Report

On

INDIA'S ELECTONICS EXPORT: A STUDY ON THE TRENDS AND GROWTH OF INDIAN EXPORT MARKET(HS-85)

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Declaration

This is to certify that, I, Vikas Kumar Chaturvedi a student of master's in business administration in International Business (2020-2022), Indian Institute of Foreign Trade, New Delhi, have submitted this research project "**India's Electronics Products Export : A study on trend and growth of Indian export market"** to IIFT in partial fulfilment for the (MBA-IB) degree. This is an original work. It is neither copied(partially/fully) from any other scholastic work nor is submitted to any other institution for any degree or diploma. I remain fully responsible for any error and plagiarism.

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Guide Certification

This is to inform that Vikas Kumar Chaturvedi, student of IIFT MBA (IB) 2020-22, has completed research project on the topic "**India's Electronics Products Export : A study on trend and growth of Indian export market"** under my guidance.

Prof. Ram Singh
Date:22nd Feb 2022

Acknowledgement

I am extremely grateful to Prof. Ram Singh for providing me an opportunity to work under his supervision. His constant encouragement, guidance and innovative ideas remained the inspiring force behind all the work that has been done.

I wish to express heartiest gratitude for all his valuable suggestions during the period of my research project.

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1. Abstract

The effectiveness of India's existing policies and programmes in achieving the objective of "Make in India for the World", with a focus on the electronics manufacturing industry, is examined in this research paper. It covers four specific topics:

1. The impact of current policies on increasing electronics manufacturing production and exports?
2. Which markets should the Indian government and exporters target for exporting electronics products?
3. Can India build a competitive electronics manufacturing industry considering ongoing geopolitical tensions?
4. How the current policy environment can be fine-tuned to achieve the stated goal?

2. Introduction of Indian Electrical and Electronics Industry

2.1 Background and Rationale

The Fourth Industrial Revolution (IR4), in combination with advancements in innovation and digital technologies (DTs), has drastically altered the global economic and human development environment. These technologies have had a huge impact on how people live, work, play, and interact around the world, especially since COVID-19 spread. The United States, Europe, and developed Asia already have a flexible policy space while creating strong DTs, and as a result, domestic production and exported final products have a higher digital value-added proportion. India is one of the fastest-growing DT venues among emerging nations, with the United States, Germany, East and South-East Asia, including China, Singapore, and others (ITA-wise net exporters) increasingly focusing in the country. However, emerging countries often suffer as a result of widening digital divides, limited success with AI, the Internet of Things (IoT), and other technologies as they grow production capacities in their industries.

Due to extended months of Work from Home (WFH) and Learning from Home (LFH) since the epidemic, there has been a concomitant spike in demand (globally and in India) for laptops, tablets, and especially smartphones. Such demands, together with the expansion of automation of the economy, are reshaping the manufacturing future, with trade in high-skilled, knowledge-based products like electronics expanding at double the rate of global commerce. With an exceptional track

record of exporting modern services and a sizable domestic market for electronic goods, India is well positioned to capitalise on these trends.

Several domestic and international forces have come together in recent years to provide India with a once-in-a-lifetime opportunity to develop a globally competitive manufacturing sector. From a geopolitical standpoint, the world is looking to India to counterbalance China as the world's factory, with its young, English-speaking, huge, and relatively cheap labour force and historic democratic traditions. With the Covid-19 outbreak exposing the vulnerability of global value chains, international corporations are increasingly embracing the China Plus One strategy (i.e., a strategy meant to avoid investments only in China and diversify business into other countries). A new world trade system is emerging because of the US-China trade war and the hardening of rhetoric on both sides to decouple their economies, offering India a second chance to reassess its trade and industrial policy. However, in terms of relocation of entire value chains, easy decoupling may not occur quickly because most countries are still reliant on the Chinese economy for infrastructure, intermediate inputs, and other services, and their firms would require lucrative incentives (such as subsidies, tax breaks, and other benefits) to relocate away from Chinese firms .

With these global developments in mind, Indian policymakers have announced a slew of programmes over the last decade, including the National Manufacturing Policy (2011), the National Policy on Electronics (2012), the Make in India initiative (2014), the Phased Manufacturing Programme (2017), and the Remission of Duties and Taxes on Exported Products (RoDTEP – 2021). The development of an internationally competitive electronics industry is at the heart of this planned industrial renaissance. There have also been positive indicators in recent months that India's trade policy may be firmly changing towards increased export promotion, as evidenced by the instance of mobile phones.

However, if this current window of opportunity is not adequately used, India would be overlooked by investors for a long time. To explain, in a decade, Vietnam built an electronics manufacturing industry from the ground up, growing exports from USD 7 billion in 2010 to USD 100 billion in 2020 – a fifteen-fold growth fuelled by the admission of a single company, Samsung. China, whose worldwide electronics exports are sixty times higher than India's, has seen a rapid increase in exports since opening its economy to the rest of the world. Malaysia, on the other hand, which was once a major exporter of microelectronics, has fallen behind due to its incapacity to adapt to technological and commercial factors. Investors will begin to look elsewhere unless India, which accounts for only 1% of global electronic exports, quickly demonstrates its ability to create an ecosystem that can

support efficient production and rapid expansion of electronics manufacturing, according to lessons learned from these countries.

Because most countries still rely on China's economy for infrastructure, intermediate inputs, and other services, their businesses would need enticing incentives (subsidies, tax breaks, etc.) to relocate away from Chinese firms. Furthermore, China's export recovery, which began in the third quarter of 2020 and would intensify in 2021, has created new doubts about the practicality of decoupling - China is predicted to grow at an annual rate of 8.1 percent in 2021.

