

## Smile curve and its linkages with global value chains

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**Abstract.** The concept and logic of ‘smile curve’ in the context of global value chains has gained importance in recent time period and discussed at the individual firm level, but rarely identified and investigated at the sectoral level using real data for cross-country analysis. Using TIVA database for 2001 and 2011 time period, several conceptual value chain are investigated including exports of Base Metals, Computer Electronics, Electrical Machinery and Transportation equipment’s in Asian Economies. This paper focuses an idea to measure both the strength and linkages between producers and consumers of global value chain. The identified smile curve provides a very intuitive understanding of the roles played by different countries in various sectors and helps in identifying the benefits gained by them through their participation in global trade. The dynamics of structural upgrading and interactive growth via trade and investment within a hierarchy of countries is aligned with “flying-geese (FG)” theory of growth. The paper also gives emphasis on the role of Regional Comprehensive Economic Partnership in broadening economic integration.

**Keywords.** Economic integration, Fragmentation, Globalization.

**JEL.** F60, F12, F15.

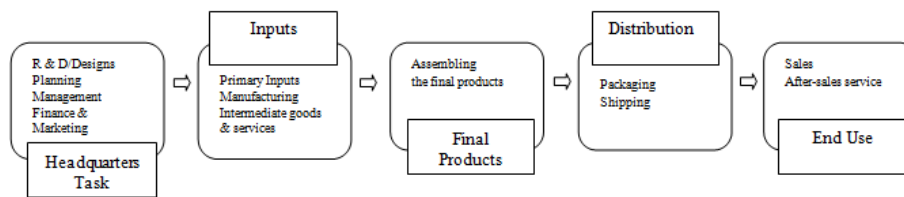
### 1. Introduction

Growth Rapid economic globalization has led to the rise of Global Value Chains (GVCs). The phenomenon relating to the rise of GVCs has been described from different perspective by the economic and political literature, such as fragmentation (Jones & Kierzkowski, 1990), offshore sourcing (Arndt, 1997), external orientation (Campa & Goldberg, 1997), disintegration of production (Feenstra, 1998), vertical specialization (Hummels *et al.*, 2001; Yi, 2003), outsourcing (Grossman & Helpman, 2002a, 2002b), vertical production networks (Hanson *et al.*, 2003), trade in tasks (Grossman & Rossi-Hansberg, 2008), the second great unbundling (Baldwin, 2011), and so on. All these different terms converge to the same fact: value chain is sliced up in assignments and functions globally. Goods are produced “in a number of stages in a number of locations, adding a little bit of value at each stage” (Krugman, 1995). The theoretical and most important cause for this transition is the reduction of service link costs (Jones & Kierzkowski, 1990), which includes cost of trade, warehouse, storage, communication and other investments. Lower costs for these service links has enabled the international unbundling of factories and offices, which means that tasks can be traded globally.

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**Figure 1. A Value Chain**  
Source: ESCAP (2015)

Main factors behind GVCs are Cost Efficiency, Market Access and Low international Trade Costs. Cost Efficiency broadly includes cost of inputs, institutional costs and benefits and infrastructure accessibility. Market access signifies both backward and forward linkages in terms of their intermediate-import and intermediate export markets access respectively. Trade costs include the whole range of costs incurred by a firm in transferring goods or services from the place of production to the place of consumption (APTIR, 2015). From the point of development economics there are several positive aspects of GVCs. First and foremost, firms can take the benefit of their comparative advantage in a specific production process, instead of establishing the whole course of production capacity and thereby participate in the global economy exchange (Kowalski *et al.*, 2015). Second, more employment opportunities are created once participation in GVCs are initiated (UNCTAD, 2013). For instance, jobs are creating in developing economies from iPhone assembly in China, BPOs operation in India, and automobile and auto part production in Thailand, Turkey and China. Third, GVCs also provide the opportunity for technology transfer or spillover to developing countries through local learning (Pietrobelli & Rabellotti, 2010; Kawakami *et al.*, 2012).

