USD 16 trillion in 2008 to USD 12.5 trillion in 2009 which, thereafter, rose till 2013 (USD 19 trillion), but then fell drastically. The global crisis of 2008-09 had delivered varied yet differential impacts worldwide including the economic slowdown and shriveling in world trade, which was felt hardly since 2013. However, global trade revived in value terms in 2017, estimated at USD 17.7 trillion and further rose to USD 19.4 trillion in 2018, using data from WTO (2019). Also, global trade revived and recorded the strongest growth in volume terms in 2017, as mentioned by WTO (2018) as: "Merchandise trade growth in 2017 was up sharply from 2016, when trade volume grew by just 1.8 per cent, the smallest increase since the financial crisis of 2008. Strong growth in trade volume in 2017 was driven primarily by cyclical factors, as world growth in GDP at market exchange rates rose to 3.0 per cent from 2.3 per cent the previous year. This economic activity was driven by increased investment spending, particularly in the United States, and rising consumption, notably in Japan. Meanwhile, China and the European Union maintained a steady rate of expansion, providing a solid base for global demand." The main reason behind this has been the increased demand for imports in many regions but most prominently in Asia which emerged as the top contributor.

Although global economic recovery has been considered to be modest, much of the contribution to global economic growth has been expected to be driven by developing countries, especially emerging economies like India and China. It is found that global economic power balance may be shifting, viz. growing influence of 'BRIC' to surpass G6 by 2030 (World Economic Forum, 2017). Although developing countries' shares in global merchandise exports and imports have declined from 2015 to 2016, while the corresponding shares for developed economies have risen (Table 1), but thereafter the trend reversed for both set of countries. Notably, shares of developed ones continued to decline in exports but more in case of imports. On the other hand, the rise in shares of developing economies has been greater particularly during 2016-17 as compared to modest rise in later years. From these set of countries, rise in shares from 2017 to 2018 can be attributed to Middle East's exports which increased from 5.5% to 6% and even that of Africa (rise from 2.4% to 2.5%), but not attributed much to Developing Asia whose export shares declined post-2015. However, the shares of latter continued to rise in imports contributing to the rising share of developing countries' imports

in world imports. Conversely, there has not been much change in shares of Developing Latin America and Europe, showing almost similar level of participation in world's trade.

**Table 1: Shares of regions in world's merchandise trade (%)**

REGIONS	Exports					Imports				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
<b>Developing economies</b>	43.6	43.4	42.4	43.2	43.5	41.0	40.9	39.7	40.7	41.1
<i>Developing Latin America</i>	5.6	5.8	5.7	5.8	5.7	6.2	6.3	5.9	5.8	5.8
<i>Developing Europe</i>	1	1.1	1.1	1.1	1.1	1.5	1.5	1.5	1.6	1.4
<i>Developing Asia</i>	26.8	28.9	28.4	28.4	28.1	25.6	25.3	25.0	26.2	27.1
<b>Developed economies</b>	52.4	53.5	54.9	53.8	53.2	56.3	57.0	58.2	57.1	56.6

**Source:** Data extracted from WTO (2019) and WTO (2016)

Moreover, in terms of share of merchandise exports in world's exports (Part A of Table 2), there has been decline in the shares of North America (NA) mainly US and of Japan in the range of 1-2% from 2008 (period when crisis started) till 2012 (period after crisis) and to 2017 (period much after crisis). Decline has been gradual over these years. After 2008-09 crisis period, the share of EU 28 has declined by almost 6 percentage points during 2008-12, which continued further. Whereas Developing Asia's shares improved by 3.7 percentage points during 2008-12, but rose by 5 percentage points even much after the end of crisis, i.e. during 2012-17, signifying greater forward participation in world trade and GVCs. Highest rise was contributed by developing East Asia of 6 percentage points from 2008 to 2017 (mainly by China, followed by Chinese Taipei and South Korea), trailed by rise of 2 percentage points in the case of SEA (majority of the countries registered stable shares: rise in shares was only of 0.8 percentage points by Vietnam, and of 0.2 percentage points by Malaysia and Thailand). Brunei Darussalam, Cambodia, and even Myanmar have almost nil shares. South Asia's shares increased by just 0.5 percentage points, with only rise in participation by India (Table 2). On the other hand, as depicted in Part B of Table 2, the share of developing Asia's intermediate imports in their total exports rose by 0.1 percentage points during 2008-17 signifying lesser use of imported inputs or slow growth in GVCs trade for the region. In fact, just after crisis, this share increased from 37.7% in 2008 to 39.3% in 2012 but thereafter, in 2017 declined to almost 2008 level. Interestingly, world's share too declined from 44% in 2008 to 42% in 2017, and so has been the case of EU-28 (fall of 5 percentage points). Japan and US shares declined by 1 percentage points, indicating almost stable position in trade. But it is important to note that the share of intermediate exports in world has risen for developing SEA and EA from 2008-17, but not of intermediate imports in their total exports which actually witnessed decline in share of 2 and 5 percentage points, respectively. But the decline was only for Thailand and Vietnam, while significant rise in usage of imported inputs post-crisis (which did dropped in 2012 before again rising upto 2017) has been for Brunei, Cambodia and Philippines majorly by 19, 13 and 12 percentage points respectively. Most notable is region-wise rise in share of imported inputs in exports for Developing South Asia from 41% in 2008 to 48.7% in 2012 and 50% in 2017. Although India's shares increased during 2008-12 but declined thereafter, while the rise in shares has been seen by Afghanistan, Nepal, and Pakistan, followed by Sri Lanka. That is, the number of developing countries which have been on lower rungs of development have actually started an increased usage of imported inputs in manufacturing to link into GVCs trade, post-crisis.

**Table 2: Shares of countries/regions in Merchandise exports (2008-17)**

<b>A: Shares of countries'/regions' merchandise intermediate exports in their total merchandise world exports (%)</b>				<b>B: Shares of merchandise intermediate imports in total merchandise exports (%)</b>		
<b>Region/Country</b>	<b>2008</b>	<b>2012</b>	<b>2017</b>	<b>2008</b>	<b>2012</b>	<b>2017</b>
<b>North America</b>	15.1	14.3	13.6	52	51.7	51.5
US	10.6	9.9	9.3	54.9	52.1	53.6
<b>EU 28</b>	39.8	33.9	33.8	45	42.5	40
<b>Japan</b>	5.9	5.6	4.6	36.3	37	35.9
<b>Developing Asia</b>	23.5	27.2	31.8	37.7	39.3	37.8
<i><b>Developing South Asia</b></i>	1.5	1.9	2	41.2	48.8	50.1
Afghanistan	0	0	0	150.2	123.4	377.3
Bangladesh	0.03	0.03	0.02	107.2	96.9	77.4
Bhutan	0	0	0	47.6	100.8	27.8
India	1.4	1.7	1.8	69.8	76.9	75.9
Maldives	0	0	0	0.2	0.2	0.4
Nepal	0.01	0.01	0	110.4	341.8	595.3
Pakistan	0.1	0.1	0.1	94.3	79.2	121.1
Sri Lanka	0.03	0.03	0.04	85.7	94.3	88.2
<i><b>Developing Southeast Asia</b></i>	7.2	8	8.7	52.2	51.5	50.4
Brunei Darussalam	0	0.01	0	11.3	11.8	29.7
Cambodia	0.02	0.01	0.02	57.3	54.2	69.9
Indonesia	1.1	1.1	1.1	50.4	52.4	51.8
Malaysia	1.4	1.6	1.6	47	51.6	48.4
Myanmar	0.02	0.04	0.05	45.2	38.4	46
Philippines	0.5	0.4	0.6	74.3	70.8	86
Singapore	2.8	2.8	2.8	46.2	41.8	42.9
Thailand	1.3	1.5	1.5	58.9	59	44.8
Viet Nam	0.2	0.5	1	76.6	67.1	60.9
<i><b>Developing East Asia</b></i>	14.7	17.3	21.2	43.6	43.4	38.7
China	8.9	10.6	12.3	50.1	51.9	47.5
Hong Kong, China	0.1	0.2	0.2	5.9	6.8	1.8
Korea, Republic of	3.1	3.8	4.4	49.8	42.7	37.8
Macao, China	0	0	0	72.9	93.3	162.9
Mongolia	0	0	0	33.7	40.6	19.4
Chinese Taipei	2.5	2.6	4.1	51.4	46.5	38.3

Source: WTO (2019)

Along with this, FDI outflow has also increased after crisis for developing economies from 28% in 2012 to 41% in 2018, although there has been decline from 79% to 55% in the same period for developed economies (Appendix Table A). The contribution has been growing from developing Asia whose FDI increased from 24% in 2012 to 32% in 2014, which declined afterwards to 26% in 2016, before rising to 40% in 2018. The share has increased mainly from developing EA by 10 percentage points from 2012-18, by 3 percentage points for Developing SEA, and only 0.3 percentage points for developing SA. Japan's outward investments have increased from 10% to 14% over the years, and from 25% to 39% for EU 28, whereas, outward investments from NA declined drastically.

At the same time, FDI inflows in developing economies have also risen during 2012-18 period, where majority went to developing Asia with rise from 28% to 40% (both outflow and inflow shares have converged in 2018 for the region) which has always been in a greater need for inviting FDI (Appendix Table B), as also supported by UNESCAP (2018). Interestingly, the share of developing SA's FDI inflows has increased from 2.2% in 2012 to 4.2% in 2018. The shares have also risen for developing SEA and EA from 8% in 2012 to 12% in 2018, and from 14% to 22% over the years, respectively.

All this makes developing and emerging Asian countries now more integrated into trade and investment terms, which needs to be understood from changes in value added linkages, theories and policies perspective as well to factor into after-crisis effects. This justifies the need to review the trends and policy documents for a number of Asian countries. Although there are rising annual reports or sector-specific case studies by WTO and UN agencies in recent times to review the changing trends mainly in Asia such as by WTO (2019), UNCTAD (2018b), UNIDO (2018), etc., but the focus has not been much on changing theoretical framework and connection of GVCs linkages trends with policy formulations in those countries.

### **3. Conceptual-Theoretical Evolution of GVCs and Literature Review with respect to Asia**

Global economic map has been continuously changing whereby new geographies of production, distribution and consumption are getting created. But, past events and the long history of evolution about industrialization and connection of world markets are vital in explaining the current scenario of GVCs as well as in predicting its future pathways (Dicken, 2011). GVCs are not a new-fangled phenomenon to be amazed at. They have been a part of the world economy say at least since the 17th century. However, major turning point came when there was an industrial revolution in Britain around mid-18<sup>th</sup> century till mid-19<sup>th</sup> century. This was the time when innovative methods and machines were used for facilitating production. During this period, steam engines were invented which helped in flow of goods from one place to the other. The trade and transportation costs were reduced and this made the separation of production and consumption across countries feasible. New manufacturing processes were developed, along with spinning machines; iron and textiles played a key role and soon this revolution spread to Western Europe and North America. In mid-19<sup>th</sup> century, the technology revolution started and more number of manufactured goods flooded the markets leading to industrial development in many countries. America became super power after WWI in the early stages of 20<sup>th</sup> century, and then Soviet Union also emerged as a major player. The colonial powers began their search for raw materials and moved beyond their economic territory towards underdeveloped and developing countries of Asia which had abundant supply of labour and natural resources. So, as the Southern countries de-industrialized, there was rise of industrialisation in Northern countries (World Economic Forum, 2012; Baldwin, 2012). However, till mid-20<sup>th</sup> century, after the end of WWII, no one anticipated the rise of Japan in East Asia which was so remarkable that marked the beginning of evolution of GVCs, which became more dominant in the 21<sup>st</sup> century. This trend changed

the outlook of trade owing to the intimate way in which the global economies have become interconnected since then and the overriding role that has been played by globalisation particularly till 2009-09 economic crisis.

In earlier times, trade was in the form of internationalisation which refers to phenomenon of crossing the national boundary and reaching to the outside markets. The term was defined as “the geographic spread of economic activities across national boundaries” (Gereffi, Humphrey, Kaplinsky, & Strugeon, 2001). But, this phenomenon has been extended over the years to globalisation which refers to “functional integration between internationally dispersed activities (Dicken 1988:5)” (as cited in Gereffi et al., 2001). Since 1980s-90s, production and supporting activities have been taking place almost globally, irrespective of the borders of a nation. The idea has been to explore the international markets for achieving cost-competitiveness of products and this phenomenon came to known as GVCs.

GVCs of today began as regional supply chains in East Asian region in the 1950s with Japan initiating the process as lead goose and stimulating 'flying geese' pattern of investment and trade. It actively pursued vertically integrated production systems and developed big national brands and large conglomerates. It actively used FDI and trade to become major investor and exporter of the region. Over time, Japan moved from low-cost products to more sophisticated products. It shifted light labour-intensive manufacturing industries to other East Asian countries and set up its plants to develop them as export platforms. Later in 1960s, this development spread to the 1st generation Newly Industrialising Economies (NIEs) namely Singapore, South Korea, Taiwan and Hong Kong. At that time, US and European firms had also started looking for low-cost locations for their products, and thus shifted their manufacturing base to Asian countries owing to locational advantages and wage differences. The 1<sup>st</sup> generation NIEs started to provide subcontracting services to these firms, including the Japanese firms. Eventually, capital intensity of the products by 1<sup>st</sup> generation NIEs increased, with increase in production and use of innovative methods. Also, more number of high-wage and advanced countries moved their labour-intensive manufacturing to East and South-East Asian economies. This led the 1st generation countries to move up the ladder in the late 70s and early 80s giving opportunity to 2nd generation NIEs, that is, Philippines, Malaysia, Thailand and Indonesia, to produce low-end consumer goods and enter the trading system. These countries soon became specialised in the production of many machinery parts and components. Both first and second generation NIEs effectively used incoming FDI and became export platforms. This led to a changing of the scenario from where inputs were produced in one country, assembled in some other country, and finished products exported by a third country to the final consumers. But the major change came in the world economy when China entered these chains in the mid-80s, along with Vietnam, Cambodia, etc., (Haddad, 2007; World Economic Forum, 2012; Gupta, 2012). Many of the above countries set up their base in China for building their GVCs.

Over the years, Japan's development passed through 'tonne age' (heavy machines, steel, ship building, textiles, etc.) to 'kilo age' (automobiles, consumer electronics, office equipment, etc.), and then 'gram age' (semiconductors, robotics, precision instruments, etc.), but it failed to move effectively towards 'vacuum age' (internet). It was China which took immense advantage of the ICT revolution of 1980s along with increased globalised market forces, which led to its sudden rise in GVCs (World Economic Forum, 2012). It soon became an assembly hub of Asia and obtained most of the inputs from other neighbouring countries and assembled them to produce final goods for Western countries. It had massive cheap labour as well as actively utilised the inward FDI flows. It thus became major producer and exporter of manufactured goods,



and that too at lowest cost. Its mass production of almost all types of goods ranging from textiles, toys to electronics to some highly sophisticated machines led to development of 'factory Asia' (Baldwin, 2012; Elms & Low, 2013). However, there are efforts to move away from Factory Asia status with declining share of FVA in gross exports post-crisis (Kee & Tang, 2015).

Second, the available literature also clearly highlights as to how the GVCs as a concept has evolved over the years. Its initial conceptualization dates back to the pioneering works of Michael Porter in mid-1980s (value chain) and of geographer Peter Dickens in 1992 (production chain). In the former concept, primary activities of inbound logistics, operations, outbound logistics, production, marketing, and after sales services are separated from secondary activities such as planning, human resource management, technology development, etc. which provides support in the completion of these primary tasks, and this intra-linkages of activities are referred to as value chains by Porter (Kaplinsky & Morris, 2001). The term 'filiere' was also coined by French economists which is defined as "a system of agents producing and distributing goods and services for the satisfaction of a final demand" (Henderson, Dicken, Hess, Coe, and Yeung, 2002); but this concept was said to be more applicable to domestic value chains (Kaplinsky & Morris, 2001).

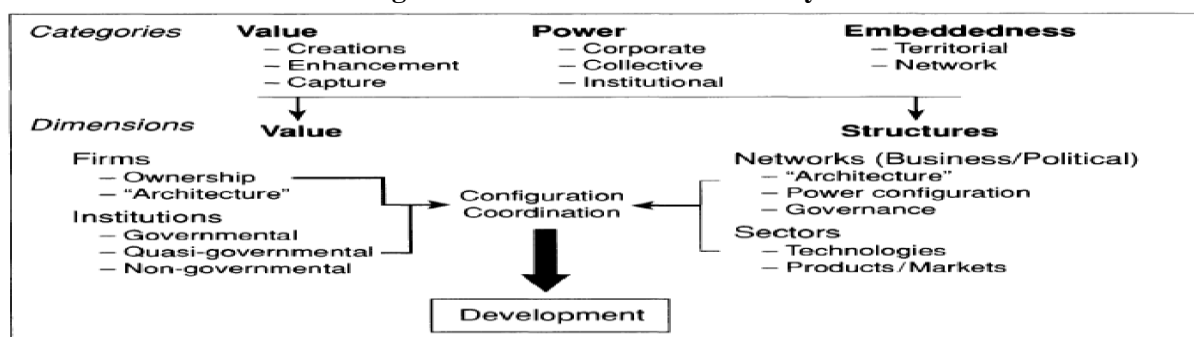
One of the prominent conceptualization of these chains was put forward by Gereffi and Korzeniewicz (1994) who presented 'global commodity chain (GCC)' as "consisting of a number of "nodes" that comprise the pivotal points in the production process: extraction and supply of raw materials, the stage(s) of industrial transformation, export, and marketing. Each node is itself a network connected to other nodes concerned with related activities; local, regional, national and world economies are seen as ever more intricate web-like structures of these chains." The main point was that the global economy has become increasingly integrated where different countries are continuously upgrading their industries in order to occupy distinct export niches. Thus, GCC includes "sets of inter-organizational networks clustered around one commodity/ product, linking households, enterprises, and states to one another within the world-economy" (Gereffi & Korzeniewicz, 1994).

The whole idea of these chains is to move a product from the stage of conception to its ultimate users. This is clearly reflected in the work of Hopkins and Wallerstein (1986: 159) (as cited in Gereffi & Korzeniewicz, 1994) which conceptualizes commodity chains as "a network of labor and production processes whose end result is a finished commodity." In terms of governance structure, there have been two types of commodity chains: producer-driven commodity chains and buyer-driven commodity chains. Former set of chains are those where large manufacturer coordinates the entire production network, both upstream and downstream, and this is more prevalent in case of capital and technology intensive industries such as automobiles, aircrafts, computer, heavy machines, etc. While, the latter set of chains are prominent in labour-intensive industries like garments, leather, etc. In this case, large retailers and brand owners play important role in setting up of decentralised production networks, such that production takes place in Third World Countries as per specifications of the buyers located in developed countries (Gereffi, 1999), and such chains have been more aligned with 21<sup>st</sup> century trade. However, success in these chains depended on how the industry transforms from assembly of imported inputs to the full-package supply or Original Equipment Manufacturing, and further to the Original Brand Name Manufacturing (OBM) system (Gereffi & Memedovic, 2003).

Further, in their pioneering work, Henderson et al. (2002) and Henderson (2002) put forward the concept of 'global production network (GPN)' as a "conceptual framework that is capable of grasping the global,

regional and local economic and social dimensions of the processes involved in many (though by no means all) forms of economic globalization”. GPN has been thus defined as the globally organized “nexus of interconnected functions and operations through which goods and services are produced, distributed and consumed....Such networks not only integrate firms (and parts of firms) into structures which blur traditional organizational boundaries - through the development of diverse forms of equity and non-equity relationships - but also integrate national economies (or parts of such economies) in ways which have enormous implications for their well-being. At the same time, the precise nature and articulation of firm-centered production networks are deeply influenced by the concrete socio-political contexts within which they are embedded.” This process is highly complex as GPNs are not very territorially specific (Figure 1).

**Figure 1: Framework of GPN Analysis**



**Source:** Reproduced from Henderson et al. (2002) and Henderson (2002)

However, these approaches were, in fact, in converse with the ‘new regionalism’ literature which placed significant importance on local institutions and “their capacity to ‘hold down’ global networks (for overviews see MacLeod 2001a; Scott 1988; Storper 1997)” (as cited in Coe, Hess, Yeung, Dicken, & Henderson, 2004). The work of Coe et al. (2004) has been phenomenal in the field of facilitating and globalizing regional development. This study derived insights from above mentioned literatures and focuses on “the dynamic 'strategic coupling' of global production networks and regional assets, an interface mediated by a range of institutional activities across different geographical and organizational scales”. It explored how through this coupling process, the value is created, enhanced and captured which ultimately decides the development of a region. “Regional development is not just shaped by regionally specific institutions, but also by a variety of extra-local institutions (e.g. national, supra-national) that will impact on activities *within* a region” (Coe et al., 2004). Regional economies of scale and scope are only advantageous to the regions and transform in a slow manner; while the strategic needs of the trans-local actors positioned within GPNs keep on changing rapidly, and thus, when there exists complementary effect between the two, relational advantages of regions meet the needs of actors leading to regional development.

Overtime, the literature on international trade used the terms like ‘international production network’ or ‘global production sharing’ to highlight “the breakup of a production process into vertically separated stages carried out in two or more countries” (Athukorala & Menon, 2010). These terms are the outcomes of a new stream of thoughts: the fragmentation theory and new economic geography, mainly with respect to East Asia’s machinery sector. International production network (IPN) can be defined as “the organisation, across national borders, of the relationships (intra and increasingly inter-firm) through which firms conduct

research, development, product definition and design, procurement, manufacturing, distribution and support services” (Borras, 1996) (as cited in Gaulier, Lemoine, & Unal-Kesenci, 2007). Increasingly, wide product coverage of global production sharing and its rapid spread from developed countries of North (with mature industries) to the developing countries of South became the novel features of production networks (Athukorala & Nasir, 2012).

More importantly, above concepts show that trade in finished goods (like exchange of cloth for wine, as per traditional trade theory) has been replaced by trade in particular production process or tasks (for example, trade is between task of cutting and stitching, task of designing, task of branding, etc. in garment industry) which has become very prominent in the decade of 2000s (Nathan, 2010). Many terms have also been coined for IPNs such as ‘Global Supply Chains (GSCs)’ (see, UNCTAD, 2011; Baldwin, 2012) before finalising the term ‘Global Value Chains (GVCs)’ (UNCTAD, 2013; Banga, 2014). Cattaneo, Gereffi and Staritz (2010) mentioned that “GVCs encompass the full range of activities that are required to bring a good or service from conception through the different phases of production – provision of raw materials; the input of various components, subassemblies, and producer services; the assembly of finished goods – to delivery to final consumers, as well as disposal after use.”

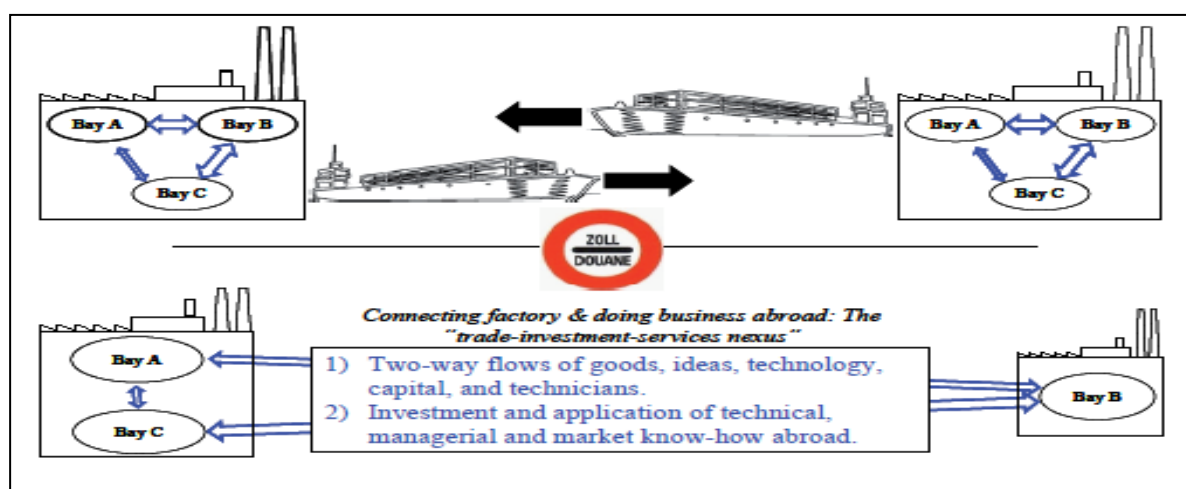
The activities propounded by international production networks or value chains began in electronics and garments industries in the late 1960s. These have gradually spread to other industries, namely, footwear, automobiles, television, radio receivers, office equipments, sewing machines, electrical machines, power and machine tools, camera, watches, printing, publishing, and ICT products (Athukorala & Menon, 2010; Athukorala, 2010; Athukorala, 2014). Thus GVCs have been mesmerized by growth in the manufacturing sector. Services also started being increasingly traded in GVCs, but level of offshoring in these activities remained much less than that in manufacturing over many years (OECD, 2008). Athukorala and Nasir (2012) show how the manufacturing sector led to greater integration of Asian developing countries in GVCs during 2000s as: “over the past four decades, the nature of world trade has been transformed by the emergence of developing countries as major exporters of manufactured goods....manufacturing trade of developing countries is heavily concentrated in developing Asia. Developing Asia’s share in world manufacturing exports increased from 11.1% in 1996-97 to 33.8% in 2009-10.” China has become the epicentre of GVCs in Asia (World Economic Forum, 2012; Banga, 2014) by producing and exporting varied range of manufactured goods, particularly labour-intensive and electronics products. In fact, the most successful yet complex international production and distribution networks have been established in the machinery industry of East Asian and South-East Asian countries (Kimura & Ando, 2005; Ando, 2006; Haddad, 2007; etc.). But South Asia remained one of the least integrated regions in GVCs because of high exports of natural resources and services which are not used much for creating exports in other countries (UNCTAD, 2013).

However, several countries particularly Asian have entered the GVCs by participating in textiles and apparel value chains. A number of studies, namely, Gereffi (1999), Gereffi and Memedovic (2003), etc. have accordingly been undertaken to understand how the advanced countries of West shifted their production in textiles and apparel industry to developing Asian economies particularly since 1950s and how this shift led to the industrial upgrading in these economies in later years. The study of East Asian model, North American model, as well as Mexican and Caribbean Basin model show how and why the industrial upgrading and innovation occurred in global apparel value chains (Gereffi & Memedovic, 2003). Gereffi, Spencer and Bair (2002) particularly highlights how the apparel industry in North America developed and how it impacted the job and wage level in different countries as well as mentions the changes in industry

that occurred in the post-NAFTA period. Gereffi (1999) emphasized the role of retailers, marketers and branded manufacturers in apparel industry. It also shows how the experience of industrial upgrading in Asia can influence the apparel sourcing in North American commodity chains. Thus, textiles and apparels and machinery have been the leading industries in the functioning of GVCs (Ando & Kimura 2005; Kimura, 2006). East Asia and South-East Asia have maintained highest participation in GVCs.