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To compete with countries like China and Vietnam, which have emerged as global electronic manufacturing hubs due to their significant cost advantages and favourable investment climate, the Indian government has announced several policies, including the Production Linked Incentive (PLI), the Scheme for Promotion of Electronic Components and Semiconductors (SPECS), Electronics Manufacturing Clusters (EMC) 2.0 in 2020, and a new Naxal-Free Zone (2019).

3. Review of Literature and Existing Gaps

Several studies have been conducted to determine the effectiveness of Indian government programmes and schemes for increasing electronics manufacturing and skill development. With mixed reviews, the focus has been on Make in India, NMP, MSIPS, PMP, Merchandise Exports from India Scheme (MEIS), PLI, and other initiatives. For example, ICEA and McKinsey cited PMP as a less successful plan for attracting big manufacturers' investments, but ICEA and EY praised the PLI scheme for luring manufacturing enterprises to India. This emphasised activities, notably in the mobile phone market, such as labour arbitrage, large-scale manufacturing, building an investor-friendly tax environment, and lowering tariff and non-tariff barriers on mobile phone P&C imports. Interventions have been proposed to create incentives for producers in this market to enhance long-term innovation capability. Because of the GVCs' reorientation prompted by the pandemic, prior studies have also emphasised India's potential to become a significant producer and exporter of mobile phones. Many major electronic firms are seeking for other sites to diversify their supply chains, thus there is more possibility for bringing more foreign investment into the country.

Broad challenges for India's electronic industry, including the mobile phone segment, are listed in existing literature, including high capital costs, duty-free PCB imports, a lack of adequate infrastructure, a lack of focus on MSME, a lack of long-term export incentives, and the availability of cheap imports from China, Vietnam, and Taiwan, among others.

Although literature indicates that the trade deficit in ITA-1 products increased by USD 17 billion from 2013 to 2019, this agreement may not be a significant impediment because imports may have expanded organically due to high demand but poor domestic production. Furthermore, because customs tariffs on ITA-1 products are not applicable globally, the true causes of India's increased imports must be examined more closely.

Several studies in the 1990s and 2000s highlighted the industry's import dependency. They anticipated strong yearly import growth rates for electronics of around 22% from 1996 to 2000, up to 35% from 2002 to 2005.

Another pattern has been noticed in terms of exports. Electronic items accounted for only 3.2 percent of India's overall exports in 1996, but they grew at a 3.5 percent annual rate from 1996 to 2000. This was followed by a higher average growth rate of 22% from 2001 to 2005 and 31% from 2006 to

2010. According to the MVIRDC World Trade Centre (2020), mobile phones and line telephone sets have increased their proportion of electronic products exports from 4% in 2015-16 to 35% in 2019.

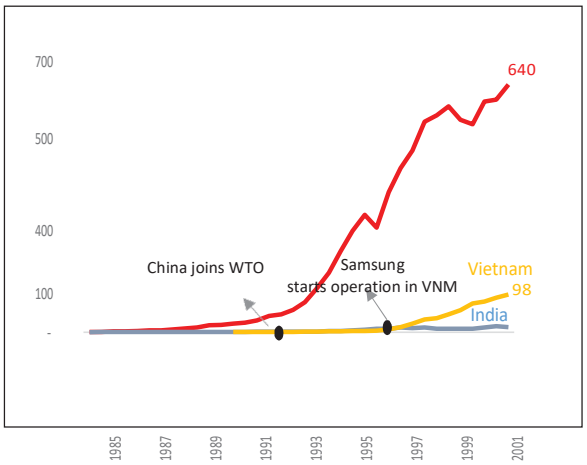

Fig 1: Trend of Electronic Production in the World

Source: WITS Software (data also include electrical appliances in electronics industry)

ICEA and IKDHVAJ (2019) looked at several state-level incentives for electronics in India, such as VAT/SGST refunds, capital subsidies, land at reduced rates, skill development subsidies, and so on; however, they did not go into detail about any one state.

GVCs study has primarily been done segment-by-segment at a worldwide level, such as on the hardware segment with a focus on East Asia; on TV segments in the case of the UK; on Apple's iPods and Hewlett-Packard (HP) and Lenovo laptop PC models. Interestingly, a number of research have been conducted on the GVCs of mobile phones. Even when the N95 phone was made in China and sold in the United States, Europe accounted for 51% of all sales. The value chains of Apple, Huawei, and Samsung smartphones were analysed, and it was discovered that their GVCs are not arranged in a linear value chain, but rather in a spider form. That is, Apple gets its P&C primarily from outside vendors, whereas Samsung and Huawei get it from within their own companies. Only a few Asian countries and the United States account for the majority of production. Furthermore, according to our findings, there is a scarcity of literature for in-depth GVCs study for Indian electronic categories, primarily mobile phones, tablets, and televisions.

KPMG has elaborated on India's role in the value chains of mobile phone handsets. Latter emphasised India's achievements in operations such as plastic and metal moulding or fabrication,

box construction, and PCB assembly, all of which demand a large amount of labour. However, India can take use of the prospects there as well; for example, In Chapter 5 of its Economic Survey, the Ministry of Finance, Government of India (2020), proposes integrating 'Assemble in India for the World' into 'Make in India,' which might help India become an export-oriented economy in electronics

3.1 Objective, Scope and Methodology

The current literature is dispersed and does not focus on comprehending the subtleties of Indian electronics in light of new government policies and the free trade vs. protectionism argument. The efficiency of India's present policies and programmes in achieving the objective of "Make in India for the World," with a focus on the electronics manufacturing industry, is examined in this study. It examines three specific questions: (i) the efficacy of current measures in increasing electronics manufacturing production and exports; (ii) can India build a competitive electronics manufacturing industry while also attempting to decouple its economy from China in light of ongoing geopolitical tensions? and (iii) strategies to fine-tune the current policy environment to meet the stated goal.