However, as specified in the OECD – WTO - World Bank Group report (2014), “Gains from GVC participation are not automatic. Benefits of GVCs can also vary considerably depending on whether a country operates at the high or at the low end of the value chain”. A paradoxical pair of concerns exists between developed and developing countries regarding the costs and risks of joining GVCs (e.g., Baldwin *et al.*, 2014). Since, there lies a huge scope of differences in comparative advantages across countries in general and in relation to GVCs in particular, rich countries may tend to engage in highend and intangible production activities such as R&D design, brand building in the prefabrication stages and marketing, promotion and after saleservice in the post fabrication stages. Thus, rich countries may worry about the deterioration of a country’s manufacturing sector when producers opt for low cost facilities overseas. For example, United States and other developed nations are being hallowed out due to availability of cheap labors in China thereby posing a threat to employment. Developing countries, on the other hand, may tend to focus on lowend and tangible production activities such as manufacturing and assembly. They may be worried on other grounds for engaging in sorts of jobs in which they are not specialized and the advantages cannot be channelized for their own benefits at the optimum and that might lead their economies to get locked into GVCs at the bottom of the so-called “Smile Curve”. The concept of the smile curve was first proposed by Stan Shih (1992), the founder of Acer, a technology company headquartered in Taiwan. Shih (1996) highlighted that in the personal computer industry, both ends of the value chain command higher value added to the product in comparison to the middle part of the value chain.

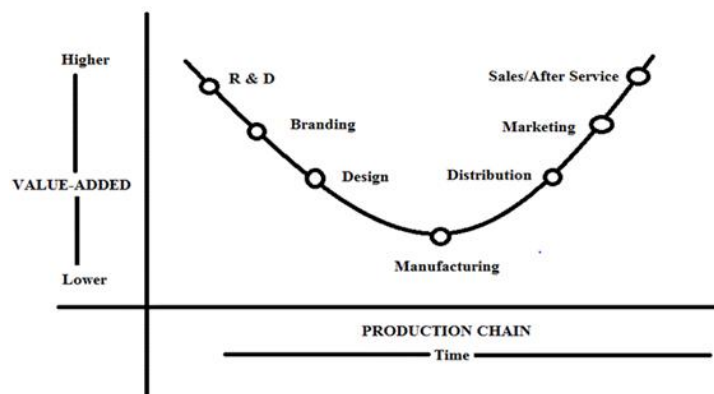


Figure 2. *The Smile Curve*  
Source: Mudambi (2008)

The smile curve logic has been widely used in the context of GVCs (e.g., Mudambi, 2008; Shin *et al.*, 2012). The goal of this paper is to shed light on how important the smile curve notion is at the sectoral level. In particular, we focus on how value added has shifted along the value chain when it comes to Asian exports. To this end, we have incorporated data for 2000 and 2011 version from TIVA (Trade in Value Added) database. The analysis covered 4 sectors namely base metals, computer electronics, electrical machinery and transport and is focused on Asian nations (India, China, Japan and Korea). Cross country analysis for each of these countries in particular sectors has also been computed which demonstrates foreign participation, namely Japan and China, in the domestic (Korean) value chain.

During the past three decades, the process of global production sharing has created a new form of division of labour between Asian economies, especially in East and Southeast Asia (UNESCAP, 2011). The rapid growth of such IPNs has dramatically transformed patterns of production and international trade in East and South East Asia in particular, with a notable expansion of intra(regional trade in parts and components. It has been noted that trade agreements can improve relations thus improving the national security of the countries involved and reducing the likelihood of the war (Kumar & Ahmed, 2015). For instance, in automobile products Thailand specializes in engine and electronic parts, Philippines specializes in fuel system and suspension parts, Malaysia specializes in bumper and drive shaft, while Indonesia specializes in engine valves and steering handle (WTO, 2011). The intermediate products are brought to the country with best capabilities for speedy and cost(efficient assembling (for instance, Thailand), and also from where the product can be exported outside AFTA with greater ease. The AFTA tariff liberalization has facilitated greater intraregion trade flows in semi(finished and final products by offering zero percent tariff on partner exports, which also deepened IIT and IPNs (UNESCAP, 2011).