To summarize the changes mainly since 1970s-80s, the spread of GVCs has not just been a geographical spread, but there have many qualitative transformations also which deal with where and how the production, distribution and consumption of goods and services are taking place. As compared to the early 20th century when there was a shallow integration in international economies with more of arm's length trade transactions, in the recent decades there has been deeper integration mainly due to rising intra-firm trade which is organised in the complex global production networks (Dicken, 2011). A product came to be made globally by various countries based on costs and quality considerations. Figure 2 illustrates the distinction between trade of 20<sup>th</sup> century and 21<sup>st</sup> century (Baldwin, 2011; World Economic Forum, 2012). This is also undergoing changes post-crisis period due to digitisation, which will be discussed further in this section.

**Figure 2: 20<sup>th</sup> Century Trade (Upper Part) and 21<sup>st</sup> Century Trade (Lower Part)**



**Source:** Reproduced from Baldwin (2011)

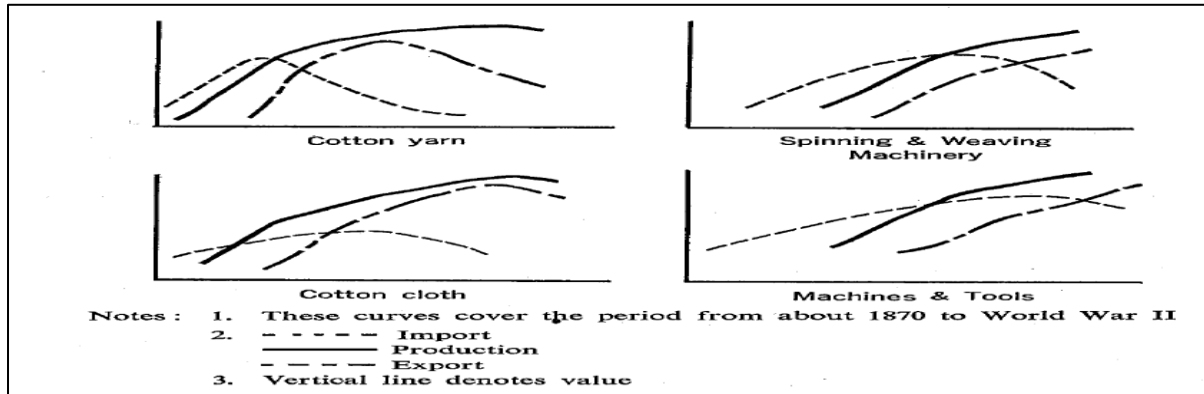
There is no particular trade model or theory which explains all the features of GVCs. At various points in time, different theories have been developed describing formations of value chains. As development of GVCs began in EA countries around 1950, followed by SEA countries, the theories till last decade largely focused on the development and spread of value chains and production networks in these countries. However, these theories also effectively explain the general working of value chains on the global platform. At the same time, they have raised questions regarding traditional trade theories, namely, Ricardo's theory of Comparative Advantage and Heckscher-Ohlin (HO) theorem which postulates that countries trade finished products among themselves (Ando & Kimura, 2009). Ricardian theory states that the country has comparative advantage in production of any commodity which it can produce at a lower opportunity costs as compared to other countries. It specializes in the production of such commodity and exports this in exchange for those commodities in which other countries have comparative advantage and its comparative disadvantage is higher. Here, the differences in technologies were of crucial importance. However, H-O

theorem assumed technology as same, but considers the differences in factor cost prices. The country exports the products which use its abundant factors/ resources, while imports those products which use its scarce factors. That is, the labour-abundant country produces and exports the products which require use of labour-intensive techniques, and the capital-abundant country exports capital-intensive products. As per these theories, trade is said to follow the typical pattern of North-South trade where developed countries of North supply finished products to developing Southern countries in lieu of their primary products. But, this has not been true in the current GVCs scenario.

The most prominent theory in explaining spread of GVCs has been the “Flying Geese Theory of Development” which was formulated by Akamatsu Kaname in 1930s to show how the developing countries may develop in a short span of time. This theory was set out in the context of Asian economies and its importance started to grow after World War II. It was originally framed with regard to Japan’s clothing, machine and tools industries. It was considered similar to the western theory of 1960s known as “Vernon Product-Cycle Theory” which focused on how individual firm decides to locate its production facilities of a particular product in its life cycle. This theory stipulated that there are three stages of product development: new product, maturing product, and standardized product (Vernon, 1966). Advanced countries develop new and innovative products and export them to other countries. When these products become mature and get adapted in global markets, the advanced countries shift their production location to other industrialized countries. Finally, when the stage of standardized product is reached, the production location moves to developing countries. The products are then imported by the countries that initially produced them. The theory thus presented how producers of developing countries could undertake production of standardised products and become their exporters. But Vernon product life cycle theory had a very micro-economic approach opposed to macro-economic approach of flying geese theory. This also does not show how the economies could upgrade their development stages (Schroepel and Mariko, 2002).

On the other hand, the *flying geese theory of industrial development* showed how less-advanced countries develop in a short time-period after entering into the trade relations with advanced western countries. It explained three sequential stages of development: imports, production and exports of manufactured goods. That is, less-advanced countries import relevant labour-manufacturing industries from advanced countries and start the production in home markets. These industries deal with low-value and simple items, including labour-intensive textile goods or manufactured consumer goods. As domestic demand for consumer goods rises in less-advanced countries, the required raw materials and technologies are imported. Over time, capital goods such as machinery are also imported. As a result, a stage arrives when domestic goods industry develops and starts to export. Imports start to fall over time in relation to higher rise in exports. Meanwhile, indigenous production also begins for capital goods used in the manufacturing of domestic consumer goods. When domestic consumer goods industry reaches to the standard of advanced countries, its exports of consumer goods decline. Labour-intensive industries are then relocated to other less-advanced countries. In the later stages, domestic industrialization in capital goods takes place leading to rise in their exports. This way, one country leads the process of development by acting as ‘goose’ and triggers the process of economic growth in other less-advanced countries (Figure 3). The curves of production and exports move beyond the curves of imports in a lesser time in case of consumer and crude products as compared to capital and refined products (Akamatsu, 1962; Korhonen, 1994; Schroepel and Mariko, 2002).

**Figure 3:** Process of Flying-Geese Theory of Development

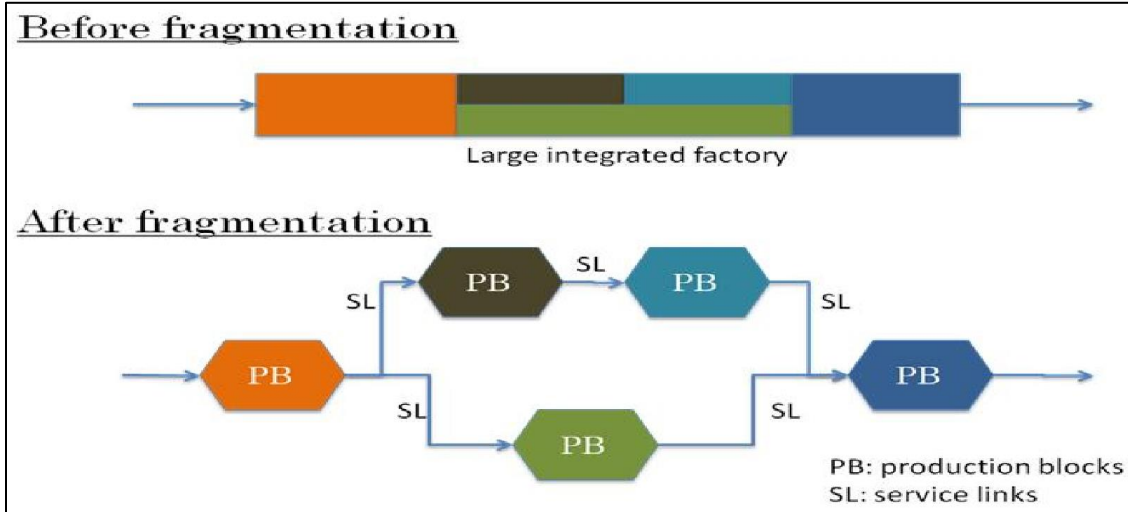


**Source:** Reproduced from Akamatsu (1962)

The above theory explained the development of GVCs in Japan and other East Asian economies around 1960s and 1970s. But in the later years, when in machinery industry particularly, the production processes became distributed among different countries, with parts and components being produced in one country, and assembled or exported by another country, a new theory emerged in 1990s to explain the phenomenon, which was the “Fragmentation Theory”. This was accompanied with emergence of a new wave of research as “New Economic Geography” (originally put forward by Paul Krugman). These theories provided useful explanation for understanding the IPNs developed in EA and SEA countries.

In original sense, *fragmentation* refers to the phenomenon where production processes of a firm are separated into production blocks (PBs) and then relocated to far-flung regions which have varied locational advantages, with the ultimate aim of reducing total costs of production. This concept was advocated by Jones and Kierzkowski (1990) as explained in Figure 3, thereby assuming that a large factory was placed (say, in an electronics industry) which integrates all the upstream and downstream production processes at a single location, but these processes actually differ in terms of technologies, factor inputs requirements, etc. which eventually makes their fragmentation inevitable (Kimura, 2009). All these fragmented PBs are connected by service links (SL) costs, that is, all the costs relating to transportation, telecommunication, coordination, etc.

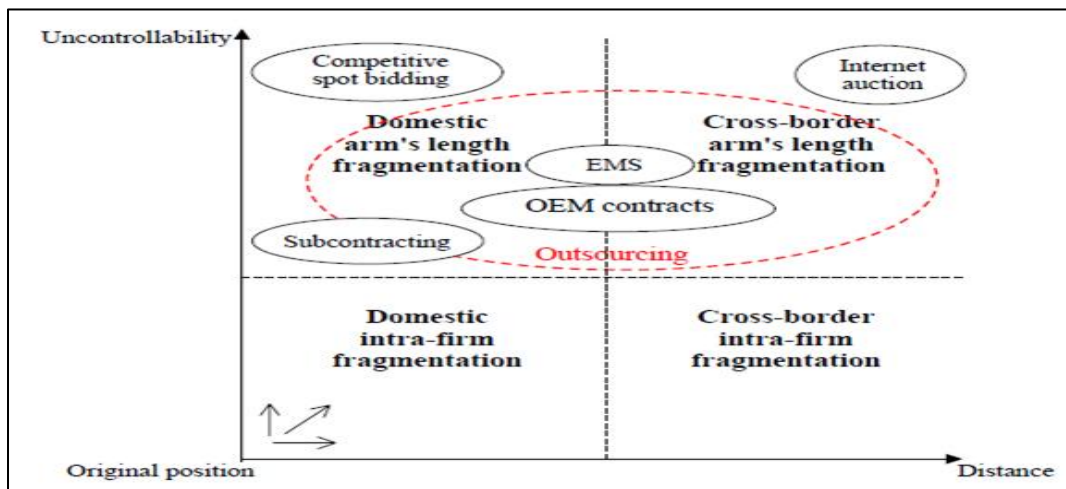
**Figure 4: Simple Version of Fragmentation Theory**



*Source:* Reproduced from Kimura (2009)

The above phenomenon is reflected in one of the well-known example of intra-firm fragmentation where there has been cross-border production sharing between the U.S. and Mexico on the basis of lower wages and SL costs in particular. The American firm had its affiliates located in Maquiladora (Mexico) which assembles the parts/components, exported by parent firm to them, and then sends back the finished products to the US headquarter. But this simple illustration could not capture highly sophisticated GPNs which actually built up in East Asian countries where both the intra-firm as well as arm's-length trade transactions took place in a very complex manner (Kimura & Ando, 2005; Ando & Kimura, 2009). For better understanding of these complexities in fragmentation activities, Kimura and Ando (2005) proposed the concept of two-dimensional fragmentation (as depicted in Figure 5).

**Figure 5: Two-Dimensional Fragmentation Theory**



*Source:* Reproduced from Kimura and Ando (2005)

The figure captures the original idea of fragmentation on the horizontal axis which was based on the geographical distance of fragmented PBs (FPBs) which begins with original position and then relocation within the domestic territory, until PBs cross the boundary of the nation as depicted by dotted line in the middle of axis. After this point, the fragmentation becomes cross-border in nature. The vertical axis represents controllability of a firm over fragmented PBs and dotted line in the middle of axis acts as boundary of firm. Below this line, there is intra-firm fragmentation, which may occur within the country or in different countries, and similarly, above the line there is arm's length (inter-firm) fragmentation which also could be domestic or cross-border (Kimura, 2009; Ando & Kimura, 2009). But all such kinds of fragmentation are feasible only when total production costs reduce which is combination of production cost per se and SL costs. To summarize, production costs per se decreases because of location advantages of the place where FPB is located and counterpart's ownership advantages. On the other hand, SL costs escalate when there is rise in geographical distance and loss in controllability of corporate activities of a firm. It is mentioned in the theory that SL costs in arm's length transactions are very sensitive to geographical distance, especially in case of products which require just-in-time system, and thus PBs are concentrated in a particular geographical location and costs are saved. Thus, along with fragmentation, agglomerations are also formed as happened in the case of East Asia.

Ando and Kimura (2009) argue that long-distance transactions are mainly intra-firm, while transactions in local markets are predominantly arm's length thereby reinforcing the creation of agglomeration. This observation has been further supported by Kimura (2009) who brought out the concept of four layers transactions in production/distribution networks, with respect to machinery industries, namely: 1<sup>st</sup> layer (local); 2<sup>nd</sup> layer (sub-regional); 3<sup>rd</sup> layer (regional); and 4<sup>th</sup> layer (entire world). It is stipulated in the theory that arm's length transactions are predominant in the 1<sup>st</sup> layer (local), while intra-firm transactions occupy a larger share in 3<sup>rd</sup> layer. Further, there are various factors affecting the choice of these transaction layers, including network set-up costs, SL costs, and intimacy of inter-firm relationships. Geographical distance remains a decisive factor, that is, short distance transactions are preferred when close monitoring and communications are required.

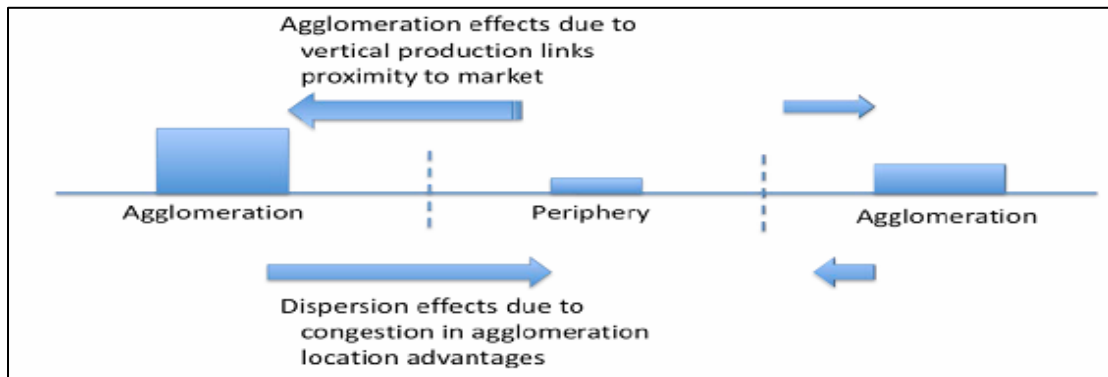
The theory provided important insights about the development strategies that have been followed by countries in which both the forces of fragmentation and agglomeration are successfully used. It stated that a country at the early stage of development should join the GPNs by hosting production blocks (PBs) which move out of congested agglomerations located in the neighbouring regions. The transactions by invited PBs occur mostly in the second layer. But when developing countries reach higher stages of development, they need to develop big industrial agglomerations, where transactions in the first layer become important. All this was based in the local and regional context, but while connecting with counties outside a particular region, long-distance transactions are essential which refers to the third layer.

Thus, industrial agglomerations are essentially important part of fragmentation theory as this helps to offer more opportunities for local firms and entrepreneurs to penetrate into GPNs developed by MNEs, and also foster transfer of technologies into the developing countries. To support the fragmentation theory, "New Economic Geography theory" claimed that whenever the trade costs decline owing to various measures of trade facilitation and development of logistic infrastructure, this may lead to either more concentration or more dispersion of economic activities. Positive effects in fragmentation lead to concentration forces, as mentioned above. But, negative agglomeration effects or congestion effects in industrial agglomerations drive the dispersion forces as a result of which some of the economic activities located therein, typically labour-intensive activities, initiate the process of searching for and moving to new production sites in the peripheries (Figure 6). This is crucial from the perspective of lagging-behind countries or regions, as then



they get the chance to attract PBs moving out of congested agglomerations, but the peripheries are required to improve their investment climate and infrastructure facilities, along with existence of significant location advantages and reduction in SL costs (Kimura & Obashi, 2009). The crux of this theory put forward by Krugman (1991) states that “emergence of a core-periphery pattern depends on transportation costs, economies of scale, and the share of manufacturing in national income.”

**Figure 6: Agglomeration and Dispersion Forces**



*Source:* Reproduced from Kimura and Obashi (2009)

However, increased fragmentation of economic activities in GVCs need to be managed and governed in a particular manner so that the gains from trade are distributed evenly and developing countries could connect with chains in a better manner (Gereffi, Humphrey, & Sturgeon, 2005; Humphrey & Schmitz, 2001). Accordingly, the “Theory of GVCs Governance” was formulated in the mid-2000s, by Gereffi et al. (2005), to show how different value chains are governed. It provides five types of GVCs governance structures, namely, markets, modular, relational, captive and hierarchy, which are differentiated by degree of explicit coordination and power asymmetry between the buyers and the suppliers in the value chains. The conditions under which these structures would arise ultimately depends on three key variables: (i) the complexity of information and knowledge transfer, relating mostly to product and process specifications, in inter-firm transactions; (ii) the extent to which these complexity can be codified, that is, degree to which such information and knowledge can be transmitted easily between various parties involved in the transaction; and (iii) the capabilities of the supply-base, that is, whether actual and potential suppliers have the required ability to meet the requirements of buyers in the transaction (Gereffi et al, 2005). Figure 7 shows various combinations of these factors determining governance of GVCs.

In case of markets structure, there are simple classic inter-firm transactions like in any market, where exchanges are solely based on prices with very little interaction between buyers and sellers. When codification ability moves to complex products, then comes the modular structure where suppliers are competent enough to supply full packages, and there is greater interaction between lead firms, suppliers and customers, as compared to market chains. Along with prices, other information also flows in high volume in inter-firm linkages. In both the GVCs structures, the costs of switching to new partners are low. In relational value chains structure, buyers and sellers exchange tacit knowledge with each other, and the suppliers are extremely competent which forces lead firms to outsource. There is frequent face-to-face interaction between the parties which require mutual trust and dependence which are generally regulated through reputation, social and spatial proximity, family ties, etc. In this case, there are high costs involved in switching to new partners.

**Figure 7: Factors Affecting GVCs Governance Structure**

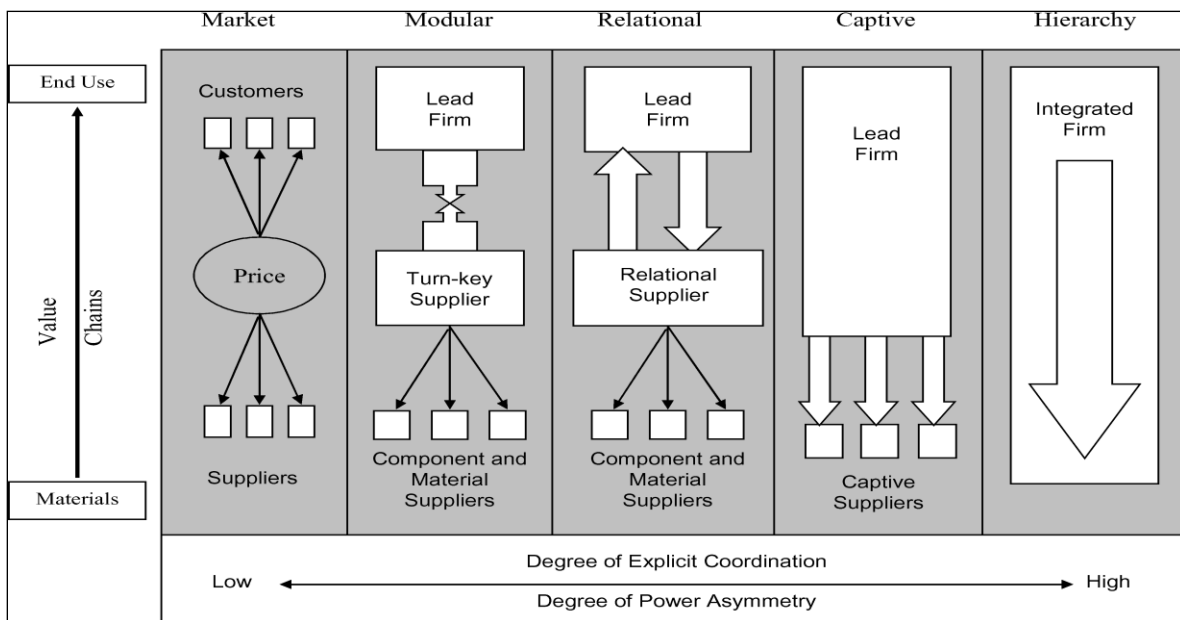
Governance type	Complexity of transactions	Ability to codify transactions	Capabilities in the supply-base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	↑ ↓ High
Relational	High	Low	High	
Captive	High	High	Low	
Hierarchy	High	Low	Low	

There are eight possible combinations of the three variables. Five of them generate global value chain types. The combination of low complexity of transactions and low ability to codify is unlikely to occur. This excludes two combinations. Further, if the complexity of the transaction is low and the ability to codify is high, then low supplier capability would lead to exclusion from the value chain. While this is an important outcome, it does not generate a governance type *per se*.

**Source:** Gereffi et al. (2005)

In case of captive value chains, products and specifications are complex, but suppliers' competence is low which require greater intervention by lead firms in the chains. Suppliers are captive in narrow range of activities such as simple assembly; while lead firm concentrate on core activities of design, logistics, etc., but at the same time it provides enough resources and market access to suppliers and helps in upgrading of their production capabilities. This way, supply chains of lead firms are strengthened. In hierarchy structure, lead firms are vertically integrated undertaking all the manufacturing in-house. They control all the resources and intellectual property and thus, tacit knowledge is exchanged between value chain activities (see Figure 8). This type of GVCs structure characterises intra-firm trade where integration is basically through FDI (Gereffi et al., 2005; Keane, 2014).

**Figure 8: Theory of GVCs Governance Structure**

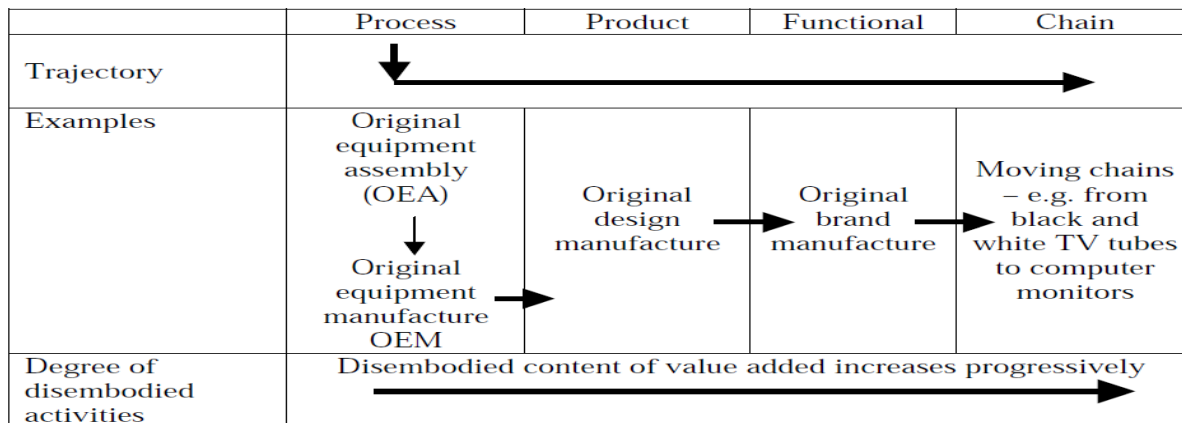


**Source:** Gereffi et al. (2005)

However, emerging economies face number of competitive pressures while integrating into GVCs. As a result, the firms in these economies need to move to those activities in production and in services which involve higher barriers to entry and provide greater rents (Kaplinsky & Morris, 2001; Humphrey & Schmitz, 2002). That is, they continuously tend to upgrade and deepen their capabilities in GVCs in order to reach higher value added activities and acquire competitive market shares. Accordingly, Kaplinsky and Morris (2001) identified the “Theory of Upgrading in GVCs”. The theory provides four trajectories which firms in emerging economies must pursue for upgrading in value chains. These are - (i) process upgrading, which means efficient transformation of the inputs into output using superior technologies; (ii) product upgrading, which implies production of more sophisticated products or faster improvements in the existing products; (iii) functional upgrading, which implies acquiring of new functions within a particular chain such as shift from production activities to designing or marketing; (iv) chain upgrading, which means moving to a new chain or new productive sectors such as shift from manufacturing of televisions to laptops (Gereffi, Humphrey, Kaplinsky, & Sturgeon, 2001; Kaplinsky & Morris, 2001; Humphrey & Schmitz, 2002). However, it is argued by Kaplinsky and Morris (2001) that there is hierarchy of upgrading in GVCs (see Figure 9).

In other words, firms in developing countries mainly enter GVCs through simple activities of assembling of parts or inputs provided by advanced countries. They initially indulge in improvement of processes as part of upgrading. As their capabilities rise, they first move to manufacturing of products and later to the functions of designing or marketing. That is, they build their own brands over time. As their knowledge level and capabilities rises within a chain, they gradually move to a new chain. The value added content emanating from disembodied activities rises as the firms move from one trajectory to another (Kaplinsky & Morris, 2001; Kaplinsky, 2013).

**Figure 9: Upgrading in GVCs**



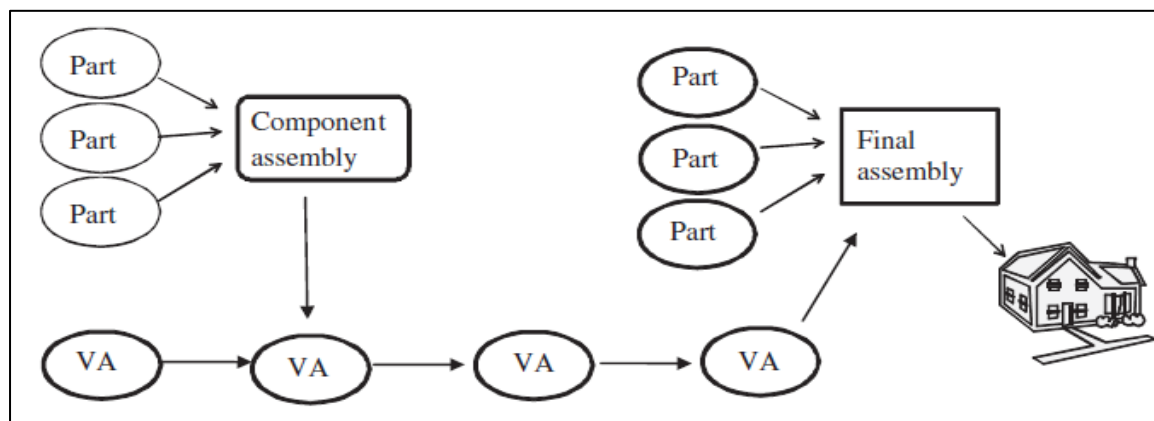
**Source:** Reproduced from Kaplinsky and Morris, 2001

The initial theories revolved around trade-nexus and then in around 1970s and 1980s, this shifted to trade-investment nexus and in post 1990s, economic development is based on ‘trade-investment-services nexus’ (Baldwin, 2011; World Economic Forum, 2012), where along with the trade of intermediate inputs and goods, foreign investments are effectively utilised and services are used to enhance production activities. Recent theories are largely based on this nexus. However, Baldwin (2012) extended this to include intellectual property (IP) rights, that is, "trade-investment-services-IP nexus". This shows that trade is not only restricted to parts and components, and overseas investments in different production processes,

training, technology etc., but also in the use of various infrastructure and logistics services to coordinate dispersed production activities, such as, telecom, internet, air cargo, finance for trade, custom clearances, etc. Most importantly, 21<sup>st</sup> century trade encompasses flow of managerial and marketing know-how, that is, formal IP and tacit knowledge, across the borders, and this is one of the decisive factors for value-added gains from trade.