4. Production, trade and value chains

4.1 Domestic Production: Trends and Issues

India's electronics sector contributed 2.5 percent to GDP in 2020, with output rising from around INR 147000 crores in 2012-13 to over INR 530000 crores in 2019-20, with mobile phones accounting for 40% of the total. However, given global output of USD 2.1 trillion, India's contribution increased by only USD 5.7 billion (to USD 75.7 billion – accounting for 3.6 percent of global production) from 2018-19 to 2019-20.

The Ministry of Electronics and Information Technology (MeitY), India's highest institution, offers data on electronics production. To begin, MeitY collaborates closely with several organisations such as ICEA, ELCINA, and others to collect production values for seven specified verticals at a highly aggregated level. Key statistics on a few sub-segments are also available for TVs, PCs, and other devices – however data is inaccessible due to non-systematic presentation and availability for only a few years (as and when are reported by different channels).

LED's success has been attributed to the growing need to conserve energy and combat climate change, particularly in light of the Indian government's responsibility to address high electricity costs. Because of the dramatic drop in their prices, the growing urban population fuelled demand for

LED items even more. Their use has also risen in traffic light, auto industry, entertainment and communication, and Smart city initiatives, among other things. By 2022, India's LED lighting industry is expected to reach USD 3.76 billion.

In terms of value, mobile phone output decreased by nearly half from 2012-13 to 2014-15, but increased by nearly 1100 percent from 2014-15 to 2019-20. Because of the shutdown of Nokia's manufacturing facilities, the company's share of phone production fell rapidly to 10% in 2014-15, from 155 million units in 2011-12 to 130 million units in 2013-14 to 58 million units in 2014-15. However, due to Make in India and Digital India, which have a big role for cellular mobile phones and their sub-assemblies, production rose after. In 2015, outreach to leading ESDM locations such as Taiwan and Japan were intensified. Other considerations included the construction of new industrial units, such as There are 268 units total (cumulative 2016-17 to 2018-19). To discourage mobile phone imports and promote domestic value-added, the introduction of PMP, followed by NPE 2019, and a raise in basic custom duty (BCD) to 20% during Budget 2018-19 (increasing from 10%, as applicable until 13th December 2017, to 15% till end of January 2018) provided a push. As a result, India is regarded as a second home for the manufacturing networks of major manufacturers such as Samsung, Xiaomi, Oppo, Vivo, and Apple. It is expected to become the world's second-largest producer of mobile phones and the second-largest market for smartphones, thereby increasing the ecosystem.

In fact, tariffs at the time appeared to have boosted local electronics manufacturing in other areas, such as LED lamps (HS 85395000), colour TVs (HS 852872), TV set-top boxes (HS 85287100), and microwave ovens (HS 8516500) – duty increased from 10% to 20%. However, following PMP may not be the best way to move forward with high BCD rates, as this goes against the free trade ideology.

Due to rising demand for LCD/LED TVs and use of DTH services, as well as increased digitalization in networks (cable TV networks) and usage of set-top boxes, CE's production share has steadily fallen over time. Nonetheless, the quick surge in demand for LCD/LED TVs has been a success story, thanks to their crisp picture quality, which has also helped to cut their prices. To meet demand, the government cut the BCD on open cells (15.6" and above), which are used to make TV panels, from 5% to nil in 2019 (also exempted duty on chip on film, PCB, glass board, etc. to boost local production of open cells).

Table 1: Electronics Production by Sectors (in INR Crores)

Item / Vertical	2012-13	2014-15	2017-18	2018-19	2019-20	2020-21 (E)	Average (2014-15 - 2016-17)	Average (2017-18 - 2019-20)	Average (2018-19- 2020-21)
Consumer Electronics (CE)	40447	55806	73524	77000	81000	70000	58771.0	77174.66	76000
Industrial Electronics	25800	39374	69057	80850	92200	77760	48890.3	80702.3	83603.33
Computer Hardware	9376	18691	21401	21180	21500	22000	19652.7	21360.33	21560
Mobile Phones	34600	18900	132000	170000	214000	220000	54300.0	172000	201333.3
Strategic Electronics	9000	15700	23562	28270	32800	28864	18171.7	28210.7	29978
Electronics Components	26645	39723	59132	67706	75800	64430	45735.0	67546.0	69312
Light Emitting Diodes (LED)	1275	2172	9630	13000	16250	14430	4799.3	12960.0	14560

Source: MeitY, Government of India

Due to output-based incentive schemes like PLI, the share of mobile phones in production climbed by 4 percentage points from 2019-20 to 2020-21, but this decreased in volume terms. In fact, overall electronics manufacturing fell in 2020-21, not because of mobile phones, but because of a major drop in CE, component, and LED production. These demands targeted governmental intervention in the case of consumer electronics, whose share of total manufacturing fell by about 13 percentage points between 2012 and 21.