## 2. Flying Geese Model

The recent popularity gained by “flying-geese (FG)” model, expounded by a Japanese economist, Kaname Akamatsu (1897-1974), in the theory of economic development had a significant relevance in academia. His original ideas were based on three separate though intertwined patterns of FG formation related to the process of industrial development in the Asian countries and the changing pattern of dynamic comparative advantage among them. A first FG analogy had its origin in the empirical findings of the sequential development pattern of imports (M) leading to domestic production (P) and then to exports (X). This MPX framework goes beyond a process of import substitution under protection and ultimately leads to export promotion. The sequence of *import-substitution-cum-export-promotion* was highlighted in his analysis in terms of comparative advantage building; only

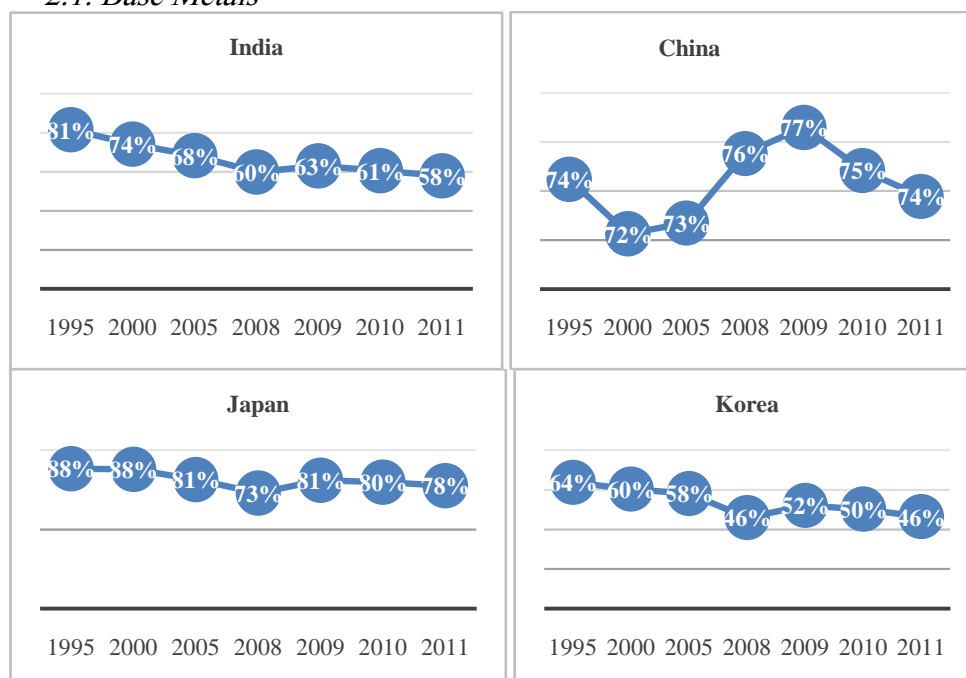
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those industries are protected under import substitution which is potentially capable of attaining comparative advantage at some future point of time. A second FG pattern is a sequence of structural changes in industrial development not only in the production of “capital goods following consumer goods” but also in the progression from “crude and simple goods to complex and refined goods” (Akamatsu,1961). This structural transformation is related to the concept of “the ladder of economic development,” which is popularly used in the field of development economics. A third FG pattern lies in “the alignment of nations along the different stages of development” (Akamatsu, 1961), a sequential positioning of the developing countries that are lined up behind the advanced nations so that the former can emulate, learn and capitalize on growth stimuli from economic interactions that are fundamental in nature. In other words, the modern process of economic development can never be autonomous and self-sufficient but derived from-and necessarily interactive with-more advanced countries.

The dynamic commercial interplays between advanced countries and developing nation’s leads to the growth of the latter and the essence of which lies in a process of climbing the ladder of comparative advantages from labour-intensive to more capital-and knowledge-intensive industries gradually. The countries across the world are at different stages of their development paths, growing at different speeds of structural transformation. This constitutes the basis of dynamic comparative advantages, and the countries within a hierarchy of countries can interact with each other in a complementary and mutually augmenting way so that they can benefit from the “economies of hierarchical concatenation” (Ozawa, 2001).