Importantly, Baldwin and Venables (2013) brought out new insights on the concepts of fragmentation, offshoring and particularly new economic geography by developing “Theory of Snakes and Spiders”. It explains how the fragmentation and offshoring actually takes place in the world economy and displays the various forms that different GVCs take. On one hand, there are centrifugal forces based on differences in international costs, owing to different factor intensities of different stages, which result in dispersion of economic activities or unbundling; and on the other hand, there are co-location/ agglomeration forces or centripetal forces which bind different activities together, based on existence of unbundling costs (costs of coordination, management or shipping, etc.). These two forces interact with each other to decide where and how different stages of production will be located. Location of and linkages between such stages ultimately depend on the engineering of production process or technology, which distinguishes between two extremes of production processes, that is, spiders and snakes (Figure 10).

**Figure 10: Theory of Snakes and Spiders**

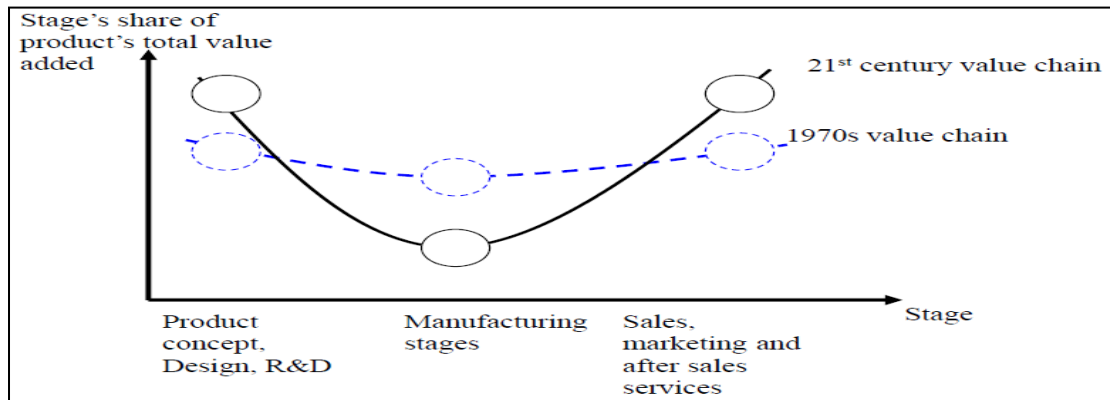


*Source:* Baldwin and Venables (2013)

‘Snakes’ refers to a linear process where goods move in a particular sequence from upstream to downstream and value added is done at each stage. But, when different parts come together for assembly, it is called ‘spider’, and this may not always be final product. Simple example to explain: process of raw cotton to cotton yarn to cotton fabric to a cotton shirt is snake, while adding buttons to shirt is spider. That is, a spider could be a part of snake, or different snakes may form one spider, and all the production processes are combination of these two. That is, products in GVCs can undergo transformation at any stage. One of the important implications from this theory has been that as costs of unbundling falls, initially offshoring happens in a slow manner, but over time, it may move rapidly with relocation of key stage like of assembling and of many parts producers. Offshoring is not a continuous process, but the interaction between above mentioned forces leads to its overshooting. However, when advancement of ICT further weakens co-location forces, the production of offshored parts tends to go back to its low-cost location, that is, process of reshoring (Baldwin & Venables, 2013; Keane, 2014). This is what proliferation of digital technologies (DT) and Industry 4.0 may lead to in next 4-5 years.

To summarize, there has been famous Smiley Curve (Baldwin, 2012) to depict the changes in the value chains which transformed drastically from 1970s to 21<sup>st</sup> century (Figure 11a).

**Figure 11a: Traditional Smiley Curve of GVCs**



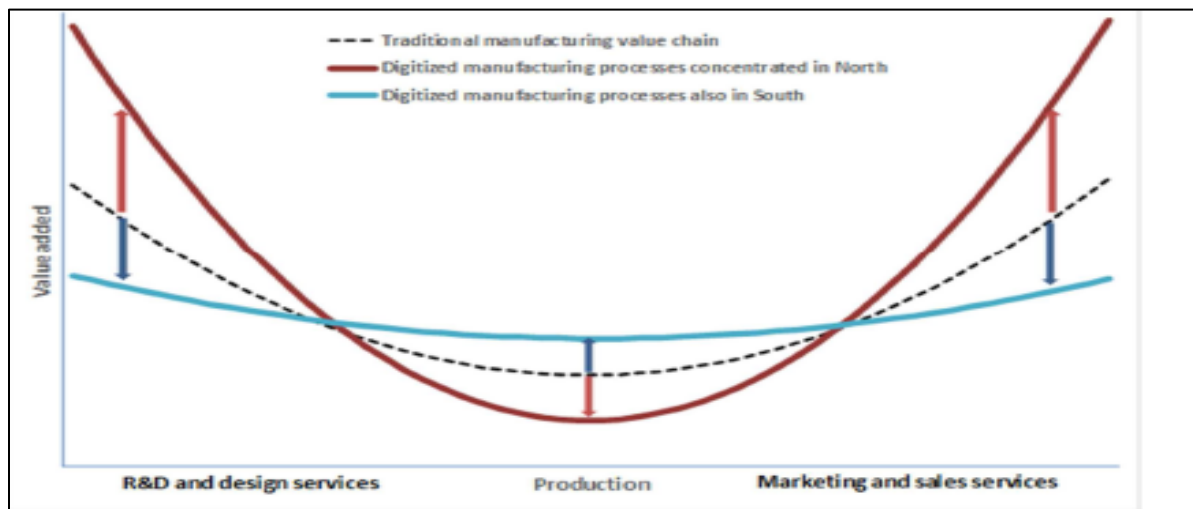
*Source:* Reproduced from Baldwin (2012)

Initially, the smile was narrow showing that value added and gains generated by developing world were not in much difference with those generated by developed countries. But, as GVCs have progressed, the smile became very deep, where manufacturing activities came to be located at the bottom of the curve with least share in total value added, while the activities of product design and R&D (pre-manufacturing) as well as sales, marketing and after sales services (post-manufacturing) started to incur higher share of value-added and gains as they get to be located at the extreme ends of value chains. Presence of higher-skilled workforce and ultimate consumers required at these two stages has been easily traced in developed nations. However, developing countries or LDCs have remained still largely stuck in the manufacturing and assembling stage, offshored to them by developed countries. Banga (2013) argues that “if most of the rents in GVCs come from shifting to services component of manufactured exports, developing countries may stand little chance in maximizing gains through functional up-gradation in the value chains.” This has been major concern that can affect the future growth of these countries in global production and trade (Baldwin, 2012; Banga, 2014).

Kaplinsky and Morris (2001) further postulated that value chains lead to creation of different types of economic rents which arises due to possession of scarce factors and presence of high barriers to entry such as in the form of IPRs, which are provide more rents to firms located in North (UNCTAD, 2018b). Over the years, many developing countries have acquired greater competence in development of their industries. But this has resulted into the decline of barriers to entry and escalation of competitive pressures in the case of production activity. Thus, economic rents tend to be large in the pre- and post-production activities; however, high entry barriers exist even in some activities with production chain. It has been argued that higher rents mostly depend on firm’s control over disembodied or intangible activities in the GVCs (Kaplinsky & Morris, 2001). However, the way now, after crisis, digital technologies (DT) are playing a critical role in industrial production and accessing technologies, inviting investments, following standards, etc. is definitely changing the shape of traditionally prepared smiley curve. Mayer (2018) presents much refined smiley curve incorporating effects of digital economy (DE) given in Figure 11b. In this case, production stage after factoring digitalisation includes effects of industrial robots; pre-manufacturing includes benefits of additive manufacturing/3D printing; while CAD/CAM technologies, Internet of Things

(IoT) related technologies such as cloud computing, big data analytics, etc. are to be at all the three stages of prior, post and during production. To explain, in post-manufacturing stage, use of such technologies can raise effectiveness of production, logistics, management of inventory and of sales and after-sales services due to higher and easy interaction between firms and its customers. In pre-manufacturing stage, DTs can help firms to make more flexible designs that too in limited time at lower costs. In manufacturing stage, usage of robots can help to escalate products' quality standards for lead firms located in advanced countries where value chains of robotics is already advancing. As economies of North are said to be higher on DE and AI thereby gaining higher value-added shares at higher ends, thus the smiley curve tends to become deeper for North side post-DT. They also use strict standards and more advanced technologies and have strong applicability of IPR. Also, they are likely to replace labour by developing more robots to compensate the labour-intensive manufacturing that has been offshored to developing nations in South, thus making much more deep U as compared to the traditional smiley curve. There is a large possibility to have digitalization and robotization to remain largely confined to the developed world. On the other hand, much flatter curve is expected than traditional smiley curve in the Southern hemisphere, with gains likely to become lesser for them in the form of value added in pre- and post-production zones. That is, DE will revolutionise the manufacturing undertaken in value chains (UNCTAD, 2018b), where robotization has already progressed much, especially since 2010, while additive manufacturing is growing rapidly but at nascent stage. However, the question arises how far anticipated digitalised curve can resolve the existing anxieties between the developed countries for de-industrialization and the developing countries having fear of thin industrialization (Mayer, 2018), as depicted by traditional curve.

**Figure 11b: Smiley Curve after factoring into Digital Economy aspects**



**Source:** Re-produced from the study of Mayer (2018)

Importantly, UNCTAD (2018), Banga (2019a) show growing online trade of digitizable products, but also widening 'digital divide' in the exports of manufacturing items between developed and developing countries. WTO (2018) shows that due to technological breakthroughs, the share in global trade could rise for latter. However, challenges are also greater for them (say, for India when compared with China) in terms of weak digital infrastructure to support trade activities, low knowledge diffusion as well as capacities in the field of digital economy, etc. (Banga, 2019b; UNCTAD, 2018). On the other hand, developed



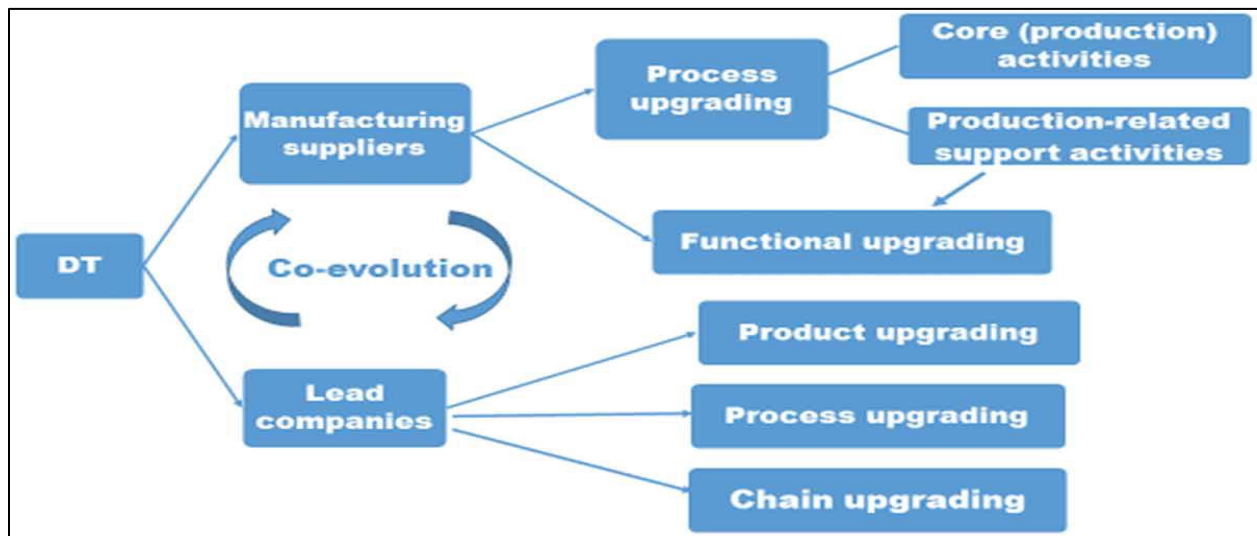
economies mainly US and EU have been able to invest heavily in advanced digital infrastructure which has led to more usage of AI, robotics, IoT, remote additive manufacturing/3D printing, etc. This has helped them to bring out innovative and efficient products and services at the global platform, improve just-in-manufacturing and logistics costs (Meltzer, 2018).

Brynjolfsson, Hui, and Liu (2018) display some direct and growing effects of AI on productivity and international trade activities. This has used the case of introducing AI-based eBay Machine Translation to show rise in US exports on eBay by 17.5 per cent. On the other hand, Goldfarb and Trefler (2018), who looks at various features of AI with respect to scale and knowledge creation, stress on greater need for exploration in this new field to get full understanding of AI's effect on trade. In short, existing literature maps the future opportunities for growth and advancements in international trade due to AI. At the same time, they highlight challenges that even developed countries are facing, for instance, greater protectionist measures have prevented many big US firms (including Google, Amazon) from entering Chinese markets, and this has in fact propelled China to develop high AI capabilities (Goldfarb & Trefler, 2018). On one hand, AI is likely to create new industries as well as boost services-led economic growth (Meltzer, 2018). WTO (2018) also shows impact in terms of lowering of trade costs, reallocation of production tasks from labour to capital which is likely to increase income, as well as growing servicification process in manufacturing by using more of ICT services.

Furthermore, Banga (2019b) also stresses that rising digitalization and application of AI can affect countries at all the stages of value chains, that is, some existing GVCs could become obsolete, some may reorganize, or some new ones may emerge. Smart manufacturing could be developed as a positive sign using highly specialized pre- and post-production services (R&D, design, data analytics) with more specific participation of countries (Meltzer, 2018). To summarize, Banga (2019b) highlights that “Even though reining in the fast-growing super platforms and big tech firms is a challenge for developing countries, these platforms are also opening access to new markets and exposing domestic consumers to new products and producers through e-commerce. Further, digital technologies like robotics and 3D printing are increasingly being used in the production stage. This is creating opportunities for developing countries to upgrade their position in GVCs, as a higher amount of digital content can add value to their exports. However, it also heightens risk.” On AI, this study shows rising investments and advancements by China along with US, while the same being at a very low scale in developing countries like India. How well countries use the robots in industrial production due to rising automation and AI technologies will be one of the major indicators of manufacturing trade competitiveness in future, as highlighted by this study. Further, due to increasing digital divide, the benefits of DT may be taken up by few winners. With respect to utilizing Industry 4.0, “most governments are still in the early stages of developing policy frameworks, and international coordination is similarly nascent.” (World Economic Forum, 2019). Meltzer (2018) presents that increased automation could lead to greater job losses for low-skilled people and those in manufacturing line, which in a way relates to the analysis of digitalized smiley curve as discussed by Mayer (2018). Research on this area is yet to be fully explored particularly for developing nations, including India which is one of the pioneers in the field of IT software and digital economy. In fact, Banga (2019c) show product upgradation and earning of higher value-added in GVCs due to competence in digital technologies in the context of Indian firms using empirical model. Baldwin (2019) mentions about digitally-driven trends of globalization and robotics called as globotics which will help initially to increase income and standard of living but over the years can lead to major disturbances on socio-economic fronts. There are also challenges to the implementation of smart factories, despite benefits in terms of lowering of costs, better quality, etc., but all this must be designed based on 3 guiding principles of “cultivating digital people, introducing agile processes, and configuring modular technologies” so that production can be digitally transformed to lead to a higher innovation path (Sjödin, Parida, Leksell & Petrovic, 2018).

Thus, there is clearly growing nexus of trade-investment-services-IPR-digital technologies-automation/ Industry 4.0 as a next mark in the field of GVCs and a more formal theory is yet to be developed which can suit all the regions mainly for Asian developing countries' linkages. However, using case of developed countries, Szalavetz (2019) provides one of the new theoretical framework as 'DT-driven Upgrading in GVCs' which is extension of Upgrading in GVCs theory based on DT and Industry 4.0 revolution (Figure 12). This framework states that rising digitalization in manufacturing does help 'factory economy actors' or manufacturing firms in process and functional upgrading (by improving efficiency of production as well as its related activities and by allowing suppliers to rise up to take higher-value added tasks or new knowledge-based activities). While, use of DT allows lead firms to expedite the product upgrading (in terms of development of new products), process upgrading (i.e., more efficiently deploying technologies and using innovation even at core activities such as planning, designing, controlling chains through use of big data, etc. along with production), and particularly chain upgrading (shifting to new activities or sectors via invention of new economic models based on DT and due to servitisation). As a result, upgrading will happen due to DT as per the framework, but "manufacturing subsidiaries and lead companies are poles apart regarding the specifics of digitalisation-induced upgrading...manufacturing suppliers' DT-driven upgrading will not diminish the gap between lead companies and manufacturing subsidiaries in terms of value generation." (Szalavetz, 2019).

**Figure 12: Framework to explain Theory of 'DT-driven upgrading in GVCs'**



*Source:* Reproduced from Szalavetz (2019)

#### 4. Changing Policies of Asia as per Trends

This section analyses the policy changes in Asian economies even in post-crisis period to understand how well foreign trade, investment and even industrial policies are revolving as per changing trends, patterns and theoretical framework or empirical findings, as mentioned in previous sections. Importantly, this reviews existing official policy documents of Asian countries, released by their governmental bodies, which includes policies, plans, strategies and related documents (see Table 3).



**Table 3: Main Policy Documents of Asian countries post crisis**

Country	Documents	Broad Objectives and Features
<b>By South Asian Countries</b>		
<b>India</b>	Foreign trade policy of India (2015-20)	Aimed at increasing India’s total exports to \$900 billion by 2019-20 and raising share in world’s trade from 2 to 3.5 percent; Replaced multiple schemes and introduced two focused schemes of Merchandise Exports from India Scheme (MEIS) and Service Exports from India Scheme (SEIS) for increasing exports of specified goods (high rewards for items with high domestic value-added) and services, respectively. Features cover more benefits to special economic zones (SEZs, reduction in Export obligations for domestic procurement of capital goods under Export Promotion Capital Goods (EPCG) scheme, Paperless working in 24*7 environment, support to e-commerce exports for handlooms, books, leather etc. through courier or foreign post offices; etc. Under policy regime, there has been introduction of Goods and Services Tax (GST), boosting MEIS rewards for labour intensive MSME sectors, launching single window contact point for exporters and importers (Contact@DGFT); creation of new Logistics Division, etc.
	‘Make in India’ Initiative and ‘Digital India’	To promote India as a manufacturing and investment hub with greater ease in doing business; To make India digitally empowered with higher internet speed, electronics manufacturing and digital literacy.
	Foreign trade policy of India (2009-14)	Special initiatives like market diversification, technological upgradation, and in the field of green products and technologies, and for exports from India’s North Eastern (NE) Region; number of schemes to boost exports as Focus Product Scheme (FPS), Focus Market Scheme (FMS) and Market linked FPS with addition of 26 new markets.
	Proposed New Industrial Policy (Yet to be released, likely to be in 2019-20)	Vision for enhancing role of industries in economic growth and enhancing India’s competitiveness on global platform; Cover long and midterm strategies of establishing full GVCs in selected sunrise industries of food processing, electronics, etc., promoting Indian brands globally with increased role of MSMEs and stable FDI regime to increase domestic value addition in manufacturing activities, etc. That is, policy lists outcomes in terms of developing ecosystem/action plan for adopting smart manufacturing, innovation, technology upgradation in line with Industry 4.0 changes in the world and for strengthening IT industry.
	National Manufacturing Policy, 2012 (to be subsumed into the New Industrial Policy, which is yet to be released)	Aims to increase share of manufacturing sector in country’s GDP to 25% by end of 2022 thereby improving its global competitiveness and promoting investments as well as creating about 100 million job opportunities. Features: Industrial growth and development of infrastructure on PPP basis with involvement of State Government. Setting up of National Investment & Manufacturing Zones (NIMZs) equipped with world-class infrastructure; Clean technologies and facilities for skill development in order to provide conducive environment for new businesses in manufacturing as well as boost exports.
	Consolidated FDI Policy (2017 and 2016 both)	For attracting more FDI into the country to support skills development; technology acquisition or upgradation and domestic base of domestic capital and to enhance India’s economic growth level. Prescribes general and specific rules for government approval on FDI (recent policy includes more liberalised rules).
	Science, Technology and Innovation Policy, 2013	Aims to link science, technology and innovation systems with economic agendas and set up world-class R&D infrastructure to emerge as the top leader in the field by 2020.
<b>Afghanistan</b>	IT Industry Development Policy, 2015-2020	Vision to develop a sustainable IT/ITeS industry in Afghanistan to create more wealth and job opportunities; seeks to boost domestic IT software /hardware products and services by building skilled workforce as well as by reinforcing national institutions in line with WTO to adopt global best practices.

		Aims “to ensure that all public sector procurements are made through domestic market software and hardware developers, manufacturers, assemblers and service providers, within the parameters of the international trade agreements.” Covers measures of improving infrastructure, covering skill gap in IT industry, enhancing skill levels, providing better regulatory framework, and for removing obstacles of low internet connectivity, lack of funds, etc.
	Afghanistan National Peace And Development Framework (ANPDF) 2017 to 2021 – (covers features of trade and investment policy)	One of the goals include “making Afghanistan an attractive trans-Asia shipment hub; diversifying export routes; and improving security by enhancing confidence and mutual benefit from stable trade.” Guides in building productive and self-reliant economy to make country exporters of many industrial goods to regional as well as global markets.  Outlines step for increasing foreign investments, enabling higher growth of SMES, and promoting domestic investments in physical infrastructure, human capital as well as technologies, supporting industrial parks, advancing RTAs and FTAs and associations with other regions and their organizations and prospects of joining the projects such as OBOR, making accessible easily the trade support services, strengthening logistics, etc.
	National Export strategy, 2018-22	Main action plan document to promote growth in export sector of the country; gives sector-specific measures for selected priority industries in terms of increasing production and competitiveness in international markets; Gives roadmap of improving capacities of traditional sectors, reducing reliance on imports and gradual diversification of exports with more value-added components; covering strategies for easy access to technology, quality inputs, land, etc., better coordination among different sectoral based value chains with improved business climate, skills, and compliance with international level standards; Also includes action plan for strengthening trade support services, access to finance, etc.
<b>Bangladesh</b>	Export Policy 2015-2018	Aimed to increase country’s export earnings to US\$ 60 billion by 2021; to increase access to market and diversify export basket; invite FDI in export-oriented industries and promote Bangladeshi products as brands; encourage production of traditional labor-intensive products; liberalize trade regime as per WTO; improve infrastructure, port capacities and upgrade the testing facilities as per international standards, increase stake of ICT and other services, produce high quality and higher-value added products for exports, encourage usage of world-class environment-friendly technologies, enhance linkages with other South Asia with special initiatives for exports to them and to other Asian countries.  Identified high-priority sectors for exports; upgrade export base, policy focusses on electronics, ceramic products, light engineering ones, value added processed marine products, silk, rubber, paper and coir products, handloom and handicrafts, tourism, and consultancy services.
	Export Policy 2018-21 (has been approved by the cabinet but not yet published)	Draft policy aims to enhance Bangladesh’s trade role in global markets and make its exports more competitive and dynamic with focus on high-end products such as denim, active pharmaceutical ingredients, etc.
	Import Policy 2015-2018	Focused on easing out imports of raw materials for use in exports purposes, provided rules for mentioning of country of origin on packaging of products as well as lists out new rules for prohibited/restricted imports.
	Outline Perspective Plan of Bangladesh (2010-	Visionary plan for promoting industrialization and digitalization in Bangladesh by 2021 with the target of reaching 10 percent annual GDP growth by 2021, increasing competitiveness of manufacturing sector in international markets with measures of product and market diversification, capturing opportunities in production GVCs and in low-cost

	2021): Making Vision 2021 A Reality’ (basic document for National Industrial Policy 2016)	labour-intensive industries; simulating flow of inward FDI; expanding ICT usage along with science and technology; etc.
<b>Pakistan</b>	Investment Policy, 2013-2018	To build conducive climate for doing business in Pakistan with reduction in costs, attracting more FDI, and promoting ease of doing business and more linking with trade and industrial policies.
	Trade Related Investment Policy Framework 2015-23	Draft framework aims to “attract investment in export-oriented manufacturing; to make the manufacturing sector more competitive in the international market as well as to enable domestic industries integrate into the global and regional value chains.
	New Industrial Policy, 2018 by Pakistan Business Council (PBC)	This policy seeks to “promote employment, value-added exports and import substitution” in order to reverse deindustrialization and promote ‘Make-in-Pakistan’.
	Digital Pakistan Policy, 2018	Vision to become a strategic enabler for an accelerated digitization eco system to expand the knowledge based economy and spur socio- economic growth”; Aims to promote sector-wise digitalization and e-commerce, increase exports of IT products, promote Inward FDI therein, accelerate adoption of new IT technologies including AI, IoT, cloud computing, etc. Involving educating youth, opening innovation centres, etc.
	Strategic Trade Policy Framework 2015-18 and STPF 2018-23 (Not yet released)	Aimed to enhance annual exports to US\$ 35 Billion; improve export competitiveness; transition from “factor-driven” economy to “efficiency-driven” and “innovation-driven” economy; increase share in regional trade”; with focus on features of diversification, market access, trade facilitation, etc. To further increase exports above US\$40 billion mark, the new framework is yet to be released.
<b>Sri Lanka</b>	Vision 2025	Aim to transform the country as the “export-oriented economic hub at the centre of the Indian Ocean” with competitive and rich economy.
	National Export Strategy of Sri Lanka 2018-2022	Provides a clear map to promote faster export growth to make Sri Lanka hub in the field with improved and transparent business policies, predictable environment, focus on trade facilitation and efficient logistics, export diversification via innovation and entrepreneurship with emphasis on sectors like IT, wellness tourism, electronics/electrical goods, processed food, spices, etc.  Aims to transform Sri Lanka into hub for high value-added exports, as well as to transform the country with rapid economic development by 2025 as well as with New Trade Policy. Focus is on skills and job creation, attracting investments, integrating SMEs into GVCs, etc.
	New Trade Policy, 2017	Aimed to liberalize trade regime with rationalisation of tariff and non-tariff barriers’ stimulating FDI flows; better foreign market access; improving trade facilitation with more economic integration; harmonisation in trade processes/documents via digitalization; increasing capacity of domestic firms to export and compete globally with special focus on SMEs; creating more jobs with help of trade growth in the country; upgrading R&D activities, etc.
<b>Bhutan</b>	Economic Development Policy 2016	Aims to become self-reliant by 2020 by promoting its organic brand; objective to “increase and diversify exports, promote industries that build the Brand Bhutan image.”; development of business and ICT infrastructure and encourage of investments.