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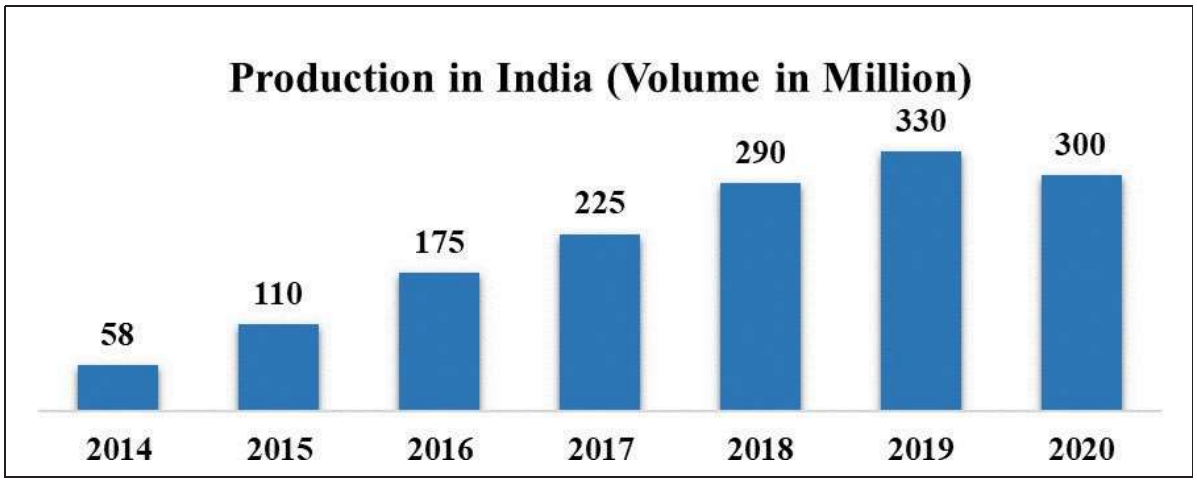
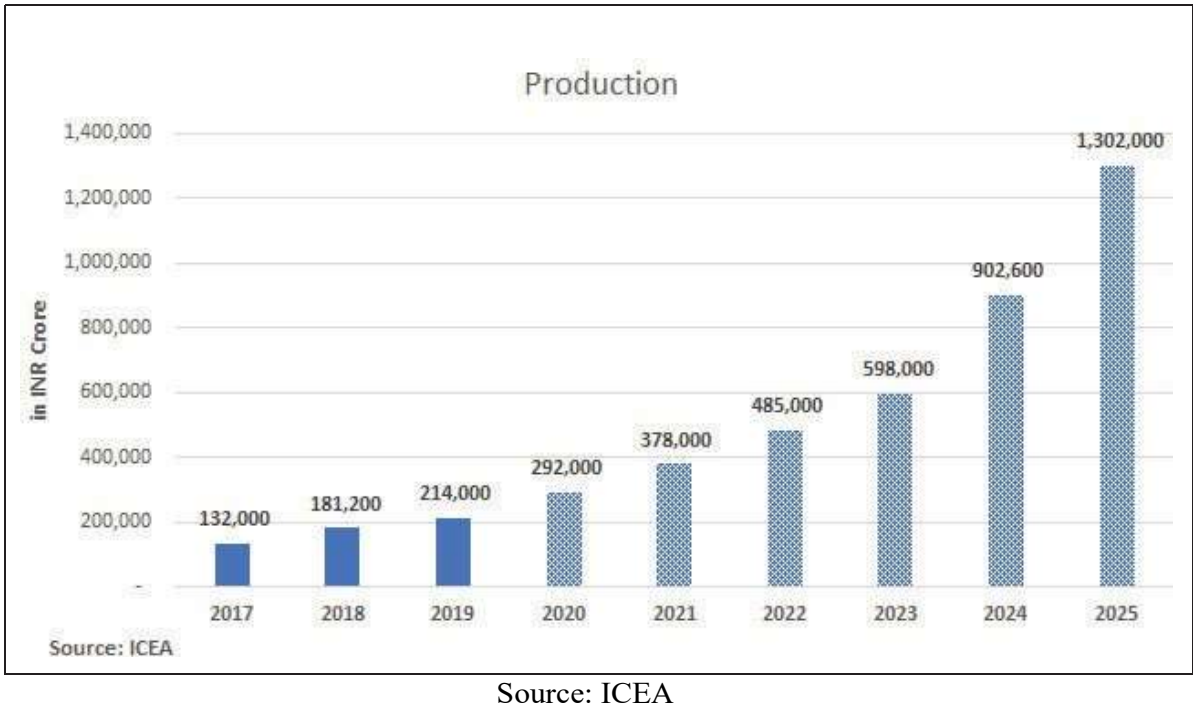
Figure 2: Production of Mobile Phones in India (Volume-wise in Million)



Source: ICEA

Figure 3: Indian Electronics Production Forecast: 2017-25



Source: ICEA

Table 2: Production Trends/Market Size as reported in MEITY Annual Reports (AR) 2012-13 to 2020-21at disaggregated level

Electronic Products	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
LCD/LED TVs	5.5 million units in 2012 (from 4 million units in 2011)	About 7 million units	8.75 million units (INR 16,200 crores)	12 million units (INR 21,000 crores)	14.5 million units (INR 23,925 crores)	16 million units (INR 26,400 crores)	12 million units (38 factories involved in production)"	12.5 million TV sets manufactured
Conventional TV (CRT TVs)	Fall in production due to fall in demand	4.5 million units	Decreased to 3.5 million units (INR 1400 crores)	Further decreased to 2.5 million (INR 1000 crores)	Negative growth	Expected 1 million units (INR 400 crores)		
Home Theatre	0.48 million in 2012 (0.40 million in 2011)				0.7 million units (INR 840 Crores)	Estimated 0.76 million units(INR 924 crores)		

DVD	3.7 million in 2012 (declined from 4 million units in 2011)			Production reduced due to DTH, set-top boxes		Production reduced		
AC, Micro-wave, refrigerator, Washing Machine					(Production of home-appliance: INR 64,742 crores)	Growth rate of 17.2%; production worth INR 44,590 crores		
Computer Hardware (Laptops, PCs)	INR 9376 crore 12 million PC units	Notebooks – INR 9010 Cr; Tablet PCs – INR 1126 Cr; Desktop PCs –	Notebooks – INR 10542 Crores; Tablet PCs –	INR 19,885 crores	INR 20,382 crores (Annual growth rate of 2.5%)	Expected production of INR 21,401 crores (Annual		India's PC penetration – 15 per 1000 people