We will now discuss important manufacturing segments of Indian industry and will compare them with their foreign counterparts. These segments includes base metals, computer electronics, electrical machinery and apparatus, transportation and telecommunication.

### 2.1. Base Metals

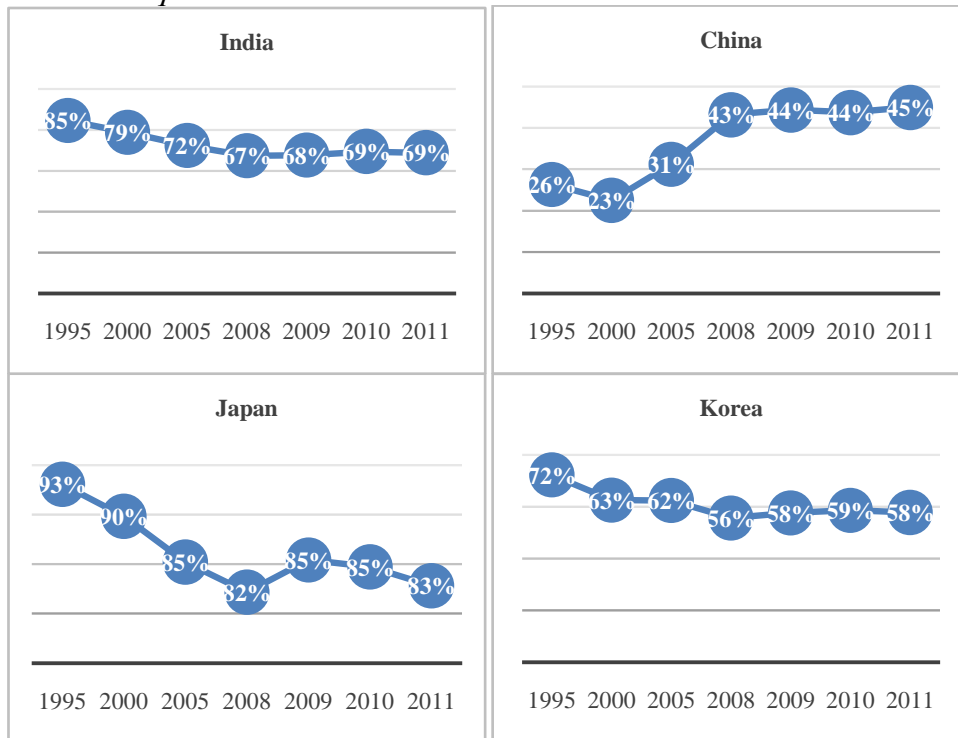


Base Metal is one of the most important segment in the manufacturing sector. Except India, all the other nations (namely China, Japan and Korea) are experiencing the post fabrication stage in the Smile Curve so called- development process. It has been observed that in all these economies, value addition in their

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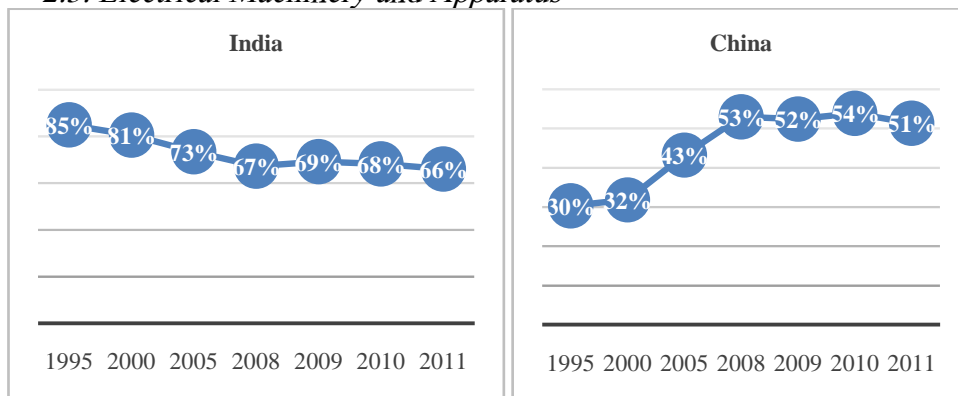
exports has increased post 2008. On the other hand, India is still engaged in pre fabrication stage and yet to climb the ladder of development.