<b>Nepal</b>	Nepal Trade Integration Strategy (NTIS) 2016	Aimed to increase share of trade in country's growth with exports promotion, to make conducive environment; emphasis on product development; strengthening of institutional capacity and infrastructure. Identified priority Export Potential Sectors as agro-based, craft and manufacturing-based (textiles, footwear and leather), and services (IT and tourism)
	Trade policy 2015	Aimed at promoting trade-led growth in Nepal in alignment with NTIS. Focus on promotion of exports with the aim "to strengthen supply-side capacity, and minimize trade deficit by increasing exports of value-added competitive products and services in the world market; to enhance access of goods, services and intellectual property to regional and world markets." Seeks to increase accesses to Nepalese goods as well competitiveness in exportable services and their linkages in RVCs and GVCs.
	Industrial Policy 2010 (new policy did not come in public domain after 2010)	Provided for industrial development with increased exports of manufacturing goods by enhancing their quality and competitiveness, protect IPRs and become attractive for getting investments in the country.
<b>East Asian Countries</b>		
<b>China</b>	Made in China 2025	Umbrella scheme of Chinese Government with focus on rapid and vigorous development and advancements in ten areas or industries, namely, new generation of IT industry (with efforts to improve designs of ICT equipment, master high-tech core technologies in computing and communication), high-end machine tools and robots (including AI and machinery learning, etc.), aerospace equipment, Marine engineering equipment along with high-tech ships, rail transit equipment, energy saving/new energy vehicles, power equipment, agricultural machinery, new materials, and biomedical and high-performance based medical devices.; Provide roadmap on improving China's industrial capabilities and competitiveness with focus on smart manufacturing, innovation, use of AI, robotics, etc.,  Objective to make China as manufacturing power by 2025 but enter the middle level of global manufacturing powers by 2035. The plan aims that: 'by 2020, 40% of core infrastructure components and key infrastructure materials will be guaranteed independently, and By 2025, 70% of the core basic components and key basic materials will be independently guaranteed, and 80 kinds of iconic advanced technologies will be promoted and applied.'" Among number of objectives, the plan seeks to "innovate the processing trade model, extend the domestic value-added chain of processing trade, and promote the transformation and upgrading of processing trade." The plan aims to formulate 'intelligent manufacturing technology' standards.
	Foreign Investment Law of China	Effective from January 2020 to provide feature of 'pre-establishment national treatment', 'negative list management' for foreign investments, and rules for protection of IPRs of foreign investors.
	New Generation of Artificial Intelligence Development Plan	Objective to bring China on the forefront of innovative economic centre of the world; to develop new generation of artificial intelligence theories, keeping at global level its technology system and applications, and to develop the industry into the high-end GVCs.
<b>Japan</b>	Japan Revitalisation Strategy - Toward the	Strategy to achieve target of GDP of 600 trillion yen; revolutionizing productivity, promoting investments in technologies and innovation for promotion of fourth industrial revolution along with consideration of Society 5.0 strategy and redesigning institutional system and R&D promotion in the wake of IoT and AI (covering measures such

	Fourth Industrial Revolution, 2016	as developing infrastructure and workforce for the same); creation high-quality health care industries using AI, IoT and new strategies for robot utilization;  objectives to capture international markets and inviting FDI, expansion of infrastructure for exports and promotion of cool Japan initiatives in the field of public-private partnerships, as well as promotion of Reform 2020 (covering next-generation systems for transportation, robotics, automatic driving technologies, etc.) and promotion of local Abenomics including improvement in services industry, enhancement in agricultural reforms, etc.
	Japan Revitalisation Strategy-Japan is Back, 2013	Plan for revitalization or strengthening of Japanese industrial base, strengthening business competitiveness even for special zones, emerging as IT-led society, and reforming employment structure’; Plan for creation of new markets with strategies for building next-generation and economical infrastructure set up; and plan for expanded global outreach which included features of developing and promote economic relations and cooperation via regional trade agreement such as TPP, RCEP, and encourage domestic globalization including inward investments
	Growth Strategy, 2019	To revamp Japan’s socio-economic system by utilizing general purpose technologies
	Foreign Investment Strategy 2018	To widen the scope of growth strategies and implement the measures under New Economic Policy package which are also on same lines of promoting Industry 4.0, Society 5.0 and use of digital technologies including AI, etc. Included features such as increasing efficiency of investments, promoting them in next generation computing and digital technologies (viz. edge-processing ones incorporating AI chips).
	New Economic Policy Package, 2017	Promote two agenda of ‘supply system innovation’ by implanting Society 5.0, and investments of SMEs and ‘human resources development revolution’ by 2020 which will boost productivity through use of AI, IoT, etc.
<b>Korea</b>	“Plan for the Fourth Industrial Revolution, 2017	Aims to create diverse new industries through intelligent technology innovation and strengthen major industries; secure world-class intelligent technologies, data, and networks accessible to all.  Government has brought I-Korea 4.0 as policy brand to further development in fourth industrial revolution with focus on ‘intelligence, innovation, inclusiveness, and interaction’.
<b>South-East Asian Countries</b>		
<b>Singapore</b>	Report of the Committee on the Future Economy, 2017	Outlines strategies such as to “deepen and diversify our international connections; acquire and utilise deep skills; strengthen enterprise capabilities to innovate and scale up; build strong digital capabilities; develop and implement Industry Transformation Maps (ITMs); and Partner each other to enable innovation and growth.” for higher growth.
	Research Innovation Enterprise 2020 Plan (released in 2016) -	Plan to continue commitment to research, innovation and enterprise to speed up economic growth, with focus on strategic domains: Advanced Manufacturing and Engineering (AME) covering robotics, digital manufacturing, automation, additive manufacturing, etc.; Services and Digital Economy covering AI and machine learning.
<b>Myanmar</b>	Myanmar Investment Promotion Plan 2016/17 - 2035/36	Aim to attain quality investments in Myanmar to become middle-income country by 2030 with focus on improved business climate, higher industrial linkages, etc., and investments in export-oriented industries in first growth path.
	Myanmar Sustainable Development Plan (2018 – 2030)	Aim at overall development of all sectors using economic model mainly manufacturing and for greater exports. Strategies include “reform trade sector and strengthen regional and international cooperation and linkages”; creating

		value chains and linking with buyers; enhancing linkages of domestic firms in RVCs/GVCs as well as improving custom procedures, regulations and logistic services.
	National Export Strategy 2015-2019 (first plan ever)	Aimed at quality infrastructure and recognition of country's products nationally and globally; strategies to renew standards and non-tariff measures as per international levels; upgrading trade facilitation regulations, etc.
	National Export Strategy 2020-2025 (to be formally released)	Aimed to boost Myanmar's exports for regional as well as global markets; encourage growth of MSMEs in new agro-processing sector, and gaining competitiveness constraints and improve efficiency of regulations with modernization.
	Myanmar Industrial Development Vision: Next Frontier in Asia: Factory, Farm, and Fashion (2015)	Aimed for industrial development; expansion of international connectivity and strategy to get more foreign capital (with focus high-value added items in the field of agriculture, fishery and forestry)
<b>Cambodia</b>	Rectangular Strategy for Growth, Employment, Equity and Efficiency: Building the Foundation toward Realizing the Cambodia Vision 2050 (2018)	Covers key aspect of 'Economic Diversification' with features of "improving logistics system and enhancing transport, energy and digital connectivity; developing key and new sources of economic growth; readiness for digital economy and industrial revolution 4.0" (involving further implanting of Further implementing Cambodia Industrial Development Policy 2015-2025, attracting more investments even in SEZ and building required physical and digital infrastructure).
	Cambodia Industrial Development Policy 2015 – 2025)	Objective of building market-oriented industrial economy with the vision of "transformation and modernization of Cambodia's industrial structure from a labor-intensive industry to a skill-based industry by 2025; Linking with GVCs; integrating into regional production networks and developing clusters while strengthening competitiveness and improving productivity of domestic industries; and marching towards developing a modern technology and knowledge based industry."
	Law On The Investment Of The Kingdom Of Cambodia, 1994	Provides rules for encouraging investments in High technology, agro and, export-oriented industries and in, Special Promotion Zones, Physical infrastructure and energy, etc.; Treating FDI in a non-discriminatory manner except for land-ownership; and allowed to invest freely in many areas. Current Law on Investment provides incentives to the investors, who are given Final Registration Certificates,; and improvement in investment facilitation services."
<b>Philippines</b>	Development Plan, 2017-22	Covered objectives of making the country as upper middle-income by 2022; focus on easy assessing economic opportunities from both domestic and foreign markets (features of strengthening value chains, stimulating FDI, strengthening backbone services of transport, logistics, financial, telecom, etc., improve competitiveness and resilience of both industry and services sectors with focus on boosting exports; trade facilitation with more linkages and expansion of products and markets to boost Philippines exports mainly of high quality goods and services). Innovation, using global practices and deploying better ICT infrastructure.
	Development Plan, 2014-16	Strived to achieve highly-competitive and innovative industrial and services sectors at the global level with more value-added, exports and ability to create employment.

<b>Malaysia</b>	Eleventh Malaysia Plan 2016-2020: anchoring growth on people	Aims to make Malaysia an advanced country with focus on strengthening macroeconomic resilience; accelerating human capital; building infrastructure and re-engineering economic growth (covering moving of economic sectors to become more knowledge based with high value-added component and diversification in manufacturing, and inclusion of ICT in services), and enhancing exports growth and balance of trade, and moving up GVCs, etc.
<b>Thailand</b>	The Twelfth National Economic And Social Development Plan (2017-2021)	Objective “to promote an economy that is strong, competitive, stable, and sustainable. Aims to strengthen existing production and service bases as well as develop new ones by using intensive innovation; to strengthen the connectivity between Thailand and other countries; to promote Thailand as a leading actor in trade, services, and investment within sub-regional, regional, and international collaboration frameworks.”; promotion of investments in technology and R&D including in digital technologies like AI/IoT, and in high industries such as of robotics; creating new value-added economy with focus on upgrading manufacturing activities base along with services sector.
	Thailand 4.0Policy	To create a ‘new value-based economy’ with focus on innovation and on industries namely bio fuels, digital economy, medical hub, automation and robotics, aviation and logistics.
<b>Vietnam</b>	Vietnam’s Socio-Economic Development Strategy For the Period OF 2011-2020	Aim to build modern industrial society with improved production in technical and economic areas with higher share of domestic value added and usage of science and technologies. Gives priority to the development of products which have competitive advantage and possibility to join in the production network and global value chain in such industries as high technology, mechanics, information and communications technology, and pharmaceuticals.
	National digital transformation scheme 2019 (to be launched) -	Aim to transform Vietnam into a digital economy by 2030 (covers features of building digital infrastructure, digitalising industries including SMES, developing digital ecosystem for value chains, etc.)
	Overall strategy for international integration through 2020, vision to 2030 (approved in 2016)	Aims to transform Vietnam into industrialized nation with aim of expanding markets; more integration within ASEAN using more of technology and knowledge, fast development of domestic industries and firms and placing country higher in RVCs/GVCs.
	Strategy on exports and imports for 2011-2020, with visions to 2030	Aims to enhance competitiveness in both exports and imports and make country more integrated into GVCs with becoming “self-reliant in international economic integration”; exploit Vietnam’s comparative advantages to improve production capacities mainly for exports; diversify products and markets and increase the share of higher value-added items in export including highly processed or high-tech and environmentally friendly items.  Strategy aim to shift structure of the economy toward industrialization with balance of trade and creation of more jobs.
	Industrial Development Strategy through 2025, vision toward 2035 (signed in 2014)	Aims to develop and revamp country’s industrial sector using all domestic and external resources with development of skilled workforce and to prioritize the development and transfer of technologies in the industrial sub-sectors and fields with competitive advantages and modern and advanced technologies such as agricultural, forestry and fishery product processing, electronics, telecommunications, new and renewable energy, mechanical engineering, and pharmaceutical chemistry.

		To promote greater linkages of production activities with services and trade for deeper participation in GVCs. One of the targets is: “annual growth rate of industrial added value will reach 6.5-7.0% by 2020, 7.0-7.5% during 2021 - 2025, and 7.5-8.0% during 2026 - 2035.”
<b>Indonesia</b>	Long-Term National Development Plan Of Indonesia (RPJPN), 2005-2025	Making nation competitiveness with objectives like “strengthening the domestic economy with a global Orientation and competitiveness”, with increased usage of S&T, innovation and building of advanced infrastructure, and promote foreign investments.

**Sources:** The information is collected from country’s official government documents (AEC, 2019; Government of Sri Lanka 2018; Board of Investment, Government of Pakistan, 2013; Cabinet Secretariat, Government of Japan 2013; Cabinet Secretariat, Government of Japan, 2016; Cabinet Secretariat, Government of Japan, 2017; Cabinet Secretariat, Government of Japan, 2019; CFE, 2017; DIPP, 2011; DIPP, 2017; Economic Planning Unit, Prime Minister’s Department of Malaysia, 2015; Export.gov, 2018; Government of Vietnam, 2011; Government of Vietnam, 2014; Government of Vietnam, 2016; Library of Congress, 2019; Mayer, J., 2018; Ministry of Commerce & Textile, 2018; Ministry of Commerce and Industry, Government of India, 2009; Ministry of Commerce and Industry, Government of India, 2015; Ministry of Commerce and Industry, Government of India, 2016; Ministry of Commerce and Industry, Government of India, 2017; Ministry of Commerce, Government of Nepal, 2015; Ministry of Commerce, Government of Nepal, 2016; Ministry of Commerce, Government of the People's Republic of Bangladesh, 2015; Ministry of Commerce, Government of the People's Republic of Bangladesh, 2016; Ministry of Commerce, Government of Pakistan, 2016; Ministry of Commerce, 2015; Ministry of Communications and IT, Government of the Islamic Republic of Afghanistan, 2015; Ministry of Economy, Trade and Industry, 2015; Ministry of Electronics and Information Technology, Government of India, 2018; Ministry of Finance, Government of the Islamic Republic of Afghanistan, 2016; Ministry of Industry and Commerce, Government of the Islamic Republic of Afghanistan, 2018; Ministry of Industry and Handicraft, 2015; Ministry of Industry, Government of Nepal, 2010; Ministry of Information and Communication, Government of Vietnam, 2019; Ministry of IT & Telecom, Government of Pakistan, 2018; Ministry of Planning and Finance, 2018; Ministry of Planning and Investment, Government of Vietnam, 2011; Ministry of Science and Technology, Government of India, 2013; MODSIT, 2017; MOEA, 2016; Myanmar Investment Commission, 2018; National Development Planning Agency, Government of Indonesia, 2007; NEDA, 2017; NESDB, Government of Thailand, 2017; New Age, 2018; NRF, 2016; Pakistan Business Council, 2018; PCFIR, 2017; Planning Commission, Government of the People's Republic of Bangladesh, 2012; Prime Minister’s Office, Sri Lanka, 2017; RGC, 2018; State Council, China, 2017; Thailand Board of Investment, 2018; The National Assembly, Kingdom of Cambodia, 1994; Towel Manufacturers’ Association of Pakistan, 2018)



The first observation is that major countries of EA have reinvented their trade and industrial policies for revival of their economy and to rise up the GVCs ladder, post-crisis period but mainly after 2012 when reforms actually kicked up in order to boost domestic industrialization. This may have resulted in a decline in overall exports of many countries since 2013. For instance, Japan, which has been the facilitator of supply chains in EA has been witnessing stagnation in its economic growth since 80s and 90s, along with ageing population, falling workforce coupled with prolonged deflation and restrictions of investments even in R&D. Post crisis, in 2013, Japan had to come up with ‘Japan Revitalization Strategy-Japan is Back’ to restore its economic growth which is now planned to be driven by technologies and also to promote the ‘Made by Japan’ initiative. This covered features related to the restructuring of industrial base, including development of SMEs through innovation and emerging IT usage platform as well as increasing access to many international markets and attracting more investments. The strategy has been revised over the years, before bringing out more comprehensive one in 2016 as ‘second stage of growth strategy’ majorly covering features of Industry 4.0 and big data analytics and AI for overall better economic growth of Japan across all the sectors: manufacturing, services and agriculture (see Table 3). This was also prepared keep in mind continuous stagnation in global demand and growth even in major developing countries including China. Further, Japanese Government has developed the ‘Action plan for the Growth Strategy’ of 2019 along with ‘Future Investment Strategy’ of 2018 to overhaul country’s socio-economic system, improve productivity, etc. by fully utilizing potential of general purpose technology (GPT) covering AI, IoT, robots, big data, block chain, and other DT relating to Fourth Industrial Revolution, etc. along with realizing full potential of Society 5.0 by improving rules for digital markets. Second, on trade fronts, China’s policies have been orienting towards promotion of domestic value added content in gross exports and reduction on dependence of imported inputs. Hence, China launched most strategic action plan in 2015 of ‘Made in China’ which guides how Chinese manufacturing sector can be made strong internally and on international level. The idea has been to move towards producing high-value added products and services and escalating manufacturing further up in the value chains. Similarly, in 2017, ‘New Generation of Artificial Intelligence Development Plan’ has been issued to capture growing opportunities in AI development with the aim to “build China's first-mover advantage in artificial intelligence development”. Both of these documents have been focused on usage of Industry 4.0 and AI technologies in developing China as a manufacturing power. In order to strengthen trade, investment and infrastructure set up, China proposed One Belt One Road (OBOR) in 2013 to promote increased cooperation and connectivity mainly among the countries in European and Asian continents, and primarily to emerge as dominant economic bloc. This is definitely an opportunity for other developing countries of Asia in terms of boosting their capital levels, improving infrastructure along with IT development (UNESCAP, 2018). Further, Korea too has brought inclusive policy for Industry 4.0.

That is, due to wide apprehension for slowing down of Chinese-centered GVCs and even in other EA, there has been fear in such countries for stagnation and losing major share in trade and already established GVCs. Such reasons might have pushed them to launch major policies to match the changes that are taking place in many advanced countries such as US and of Europe and acquire at par niche in DT and automation, and to remain dominant power in manufacturing sector with upgraded GVCs and rising servitisation.

Such efforts are also underway in many SEA countries, where many of them are coming up with broad development plans and strategy, viz. by Indonesia, Vietnam, Myanmar, Philippines, Singapore, etc., to boost exports, achieve higher GVCs integration with more domestic value added component and industrial competitiveness, more FDI, along with huge consideration of resolving social factors like poverty, enrichment of human resources, strengthening innovation as well as scientific ecosystem, skill and infrastructure development, better ICT usage, etc. That is, these countries currently do not provide formal and exclusive trade policy or FDI policy or even industrial policy, rather focus on overall development and

improved income level among different countries with the vision up to certain time period say 2020, 2025 or 2030, such as Myanmar's aim to rise to middle-income country level by 2030, Malaysia's aim to become advanced country, and Philippines's aim to become upper middle-income group country by 2022. In fact, Philippines' policies of trade now focus on improving bilateral relations, also with non-traditional partners, via preferential schemes, use of free trade agreements, etc. with strategies such as "promote utilization of PH-EFTA FTA, maximize opportunities in the US and EU GSP/+ schemes." (Rodolfo, 2018). This is also the strategy of many other SEA economies such as Vietnam.

Some of SEA countries have also included ambitious strategies to consider factors of changing digital economy aspects and even of Industry 4.0 in their plans, such as, by Singapore, Thailand and even readiness for the same in case of Cambodia. SEA thus do not desire to be left out in the changing times with their own pattern of development with consideration of socio-economic as well as environmental aspects, which in a way is quite diverse than policy announcements by EA countries.

Third observation is that for many developing countries in SA, post-crisis period saw emergence of dedicated trade policies to boost exports and their share in world trade rather than to directly plunge in the pond of vastly growing fourth industrial revolution and AI/IoT. In fact some of the countries embarked on such measures even before crisis, due to following of multiple strategies, but the actual effect took off only after crisis. For instance, India followed inward-looking import-substitution policy with suspicion towards export-led growth during 50s-60s, and then to export promotion measures 1980s along with greater import liberalization and then to liberalization and globalization reforms 1990s before launching Foreign Trade Policy (FTP) of 2004-09 as first-integrated policy. This FTP aimed to double India's share in global merchandise trade by end of the policy period and lead towards trade-led growth and employment. This has been the major announcement due to more focused strategies for liberating controls, simplifying costs and procedures, giving attention to different 'special focus areas' so as to make India a global trade hub. This included special initiatives for traditional sectors namely agriculture, handicrafts, handlooms, gems and jewellery, and leather and footwear, and even the IT hardware and sports goods. A special feature was encouragement to services exports. However, it was since crisis period that India more actively looked through opportunities and modifying its policies to support domestic industries and export competitiveness. 2009-14 FTP was much diversified due to the need of the hour in wake of recessionary trends which started out with immediate goals so that the economy remains resilient and well-protected and can resolve adverse effects due to declining demand in traditional markets. That is, FTP set out the target of 15 percent annual growth for first two years so that exports could reach \$200 billion by end of fiscal year 2010-11. This further postulated 25 percent annual growth rate in the remaining years. Focus areas to achieve targets in 2009-14 policy were improved infrastructure, lowering of transaction costs and full refund of indirect taxes. In fact, seed for doubling India's trade share in world market by 2020 have been sown in this policy, which was carried further in FTP 2015-20. The latter has however been more visionary in nature by clubbing number of initiatives into few targeted schemes and focusing on advancement in entire trade. This policy came to overcome the concern of India's declining exports since 2013. Major focus areas have been trade facilitation in both manufacturing and services sectors, and ease of doing business, along with stress on industrial growth, infrastructure, IT and communication, skill development and employment creation (that is, connecting all initiatives of Make in India, Skill India and Digital India). The policy also mentions about increasing domestic value addition and linking in GVCs and/or leading RVCs in sectors like textiles, pharmaceuticals, auto-components, etc. Owing to such efforts, India's Doing Business rank upgraded from 130 in 2016 to 77 in 2018 (highest reached by a large country after 2011) (World Bank 2018, 2019) mainly on aspects of dealing with construction permits, trading across borders, starting a business, getting credits, etc. To further facilitate Make in India, Government in 2019 budget has introduced comprehensive digitalization system of export/import transactions and electronic tagging RFID technology to improve

export logistics. In fact, in Logistics Performance Index, India's position has improved from 54 in 2014 to 44 in 2018, which is likely to increase India's export competitiveness (World Bank 2018a). It is ascertained that the logistic sector in India is to be about USD 215 billion in 2019-20 with annual growth rate of more than 10%. However, still there is a long way to go as the sector is not yet well developed and much-efficient in India (the rank declined from 35 in 2016). But this is the necessary segment to resolve as with the decline of 10 percent in indirect logistics costs, Indian exports could rise in the range of 5-8 per cent (Ministry of Finance, 2018). India had already ratified WTO's Trade Facilitation Act (TFA) in 2016 to streamline movement, release and clearance of goods, simplify custom procedures and to connect with GVCs. Nevertheless, unlike Japan and China, Indian trade policies still do not grasp the usage of Industry 4.0 and AI and robotization. Although India's FDI policies show liberalization in many sectors post-crisis, but wait is for the release of New Industry Policy which will be centered on Make in India initiative, smart manufacturing digitalization and usage of certain features of Industry 4.0, linking into GVCs even for MSMEs, innovation and balanced FDI policy regime.

Regarding other SA countries, efforts have been initiated since the last 4-5 years to bring focused export policies along with IT or industrial policy to strengthen domestic markets at least in traditional industries, as well as garnering upgraded shares in high-end industries. Trade facilitation, export diversification, building institutional capacity and improving infrastructural set up have been their key strategies. The primary aim of such policy announcements has been to improve connectivity with foreign markets particularly for capturing rising share in regional or global value chains, and attracting higher FDI inflows. Such countries largely include Bangladesh, Nepal, Pakistan, and Sri Lanka.

Further, Pakistan's Digital Policy seeks to adopt to DT such as AI. Even Afghanistan through its Draft IT policy seeks to achieve the objective of realizing full potential of IT infrastructure for development purposes. Sri Lanka is too keen on leveraging trade-investment nexus with India, China, Singapore, etc. via exploring free trade agreements (FTAs), along with gaining better role in OBOR project along with infrastructure development efforts (Hewage, 2017). Countries like Afghanistan plan to move from agro based economy to becoming an exporter of industrial products, and Pakistan plan to move from factor-driven to innovation-driven economy. Many SA countries wish to improve growth of SMEs and increase their role in value chains' participation such as by India, Afghanistan, etc., and aim to improve custom procedures and logistics such as by India, Nepal, etc. Overall, there are efforts to promote country-wise product brands on the global platform such as by Pakistan, Bhutan, and Afghanistan (with the target of achieving 'Made in Afghanistan' in terms of domestic software and hardware technology brand).

However, several policy documents with development plans and strategies in many countries have overlapping objectives and interlinkages in them such as in case of Nepal, Vietnam, etc. Such efforts have gained more momentum post 2014 due to a decline in the global exports.

Given huge policy announcements by Japan and developing economies in Asia mainly dedicated strategies to lead Industry 4.0 revolution and promote digitalized manufacturing, even by South East Asian economies, and promotion of usage of ICT in domestic industries in many South Asian countries (who too are in the process of building capacities to embrace DT and automation changes in their upcoming industrial and sector-specific policies), thus the anticipated much flatter digitalized curve than traditional smiley curve, as discussed in previous section, may not come largely true in case of such developing Asia. Also, as manufacturing activities are developing with DT, the gap may not stay wide between suppliers in GVCs and lead firms as some of these Asian economies are very likely to be able to lead GVCs in some of the industries as well as upgrade in those chains in terms of new product development, movement to new activities, etc. These chains would be largely those in which country's forward and backward linkages have been established more in the post-crisis period. This part is analyzed in the next section of this paper.

## 5. Value-Added Analysis of Asian Manufacturing GVCs

This section enumerates changes in Asian GVCs in terms of backward & forward linkages, in the post-crisis period, in comparison to European and American economies.