		INR 4309 Crores	INR 1430 Crores; Desktop PCs – INR 3620 Crore			growth rate of 5%)		
Electro-mechanical components cover PCBs, switches, connectors; passives include capacitors, resistors, wound components, etc.; actives are ICs, diodes, transistors; associated components	Components with largest share by value – connectors (USD 256 Mn), speakers (USD 327 Mn), Cables (USD 30 Mn), switches (USD 226 Mn), PCBs (USD	Electromechanical components (27%), passives (22%), Active components (24%), Associate Components (29%) Components as per higher shares in local production: wound components ($924 Mn); connectors ($516 Mn); speakers	Dominated by electromechanical components (29%), passives (24%), Active components (18%), Associate Components (29%) Demand over	Size of market – INR 45,383 crores	INR 52,099 crores (70% exported, only 25% for domestic use)	25-30% value addition in components; Expected Production as INR 58,351 crores (Over 70% exported)	Dominated by electromechanical components (29%), passives (24%), Active components (18%), Associate Components (29%)	Size of market - USD 25.3 billion (excluding the imported PCB-Assemblies)

cover optical discs, magnets, FR tuners, etc.	157 million), etc. USD 5.19 Bn (30% exported) – from USD 4.99 Bn in 2011-12"	($450 Mn), PCBs ($427 Mn), etc. Demand over USD 14 billion	USD 16 billion					

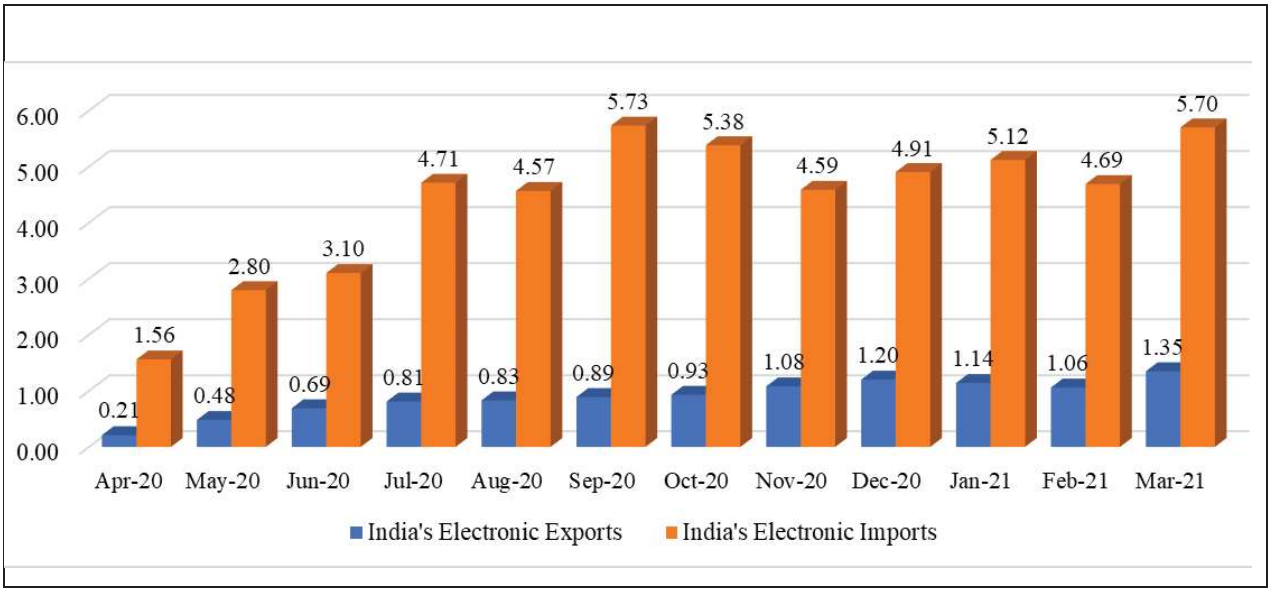
Source: MEITY's Annual Reports (MeitY, Government of India, 2013, 2014, 2015, 2016, 2017a, 2018, 2019a, 2020a,2021)

4.2 Exports and Imports Trends

After years of stagnation, the Indian electronics industry has been given a new lease on life. That is, between 2014 and 2019, its exports (including appliances) virtually doubled (from USD 9 billion to USD 15 billion). The exports of India's electronics industry fell by around 24% from 2013-14 to 2016-17, but increased fast during 2017-19, according to this study, which looked at 380 goods. (An increase of 85%). Since then, electronic item production has improved, but not in proportion to demand, resulting in India's enormous deficit (viz. former was USD 70 billion in 2018-19, while demand was around USD 106 billion in 2017-18). Surprisingly, imports fell after 2018.