### 2.2. Computer Electronics

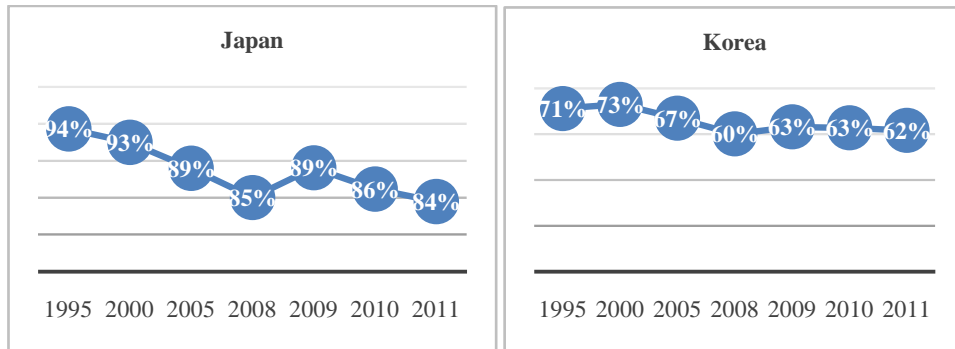


As far as Computer Electronics are concerned, China is experiencing growth as it had crossed the bottom of the so called Smile Curve and has benefited from the comparative advantage due to availability of cheap labour for the production of goods in the Chinese domestic market. For other Asian nations, the growth in this segment is nearly stagnant and still lies in the pre fabrication stage of R & D, branding and design. Unlike China, major competitor, India has not leveraged their labour-intensive techniques for the manufacturing of goods, in this particular area.