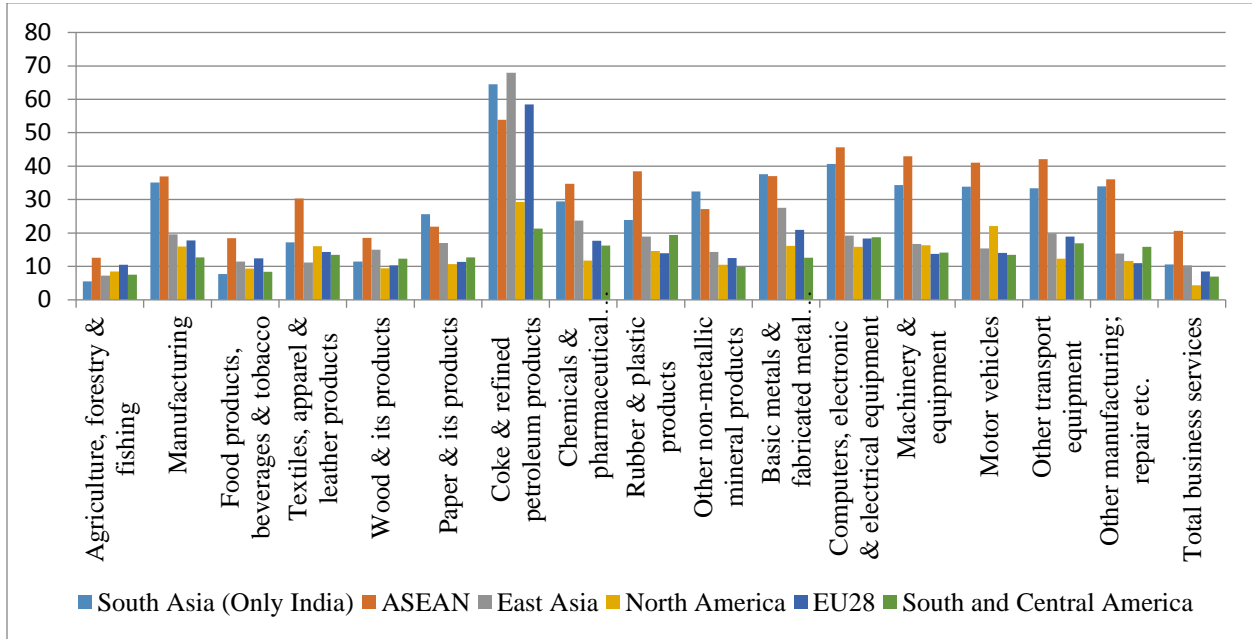
### 5.1 Trends in GVCs Backward linkages

The TiVA database does not present much decline in share of backward linkages (BL) from pre-crisis (2005-06) to the time of crisis and just after crisis (when shares in fact increased up to 2011) for the selected regions (Appendix Table C). However, the shares declined thereafter except in case of South and Central America (SCA). For instance, Association of Southeast Asian Nations (ASEAN) had 31.4% FVA shares in their exports in 2005, which initially declined in 2009 to 28% before rising to 29.1% in 2012, which decreased to 28% in 2016. East Asia (EA) had 15% FVA share in 2005, which also followed similar pattern of reaching the highest level at 18% in 2011, before declining afterwards. It may be noted that all these regions had experienced gradual decline in shares post 2012, but this was stronger and faster post 2014 when exports also declined in many countries. The BL shares' decline has been more particularly higher in case of South Asia (SA) and EA, followed by EU 28, but relatively lower in case of ASEAN. To elaborate, SA's fall in BL has been gradual from 25% in 2012 to 23% in 2014, but then rapidly to 16% in 2016. EA's share declined by 1 percentage points during 2012-14, but registered fall from 17.6% in 2012 to about 13% in 2016 (Korea and Hong Kong majorly contributed to this trend, including China). EU-28's share declined from 14.3% in 2012 to 13% in 2014 and 11.6% in 2016 (although majority of the countries continued to have quite stable linkages in GVCs even post-crisis, but decline has been traced for Bulgaria, Latvia, Lithuania, Greece, Spain, Sweden, UK, as well as Czech Republic during 2012-16). Share of North America (NA) had declined slightly from 9.7% in 2012 to about 9% in 2014 but to 7.4% in 2016, where US contributed to the trend. On the contrary, share of Mexico increased from 33.8% in 2012 to 36.4% in 2016. ASEAN's share decreased only by 0.9 percentage points during 2012-16, and the decline has been mainly about 1 percentage points in case of majority of the ASEAN countries during 2015-16 period. Only Brunei Darussalam and Cambodia have registered a rise in shares in this period. In case of SCA's exports, FVA share have risen from 9.4% in 2012 to 10.3% in 2015, although declined to 8.7% in 2016 owing to greater fall in the shares of Chile, Colombia and Brazil (Appendix Table C). All this suggest significant rise in DVA content of exports for SA & EA countries in particular in the period after crisis mainly post 2013-14.

Sector-wise, backward participation in GVCs has declined in all the three sectors (agriculture, manufacturing and total business services (TBS)) from 2011 to 2016 for almost all the regions selected in this paper (Figure 13 and Figure 14). That is, impact has been more powerful in years after crisis for GVCs integration at regional level. Dependence has reduced for usage of imported inputs which aligned with overall declining exports of world during 2013-16. Only exception has been the ASEAN region in case of agriculture, with rise of 3.5 percentage points in 2011-16, and in TBS with almost similar shares in both the periods. However, the shares for ASEAN in manufacturing only declined by about 3 percentage points during the two period. Thus, ASEAN continued to have comparatively much higher shares than other regions not only in this sector, but also in agriculture and services. Notably, there has been an overall decline in the backward linkages in agriculture of 1-2 percentage points for the all other regions except SCA. In case of TBS, EU-28's position remained almost same, while there has been decline of 2-3 percentage points in case of SA and EA, and 1 percentage points in case of American countries. Notably, the decline in the FVA shares has been greater in case of manufacturing during 2011-16, where maximum fall has been registered for SA (India) with decline of about 12 percentage points, followed by EA (6 percentage points), NA and EU-28 (3.4 percentage points), and ASEAN. SCA experienced fall of 1-2 percentage points in both backward and forward linkages. Country-wise, in Table 4, information on decline BL shares have also

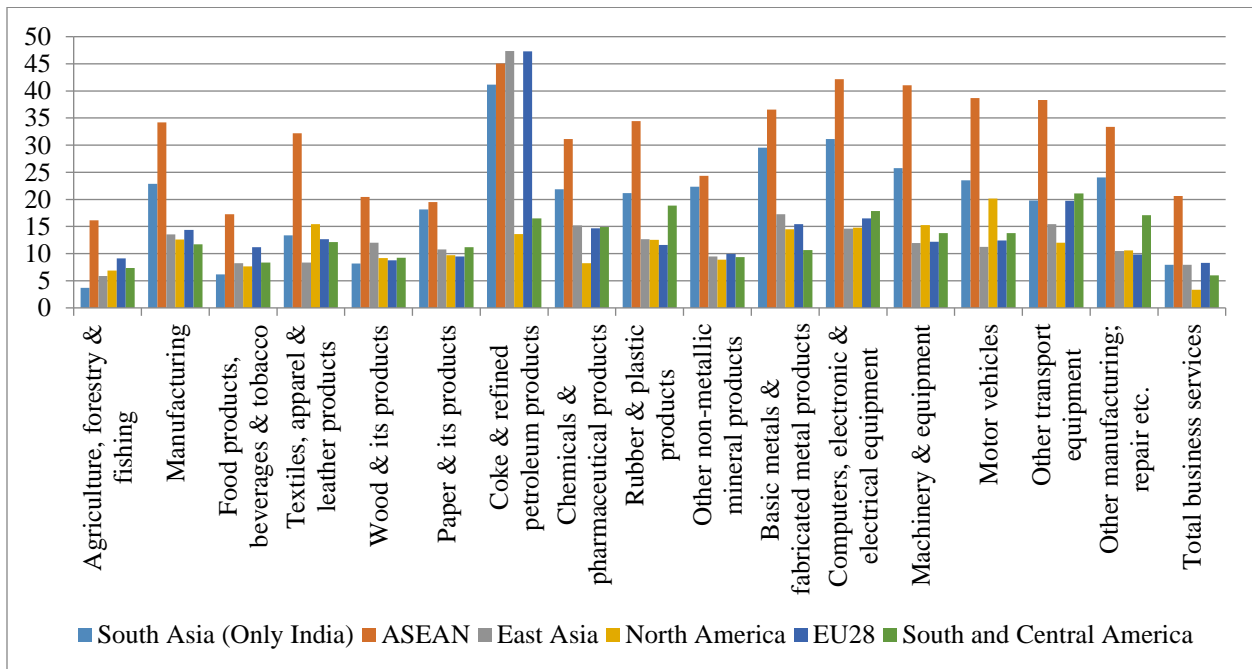
shown similar patterns in case of manufacturing, although country-wise there has been rising shares in case of TBS such as in case of EU-28.

**Figure 13: Region wise FVA share of gross exports (2011) (%)**



**Source:** Data from OECD-WTO TiVA Database 2018 version

**Figure 14: Region wise FVA share of gross exports (2016) (%)**



**Source:** Data from OECD-WTO TiVA Database 2018 version

Within manufacturing sector, in terms of GVCs backward linkages, ASEAN region's shares declined in all the activities except textiles and wood products during 2011-16 (Tables 5 and 6). EU 28 continued to stay as important link for other transport equipment (other than automotive). On the other hand, faster decline in BL has been in case of number of manufacturing activities in case of SA and EA (of more than 20 percentage points in case of petroleum products, of 8-10 percentage points and more for machineries including ICT and electrical goods, motor and transport equipment in case of India, and for chemical, metal and paper products in case of SA (India) as well as EA. However, decline in the linkages' shares has been below 5 percentage points for electrical and computer equipment, machinery equipment, and motor vehicles for EA and ASEAN. This implies that strong supply chains still exist in these regions for such machine products even years after crisis, but where India has reduced its dependence on usage of imported inputs in exports. Further, the shares have been below 2 percentage points for other regions in these categories. That is, American and European regions have shown relatively lower declining pattern in FVA shares, owing to maturity of their existing value chains, as compared to the Asian region. For these two regions, integration has also been much lower in case of TBS (even lower than that in agriculture). Although backward linkages in manufacturing have been higher in 2011 than TBS, but SA and EA still had significant shares in latter of around 10% (although declined to 8% in 2016) and ASEAN had much higher level of 21% in both the periods (see Figures 13 and 14). Nevertheless, the manufacturing GVCs remained to be the focal point for all the regions particularly for Asia, with highest FVA share of gross exports in the sector by ASEAN, and then SA (shares although declined) in both the periods, while others had shared in the range of 12-14% in 2016.

**ASEAN:** In 2011, ASEAN region largely imported inputs from the sub-sector of coke and refined petroleum, computer and electrical equipment, machinery equipment, and from transport equipment (shares of 40% and above), followed by rubber and plastics, basic and fabricated metal products, chemical/pharmaceutical products (in the range of 35-38%), as well, as textiles, apparel and leather items (30%). In 2016 too, the trend remained the same (except in case of textiles where shares have risen by 2 percentage points). However, there has been a mild decline of 3-4 percentage points in ASEAN sourcing in case of ICT machinery, rubber, and 9% in case of coke oil, etc. That is, ASEAN countries still connect with rest of the world for inputs used in exports for various machinery and metal products. Country-wise, see Tables 3 to 5, highest FVA shares in exports during 2011 in manufacturing sector have been registered by Singapore (53%), Malaysia, Vietnam and Thailand (shares in the range of 46-49%), but their shares declined in 2016 to the range of 39-43% (Vietnam has been the exception). These were followed by Cambodia and Philippines with 30-34% shares in 2011 and importantly their shares have risen up to 2016. Interestingly, shares of Brunei Darussalam and also of Vietnam increased in case of agriculture, manufacturing and services showing their growing linkages into GVCs during 2011-16.

**EA:** During 2011, EA imported inputs for use in its production of exports from the categories of coke oil (70%), followed by metals (28%), chemicals (24%), other transport equipment, ICT, rubber/plastic (19-20%). Shares declined sharply over the years suggesting rise in EA's DVA content of exports, although significant shares remained in case of petrol and metals. Country-wise, in 2011, Hong Kong, Korea and Chinese Taipei had shares above 45% in backward linkages, which declined to around 34% in case of latter two. China's share declined from 23% in 2015 to 18% in 2016.

**SA:** SA largely imported coke oil with 65% share in 2011 & 41% during 2016, and imported ICT goods, metal items, machinery equipment transport equipment (32% - 40% shares) and even chemicals (30%). Their shares declined sharply in 2016 (imported content of ICT and metals still significant thought at around 30%).

**NA:** The region imported just about 16% for use in exports in 2011, which was largely from coke oil, motor vehicles, metals, and machinery equipment (16%). In 2016, motor vehicles shares remained important as around 20%. Country-wise, situation has been altogether different, as Mexico imported about 46% in both the periods, and Canada did above 32%. It has been the actual slowdown of US in manufacturing value chains.

**SCA:** The region largely imported petrol products in 2011, followed by rubber and plastic items, ICT/electrical goods, other transport equipment. In 2016, shares did not show much decline for these categories. In fact, share increased in case of transport machinery. Country-wise, in 2011, highest usage of imported content in exports has been by Costa Rica, Chile, and Peru (above 20%). Their shares declined in 2016 mainly for Cost Rica, except doubling of shares for Colombia.

**EU-28:** EU in 2011 largely imported coke oil, followed by metals, other transport equipments and ICT products. Trend has been the same in 2016 although with fall in shares of coke oil, metals, and chemicals. Country-wise, FVA content in exports in 2011 has been much 30% for all except in case of Romania, Germany. Highest imported content has been observed in Slovak Republic, Luxembourg, Hungary, Malta, Bulgaria, Estonia and Lithuania. Except Romania & Netherland, there has been declined in FVA shares of all EU countries in 2016, and the main countries with higher GVCs shares have been Hungary, Slovak Republic, Malta, Czech Republic, Estonia, Luxembourg, etc.

To summarize, decline in FVA content in exports or backward linkages share has been greater for countries in EA and SA, followed few ASEAN countries such as Singapore, Thailand, Malaysia, as well as those in SCA as compared to lower level of decline for EU and NA in the case of manufacturing.

Among all the regions, highest share of BL has been 35% in case of ASEAN, thus this has been taken as the benchmark for understanding key players in industrial value chains (see highlighted sub-sectors in tables 5 and 6 showing shares at this benchmark and above). Main findings are:

- a. BL have declined over the years but is present in entire manufacturing value chain ranging from textiles, wood and paper products to chemicals and metals and to ICT/electrical and transport machinery. This is very true for EU-28 and ASEAN which have been connected to many GVCs.
- b. Integration of US and SCA countries have been lower and further declined during 2011-16, thereby having presence in only few industry value chains such as coke oil, automotive, etc. However, Mexico continued to be more integrated.
- c. SA initially had significant role as buyer of inputs in GVCs of coke oil, metals, machinery and chemical products, which reduced over the years. On the other hand, EA along with ASEAN in 2011 had a greater presence in all types of machinery goods, coke oil, chemicals, rubber, plastics, etc. In 2015, EA's role became restricted to few value chains of coke oil, metals, ICT, machinery equipment, and automotive (majorly by Chinese Taipei and Hong Kong).
- d. ASEAN's role has been significant & spreading across machinery, ICT, metals, textiles, etc.
- e. In the food value chain, ASEAN countries dominated as key buyer with few EU and EA countries, as highlighted in the table. Number of countries in EA (excluding Japan and China) and SEA had significant role in textile and leather value chains in 2011, which although has reduced further mainly for EA countries.
- f. In textiles and leather and paper value chains, ASEAN, Mexico, EA (Hong Kong and Chinese Taipei) & even European countries dominated. This has also been the case for chemicals, rubber plastic, mineral products, and machinery equipment value chains, but more number of European countries were

found therein with high FVA shares. Singapore, Vietnam, Hong Kong, and Chinese Taipei have important role in wood value chains.

- g. In metals value chain, SA, ASEAN, Europe & even EA have been important buyers. Europe and ASEAN have more participation in ICT value chains.

Overall there has been restructuring of Asian GVCs post-crisis in terms of transferring their shares in total manufacturing GVCs pie perhaps to less developing countries, and LDCs both in Africa and Asia. This is to stay immune from the after-effects of crisis, capture opportunities due to slowdown in advanced economies, tackle the lack of global demand and make domestic industries stronger, which is also the need of the hour.

**Table 4: Sector-wise countrywide FVA share of gross exports (2011 and 2016) (%)**

Country	2011			2016		
	Agriculture, forestry & fishing	Manufacturing	Total businesses	Agriculture, forestry & fishing	Manufacturing	Total businesses
India	5.5	35.1	10.6	3.7	22.9	7.9
<b>ASEAN</b>						
Brunei Darussalam	36.1	17.3	16.7	37.5	23.5	18.3
Cambodia	18.7	34.4	21.3	16.9	34.3	23.0
Indonesia	6.3	19.3	8.3	4.7	15.5	5.8
Malaysia	17.3	48.5	22.6	14.4	43.1	21.7
Philippines	10.3	30.9	13.9	8.6	33.5	12.1
Singapore	29.7	53.1	31.3	27.3	47.7	32.1
Thailand	14.3	46.0	22.9	11.2	38.7	19.6
Viet Nam	31.9	46.9	26.8	31.0	47.5	27.6
<b>East Asia</b>						
Japan	11.4	17.2	6.5	9.4	13.2	6.1
Korea	19.0	45.4	25.8	14.3	33.4	16.1
China	6.9	23.3	8.0	6.0	17.5	6.5
Hong Kong	33.1	48.0	29.0	24.4	44.5	21.9
Chinese Taipei	29.5	47.5	17.8	19.3	34.6	13.4
<b>North America</b>						
Canada	18.7	34.3	8.0	19.4	32.5	9.4
Mexico	9.4	46.4	5.5	9.7	45.9	7.8
US	10.9	20.4	5.4	8.7	15.3	4.0
<b>EU 28</b>						
Czech Republic	28.4	45.3	20.8	27.5	44.1	19.8
Estonia	27.9	49.6	23.5	27.9	46.4	21.7
Hungary	27.1	58.1	21.3	27.2	54.0	21.5
Latvia	24.1	31.0	16.7	21.9	28.6	15.0



Lithuania	33.0	48.1	15.7	33.7	40.7	16.7
Poland	20.9	36.6	14.5	22.3	34.8	14.6
Slovak Republic	25.1	54.8	19.2	22.6	52.6	21.1
Slovenia	24.5	43.0	19.8	22.5	39.4	18.5
Bulgaria	26.8	48.6	18.9	25.7	43.9	19.3
Croatia	18.6	28.5	12.9	19.6	28.4	13.4
Cyprus	20.3	33.5	23.6	19.6	28.1	23.7
Malta	37.9	60.2	75.9	56.3	57.9	66.0
Romania	11.9	25.7	21.6	15.4	27.4	15.4
Austria	21.6	39.0	13.8	22.1	35.5	13.8
Belgium	36.3	48.2	22.7	36.4	45.0	24.2
Denmark	25.4	31.5	31.2	26.1	26.8	30.2
Finland	18.1	37.4	15.7	15.6	31.7	15.5
France	17.8	32.4	11.6	18.2	30.6	11.7
Germany	20.5	27.7	11.4	21.5	24.4	10.6
Greece	18.3	41.0	16.6	15.9	36.0	13.7
Ireland	42.2	39.4	41.0	40.0	35.7	48.1
Italy	14.1	32.1	11.6	11.9	27.9	10.3
Luxembourg	50.1	54.6	61.7	49.0	49.7	69.0
Netherlands	26.0	38.5	15.9	25.6	39.5	17.0
Portugal	22.7	39.4	13.4	21.2	38.1	12.8
Spain	14.1	34.7	10.2	13.2	31.2	9.5
Sweden	16.1	31.0	13.6	14.9	27.0	12.0
United Kingdom	20.2	31.5	10.1	16.6	27.6	9.2
<b>South and Central America</b>						
Chile	18.4	23.9	19.0	14.1	17.5	11.0
Argentina	6.4	15.0	7.2	4.1	9.3	5.1
Brazil	7.8	13.8	4.9	8.2	13.0	5.7
Colombia	6.7	15.8	7.1	7.1	34.3	6.5
Costa Rica	18.8	28.9	11.3	17.0	17.6	8.9
Peru	8.0	19.9	9.1	6.5	14.6	8.7

*Source:* Data from OECD-WTO TiVA Database 2018 version

Although not much comparable, using some estimation from UNCTAD EoRA database, sector-wise backward linkages have been calculated for other SA economies (other than SA). The results show very low levels of their integration in manufacturing except in case of paper products for Bangladesh (in metals too) and Pakistan (also transport equipment), whereas Afghanistan, Nepal, Bangladesh, Pakistan and Bhutan have high FVA shares in fishing. Thus among SA, India is still better integrated into GVCs (even though less than other better integrated Asian economies).

**Table 5: Country wise FVA share of gross exports (2011) – Only manufacturing activities (%)**

Country	Food products, beverages & tobacco	Textiles, apparel & leather products	Wood & its products	Paper & its products	Coke & refined petroleum products	Chemicals & pharmaceutical products	Rubber & plastic products	Other non-metallic mineral products	Basic metals & fabricated metal products	Computers, electronic & electrical equipment	Machinery & equipment, nec	Motor vehicles & trailers	Other transport equipment	Other manufacturing; repair etc.
India	7.7	17.2	11.5	25.7	64.5	29.4	23.9	32.4	37.6	40.7	34.4	33.9	33.3	34.0
<b>ASEAN</b>														
Brunei Darussalam	41.3	18.4	33.8	29.6	8.2	15.2	31.0	9.0	12.6	37.1	32.8	36.8	31.9	21.5
Cambodia	23.6	41.7	13.7	46.4	41.8	38.7	45.8	35.4	46.0	41.6	40.9	40.2	37.0	33.1
Indonesia	9.2	22.1	7.1	16.8	21.8	18.8	29.0	8.5	16.9	35.5	35.8	20.2	40.3	18.8
Malaysia	33.0	35.1	22.1	30.1	29.9	40.4	48.7	33.3	53.0	60.4	46.9	60.3	55.2	42.4
Philippines	11.5	17.8	23.0	32.7	58.9	35.8	36.0	28.2	27.6	35.9	31.4	34.9	34.5	25.5
Singapore	40.9	37.9	37.9	35.3	84.3	45.8	40.2	46.8	45.8	45.9	46.4	40.2	44.0	41.1
Thailand	19.6	25.9	31.3	35.8	58.4	42.4	49.2	35.5	56.7	57.6	58.9	51.9	52.4	47.2
Viet Nam	37.9	45.5	49.7	45.8	43.8	50.9	54.2	34.7	53.0	54.7	61.2	51.8	56.4	49.6
<b>East Asia</b>														
Japan	11.5	18.5	12.6	10.5	57.4	18.1	15.9	13.3	26.6	16.0	13.4	12.4	14.6	15.1
Korea	30.7	34.4	33.3	33.5	80.9	46.1	38.9	37.8	50.3	41.5	38.6	37.8	42.3	37.2
China	10.3	13.1	16.5	16.8	42.4	21.4	22.3	16.0	25.2	31.4	21.2	20.7	20.2	16.0
Hong Kong	32.3	41.0	40.4	33.9	53.1	39.9	35.3	39.0	60.0	48.6	64.6	43.4	39.4	39.2
Chinese Taipei	36.8	44.5	45.3	43.2	83.2	63.6	50.4	45.0	56.7	37.4	49.1	45.9	43.3	39.6
<b>North America</b>														
Canada	21.3	27.6	16.1	20.2	37.4	26.7	33.1	16.3	40.0	31.0	28.8	47.2	28.8	22.6
Mexico	27.6	45.3	32.0	41.6	26.0	43.0	48.1	45.6	30.5	57.9	38.5	46.4	43.0	38.1

US	12.2	17.4	14.4	14.2	42.2	14.3	16.4	12.2	20.3	11.6	20.6	27.6	15.1	13.6
<b>EU 28</b>														
Czech Republic	31.5	36.7	31.0	37.9	82.1	41.9	45.5	30.8	43.2	55.1	40.0	47.8	34.1	31.2
Estonia	36.1	41.4	35.0	37.9	22.4	50.9	49.4	33.7	49.0	68.9	47.3	50.9	44.3	38.1
Hungary	34.9	40.4	40.5	47.1	69.7	44.5	49.5	40.5	52.7	73.3	46.8	61.0	46.6	38.3
Latvia	30.7	35.4	21.3	35.2	10.2	26.5	40.4	29.1	44.6	36.1	30.8	38.0	46.5	23.6
Lithuania	28.1	23.3	29.1	27.7	80.3	48.4	36.8	34.1	32.3	33.7	29.6	22.9	19.5	27.6
Poland	23.4	28.4	23.0	30.6	60.5	34.7	34.7	23.0	33.2	46.7	32.8	43.5	40.8	28.6
Slovak Republic	34.4	38.8	21.2	37.9	82.9	50.3	50.2	32.6	48.4	65.3	45.1	59.7	42.6	30.6
Slovenia	33.1	40.4	36.1	43.2	36.3	35.9	41.8	36.2	46.0	45.9	41.6	53.8	45.4	32.5
Bulgaria	28.2	22.2	34.3	33.6	79.0	38.4	51.4	34.2	58.8	43.5	38.7	43.8	50.2	33.3
Croatia	21.0	26.6	26.1	28.1	39.2	31.1	35.6	26.5	34.6	31.3	31.2	37.8	35.0	24.3
Cyprus	32.1	28.7	24.2	32.9	55.3	26.8	42.4	33.6	36.6	59.7	38.5	41.1	47.4	29.4
Malta	41.9	40.2	47.4	42.8	22.0	43.4	52.6	44.3	47.6	73.3	30.9	25.3	74.7	42.0
Romania	14.3	17.6	13.0	18.6	32.1	37.5	45.7	28.3	33.4	17.8	31.0	25.1	25.1	20.1
Austria	29.1	32.5	29.1	32.8	80.2	47.4	34.1	26.9	42.4	33.1	36.9	47.1	37.8	30.4
Belgium	41.2	38.9	40.1	41.2	67.3	41.7	41.1	35.2	49.9	37.4	39.0	60.4	28.0	32.1
Denmark	32.6	30.7	27.2	27.9	49.2	17.9	35.5	33.8	34.7	28.6	42.5	31.2	32.2	23.4
Finland	26.3	27.9	22.0	25.7	71.1	28.9	33.4	24.8	48.3	34.6	39.9	37.6	33.5	25.1
France	20.4	28.3	19.4	24.3	69.1	29.6	27.4	19.4	35.5	28.5	29.2	33.8	44.3	22.4
Germany	26.1	25.0	22.3	25.8	62.2	27.0	27.0	20.4	32.0	24.6	25.0	28.1	31.1	20.1
Greece	20.6	23.1	19.1	27.3	71.2	27.6	33.8	21.7	33.2	30.4	23.6	21.5	25.5	15.7
Ireland	37.1	35.5	39.3	39.6	82.0	38.2	45.5	37.4	43.4	50.0	41.0	50.9	46.8	29.4
Italy	22.1	25.1	21.2	23.7	74.6	40.1	30.8	21.3	35.2	34.2	30.5	31.4	30.6	22.2
Luxembourg	50.6	42.2	59.3	48.4	55.3	52.3	56.8	47.1	61.0	42.0	47.5	45.2	45.2	38.6
Netherlands	29.9	26.9	25.2	28.4	65.8	36.7	30.3	26.0	36.8	52.1	28.2	34.8	29.2	18.1
Portugal	29.4	28.3	24.4	29.0	78.1	40.6	36.8	24.9	39.2	44.5	43.2	51.8	42.8	25.9