India's electronic imports were significant even during the COVID period (2020-21), particularly after February 2021. Exports have been steadily increasing month after month, which is encouraging

Figure 4: Changing India's Exports and Imports of Electronics (April 2020-February 2021)



Source: Export-Import Bank of India, DoC, Government of India

4.3 Export-Profile of Indian Electronics

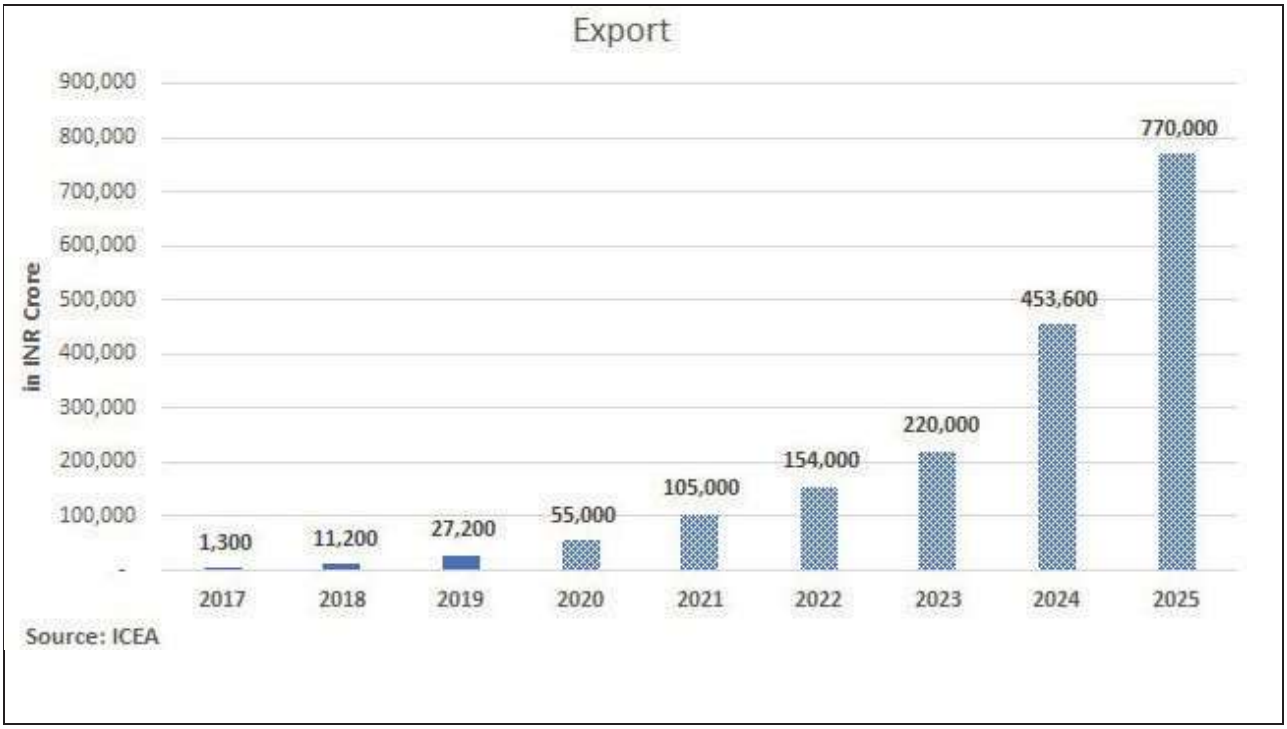
The most exported item in 2013-14 was 'Smart Phones,' followed by its parts. Smartphones, voltage stabilisers, electrical apparatus such as control panels and their parts, and solar cells were among the top

ten products in 2019-20. Over the years, the share of phone parts (HS 85177090) has reduced from 8% to 1%, that of set top boxes (HS 85287100) has decreased from 3% to 1%, that of PCBs (HS 85340000) has decreased from 2% to 1%, that of line telephone sets (HS 85171190) has decreased from 2% to 0.1 percent, and so on.

In the case of smart phones, battery chargers, and solar cells, the overall trend indicates exports of top electronic items from India to the UAE and Russia, as well as the United States, Turkey, South Africa, a number of European countries such as the Netherlands and Germany, China, Hong Kong, and a few Central, Middle-East, and South Asian countries. Furthermore, during 2019-20, India's value chains for smartphones, transformer parts, and solar cells diverged slightly from previous GVCs, which included more East Asian countries like Hong Kong, Japan, and others among the global top importers

It's worth noting that India's electronics exports are expected to skyrocket through 2025. India's electronics industry appears to have a promising future. Note that, compared to the equivalent time of 2019-20, India's top export basket did not alter much during 2020-21 (period coinciding with COVID-19 limits), save for the introduction of PCBA, parts of phones, and other electronics in the top exported commodities during 2020.

Figure 5: Projected Growth of India’s Exports of Electronics



5. Selecting the best product and markets for Export

5.1 List of Exporters of HS-85

Rank	Exporters	Select your indicators
		Value exported in 2020 (USD thousand)
	World	3077273838
1	China	710209792
2	Hong Kong, China	311637561
3	Taipei, Chinese	174276546
4	United States of America	162787891
5	Korea, Republic of	159680889
6	Germany	149873513
7	Singapore	131983577
8	Viet Nam	111093023
9	Japan	102497509
10	Malaysia	86403816
26	India	13465132

Table 3: Largest Exporters of HS-85(Electronic Products)

The total world exports is $3077 Billion, out of which China exports $710 B and is the largest exporter of electronic products followed by Hong Kong with $312 B. India occupies the 26th position with $13.4B worth of exports.

5.2 List of importing markets for the product exported by India in 2020

Considering India as the exporter, the import market includes USA, UAE, Germany, China. France, United Kingdom, Netherlands, Russia, Hong Long and Italy(Table 4). While USA is the largest importer of Indian products, Russia has the largest growth in exports from India at 67% followed by United Arab Emirates at 35%. The countries with negative Balance of Trade are Germany, China, France and Hong Kong.