### 2.3. Electrical Machinery and Apparatus

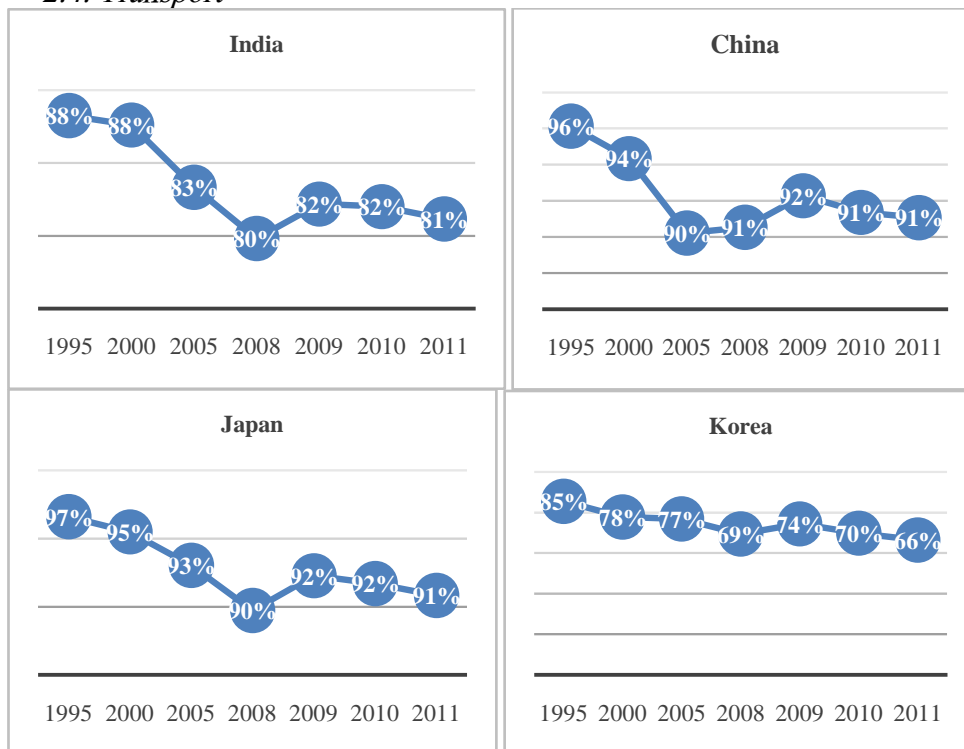


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Similar is the case in Electrical Machinery and Apparatus segment, China is experiencing growth and is exporting the goods at competitive prices in the global market. For other Asian nations, the growth in this segment is nearly stagnant or even experiencing declining trend and still lies in the pre fabrication stage of R & D, branding and design. India still needs to invest in this sector to compete in the international market.

### 2.4. Transport



In Transportation segment, all the Asian economies, included in our study, were able to unshackle the glitches of underdevelopment path and are comfortably operating at the post-fabrication stage of the Smile Curve.

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**Table 1. Cross Country Analysis Percentage Share**

Source Industry – Base Metals								
Exporting Country	Source Country							
	2000				2011			
	India	China	Japan	Korea	India	China	Japan	Korea
India	74.09	0.38	0.70	0.30	57.89	2.68	1.17	0.70
China	0.18	72.25	5.48	1.99	0.62	73.78	3.05	1.30
Japan	0.06	0.65	87.98	0.43	0.24	1.91	77.65	1.05
Korea	0.27	2.37	8.46	60.32	0.98	5.93	6.57	46.42
Source Industry – Computer, Electronic and Optical Equipment								
Exporting Country	Source Country							
	2000				2011			
	India	China	Japan	Korea	India	China	Japan	Korea
India	78.79	0.40	0.95	0.36	68.81	5.10	1.81	1.12
China	0.27	22.56	20.99	6.05	0.78	45.01	10.62	6.35
Japan	0.05	0.52	89.84	0.79	0.20	3.95	82.82	0.99
Korea	0.16	1.10	11.14	62.52	0.56	7.71	7.33	57.77
Source Industry – Electrical and Optical Equipment								
Exporting Country	Source Country							
	2000				2011			
	India	China	Japan	Korea	India	China	Japan	Korea
India	79.57	0.39	0.91	0.34	67.53	4.37	1.62	1.02
China	0.28	24.79	19.60	5.80	0.83	46.19	10.12	5.85
Japan	0.05	0.52	90.06	0.76	0.20	3.84	83.09	0.97
Korea	0.17	1.10	11.00	62.90	0.60	7.58	7.15	58.23
Source Industry – Electrical machinery and apparatus								
Exporting Country	Source Country							
	2000				2011			
	India	China	Japan	Korea	India	China	Japan	Korea
India	80.51	0.38	0.86	0.33	66.04	3.52	1.39	0.89
China	0.34	31.80	15.23	4.99	1.04	51.38	7.98	3.68
Japan	0.04	0.47	92.51	0.45	0.20	3.24	84.49	0.86
Korea	0.48	1.20	7.20	73.08	0.93	6.58	5.76	61.71
Source Industry – Transport and storage, post and telecommunication								
Exporting Country	Source Country							
	2000				2011			
	India	China	Japan	Korea	India	China	Japan	Korea
India	87.61	0.23	0.38	0.14	81.15	1.75	0.52	0.37
China	0.05	94.34	0.71	11.69	0.20	91.07	0.66	9.67
Japan	0.03	0.17	95.48	0.17	0.11	0.64	90.84	0.22
Korea	0.18	0.48	2.47	77.76	0.85	1.94	2.27	66.36

**Source:** Author's Computation

Cross country analysis portrays the performance of the Asian nations in manufacturing sector across different segments. Firstly, India's share in their value added exports has declined in 2011 as comparison to 2001 across all the segments. Moreover, India's participation in the foreign countries value addition is also very minimal i.e. less than 1%. Secondly, China's trade in value added, exporting from their source industry, has increased significantly over the years. Thirdly, Japan and Korea's trade in their value added exports has declined over the years and the maximum value added is contributed domestically in Japan across all the nations. Lastly, Japan and Korea's participation in the foreign countries value addition has increased in 2011.