Spain	21.7	26.7	22.0	20.8	75.7	32.3	29.0	19.6	35.2	30.8	26.3	42.7	28.6	18.5
Sweden	25.1	27.6	24.0	24.5	73.4	22.2	29.7	25.5	38.4	26.0	29.6	33.7	23.1	25.0
United Kingdom	23.2	20.9	26.4	22.1	58.5	29.4	26.5	27.0	37.5	29.7	26.7	35.9	31.9	17.8
<b>South and Central America</b>														
Chile	18.9	30.7	19.7	21.4	79.4	27.4	34.6	20.7	20.2	32.1	23.1	44.2	20.8	26.1
Argentina	7.8	11.8	8.3	12.4	12.5	15.4	18.7	9.7	15.5	20.2	15.5	29.3	18.0	10.8
Brazil	8.8	10.0	7.6	10.6	25.8	16.9	15.3	9.7	16.6	18.6	15.0	14.6	18.1	10.5
Colombia	10.7	15.3	11.2	13.4	15.1	18.8	23.6	10.3	15.9	23.8	17.5	32.0	41.2	12.6
Costa Rica	22.1	30.3	13.1	28.9	39.6	32.4	37.9	23.9	37.1	31.8	43.6	43.2	38.0	30.5
Peru	13.8	23.8	9.4	18.4	28.2	23.4	30.2	11.8	17.9	32.9	26.2	30.4	23.7	17.1

*Source:* Data from OECD-WTO TiVA Database 2018 version

**Table 6: Country wise FVA share of gross exports (2016) – only manufacturing activities (bold figures indicate decline in shares from 2011 to 2016) (%)**

Country	Food products, beverages & tobacco	Textiles, apparel & leather products	Wood & its products	Paper & its products	Coke & refined petroleum products	Chemicals & pharmaceutical products	Rubber & plastic products	Other non-metallic mineral products	Basic metals & fabricated metal products	Computers, electronic & electrical equipment	Machinery & equipment, nec	Motor vehicles & trailers	Other transport equipment	Other manufacturing; repair etc.
India	6.2	13.4	8.2	18.1	41.2	21.9	21.2	22.3	29.6	31.1	25.8	23.5	19.8	24.1
<b>ASEAN</b>														
Brunei Darussalam	44.8	21.5	31.6	30.9	5.3	12.5	30.4	10.1	13.2	40.4	35.5	39.7	33.5	23.1
Cambodia	20.7	37.0	12.6	42.4	49.8	39.5	44.4	36.3	44.3	38.5	36.3	34.9	38.9	27.9
Indonesia	7.3	20.0	6.4	15.1	14.5	13.7	25.6	7.0	14.9	26.4	27.8	16.2	33.3	16.2
Malaysia	26.7	35.3	18.5	26.6	19.2	35.2	43.8	29.8	46.4	54.6	43.6	55.6	49.7	34.0
Philippines	10.5	16.2	21.8	28.4	37.9	28.5	31.9	24.0	23.1	38.9	31.7	40.9	35.8	24.8

Singapore	<b>39.0</b>	<b>34.7</b>	<b>37.5</b>	<b>31.4</b>	<b>73.6</b>	<b>43.0</b>	<b>34.4</b>	<b>46.4</b>	49.3	<b>43.6</b>	<b>44.3</b>	<b>39.7</b>	<b>39.2</b>	42.5
Thailand	<b>15.9</b>	<b>20.8</b>	<b>26.4</b>	<b>27.2</b>	<b>43.6</b>	<b>32.2</b>	<b>41.4</b>	<b>28.4</b>	<b>48.0</b>	<b>47.9</b>	<b>52.2</b>	<b>45.8</b>	<b>47.6</b>	<b>39.2</b>
Viet Nam	<b>36.8</b>	<b>44.8</b>	<b>49.4</b>	<b>43.8</b>	<b>31.1</b>	<b>46.4</b>	<b>51.8</b>	<b>32.5</b>	<b>50.5</b>	61.4	62.3	<b>51.5</b>	<b>54.3</b>	<b>48.2</b>
<b>East Asia</b>														
Japan	<b>10.1</b>	<b>17.6</b>	13.3	<b>9.7</b>	<b>42.1</b>	<b>14.1</b>	<b>12.6</b>	<b>10.9</b>	<b>18.5</b>	<b>13.6</b>	<b>10.5</b>	<b>10.4</b>	15.2	<b>12.9</b>
Korea	<b>24.5</b>	<b>28.9</b>	<b>25.4</b>	<b>23.5</b>	<b>64.8</b>	<b>31.6</b>	<b>27.8</b>	<b>26.0</b>	<b>34.4</b>	<b>34.0</b>	<b>28.5</b>	<b>27.8</b>	<b>33.4</b>	<b>28.5</b>
China	<b>7.8</b>	<b>9.4</b>	<b>13.4</b>	<b>11.7</b>	<b>29.7</b>	<b>14.4</b>	<b>15.1</b>	<b>10.9</b>	<b>15.9</b>	<b>25.1</b>	<b>15.2</b>	<b>15.8</b>	<b>15.3</b>	<b>12.3</b>
Hong Kong	<b>25.5</b>	<b>34.0</b>	<b>33.8</b>	<b>29.1</b>	<b>43.1</b>	<b>31.0</b>	<b>28.3</b>	<b>31.0</b>	<b>59.1</b>	<b>47.5</b>	66.5	<b>39.7</b>	<b>34.0</b>	<b>38.9</b>
Chinese Taipei	<b>27.2</b>	<b>32.6</b>	<b>32.7</b>	<b>33.0</b>	<b>57.1</b>	<b>45.9</b>	<b>35.7</b>	<b>32.8</b>	<b>46.2</b>	<b>27.7</b>	<b>43.0</b>	<b>40.1</b>	<b>38.6</b>	<b>32.7</b>
<b>North America</b>														
Canada	21.3	<b>26.7</b>	17.8	21.7	<b>30.3</b>	<b>26.5</b>	33.7	19.9	<b>37.9</b>	<b>30.7</b>	<b>27.9</b>	<b>45.9</b>	<b>27.4</b>	<b>20.9</b>
Mexico	<b>24.3</b>	<b>39.3</b>	<b>27.4</b>	<b>37.8</b>	30.9	<b>42.3</b>	<b>40.3</b>	<b>45.4</b>	35.1	<b>54.0</b>	41.2	47.4	43.6	<b>34.4</b>
US	<b>9.8</b>	<b>16.3</b>	<b>13.6</b>	<b>12.2</b>	<b>26.8</b>	<b>9.8</b>	<b>13.8</b>	<b>9.9</b>	<b>15.6</b>	<b>10.0</b>	<b>18.0</b>	<b>23.8</b>	<b>14.3</b>	<b>11.3</b>
<b>EU 28</b>														
Czech Republic	<b>30.2</b>	37.9	<b>30.4</b>	<b>37.2</b>	<b>65.0</b>	<b>37.2</b>	<b>42.5</b>	<b>30.4</b>	<b>38.1</b>	<b>50.4</b>	<b>39.5</b>	50.5	34.6	32.6
Estonia	<b>36.0</b>	<b>38.0</b>	<b>33.4</b>	<b>36.3</b>	23.4	<b>50.5</b>	<b>45.6</b>	33.7	<b>45.8</b>	<b>65.3</b>	<b>44.5</b>	<b>46.0</b>	44.6	<b>35.7</b>
Hungary	<b>34.4</b>	<b>39.5</b>	41.4	<b>42.9</b>	<b>53.7</b>	<b>38.5</b>	<b>47.1</b>	<b>40.4</b>	<b>48.3</b>	<b>66.8</b>	50.1	<b>60.4</b>	52.7	40.7
Latvia	<b>29.3</b>	<b>33.0</b>	23.1	<b>32.0</b>	17.3	28.4	<b>38.3</b>	<b>26.1</b>	<b>36.4</b>	<b>34.8</b>	34.2	<b>35.7</b>	<b>33.5</b>	23.6
Lithuania	29.6	25.5	30.2	<b>27.4</b>	<b>71.8</b>	<b>46.5</b>	40.3	<b>31.2</b>	35.6	35.3	30.8	38.0	22.1	28.6
Poland	24.5	29.3	23.3	<b>30.3</b>	<b>50.5</b>	<b>33.9</b>	<b>34.6</b>	<b>22.3</b>	<b>30.8</b>	<b>46.3</b>	35.4	<b>42.6</b>	40.9	<b>27.1</b>
Slovak Republic	<b>30.7</b>	<b>35.5</b>	<b>20.1</b>	<b>36.0</b>	<b>63.6</b>	<b>43.2</b>	<b>44.7</b>	<b>32.4</b>	<b>42.6</b>	66.5	45.1	59.9	43.9	32.8
Slovenia	<b>31.9</b>	<b>35.6</b>	<b>35.1</b>	<b>42.6</b>	46.8	<b>34.9</b>	<b>38.5</b>	<b>32.0</b>	<b>39.6</b>	<b>43.1</b>	<b>37.2</b>	<b>49.4</b>	<b>39.7</b>	<b>27.8</b>
Bulgaria	31.6	28.0	<b>29.6</b>	37.0	<b>68.8</b>	39.1	<b>50.3</b>	<b>32.8</b>	<b>54.4</b>	46.0	42.7	46.9	51.5	33.7
Croatia	22.7	31.3	27.6	<b>27.9</b>	<b>26.2</b>	<b>29.8</b>	<b>35.4</b>	<b>25.1</b>	<b>30.1</b>	33.2	32.5	39.0	35.1	26.4
Cyprus	<b>30.2</b>	31.0	<b>20.8</b>	<b>30.2</b>	<b>23.7</b>	<b>23.0</b>	<b>39.6</b>	<b>24.6</b>	<b>27.1</b>	<b>26.7</b>	<b>37.4</b>	<b>40.5</b>	54.0	<b>24.1</b>
Malta	46.2	48.0	<b>41.5</b>	46.2	<b>18.2</b>	50.8	54.8	51.1	56.5	<b>70.0</b>	37.5	<b>17.9</b>	78.1	43.3
Romania	17.4	22.5	20.9	23.5	<b>24.2</b>	<b>28.1</b>	<b>33.9</b>	<b>19.1</b>	<b>30.7</b>	28.1	<b>25.7</b>	32.8	29.0	21.3

Austria	<b>28.9</b>	33.7	<b>28.3</b>	<b>30.5</b>	<b>70.4</b>	<b>41.0</b>	<b>32.4</b>	<b>25.1</b>	<b>35.6</b>	<b>31.3</b>	<b>35.9</b>	<b>44.6</b>	41.0	<b>26.8</b>
Belgium	41.4	39.6	40.5	<b>40.5</b>	<b>60.6</b>	<b>38.8</b>	41.5	<b>35.0</b>	<b>49.1</b>	<b>37.2</b>	39.2	61.1	31.0	33.9
Denmark	34.0	<b>28.8</b>	<b>26.1</b>	<b>25.5</b>	<b>39.4</b>	<b>14.1</b>	<b>30.8</b>	<b>28.8</b>	<b>28.0</b>	<b>24.1</b>	<b>35.6</b>	33.1	38.5	<b>20.8</b>
Finland	<b>25.9</b>	<b>26.5</b>	<b>19.3</b>	<b>23.7</b>	<b>53.3</b>	<b>28.9</b>	<b>31.2</b>	<b>23.3</b>	<b>40.6</b>	<b>30.9</b>	<b>35.7</b>	38.4	39.2	25.3
France	20.8	<b>28.3</b>	<b>18.9</b>	<b>22.1</b>	<b>58.0</b>	<b>24.8</b>	<b>25.1</b>	<b>17.9</b>	<b>31.8</b>	<b>26.4</b>	<b>27.9</b>	34.6	45.4	<b>21.4</b>
Germany	<b>24.7</b>	<b>24.3</b>	<b>22.1</b>	<b>23.1</b>	<b>46.5</b>	<b>23.7</b>	<b>25.3</b>	<b>18.0</b>	<b>25.4</b>	<b>22.7</b>	<b>22.4</b>	<b>25.5</b>	<b>27.7</b>	<b>18.5</b>
Greece	<b>18.3</b>	26.2	32.2	32.1	<b>62.6</b>	<b>21.4</b>	39.3	<b>19.9</b>	<b>24.8</b>	30.9	24.4	28.1	27.0	19.6
Ireland	<b>28.9</b>	<b>34.8</b>	<b>37.8</b>	<b>29.3</b>	<b>62.8</b>	<b>38.0</b>	<b>37.2</b>	<b>35.2</b>	<b>35.4</b>	<b>42.5</b>	<b>28.6</b>	<b>40.9</b>	<b>15.9</b>	<b>24.6</b>
Italy	<b>20.2</b>	<b>21.7</b>	<b>18.9</b>	<b>21.8</b>	<b>57.8</b>	<b>32.7</b>	<b>26.3</b>	<b>18.5</b>	<b>28.9</b>	<b>32.1</b>	<b>29.0</b>	32.5	<b>29.4</b>	<b>19.9</b>
Luxembourg	<b>47.7</b>	<b>33.4</b>	59.5	<b>47.6</b>	<b>48.7</b>	<b>47.3</b>	<b>45.7</b>	<b>36.2</b>	<b>58.9</b>	<b>39.6</b>	<b>46.2</b>	<b>41.6</b>	<b>42.6</b>	<b>34.1</b>
Netherlands	32.4	29.5	25.3	34.3	<b>56.3</b>	<b>35.9</b>	31.7	28.2	<b>32.5</b>	63.4	31.2	39.6	36.7	20.6
Portugal	<b>28.2</b>	28.4	25.1	<b>28.0</b>	<b>68.0</b>	<b>37.7</b>	<b>35.2</b>	25.3	<b>37.9</b>	<b>43.0</b>	<b>41.7</b>	56.1	53.5	25.9
Spain	<b>21.6</b>	27.4	<b>21.7</b>	20.9	<b>63.1</b>	<b>27.7</b>	<b>26.6</b>	19.8	<b>29.7</b>	<b>28.6</b>	<b>23.5</b>	<b>42.5</b>	30.2	<b>17.4</b>
Sweden	<b>24.8</b>	<b>27.2</b>	<b>19.4</b>	<b>21.8</b>	<b>54.8</b>	<b>21.8</b>	<b>26.8</b>	<b>23.4</b>	<b>30.3</b>	27.4	<b>27.0</b>	<b>28.9</b>	<b>21.8</b>	<b>22.9</b>
United Kingdom	<b>20.4</b>	<b>14.9</b>	<b>24.6</b>	<b>18.7</b>	<b>37.5</b>	<b>24.5</b>	<b>22.8</b>	<b>19.4</b>	<b>30.9</b>	<b>27.5</b>	29.4	<b>31.0</b>	38.0	17.8
<b>South and Central America</b>														
Chile	<b>14.5</b>	<b>25.2</b>	<b>12.4</b>	<b>16.6</b>	<b>58.4</b>	<b>22.0</b>	<b>29.3</b>	<b>16.9</b>	<b>16.1</b>	<b>20.8</b>	<b>17.0</b>	<b>29.5</b>	28.2	<b>20.1</b>
Argentina	<b>5.1</b>	<b>9.2</b>	<b>5.8</b>	<b>9.1</b>	<b>9.8</b>	<b>10.8</b>	<b>14.0</b>	<b>6.7</b>	<b>8.3</b>	<b>15.9</b>	<b>11.0</b>	<b>21.6</b>	<b>15.0</b>	<b>7.7</b>
Brazil	9.8	<b>9.4</b>	8.3	<b>10.5</b>	<b>16.3</b>	<b>15.0</b>	<b>14.5</b>	<b>9.6</b>	<b>13.5</b>	<b>17.7</b>	<b>14.7</b>	14.8	22.0	10.6
Colombia	12.0	15.9	<b>10.3</b>	<b>13.1</b>	17.2	21.2	26.6	<b>8.8</b>	16.1	<b>23.2</b>	<b>15.7</b>	<b>30.5</b>	<b>33.0</b>	<b>11.1</b>
Costa Rica	<b>20.4</b>	<b>24.7</b>	14.0	<b>26.6</b>	<b>38.6</b>	<b>27.7</b>	<b>33.9</b>	<b>20.6</b>	<b>28.9</b>	34.2	<b>42.4</b>	<b>34.9</b>	<b>29.0</b>	<b>25.4</b>
Peru	<b>12.5</b>	<b>21.9</b>	11.3	<b>15.3</b>	<b>19.1</b>	<b>20.8</b>	<b>27.0</b>	<b>10.8</b>	<b>10.0</b>	<b>20.9</b>	<b>15.4</b>	<b>24.0</b>	<b>16.8</b>	<b>12.8</b>

Source: Data from OECD-WTO TiVA Database 2018 version

## 5.2 Trends in GVCs Forward linkages

In 2005, pre-crisis period, the share of ASEAN GVCs forward linkage (FL) was 41% (only 10 percentage points higher BL), while there was large difference between the two shares for the other regions. However, the gap widened over the years for ASEAN by 14-15 percentage points post 2009. The region's FL has increased only by 2 percentage points from 2005-15 (BL declined by 3 percentage points during 2005-16), and rather declined by 1 percentage point post 2012 in both the measures.

Except SCA region, there has been rise in forward participation in GVCs in manufacturing by all the other regions during 2011 and 2016. Highest increase has been registered by EA (6 percentage points), and SA (India) by 5 percentage points, and then by EU 28 (4 percentage points). On the other hand, very low changes of 0.6 percentage points in FL have been shown by NA. Interestingly, all the regions except ASEAN have registered a rise in FL shares by about 2-3 percentage points in agriculture (where ASEAN has higher BL). In case of TBS, FL increased only for the regions of EA and EU by 3 percentage points each. To summarize, EA and EU has rising forward participation in GVCs in all the three broad sectors, India and NA in case of agriculture and manufacturing, while ASEAN only in manufacturing, and SCA only in agriculture sector. Overall, shares of manufacturing remained high in forward participation in selected regions mainly in Asia (i.e., SA and EA). Country-wise, the trends are almost the same as shown in Table 7.

In the context of manufacturing GVCs, SA's FL share increased for almost all the activities from 2011 to 2016 (except decline of 5 percentage points in food products) thereby making the region (or India) as the growing significant player in leading the GVCs. The shares have been higher in case of wood, non-metallic mineral and paper products, and even in refined petroleum products (rise of 12-18 percentage points), followed by about 7 percentage points rise in case of metals, and computer/electrical equipment. SA/India has although reduced focus on FVA usage in imports for many of its manufacturing sub-sectors, but has been increasing exports of intermediate goods prominently in these industrial sub-sectors.

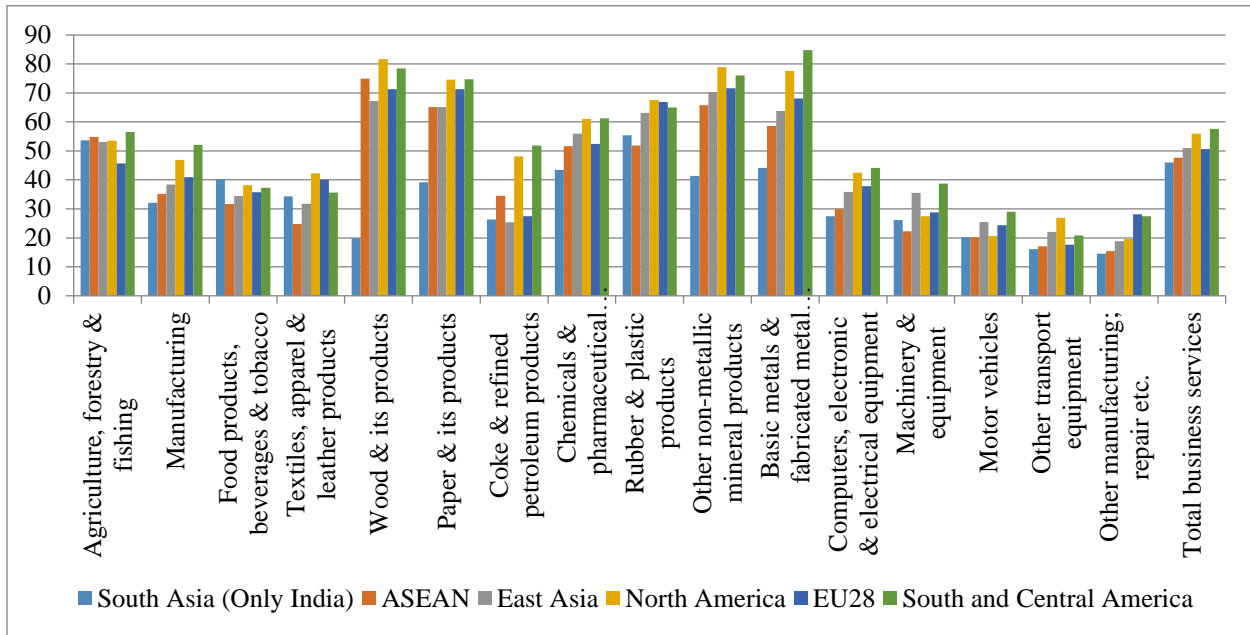
Except in case of motor vehicles, EA's FL has increased in all the sub-sectors from 2011 to 2016. Rise has been mainly in metals and computer equipment (8-10 percentage points), rubber/plastic items of 6 percentage points, and machinery and equipment, textiles, chemicals and petroleum products of 4-5 percentage points. ASEAN's FL increased much lesser but nonetheless in case of textiles (along with backward linkages therein), chemicals, but particularly in ICT and electronics of 7 percentage points. EU's FL increased more in petroleum, chemical, wood, metals, machinery, and even textiles products. NA's linkages have been growing in petroleum, motor vehicles and electronics (rise upto 10 percentage points). Whereas, rise in shares for SAC during 2011-16 has been in textiles and wood products of 3 percentage points, while lower rise or declining shares in others mainly other transport equipment and chemicals (Tables 8 and 9).

To elaborate, in case of manufacturing, in 2011, the share of ASEAN, EA, SA was in the range of 32-38%, which increased to 37% to 45% (in case of EA) in 2015. Share of SCA, NA has been almost amount 51-52%, & 47% respectively in 2015. EU-28's share rose from 41% in 2011 to 45% in 2015.

**ASEAN:** The region largely exported inputs in 2011 from the sub-sectors of wood and paper (65-75% share), metals (59%), chemicals and rubber/plastic items (52%). In 2016, share of these products remained largely the same, while FL share of ICT products rose to 37% in 2016 from 30% in 2011. Maximum forward participation in manufacturing has been by all the countries of ASEAN in 2011, although shares of Singapore, Thailand, Vietnam, and Malaysia have been in the range of 25-31% (improved in later years). On the other hand, Brunei had higher share (above 50%) in 2011 which decreased drastically to 15% in 2015. Interestingly, Indonesia and Philippines displayed significant shares of above 40% in 2015.

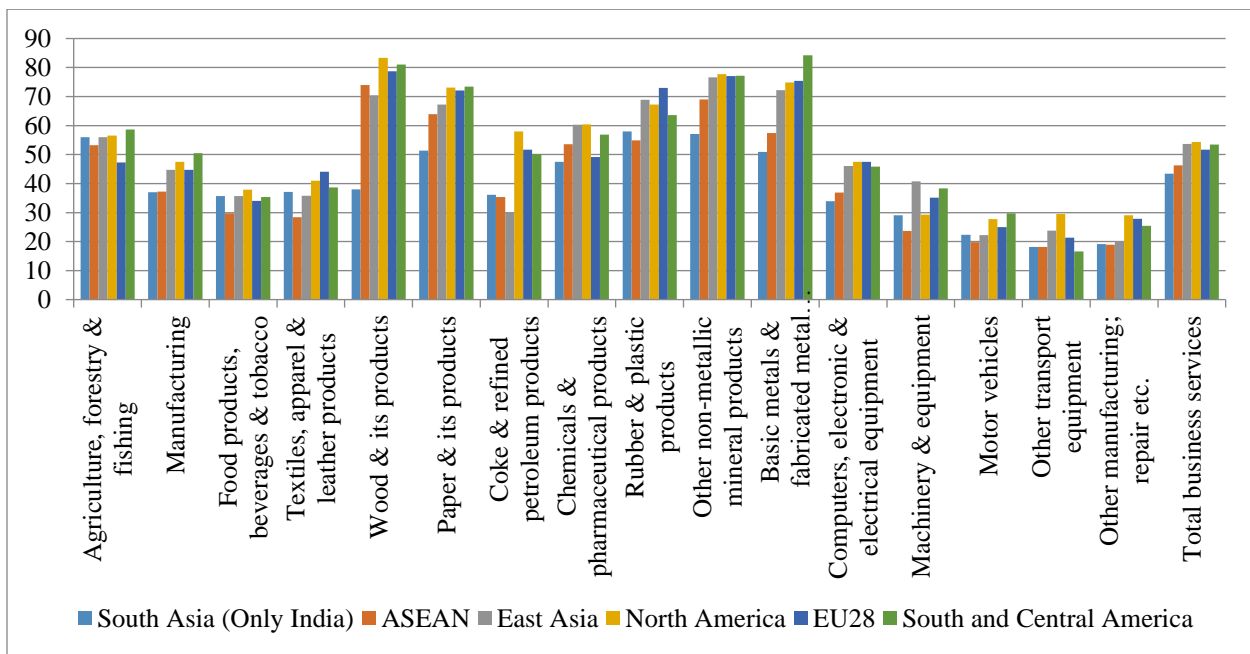
**SA:** In 2011, Indian largely supplied inputs in case of rubber/plastic, metals, chemicals, food, and paper products (shares of 40% and above). In 2015, the region’s FL shares have increased in all sub-sectors, except food and the most significant ones have been chemicals and non-metallic mineral products, metals and paper products. FL is about 30% in ICT and machinery equipment, less than that of EA region.

**Figure 15: Region-wise DVA in exports of intermediates as a share of total exports (2011) (%)**



**Source:** Data from OECD-WTO TiVA Database 2018 version

**Figure 16: Region-wise DVA in exports of intermediates as a share of total exports (2015) (%)**



**Source:** Data from OECD-WTO TiVA Database 2018 version



**EA:** In 2011, the region too largely supplied inputs belonging to the industry of wood, papers, rubber, plastic, chemicals, metals (above 50% share), along with above 30% share in ICT, machinery equipment, food and textile products. In 2015, EA's FL share rise has been more in case of electric items, metals, rubber/plastic, machinery equipment and even coke oil. Country-wise, in manufacturing, the share of Japan has been the highest, and there has been rise in FL shares of all countries (Hong Kong's share did not rise much). China's FL increased by 6 percentage points, Chinese Taipei by 10 percentage points, and Korea by 8 percentage points. Thus, this region exports more of its value added for adding into other countries' exports (rise of 6.3 percentage points as compared to just 2 percentage points in ASEAN region).

**NA:** In 2011, the region exported large DVA from wood, paper, chemicals and mineral products, metals, also some textile and ICT sub-sectors. In 2015, the shares of most of them declined except for coke oil & ICT products, as well as motor vehicles. Country wise too, same trend has been followed by US. Mexico's FL has been lower than that of US, but still remains significant (mainly in metals and wood) during both the periods. Canada's FL largely declined during 2011-16 in motor vehicles and chemicals, but rose in ICT products.