Importers	Value exported in 2020 (USD thousand)	Trade balance 2020 (USD thousand)	Growth in exported value between 2016-2020 (%, p.a.)
World	13465132	-29490831	16
United States of America	2738307	1185670	25
United Arab Emirates	1615252	1394728	35
Germany	709875	-483411	16
China	638700	-17212400	17
France	463378	-112349	17
United Kingdom	453308	62114	5
Netherlands	380859	196615	17
Russian Federation	333069	281702	67
Hong Kong, China	305432	-6851745	14
Italy	287043	81111	27

Table 4: Largest Importers of Indian electronic products

5.3 List of products at 4 digits level exported in 2020

The largest exported 4-digit HS codes are Electronic integrated circuits (HS-8542), Telephone sets (HS-8517), Diodes, transistors and similar semiconductor devices (HS-8541), Insulated cables, wires and other insulated products (HS-8544), Electrical transformers, static converters (HS-8504), Electrical apparatus for switching or protecting electrical circuits (HS-8536), Monitors and projectors (HS-8528), Electric accumulators (HS-8507) etc.

From the table 5, most of the products are the raw material used in making products like mobiles, laptops, air-conditioners, refrigerators and other electronic products.

HS-85	Product Label	Value exported in 2020 (USD thousand)
TOTAL	All products	18401315648
'8542	Electronic integrated circuits; parts thereof	922586573
'8517	Telephone sets, incl. telephones for cellular networks or for other wireless networks; other ...	622282774
'8541	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, ...	138556407
'8544	Insulated "incl. enamelled or anodised" wire, cable "incl. coaxial cable" and other insulated ...	128275110
'8504	Electrical transformers, static converters, e.g. rectifiers, and inductors; parts thereof	111113921
'8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections ...	106261419
'8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus ...	97963902
'8507	Electric accumulators, incl. separators therefor, whether or not square or rectangular; parts ...	73316336
'8523	Discs, tapes, solid-state non-volatile storage devices, "smart cards" and other media for the ...	70496155
'8537	Boards, panels, consoles, desks, cabinets and other bases, equipped with two or more apparatus ...	68975842

Table 5: Most exported 4-digit HS-85 products

5.4 Sectoral Hirschman Index (SHI) of HS-85

Sectoral Hirschman Index (SHI) is the index that is used to calculate the sectoral concentration of exports from a sector. In this case, we use the SHI to check the degree on concentration of products exported under HS Code 39.

If the SHI is > 0.5, we conclude that the sector is not diversified enough into other products and we should look in to venturing into newer products. But is SHI < 0.5, we conclude that there is enough potential for exports with the existing products and the category is well-diversified.

Using this index, we calculate the SHI for the HS Code 39 category of products and the **SHI calculated is 0.3968.** This reveals that the sector is well diversified and there is no need to enter into new product categories. Thus, from this we can continue to the search to select the right products under the HS 39 sector.

Table 6: Calculating SHI of HS-85

		Value exported in 2020 (USD thousand)	Share	Squares
'TOTAL	All products	275488745		
'8517	Telephone sets, incl. telephones for cellular networks or for other wireless networks; other ...	3937458	0.014293	0.000204
'8504	Electrical transformers, static converters, e.g. rectifiers, and inductors; parts thereof	1699913	0.006171	3.81E-05
'8544	Insulated "incl. enamelled or anodised" wire, cable "incl. coaxial cable" and other insulated ...	1002856	0.00364	1.33E-05
'8503	Parts suitable for use solely or principally with electric motors and generators, electric ...	794240	0.002883	8.31E-06
'8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections ...	695978	0.002526	6.38E-06
'8538	Parts suitable for use solely or principally with the apparatus of heading 8535, 8536 or 8537, ...	610444	0.002216	4.91E-06
'8537	Boards, panels, consoles, desks, cabinets and other bases, equipped with two or more apparatus ...	537907	0.001953	3.81E-06
'8501	Electric motors and generators (excluding generating sets)	510734	0.001854	3.44E-06
'8502	Electric generating sets and rotary converters	421142	0.001529	2.34E-06
'8507	Electric accumulators, incl. separators therefor, whether or not square or rectangular; parts ...	359295	0.001304	1.7E-06
'8511	Electrical ignition or starting equipment of a kind used for spark-ignition or compression-ignition	276045	0.001002	0.000001
'8542	Electronic integrated circuits; parts thereof	265331	0.000963	9.28E-07
'8529	Parts suitable for use solely or principally with transmission and reception apparatus for ...	200252	0.000727	5.28E-07
'8545	Carbon electrodes, carbon brushes, lamp carbons, battery carbons and other articles of graphite ...	196573	0.000714	5.09E-07
'8535	Electrical apparatus for switching or protecting electrical circuits, or for making connections ...	181511	0.000659	4.34E-07
'8541	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices	160326	0.000582	3.39E-07
'8523	Discs, tapes, solid-state non-volatile storage devices, "smart cards" and other media for the	155061	0.000563	3.17E-07
'8512	Electrical lighting or signalling equipment (excluding lamps of heading 8539), windscreen wipers	133459	0.000484	2.35E-07