### 3. RCEP/ TPP

Regional Comprehensive Economic Partnership (RCEP) is a coherent approach towards economic integration. Association of South East Nations (ASEAN) that includes ten member states namely Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam) is negotiating the RCEP to broaden and deepen ASEAN's engagement with its Free Trade Agreement (FTA) partners namely Australia, China, India, Japan, Republic of Korea and New Zealand. Core areas of negotiation include trade in goods and services, investment, economic and technical cooperation, intellectual property rights, dispute settlement, competition and other relevant issues. ASEAN's economic dynamism

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is expected to benefit from RCEP that will provide a platform for broader economic integration and help address concerns about the ‘noodle bowl’ effect of overlapping bilateral and regional agreements. RCEP will deliver tangible benefits through potential improvements in market access, more coherent trade facilitation, regulatory rules, reforming barriers and cooperation. In turn, this will provide more choices and opportunities for ASEAN people to participate gainfully in global value chains.

The role of RCEP has become even more prominent after the US election 2016. US President, Donald Trump, withdrew the US from the Trans-Pacific Partnership (TPP), a trade agreement among twelve of the Pacific Rim countries. The intentions behind are based on the perspective that bilateral FTAs will lead to good trade deals rather than a big RTAs, since US already has FTAs with several TPP members like Australia, Canada, Chile Mexico, Peru and Singapore. Through this mechanism, there is no scope that enables non-US TPP member country to arbitrate against the US. In such a scenario, RCEP emerges as the next best alternative for regional economic integration. China being the largest economy in the RCEP and the second largest economy of the Asia-Pacific and the world is in a position to influence RCEP talks. China has capitalized the Trump victory and US withdrawal from the TPP by reviving the demand for a Free Trade Area in the Asia-Pacific (FTAAP) to be based on the RCEP. It has been able to expand the size and scope of the current RCEP from an Asia-centric, ASEAN+ architecture to an agreement spanning both sides of the Pacific. This development would make India a part of the Asia-Pacific regulatory framework, from the long term perspective, Indian business will produce win-win outcomes.

**Table 2.** Trade Balance of Asian Economies with RCEP over the period 2001-2015 in Million \$

Importing Country	Exporting Country											
	India			China			Japan			Korea		
	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15
India	-	-	-	-2.88	61.08	170.23	0.44	10.97	13.75	6.33	15.90	30.26
Australia	-10.14	-41.45	-43.59	-12.00	-81.37	-249.01	-37.37	-114.51	-166.84	-19.74	-51.31	-58.85
China	-7.97	-88.43	-210.2	-	-	-	-115.69	-79.34	-223.95	67.88	132.05	266.27
Japan	-3.55	-15.60	-24.04	-54.85	-179.12	-105.24	-	-	-	-92.70	-151.7	-121.36
Korea	-8.34	-20.86	-43.46	-123.06	-249.17	-415.61	82.51	139.03	103.40	-	-	-
ASEAN	-4.29	-31.15	-48.95	-68.54	-51.63	183.31	15.09	7.19	-22.60	6.50	37.08	164.48
New Zealand	-0.10	-0.84	-1.78	-1.03	0.16	-13.73	-1.81	-2.45	-3.42	-1.23	-1.31	0.10
Total	-34.41	-198.3	-372.0	-262.39	-500.05	-430.06	-56.82	-39.09	-299.66	-32.96	-19.35	280.90

**Note:** Negative values indicate that Imports are greater than Exports for a given country in a particular time period

In Table 2, India’s trade balance is negative and has deteriorated with all the RCEP partners in the analyzed period (2001-2015). China has positive trade balance with its trading partner ASEAN and India while negative trade balance with Australia, Japan, Korea and New Zealand. Japan has a positive trade balance with India and Korea and negative trade balance with other member nations. Korea has negative trade balance with Australia and Japan and positive trade balance with all other partners. Among the 4 nations analyzed, Korea is the only nation that has overall positive trade balance in 2011-2015

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