**SCA:** In 2011, the region significantly exported value added from industrial sub-sectors of wood, paper, chemical, metals, like NA. In 2016, shares declined except for textiles, wood and also electrical machinery. Country-wise, shares in manufacturing have been about 50% and above for Peru, Chile and Colombia in 2011. Except Peru, the shares of other countries declined in 2016 but still remained above 48%.

**EU-28:** The region too largely exported inputs belonging to the category of wood, paper products, chemicals, rubber-plastics, metals, and computer products (above 60%), as well as textiles (above 40%) but remained less integrated than NA (though equivalent or slightly better placed than ASEAN). From 2011 to 2016, shares of FL in coke oil, ICT/electrical products, wood, and machinery equipment, have increased. Country-wise, in 2011, shares were in the range of 21-22% (Hungary and Malta) to above 40-42% (Finland, Latvia). In 2015, the share increased for many of the countries in the range of 25% (Malta) to 46% (Finland).

It may be noted that product-country combinations have been highlighted where share of FL is 50% or more in the tables 8 and 9. This is because the highest share of forward linkages among the regions during 2011 and 2015 has been around 50% which is taken as benchmark for finding prominent suppliers in different industry value chains. Main findings are as follows:-

- a. In both the years, FL has been significantly large in selected value chains only, that is, in case of wood, paper, rubber and plastic, non-metallic mineral products and basic & fabricated metal products' value chains. In these chains, all the regions have been the important suppliers.
- b. However, in 2011, maximum number of ASEAN and EA countries (mainly Japan and China), US, along with SCA countries played more significant role in chemical and pharmaceutical as compared to few European countries. The trend continued even in 2015 with more nations such as Korea but with increasing role of EA countries (also, shares of ASEAN countries did not fall except in case of Brunei Darussalam).
- c. As prominent coke oil suppliers in GVCs, Indonesia, Malaysia and some SCA countries dominated in both years, EU-28's link in this chain in 2015 was lower.
- d. Using the 50% benchmark, Japan has higher FL in textiles and leather value chains in both the years, but has improved shares in ICT & electrical value chains (along with Chinese Taipei and US) in 2015. On the other hand, SA (India) has been a key player in the value chains of wood, paper, rubber/plastic, chemical, metals, and mineral products, with rising shares.
- e. Shares of ASEAN and SCA countries have been significant in case of wood value chains during 2015.

- f. Although forward linkages by regions have been lower for motor vehicles, machinery equipment, and other transport equipment value chains, but the shares did not decline during 2011-16 for many Asian countries (except for ASEAN's decline in automotive FL).

The reasons for rising FL in many ASEAN regions matches with the visions of newly announced trade and industrial policies, which have made to meet growing import demands and to develop domestic industrialization with higher value added content to link better or upgrade into GVCs/RVCs.

**Table 7: Country-wise DVA in exports of intermediates as a share of total exports (2011 and 2016 for sectors) (%)**

Country	2011			2015		
	Agriculture, forestry & fishing	Manufacturing	Total business services	Agriculture, forestry & fishing	Manufacturing	Total business services
India	53.6	32.1	46.0	56.0	37.0	43.4
<b>ASEAN</b>						
Brunei Darussalam	12.1	54.9	56.2	21.1	14.8	49.0
Cambodia	52.3	32.0	35.5	56.8	34.4	32.9
Indonesia	61.0	46.5	55.4	58.6	45.1	51.6
Malaysia	47.1	31.2	39.9	46.1	36.2	41.3
Philippines	50.3	40.9	49.5	55.5	43.5	50.1
Singapore	25.4	28.2	49.7	38.8	31.9	49.0
Thailand	53.9	31.3	36.3	53.7	34.5	33.8
Viet Nam	43.3	25.2	36.3	43.4	27.1	35.2
<b>East Asia</b>						
Japan	32.9	44.6	61.2	45.8	46.0	58.4
Korea	48.5	30.9	48.3	48.2	39.3	51.6
China	57.4	38.8	46.9	56.6	44.5	50.0
Hong Kong	9.7	27.5	38.3	15.6	28.0	41.5
Chinese Taipei	42.4	33.9	52.3	41.7	44.1	54.0
<b>North America</b>						
Canada	52.4	41.7	54.9	53.1	39.5	53.7
Mexico	63.6	26.5	46.4	63.0	24.1	41.0
US	53.1	43.3	52.0	57.3	45.8	51.3
<b>EU 28</b>						
Czech Republic	46.9	29.9	40.2	45.9	31.6	40.8
Estonia	47.7	29.7	45.8	44.0	32.1	43.1
Hungary	43.2	21.9	41.3	39.7	26.7	40.0
Latvia	50.4	42.3	45.9	47.7	43.3	44.2
Lithuania	41.7	27.4	44.5	40.1	30.8	42.9
Poland	47.5	35.2	45.4	45.6	37.8	44.3

Slovak Republic	46.2	25.6	40.0	47.8	28.2	41.2
Slovenia	44.0	32.9	37.6	45.6	37.5	37.9
Bulgaria	42.3	30.0	33.5	41.6	30.1	37.9
Croatia	32.3	34.8	25.4	33.5	35.5	23.7
Cyprus	41.1	27.1	47.1	40.4	30.6	42.6
Malta	22.1	20.6	12.8	18.9	24.5	17.8
Romania	53.2	39.4	42.0	49.6	39.3	45.7
Austria	39.2	37.4	44.1	39.6	40.6	43.0
Belgium	41.3	32.7	50.8	40.2	33.2	48.3
Denmark	41.2	31.5	46.5	38.2	34.9	44.1
Finland	51.6	40.2	49.0	53.4	45.9	48.7
France	46.1	36.4	50.1	47.8	38.5	51.5
Germany	49.2	38.0	52.6	47.5	40.0	53.8
Greece	39.6	35.6	43.6	38.4	34.1	35.5
Ireland	30.6	27.8	39.3	27.7	30.7	32.2
Italy	51.1	35.1	43.9	50.5	38.1	43.8
Luxembourg	28.5	32.2	25.4	24.0	31.8	20.5
Netherlands	45.3	35.7	55.2	44.7	33.8	52.2
Portugal	44.0	34.8	37.6	43.8	35.8	35.0
Spain	51.2	35.0	40.5	50.3	36.9	39.4
Sweden	48.6	39.1	49.9	48.7	42.3	49.4
United Kingdom	48.0	34.5	58.1	46.7	38.6	57.1
<b>South and Central America</b>						
Chile	53.0	51.7	55.0	54.5	50.5	54.1
Argentina	53.4	43.7	52.0	56.9	44.4	50.1
Brazil	56.6	49.1	61.7	58.4	48.3	57.7
Colombia	63.4	55.9	45.2	62.1	47.9	40.8
Costa Rica	54.9	34.3	36.6	55.0	33.1	40.6
Peru	61.8	49.5	44.3	61.1	52.7	40.4

*Source:* Data from OECD-WTO TiVA Database 2018 version

**Table 8: Country-wise DVA in exports of intermediates as a share of total exports (2011) – only manufacturing (%)**

Country	Food products, beverages & tobacco	Textiles, apparel & leather products	Wood & its products	Paper & its products	Coke & refined petroleum products	Chemicals & pharmaceutical products	Rubber & plastic products	Other non-metallic mineral products	Basic metals & fabricated metal products	Computers, electronic & electrical equipment	Machinery & equipment, nec	Motor vehicles & trailers	Other transport equipment	Other manufacturing; repair etc.
India	40.3	34.3	19.8	39.1	26.3	43.5	55.4	41.4	44.2	27.5	26.2	20.1	16.1	14.6
<b>ASEAN</b>														
Brunei Darussalam	11.9	11.8	46.4	24.0	4.7	76.2	55.3	82.4	86.5	17.6	38.4	1.1	32.1	5.2
Cambodia	31.5	16.7	75.8	46.5	6.9	27.3	40.4	44.5	42.1	25.3	14.2	15.4	19.0	13.4
Indonesia	34.8	27.1	84.7	70.1	59.6	67.8	59.0	82.4	79.6	33.8	24.0	29.8	13.3	17.4
Malaysia	25.9	22.2	68.0	49.7	57.5	50.3	43.7	60.0	43.4	22.1	19.5	13.5	11.8	16.9
Philippines	35.9	12.7	72.1	55.4	32.9	53.9	56.0	66.4	70.0	38.9	29.3	28.9	23.1	40.4
Singapore	22.3	12.9	40.5	53.6	12.6	40.0	47.1	49.7	45.9	33.2	23.6	19.8	13.6	15.6
Thailand	34.2	34.1	64.4	50.3	33.1	50.3	42.3	57.1	39.3	23.7	14.7	15.8	12.7	8.8
Viet Nam	26.1	20.1	47.2	42.6	42.7	40.4	38.0	59.0	44.0	22.1	13.8	25.9	14.4	9.6
<b>East Asia</b>														
Japan	39.0	61.6	37.8	76.8	34.8	68.8	71.3	79.7	70.0	49.9	32.8	26.9	22.0	19.5
Korea	29.1	44.5	50.5	54.2	15.8	46.4	50.9	54.2	45.4	33.7	20.9	18.7	18.6	14.8
China	39.7	33.3	68.5	66.4	46.2	59.3	62.1	72.2	65.7	32.2	32.8	25.6	21.5	17.0
Hong Kong	18.6	28.0	5.7	51.2	38.5	41.8	55.7	55.5	35.3	29.9	11.6	3.0	18.8	16.3
Chinese Taipei	24.2	38.5	45.9	47.7	13.9	32.5	42.8	50.6	39.9	38.1	18.3	16.6	14.9	12.2
<b>North America</b>														
Canada	31.1	27.6	76.5	65.6	38.6	48.2	50.1	69.7	57.4	35.9	43.8	19.2	15.0	21.3
Mexico	25.0	10.3	53.0	39.7	44.0	38.5	36.8	46.0	63.6	18.1	42.3	19.3	17.6	11.5
US	32.1	45.5	76.2	68.1	39.4	59.5	68.7	77.1	72.7	47.2	23.3	20.2	25.7	17.4
<b>EU 28</b>														

Czech Republic	26.0	27.1	52.8	50.4	11.2	40.9	45.0	57.4	47.5	21.7	27.5	20.0	22.2	20.0
Estonia	22.3	19.3	56.1	51.3	51.7	36.9	40.4	56.2	37.9	13.2	21.1	14.9	21.9	21.5
Hungary	25.9	24.9	47.7	42.9	19.7	30.5	39.9	48.6	38.3	12.0	24.8	16.8	17.5	21.6
Latvia	21.9	18.3	66.8	42.1	58.8	35.3	48.8	50.7	50.5	25.5	25.3	18.4	14.0	26.9
Lithuania	26.6	24.4	54.8	59.5	12.6	39.3	52.6	56.6	51.8	28.8	23.3	22.1	23.4	16.8
Poland	30.2	23.6	60.5	56.8	26.4	46.6	52.8	63.7	54.7	26.4	29.9	21.4	18.6	19.0
Slovak Republic	24.0	25.4	62.4	50.7	11.5	35.0	41.1	56.5	45.9	15.9	25.7	14.7	19.9	21.5
Slovenia	23.1	27.8	47.9	46.0	41.1	30.8	43.0	54.2	45.7	30.1	26.1	17.9	19.6	20.6
Bulgaria	22.9	18.4	53.1	47.6	14.2	36.0	41.0	54.8	39.0	27.9	23.6	20.4	16.3	18.3
Croatia	21.2	23.6	52.7	40.9	30.4	43.7	44.6	60.4	52.9	33.6	29.9	21.7	27.4	24.9
Cyprus	18.3	8.4	15.3	42.0	32.9	19.7	48.5	52.9	58.3	14.1	19.3	11.9	20.2	33.9
Malta	22.0	16.9	8.8	49.1	8.7	15.5	39.3	45.3	39.9	15.8	34.7	22.3	8.7	21.3
Romania	30.1	27.6	73.8	65.9	44.6	47.0	46.4	61.3	63.0	42.5	30.4	26.3	22.3	19.3
Austria	29.5	30.3	58.5	54.4	13.2	38.0	54.1	61.2	51.5	34.3	26.1	21.5	18.7	31.5
Belgium	25.5	27.3	49.7	47.6	21.5	40.2	48.3	54.0	46.5	32.2	24.7	13.1	24.5	25.4
Denmark	26.8	24.5	56.4	51.5	32.3	34.0	51.4	54.5	53.0	32.0	25.5	26.0	20.9	17.6
Finland	27.9	29.1	65.5	61.0	19.7	51.1	54.6	60.9	48.0	30.5	22.6	20.9	24.0	23.7
France	33.2	28.2	67.7	61.9	19.6	46.2	61.6	69.6	59.8	33.4	26.7	23.7	14.8	32.9
Germany	29.4	35.0	66.0	61.2	24.6	51.1	61.0	68.0	61.3	37.3	27.8	23.2	25.4	25.8
Greece	28.1	23.9	53.7	46.4	20.1	42.7	53.0	58.7	62.6	33.1	24.8	26.1	21.6	29.9
Ireland	27.3	22.6	51.3	49.1	8.6	27.3	44.7	50.3	45.1	24.9	29.4	20.7	20.0	20.6
Italy	31.5	32.3	47.1	60.6	16.0	39.5	55.9	64.7	54.4	32.5	25.1	24.2	21.8	22.7
Luxembourg	20.1	24.1	34.9	41.8	3.5	39.0	36.6	44.3	36.7	24.6	20.7	15.7	19.3	35.0
Netherlands	30.1	30.2	58.0	56.2	21.5	47.3	58.2	63.1	52.3	22.1	31.3	24.2	24.0	34.2
Portugal	29.5	28.6	65.4	56.5	13.8	42.5	53.8	66.0	51.7	26.3	24.9	16.2	23.4	27.2
Spain	30.9	27.3	61.2	60.1	15.6	44.3	56.1	66.6	56.2	33.7	28.5	17.9	23.8	30.0
Sweden	30.5	28.8	64.2	61.6	16.1	43.3	57.2	60.2	56.0	36.8	29.3	20.6	21.6	23.4
United Kingdom	33.9	30.9	48.5	54.3	27.6	40.3	57.4	59.7	54.5	31.9	31.2	21.2	18.7	25.1
<b>South and Central America</b>														

Chile	35.5	25.8	72.6	69.1	15.1	55.7	53.6	67.6	73.9	29.7	25.5	15.8	21.4	29.8
Argentina	37.4	45.0	79.3	68.4	64.1	59.0	65.1	78.3	79.0	39.9	30.0	19.7	22.5	29.3
Brazil	35.4	44.0	81.1	74.5	52.4	60.6	67.6	76.9	80.4	39.7	33.4	32.1	19.1	34.8
Colombia	35.3	29.6	73.7	65.4	53.4	56.3	62.4	77.2	82.1	41.2	36.3	8.1	13.6	24.3
Costa Rica	32.4	13.0	69.6	58.4	47.3	47.1	52.9	63.8	58.6	38.0	26.7	19.3	9.5	11.7
Peru	36.4	18.7	82.6	59.0	44.7	59.5	60.8	81.4	80.5	28.5	34.9	7.0	13.8	14.0

Source: Data from OECD-WTO TiVA Database 2018 version

**Table 9: Country-wise DVA in exports of intermediates as a share of total exports (2015) – only manufacturing (bold ones indicate decline from 2015 to 2011) (%)**

Country	Food products, beverages & tobacco	Textiles, apparel & leather products	Wood & its products	Paper & its products	Coke & refined petroleum products	Chemicals & pharmaceutical products	Rubber & plastic products	Other non-metallic mineral products	Basic metals & fabricated metal products	Computers, electronic & electrical equipment	Machinery & equipment, nec	Motor vehicles & trailers	Other transport equipment	Other manufacturing; repair etc.
India	<b>35.7</b>	37.2	38.1	51.4	36.2	47.5	58.0	57.1	50.9	33.9	29.1	22.4	18.2	19.1
<b>ASEAN</b>														
Brunei Darussalam	15.3	<b>7.9</b>	<b>34.2</b>	<b>5.4</b>	<b>3.3</b>	<b>37.4</b>	<b>49.8</b>	<b>81.2</b>	<b>85.6</b>	<b>15.1</b>	<b>25.9</b>	<b>0.6</b>	<b>23.8</b>	<b>3.5</b>
Cambodia	33.0	26.2	83.2	50.1	<b>0.6</b>	47.4	48.5	58.7	50.4	41.9	23.6	29.9	23.1	17.1
Indonesia	<b>31.3</b>	33.1	86.4	<b>68.1</b>	59.6	68.3	60.9	87.9	<b>77.9</b>	41.8	28.1	<b>27.3</b>	14.4	21.0
Malaysia	<b>25.0</b>	24.2	70.1	52.1	61.9	53.9	46.7	66.0	47.0	29.1	25.0	16.0	15.5	22.1
Philippines	<b>33.8</b>	22.5	76.6	<b>53.5</b>	36.8	62.1	61.0	75.0	74.3	43.4	33.7	<b>26.5</b>	24.3	42.0
Singapore	22.9	17.8	<b>35.9</b>	54.9	16.6	40.7	50.6	<b>46.3</b>	<b>45.3</b>	37.9	24.1	<b>18.8</b>	17.4	22.1
Thailand	<b>33.9</b>	<b>33.6</b>	69.0	<b>48.9</b>	37.7	56.5	48.1	61.0	44.7	32.5	17.9	17.5	15.3	14.5
Viet Nam	<b>25.4</b>	24.5	47.9	<b>42.4</b>	47.5	44.1	40.8	59.2	44.9	22.4	14.9	<b>23.0</b>	<b>12.9</b>	<b>9.4</b>
<b>East Asia</b>														
Japan	<b>33.9</b>	<b>53.8</b>	<b>36.2</b>	<b>73.0</b>	34.9	<b>67.3</b>	72.2	<b>77.8</b>	73.7	<b>54.8</b>	40.6	<b>23.7</b>	22.5	27.3
Korea	29.9	47.8	56.3	60.5	21.0	55.3	60.4	65.1	57.6	44.7	28.6	19.5	23.3	22.3

China	40.4	36.9	71.2	68.1	48.5	62.8	68.1	77.3	73.1	40.2	38.1	25.8	<b>21.0</b>	18.2
Hong Kong	30.8	28.7	<b>0.3</b>	<b>39.6</b>	<b>36.0</b>	45.1	61.1	61.8	<b>34.9</b>	<b>27.0</b>	<b>10.4</b>	4.9	19.7	19.1
Chinese Taipei	26.3	46.7	51.8	53.2	18.1	43.0	52.8	61.7	49.7	50.4	25.9	<b>15.4</b>	18.6	18.6
<b>North America</b>														
Canada	32.0	<b>26.7</b>	<b>74.5</b>	<b>63.4</b>	<b>36.9</b>	<b>42.7</b>	51.7	<b>66.6</b>	59.2	40.1	<b>42.8</b>	<b>9.8</b>	18.4	25.3
Mexico	26.0	14.6	57.9	42.3	<b>40.8</b>	<b>35.6</b>	42.6	48.7	<b>56.5</b>	26.6	<b>38.8</b>	<b>12.1</b>	20.5	13.8
US	35.5	<b>44.3</b>	77.4	<b>67.6</b>	48.5	<b>59.1</b>	<b>65.3</b>	<b>76.6</b>	<b>72.7</b>	52.9	27.8	29.6	28.1	24.4
<b>EU 28</b>														
Czech Republic	<b>25.4</b>	28.4	55.3	<b>48.9</b>	11.7	46.0	47.2	<b>56.2</b>	51.2	26.1	28.6	22.3	23.7	26.9
Estonia	<b>20.5</b>	21.6	58.4	<b>49.5</b>	<b>46.7</b>	38.7	43.6	58.9	41.0	17.1	23.2	18.7	26.1	25.8
Hungary	<b>24.7</b>	27.1	<b>47.6</b>	44.3	20.1	33.5	42.2	50.4	40.0	19.5	27.6	22.3	18.0	24.2
Latvia	22.3	21.1	<b>65.4</b>	45.8	<b>48.0</b>	36.4	52.6	56.0	50.6	28.6	27.7	<b>17.8</b>	19.1	<b>26.3</b>
Lithuania	<b>26.1</b>	<b>23.1</b>	62.1	<b>58.8</b>	13.0	42.1	<b>52.6</b>	58.2	<b>47.6</b>	30.8	26.2	24.4	29.2	24.0
Poland	<b>28.2</b>	27.4	61.4	<b>56.4</b>	28.9	<b>46.1</b>	54.6	64.6	<b>54.6</b>	30.1	<b>29.7</b>	30.0	19.7	24.0
Slovak Republic	<b>22.9</b>	26.7	64.0	51.3	18.3	42.9	47.6	57.7	50.1	19.0	<b>25.4</b>	18.3	<b>19.1</b>	22.6
Slovenia	24.3	28.1	48.4	46.5	<b>23.1</b>	34.5	48.7	58.7	49.3	33.7	28.6	26.7	25.6	28.1
Bulgaria	23.3	19.4	59.8	<b>46.6</b>	14.5	<b>31.8</b>	41.9	55.7	<b>37.0</b>	28.4	<b>23.0</b>	<b>20.3</b>	17.6	22.0
Croatia	22.2	25.0	<b>52.2</b>	41.5	31.2	<b>41.5</b>	48.7	61.7	54.2	34.0	30.5	24.0	<b>22.0</b>	26.7
Cyprus	18.9	13.3	18.6	<b>39.0</b>	<b>27.0</b>	24.0	<b>48.4</b>	63.5	<b>57.4</b>	33.5	23.7	19.3	22.9	41.9
Malta	22.6	<b>13.2</b>	13.0	<b>40.5</b>	<b>5.0</b>	16.2	39.9	<b>42.4</b>	<b>31.6</b>	23.3	<b>32.0</b>	23.9	13.0	22.8
Romania	<b>25.8</b>	28.0	<b>67.7</b>	<b>57.3</b>	44.8	54.5	54.3	69.3	<b>62.9</b>	<b>39.7</b>	31.5	29.5	22.7	26.0
Austria	<b>28.6</b>	<b>30.0</b>	59.3	55.3	16.1	45.0	55.4	63.5	56.1	39.8	29.9	27.3	20.2	35.5
Belgium	<b>24.3</b>	<b>24.9</b>	50.0	48.1	22.5	<b>38.9</b>	<b>47.9</b>	<b>52.9</b>	46.7	34.1	27.5	15.9	25.3	30.4
Denmark	<b>25.2</b>	26.5	59.7	52.8	42.9	35.2	55.8	61.8	59.7	39.3	31.5	30.6	21.6	23.2
Finland	29.7	30.8	68.4	61.2	28.5	53.5	58.6	64.5	56.4	35.3	28.3	30.0	<b>23.7</b>	29.3
France	<b>33.1</b>	31.6	69.9	61.9	22.6	49.9	65.7	71.2	65.0	38.2	29.9	29.7	15.8	42.9
Germany	<b>28.9</b>	<b>33.4</b>	66.1	61.2	27.6	51.3	62.7	68.1	64.1	42.4	31.8	26.8	26.9	35.9

Greece	<b>26.8</b>	<b>22.1</b>	<b>43.2</b>	<b>41.9</b>	<b>17.7</b>	45.1	<b>48.6</b>	66.7	70.2	<b>31.4</b>	<b>24.4</b>	<b>23.7</b>	26.0	<b>22.5</b>
Ireland	28.3	23.6	<b>47.4</b>	61.5	15.2	29.6	53.2	52.3	51.1	31.4	34.8	22.2	31.5	27.1
Italy	31.7	36.4	54.8	60.8	18.5	45.3	59.9	68.3	58.2	36.4	28.8	<b>24.1</b>	22.6	27.4
Luxembourg	<b>18.2</b>	<b>23.8</b>	<b>33.6</b>	42.5	4.1	<b>38.5</b>	43.4	51.8	<b>35.1</b>	<b>23.7</b>	21.1	20.3	<b>13.8</b>	37.3
Netherlands	<b>28.7</b>	<b>29.7</b>	<b>57.8</b>	<b>50.4</b>	<b>19.7</b>	<b>46.2</b>	<b>57.9</b>	<b>60.1</b>	53.4	<b>18.3</b>	<b>30.8</b>	26.8	<b>23.8</b>	36.6
Portugal	<b>27.5</b>	31.8	66.0	<b>55.2</b>	15.0	<b>41.6</b>	55.7	<b>66.0</b>	<b>51.2</b>	28.3	<b>24.7</b>	20.5	<b>19.3</b>	<b>24.9</b>
Spain	<b>30.0</b>	30.2	62.7	<b>56.5</b>	19.3	47.1	58.3	66.9	59.4	35.0	29.7	22.9	24.8	<b>27.1</b>
Sweden	<b>30.4</b>	31.7	67.9	61.7	25.5	44.3	58.8	62.3	62.7	39.2	32.4	24.1	24.5	29.5
United Kingdom	34.9	31.4	51.4	57.3	35.5	42.5	64.5	67.5	64.4	38.4	33.2	25.5	20.7	35.1
<b>South and Central America</b>														
Chile	35.6	33.3	78.1	70.7	25.6	<b>53.7</b>	55.3	69.2	<b>69.1</b>	33.4	28.8	16.9	22.4	35.8
Argentina	<b>35.4</b>	48.6	81.1	68.9	<b>62.3</b>	<b>54.5</b>	67.8	80.4	85.7	46.2	36.4	27.0	30.3	<b>28.4</b>
Brazil	<b>34.0</b>	44.6	81.2	<b>72.5</b>	<b>49.7</b>	<b>57.7</b>	<b>65.7</b>	<b>76.8</b>	<b>79.1</b>	41.6	<b>33.3</b>	<b>24.9</b>	<b>16.0</b>	36.0
Colombia	<b>31.1</b>	<b>25.3</b>	<b>61.3</b>	<b>59.3</b>	<b>44.9</b>	<b>47.4</b>	<b>54.3</b>	78.1	<b>77.5</b>	<b>36.4</b>	<b>29.9</b>	18.3	<b>12.4</b>	25.9
Costa Rica	<b>30.9</b>	30.1	72.7	59.2	<b>45.8</b>	<b>45.9</b>	56.0	68.1	63.7	41.5	31.8	<b>14.9</b>	27.4	14.9
Peru	<b>34.6</b>	23.7	<b>80.8</b>	<b>58.1</b>	51.3	<b>55.9</b>	61.6	82.0	89.8	32.0	38.4	13.4	16.9	15.6

*Source:*Data from OECD-WTO TiVA Database 2018 version



## 6. Policy Directions to Reshape Asian Role in GVCs

Review of Asian countries' announced policy documents and analysis of trends in forward and backward linkages vis-à-vis economies in Europe and America reveal the potentialities and capabilities that former have in terms of upgrading or leading GVCs and even strengthening RVCs. Asia can emerge as major leader in manufacturing value chains if the region properly integrate industry-specific policies with those related to services sector mainly IT and digital policies.

FDI has never been a separate issue as most of the GVCs happen to be highly influenced by FDI flows that goes into number of developing countries, as well as by latter's outward FDI flows that feed other country's value chains. Thus, the paper suggests for improved policy synchronization of FDI, trade and industrial policies which is although currently happening in few countries of Asia. But more dedicated efforts are required to weave together the objectives placed in different plans, policies and strategies. For instance, development of Industry 4.0 must rise but a view to support domestic industries who are largely export-oriented in nature so that a country can improve its global competitiveness. Ministries or government departments in each country dealing with implementation of investment, trade and industrial policies must meet regularly to discuss the progress so that united efforts can be taken, particularly in SA countries. To elaborate, India could think of combining its foreign trade policies with digitalization, for instance as suggested by Banga (2019b) to come up with 'Digitally-Informed' foreign trade policy with a view to "improve India's digital infrastructure for trade, enhance the digital content in its exports, build digital skills in tradeable sectors, promote the use of digital technologies in manufacturing exports, and use big data analytics to inform foreign trade policy." (Banga, 2019b) All such efforts are crucial for major developing countries such as India to deal with rising challenges and opportunities from Industry 4.0, advanced digital technologies and innovation which are taking place in East Asian countries at transformational level, as India still lags behind in gaining comparative advantages in IPR, DT, AI, etc.

The way US and other advanced countries are progressing in terms of robotization in manufacturing can led to job losses in and reshoring of activities from developing countries of Asia. But former's efforts are also said to be harmful for their own economy in terms of rising de-industrialization. Thus, Asia can lead differently by incorporating such technologies but with a view of creating and vastly adopting new model of globalization, automation and digitation along with well-thought yet quick consideration of social and environmental aspects too, such as coming up with more environmentally-friendly biodegradable or green products, keeping human resources on equal stand foot as robots in production phase so to meet growing need for employment of rising population in countries like India, China, etc. All this is further required on the two grounds: (i) the kind of jobs that Developing Asia creates as compared to developed ones in the form of small business related jobs located in villages, agriculture-based jobs, small-items manufacturing based jobs with high component of labour-usage, etc.; and (ii) Asia cannot escape effects of robotization and DT that are currently advancing in abroad economies, and thus need more sustainable level of readiness to deal with continuous challenges that they are currently facing and will continue to face on this front. The question of how all this is to be done is critical but not difficult to answer due to rising efforts of countries even for Society 5.0 such as in Japan.

However, while it is important to learn lessons from successful experiences of countries in the post-crisis period, the differences in each country's trade and investment climate, and size of markets should be kept in mind particularly in Asia which has variety of political, social and cultural set up. For instance, many SEA and EA countries have followed export-led industrialization, while focus of India has been on domestic growth over many years though recently it is making policies to double exports' share at world's level and move up in GVCs.

Moreover, there are also challenges for applying smart production in traditional industries' production patterns where more awareness needs to be spread so that better quality products for exports purposes could be easily supplied by developing Asian economies.

The key takeaway is that unless different Asian regions' cooperate among themselves, they will even fail to compete with rising heads of advanced nations. The efforts first must be done at country level, then for growth at regional level in different industry value chains, so as to create dynamic cross-region linkages, such as in case of machinery equipment, automotive, textile and leather value chains. For instance, countries at lower rungs of development say in South Asia could help many ASEAN and East Asian countries to move up the ladder easily in this chain by providing backward linkages' support. India's services sector could be linked to manufacturing value chains of EA and SEA, while it can continue to strengthen its growing forward linkages in case of metals, minerals, paper industry as well as rubber and plastics, and build more capacities along with ASEAN for linkages in computer/ICT/electrical goods, machinery and equipment and transport equipment. Many Asian counties have higher forward linkages in wood value chains too, along with many economies of Europe and America, but scope for Asia also lies in improving position as key supplier in food and textile/leather value chains.

Although post crisis, shares of many Asian countries are declining, but this is also indicative of shifting share of GVCs pie to number of less developing countries. Thus the suggestion is that each country should to strive maintain balance between backward and forward linkages as per industry requirement. This should be decided formally by regular interactions of industrial associations, policy makers along with government bodies at regional level which will help to pin-point more particular targets for each country in the region and the areas where each can contribute to strengthen regional value chains in identified competitive manufacturing sub-sectors. There is also a scope for increasing participation in total business services sector for value chains integration purposes mainly by ASEAN.

Also as the trade-war between China and US is rising, affecting many other countries including India, thus more opportunities could be captured in strengthening GVCs by reshaping the position of other Asia including India. Also, FDI outward and inward flows of devolving Asia are also rising post-crisis as compared to developed world, thus making it more suitable to harness such opportunities.

Protectionism can also not serve growing efforts for bilateral and regional free trade agreements in the longer run, and thus it is essential that Asia should unite, even with EU, to build its policies and strategies as per the multilateral framework of WTO. This is because liberal trade regime has found to have largely delivered good results over the years in terms of strengthening economic relations among the countries. Successful negotiation of Regional Comprehensive Economic Partnership (RCEP) agreement could be a game-changer if all ASEAN countries can be involved even those who are at lower strata of GVCs and investments currently.

## **7. Conclusion**

The paper has reviewed the changing nature and pattern of GVCs integration, via backward and forward linkages in selected Asian economies (i.e. South East Asia, East Asia and South Asian economies), particularly in comparison with European and American economies. Manufacturing GVCs have been continuously reorganizing post crisis of 2008-09, and the trends have been dwindling for many economies post 2013-14 when global exports largely declined. From this period onwards, many Asian economies have registered a decline in their FVA context in gross exports, particularly in East Asian ones such as China, and in South Asia (India), thereby suggesting rise in domestic value content in exports and particularly in forward linkages. Total business services and agriculture sectors still could not find higher backward or

forward linkages post-crisis despite declining FVA shares in both the sectors for many regions. However, ASEAN region as a whole has shown significantly rising integration in these sectors, along with much higher share of FVA in manufacturing.

It may be noted that very high forward linkages in Asia (and even Europe) have mostly been in wood, paper, chemicals, metals, etc., but higher backward linkages were found in ICT, machinery and transport equipment, along with coke oil, metals, and even textiles.

This paper has also reviewed the changing theoretical platform of GVCs which has been organised mainly with focus on Asian integration, starting from flying-geese pattern, fragmentation and agglomeration, to the snakes and spiders patterns, encompassing nexus of trade-investment-services along with IPR issues. However, smiley curve is now anticipated to change as per the interplay of digital technologies (DT) and fourth industrial revolution such as AI, big data analytics, automation in manufacturing, etc. thereby scope for widening the value added that can be earned by Southern developing and Northern advanced countries. Recent explanation has been found in the framework of DT-driven upgrading in GVCs owing to growing nexus of trade-investment-services-IP-DT-Industry 4.0. However, more theoretical models of GVCs incorporating major changes in GVCs mainly in developing countries still need to be properly formulated. But it is clear that comparative advantages in GVCs would not only be restricted to trade in tasks, production, processes but would also extend in IT usage, IPR policies and use of smart innovative manufacturing technique, including robotics and data flows across the regions or within it.

Foreign trade, industrial, and even investment policy documents of Asian economies have also been properly analysed and it is found that China, Japan and Korea are making their policies more attuned to DT and AI, while SEA countries such as Philippines, Myanmar, Vietnam, Singapore, Cambodia, Thailand are coming up strong holistic development plans incorporating objectives of export promotion, FDI growth, and DT. SA countries like India, Nepal, Bangladesh, Pakistan, etc. are coming up with dedicated trade and industrial policies with the aim of promoting their own brands globally and to better link into GVCs.

Post crisis, big developing Asian countries are promoting their domestic value added in manufacturing via schemes like India's 'Make in India', China's 'Made in China 2025', etc. This is critical in terms of rising protectionism practices being followed by many countries, along with import restrictions and tariff hikes by US on China and other trading partners. The idea is now to synchronize policies of Asia - first region-wise and then their linking with each other - to strengthen Asian value chains as European & American value chains in manufacturing are either slowing down or are already developed so that any further linking may not happen that fast. For the Asian economies, this is the right time to cooperate rather than compete which will require fresh innovative thinking and brainstorming sessions. For instance, EA and SEA should increase forward linkages in more sophisticated complex stream of manufacturing in machinery, ICT as well as in the metal segment. SA should now use opportunity to strengthen textile and leather value chain, and in metals and chemical products where India holds capacity.

Although China-centered GVCs are slowing down, but due to digitalization, automation, and innovation and associated changes in trade policies that have been gradually taking place, many developing countries of Asia mainly China, Korea, SEA countries such as Thailand, Singapore, Vietnam, etc. as well as many South Asian economies such as India (even though sector-specific and lesser integration than other Asia) are all set to emerge with a different look in GVCs. Japan is now reviving to strengthen its domestic as well as regional value chains. On the other hand, US and EU value chains have matured much, leaving significant opportunity for Asia to take over and build new paradigms, even in manufacturing. Asian economies can thus take global trade and growth out of prolonged grim state.

## ANNEXURE

**Table A: Share of region/country in global FDI outflows (%)**

<b>Region/Country</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<i>Developed economies</i>	<b>69.5</b>	<b>64.8</b>	<b>60.0</b>	<b>73.9</b>	<b>71.3</b>	<b>64.9</b>	<b>55.1</b>
<i>Developing economies</i>	<b>27.9</b>	<b>29.7</b>	<b>34.4</b>	<b>24.2</b>	<b>27.1</b>	<b>32.4</b>	<b>41.2</b>
<i>EU 28</i>	<b>25.1</b>	<b>24.9</b>	<b>16.5</b>	<b>38.9</b>	<b>31.6</b>	<b>29.0</b>	<b>38.5</b>
<i>North America</i>	<b>29.3</b>	<b>26.2</b>	<b>30.3</b>	<b>19.7</b>	<b>23.2</b>	<b>26.7</b>	<b>-1.3</b>
United States	24.9	22.0	25.6	15.7	18.7	21.1	-6.3
<i>Developing Asia (excluding Japan)</i>	<b>24.0</b>	<b>26.3</b>	<b>31.7</b>	<b>22.1</b>	<b>25.7</b>	<b>28.9</b>	<b>39.6</b>
<i>South Asia</i>	<b>0.8</b>	<b>0.2</b>	<b>0.9</b>	<b>0.5</b>	<b>0.4</b>	<b>0.8</b>	<b>1.1</b>
Afghanistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bangladesh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
India	0.7	0.1	0.9	0.5	0.3	0.8	1.1
Pakistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sri Lanka	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>South-East Asia</i>	<b>4.6</b>	<b>5.9</b>	<b>6.9</b>	<b>4.1</b>	<b>3.2</b>	<b>5.0</b>	<b>6.9</b>
Cambodia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Indonesia	0.4	0.5	0.5	0.4	-0.8	0.1	0.8
People's Democratic Republic of Lao	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaysia	1.3	1.0	1.3	0.6	0.5	0.4	0.5
Philippines	0.3	0.2	0.5	0.3	0.1	0.1	0.1
Singapore	1.6	3.3	4.0	2.7	2.6	3.1	3.7
Thailand	0.8	0.8	0.4	0.1	0.8	1.2	1.7
Timor-Leste	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viet Nam	0.1	0.1	0.1	0.1	0.1	0.0	0.1
<i>East Asia</i>	<b>16.9</b>	<b>16.9</b>	<b>22.2</b>	<b>15.2</b>	<b>19.5</b>	<b>20.4</b>	<b>26.8</b>
China	6.9	7.8	9.5	8.7	12.7	11.1	12.8
Hong Kong	6.5	5.9	9.6	4.3	3.9	6.1	8.4
Republic of Korea	2.4	2.1	2.2	1.4	1.9	2.4	3.8
Macao	0.0	0.1	0.1	0.0	-0.1	0.0	0.0
Mongolia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taiwan Province of China	1.0	1.0	1.0	0.9	1.2	0.8	1.8
<i>Japan</i>	<b>9.6</b>	<b>9.9</b>	<b>10.1</b>	<b>8.1</b>	<b>9.8</b>	<b>11.3</b>	<b>14.1</b>
<i>South and Central America</i>	<b>3.1</b>	<b>2.5</b>	<b>1.8</b>	<b>1.5</b>	<b>0.7</b>	<b>2.5</b>	<b>0.6</b>

*Source:* UNCTAD (2019) [Note: Developing countries is as per UNCTAD database]

**Table B: Share of region/country in global FDI inflows (%)**

<b>Region/Country</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<i>Developed economies</i>	<b>50.4</b>	<b>48.6</b>	<b>45.9</b>	<b>62.4</b>	<b>62.4</b>	<b>50.7</b>	<b>42.9</b>

<i>Developing economies</i>	<b>45.1</b>	<b>45.6</b>	<b>49.9</b>	<b>35.8</b>	<b>34.2</b>	<b>46.1</b>	<b>54.4</b>
<i>EU 28</i>	<b>25.6</b>	<b>24.1</b>	<b>19.6</b>	<b>31.3</b>	<b>29.0</b>	<b>22.7</b>	<b>21.4</b>
<i>North America</i>	<b>16.5</b>	<b>18.9</b>	<b>19.2</b>	<b>25.1</b>	<b>26.5</b>	<b>20.2</b>	<b>22.5</b>
United States	13.5	14.1	14.9	23.0	24.6	18.5	19.4
<i>Developing Asia (excluding Japan)</i>	<b>27.6</b>	<b>29.0</b>	<b>33.9</b>	<b>25.3</b>	<b>24.7</b>	<b>32.9</b>	<b>39.4</b>
<i>South Asia</i>	<b>2.2</b>	<b>2.5</b>	<b>3.1</b>	<b>2.5</b>	<b>2.8</b>	<b>3.5</b>	<b>4.2</b>
Afghanistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bangladesh	0.1	0.1	0.1	0.1	0.1	0.1	0.3
Bhutan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maldives	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nepal	0.0	0.0	0.0	0.0	0.0	0.0	0.0
India	1.6	2.0	2.5	2.2	2.3	2.7	3.3
Pakistan	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Sri Lanka	0.1	0.1	0.1	0.0	0.0	0.1	0.1
<i>South-East Asia</i>	<b>7.6</b>	<b>8.3</b>	<b>9.5</b>	<b>5.6</b>	<b>6.1</b>	<b>9.6</b>	<b>11.5</b>
Brunei Darussalam	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Cambodia	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Indonesia	1.3	1.3	1.6	0.8	0.2	1.4	1.7
People's Democratic Republic of Lao	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Malaysia	0.6	0.8	0.8	0.5	0.6	0.6	0.6
Myanmar	0.0	0.0	0.1	0.1	0.2	0.3	0.3
Philippines	0.2	0.2	0.4	0.2	0.4	0.6	0.5
Singapore	4.1	4.0	5.4	2.9	3.8	5.1	6.0
Thailand	0.6	1.1	0.4	0.3	0.1	0.4	0.8
Timor-Leste	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viet Nam	0.6	0.6	0.7	0.6	0.7	0.9	1.2
<i>Developing East Asia</i>	<b>14.4</b>	<b>15.5</b>	<b>19.0</b>	<b>15.6</b>	<b>14.1</b>	<b>17.9</b>	<b>21.5</b>
China	8.2	8.7	9.5	6.7	7.0	9.0	10.7
Hong Kong	4.8	5.2	8.3	8.6	6.1	7.4	8.9
Democratic People's Republic of Korea	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Republic of Korea	0.6	0.9	0.7	0.2	0.6	1.2	1.1
Macao	0.3	0.3	0.3	0.1	0.1	0.0	0.1
Mongolia	0.3	0.1	0.0	0.0	-0.2	0.1	0.2
Taiwan Province of China	0.2	0.3	0.2	0.1	0.5	0.2	0.5
<i>Japan (Developed Asia)</i>	<b>0.1</b>	<b>0.2</b>	<b>0.9</b>	<b>0.1</b>	<b>0.9</b>	<b>0.7</b>	<b>0.8</b>
<i>South and Central America</i>	<b>13.3</b>	<b>12.8</b>	<b>11.6</b>	<b>7.5</b>	<b>6.9</b>	<b>10.1</b>	<b>11.1</b>

Source: UNCTAD (2019)

**Table C: FVA share of gross exports in the world (%)**

<b>Region/Country</b>	<b>2005</b>	<b>2008</b>	<b>2009</b>	<b>2011</b>	<b>2012</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>India</b>	<b>18.8</b>	<b>24.5</b>	<b>21.8</b>	<b>25.1</b>	<b>25.1</b>	<b>23.0</b>	<b>19.1</b>	<b>16.1</b>
<b>ASEAN</b>	<b>31.4</b>	<b>30.5</b>	<b>28.1</b>	<b>28.9</b>	<b>29.1</b>	<b>29.2</b>	<b>28.9</b>	<b>28.2</b>
Brunei Darussalam	7.5	7.3	7.5	9.0	11.3	6.9	5.4	7.7
Cambodia	29.5	27.6	25.5	26.4	27.4	27.7	26.9	28.6
Indonesia	18.4	15.0	12.1	12.8	13.3	14.1	12.9	11.3
Malaysia	45.0	40.3	39.8	39.4	38.1	36.6	36.9	36.1
Philippines	26.3	24.8	21.9	23.5	23.9	20.4	22.0	23.4
Singapore	42.8	45.2	42.1	43.5	43.8	43.0	40.9	39.5
Thailand	38.4	39.0	34.4	38.8	38.4	36.7	33.6	32.5
Viet Nam	36.1	41.5	37.2	41.8	40.9	42.4	44.5	43.6
<b>East Asia</b>	<b>14.5</b>	<b>17.8</b>	<b>14.7</b>	<b>18.1</b>	<b>17.6</b>	<b>16.5</b>	<b>13.5</b>	<b>12.7</b>
Japan	10.2	15.2	10.9	14.3	14.0	15.8	13.2	11.4
Korea	32.7	41.2	37.2	42.4	42.0	37.3	32.6	30.4
China	26.3	23.0	19.5	21.7	20.8	19.5	17.3	16.7
Hong Kong	27.7	32.7	29.1	32.4	31.9	29.2	26.6	24.8
Chinese Taipei	37.1	43.7	36.4	42.1	41.2	38.3	32.4	29.8
<b>North America</b>	<b>8.1</b>	<b>9.9</b>	<b>7.6</b>	<b>9.7</b>	<b>9.7</b>	<b>8.7</b>	<b>7.7</b>	<b>7.4</b>
Canada	19.6	19.6	20.1	20.9	21.7	20.1	21.2	20.6
Mexico	34.0	33.3	33.6	32.3	33.8	34.1	36.1	36.4
US	10.8	12.9	9.4	12.7	12.4	11.2	9.5	9.0
<b>EU 28</b>	<b>10.4</b>	<b>12.7</b>	<b>10.8</b>	<b>14.0</b>	<b>14.3</b>	<b>12.9</b>	<b>12.2</b>	<b>11.6</b>
Czech Republic	34.4	35.5	33.3	38.7	39.3	39.7	39.3	37.7
Estonia	30.4	31.8	27.8	38.4	38.6	36.9	34.8	34.5
Hungary	44.0	46.7	43.5	47.8	47.0	46.0	43.1	44.1
Poland	24.7	27.8	24.4	28.4	27.3	27.5	26.6	26.9
Slovak Republic	43.0	45.1	41.9	46.7	46.6	45.9	44.8	44.5
Slovenia	33.3	35.2	30.6	35.5	35.1	33.9	32.5	31.6
Bulgaria	32.4	40.7	31.7	37.2	38.0	37.3	36.2	32.2
Croatia	22.3	21.8	19.0	19.4	18.8	19.0	20.0	19.2
Cyprus	23.6	27.6	25.7	24.1	24.0	27.2	27.8	23.6
Latvia	21.4	20.4	18.8	23.2	24.8	22.2	22.4	20.7
Lithuania	29.5	33.5	26.8	35.5	34.8	32.6	31.6	29.4
Malta	50.9	60.3	62.3	67.9	65.7	61.5	59.2	59.3
Romania	27.6	22.7	19.8	23.7	24.3	23.6	22.9	21.6
Austria	25.5	27.2	23.3	29.7	29.9	28.7	26.5	26.6
Belgium	30.6	35.3	30.8	36.5	37.0	35.5	34.1	33.9
Denmark	26.2	31.5	27.7	29.5	30.1	29.1	29.3	28.1
Finland	27.5	31.6	27.8	31.4	32.1	29.9	25.9	25.9
France	20.4	22.3	18.9	23.4	23.2	22.2	21.4	22.1

Germany	18.6	21.4	18.1	23.2	23.1	21.7	21.0	20.3
Greece	19.1	20.2	17.0	25.3	29.8	28.3	24.5	21.5
Ireland	35.7	40.2	39.1	40.1	42.8	44.7	40.2	41.7
Italy	20.5	23.9	19.8	25.5	24.7	22.8	22.2	22.0
Luxembourg	58.2	61.9	59.0	60.7	62.9	66.8	68.8	67.4
Netherlands	22.9	23.3	21.3	26.4	26.6	26.7	27.9	27.0
Portugal	26.4	28.4	23.7	29.6	30.2	29.5	28.4	28.0
Spain	23.0	24.4	19.0	24.3	25.0	23.7	22.7	21.6
Sweden	24.7	27.0	22.7	24.5	24.8	22.7	20.7	19.7
United Kingdom	14.3	16.6	15.9	18.8	18.8	16.3	15.1	15.4
<b>South and Central America</b>	<b>10.2</b>	<b>10.5</b>	<b>8.2</b>	<b>8.8</b>	<b>9.4</b>	<b>10.1</b>	<b>10.3</b>	<b>8.7</b>
Argentina	11.0	11.8	9.0	11.3	9.7	9.1	6.9	6.9
Brazil	11.2	11.0	8.3	9.7	10.6	11.5	12.5	10.2
Chile	17.7	19.4	15.4	15.8	15.5	15.0	15.1	12.4
Colombia	10.5	10.6	8.8	7.6	7.7	9.4	11.6	10.1
Costa Rica	22.9	23.1	19.0	19.6	20.0	19.0	16.2	16.0
Peru	13.3	15.0	12.4	12.1	12.7	12.3	10.3	9.8

*Source:* Data from OECD-WTO TiVA Database 2018 version

**Table D: DVA in exports of intermediate products as a share of total gross exports (%)**

<b>Region/Country</b>	<b>2005</b>	<b>2008</b>	<b>2009</b>	<b>2011</b>	<b>2012</b>	<b>2014</b>	<b>2015</b>
<b>India (South Asia)</b>	<b>42.9</b>	<b>41.6</b>	<b>39.5</b>	<b>38.1</b>	<b>37.9</b>	<b>38.8</b>	<b>40.0</b>
<b>ASEAN</b>	<b>41.4</b>	<b>42.9</b>	<b>43.3</b>	<b>44.4</b>	<b>43.8</b>	<b>43.1</b>	<b>42.8</b>
Brunei Darussalam	82.8	85.4	84.6	85.4	83.4	86.9	87.8
Cambodia	38.1	35.6	34.9	38.9	38.6	40.5	39.2
Indonesia	55.4	58.0	59.7	62.3	60.6	57.2	55.8
Malaysia	34.1	38.3	37.1	38.0	39.2	40.9	41.0
Philippines	38.9	44.3	45.4	45.1	43.9	47.2	46.9
Singapore	38.2	35.7	37.2	37.2	36.9	38.3	40.3
Thailand	33.6	33.5	35.7	33.2	32.6	32.8	34.2
Viet Nam	35.9	32.8	34.3	31.6	32.7	31.8	30.2
<b>East Asia</b>	<b>44.3</b>	<b>42.2</b>	<b>42.9</b>	<b>40.6</b>	<b>40.8</b>	<b>42.8</b>	<b>46.3</b>
Japan	51.6	48.4	52.5	49.1	49.0	48.5	49.9
Korea	41.1	35.4	37.0	33.4	34.4	37.5	41.2
China	39.8	41.5	41.1	39.9	40.0	41.7	45.2
Hong Kong	41.0	37.8	39.1	35.4	34.8	36.2	38.1
Chinese Taipei	41.7	37.7	42.2	37.0	38.1	40.5	46.0
<b>North America</b>	<b>50.8</b>	<b>50.6</b>	<b>51.1</b>	<b>52.0</b>	<b>51.2</b>	<b>51.0</b>	<b>51.1</b>
Canada	55.3	56.2	54.3	55.9	54.0	55.7	54.1
Mexico	37.3	39.7	36.7	40.3	38.7	35.7	31.8
US	47.2	46.6	48.1	47.6	47.4	47.8	48.4

<b>EU 28</b>	<b>48.1</b>	<b>46.4</b>	<b>46.4</b>	<b>44.6</b>	<b>44.6</b>	<b>45.2</b>	<b>45.8</b>
Czech Republic	35.5	34.5	34.5	33.0	32.9	32.7	34.1
Estonia	39.7	41.4	42.6	36.7	35.9	36.6	37.3
Hungary	28.6	27.4	28.5	27.5	28.7	29.1	30.6
Poland	41.0	40.0	40.8	39.6	39.6	39.8	40.6
Slovak Republic	33.3	30.7	31.0	29.0	29.4	29.8	31.3
Slovenia	34.5	34.5	35.5	35.0	35.6	36.7	38.0
Bulgaria	33.0	29.9	32.1	32.7	32.3	32.8	34.9
Croatia	25.7	25.8	28.2	28.4	28.2	28.4	28.0
Cyprus	37.0	40.3	42.4	44.1	41.8	39.2	40.4
Latvia	48.3	48.0	46.9	44.7	43.5	44.6	44.0
Lithuania	35.8	35.4	37.3	34.3	34.9	36.0	36.2
Malta	25.0	20.2	20.0	14.4	15.6	16.7	17.4
Romania	38.6	43.5	43.5	40.9	41.3	41.7	42.5
Austria	41.1	40.9	42.3	39.8	40.0	40.5	41.3
Belgium	41.9	40.5	42.4	40.6	40.2	40.9	40.8
Denmark	43.6	42.1	43.0	42.2	41.5	40.5	40.7
Finland	45.6	41.4	42.9	42.4	42.4	43.8	46.7
France	41.2	41.2	42.0	41.7	41.8	42.6	43.7
Germany	45.1	43.6	45.3	41.8	42.1	42.8	43.7
Greece	39.3	40.7	39.7	39.9	36.6	34.6	34.4
Ireland	34.0	32.6	33.1	33.7	32.6	30.8	31.4
Italy	39.8	38.3	39.4	37.4	38.3	38.7	39.4
Luxembourg	27.2	26.5	27.3	26.1	24.8	22.6	21.2
Netherlands	47.0	48.1	48.0	47.2	47.2	46.0	44.5
Portugal	36.5	36.8	37.6	36.3	36.2	35.4	35.8
Spain	36.4	37.7	38.6	37.6	37.8	37.7	38.2
Sweden	43.4	41.9	44.6	43.6	43.5	44.9	45.5
United Kingdom	51.1	51.0	51.0	48.8	49.0	49.5	49.5
<b>South and Central America</b>	<b>59.4</b>	<b>61.5</b>	<b>62.4</b>	<b>65.9</b>	<b>64.7</b>	<b>62.9</b>	<b>60.5</b>
Argentina	52.8	49.7	51.3	49.4	50.1	48.6	49.0
Brazil	55.1	58.8	59.0	61.9	59.9	59.0	56.6
Chile	65.8	65.9	68.7	70.5	70.2	68.6	67.2
Colombia	62.8	66.4	66.8	75.6	76.1	73.1	66.7
Costa Rica	32.9	33.7	36.3	37.6	36.4	38.7	38.5
Peru	64.0	64.5	65.5	69.5	67.7	64.3	65.4

*Source:* Data from OECD-WTO TiVA Database 2018 version



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