'8543	Electrical machines and apparatus, having individual functions, n.e.s. in chapter 85 and parts ...	132035	0.000479	2.3E-07
'8526	Radar apparatus, radio navigational aid apparatus and radio remote control apparatus	123109	0.000447	2E-07
'8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus	117552	0.000427	1.82E-07
'8532	Electrical capacitors, fixed, variable or adjustable "pre-set"; parts thereof	117442	0.000426	1.82E-07
'8534	Printed circuits	110970	0.000403	1.62E-07
'8546	Electrical insulators of any material (excluding insulating fittings)	94221	0.000342	1.17E-07
'8525	Transmission apparatus for radio-broadcasting or television, whether or not incorporating reception	81126	0.000294	8.67E-08
'8514	Industrial or laboratory electric furnaces and ovens, incl. those functioning by induction	77941	0.000283	8E-08
'8516	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating	70039	0.000254	6.46E-08
'8509	Electromechanical domestic appliances, with self-contained electric motor; parts thereof	54513	0.000198	3.92E-08
'8531	Electric sound or visual signalling apparatus, e.g. bells, sirens, indicator panels, burglar	53373	0.000194	3.75E-08
'8547	Insulating fittings for electrical machines, appliances or equipment, being fittings wholly	44046	0.00016	2.56E-08
'8515	Electric, incl. electrically heated gas, laser or other light or photon beam, ultrasonic, electron	42456	0.000154	2.38E-08
'8518	Microphones and stands therefor (excluding cordless microphones with built-in transmitter)	40172	0.000146	2.13E-08
'8539	Electric filament or discharge lamps, incl. sealed beam lamp units and ultraviolet or infra-red	38827	0.000141	1.99E-08
'8533	Electrical resistors, incl. rheostats and potentiometers (excluding heating resistors);	34175	0.000124	1.54E-08
'8505	Electromagnets (excluding magnets for medical use); permanent magnets and articles intended	33176	0.00012	1.45E-08
'8527	Reception apparatus for radio-broadcasting, whether or not combined, in the same housing, with	26983	9.79E-05	9.59E-09
'8530	Electrical signalling, safety or traffic control equipment for railways, tramways, roads, inland	13569	4.93E-05	2.43E-09
'8506	Primary cells and primary batteries, electrical; parts thereof (excluding spent)	10892	3.95E-05	1.56E-09
'8508	Vacuum cleaners, incl. dry cleaners and wet vacuum cleaners	2093	7.6E-06	5.77E-11
'8540	Thermionic, cold cathode or photo-cathode valves and tubes, e.g. vacuum or vapour or gas filled	1840	6.68E-06	4.46E-11
'8513	Portable electric lamps designed to function by their own source of energy, e.g. dry batteries	1625	5.9E-06	3.48E-11
'8522	Parts and accessories suitable for use solely or principally with sound reproducing and recording	1356	4.92E-06	2.42E-11
'8521	Video recording or reproducing apparatus, whether or not incorporating a video tuner	1153	4.19E-06	1.75E-11
'8519	Sound recording or sound reproducing apparatus	771	2.8E-06	7.83E-12
'8548	Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary	591	2.15E-06	4.6E-12
'8510	Electric shavers, hair clippers and hair-removing appliances, with self-contained electric	563	2.04E-06	4.18E-12
Others		262023611	0.951123	0.904634
Sum of Squares				0.904927
SHI				0.951276

5.5 Regional Hirschman Index (RHI) of HS

Regional Hirschman Index (RHI) is that index which is used to calculate the regional or geographical concentration of the exports from a sector. Here, we use the RHI to check if the exports of products from HS Code 39 are concentrated only to a few nations or if is well diversified.

From this index one can check the geographical concentration of the products exports – if the RHI > 0.5, we say that the RHI is highly concentrated to only a few markets and there is an urgent need to diversify the exports to other countries. On the other hand, if the RHI < 0.5, we conclude that the geographical locations to which the products from the category are exported is well diversified. This means that an exporter can continue the market penetration activities without venturing into newer markets.

Using this index for HS Code 39 sector, we find that the **RHI is 0.95.** From this we can conclude that the HS Code 39 category is concentrated among few nations and that there is a need to search of newer markets to explore of our products exports

	Value exported in 2020 (USD thousand)	Share	Square
World	13465132		
United States of America	2738307	0.2033628	0.041356
United Arab Emirates	1615252	0.11995813	0.01439
Germany	709875	0.0527195	0.002779
China	638700	0.04743362	0.00225
France	463378	0.03441318	0.001184
United Kingdom	453308	0.03366532	0.001133
Netherlands	380859	0.02828483	0.0008
Russian Federation	333069	0.02473567	0.000612
Hong Kong, China	305432	0.02268318	0.000515
Italy	287043	0.0213175	0.000454
Singapore	277555	0.02061287	0.000425
Nigeria	264654	0.01965476	0.000386
Bangladesh	264416	0.01963709	0.000386
Turkey	243551	0.01808753	0.000327
Nepal	235287	0.0174738	0.000305
South Africa	217050	0.01611941	0.00026
Others	4037396	0.2998408	0.089905
Sum of Squares			0.157468
SHI			0.396822

Table 7: Calculating RHI of HS-85

5.6 Revealed Comparative Advantage (RCA) of HS-85

It is a trade indicator which is used for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. It is based on the Ricardian comparative advantage concept. While RCA can be used to provide a general indication and first approximation of a country's competitive export strengths, it does not consider factors which affect competitiveness such as tariffs, non-tariff measures, subsidies and others.

RCA uses trade patterns to identify the sectors in which an economy has a comparative advantage, by comparing the country of interests' trade profile with the world average.

If RCA >1, it indicates high level of competitiveness, and a high RCA value gives the confidence of acceptance of product in international market.

We have calculated the RCA for 5 years and shortlisted products at a 6-digit level HS code with 1<RCA<15 and rising.

We calculate the RCA of HS-85 for India and the L2 competitor (China), taking into consideration the world imports. We select the 4-digit HS codes whose RCA(India) is greater than 1, increasing for the last 4 years, whose RCA(China) is decreasing, and the trend of world imports is increasing.

Table 8: Calculating RCA(India) of HS-85

	RCA- India					
Code	2016	2017	2018	2019	2020	Trend
'8501	2.362625	2.502361	2.018273	1.868463	1.981407	
'8502	3.837305	4.470375	4.081176	2.802941	4.095018	
'8503	3.791851	4.285735	5.82482	6.416589	8.611805	
'8504	3.799557	3.73463	3.320528	3.430184	3.337985	
'8505	0.95471	1.217276	1.047185	0.831554	0.823189	
'8506	0.303735	0.280099	0.207897	0.406628	0.268514	
'8507	1.484575	1.583666	1.475543	1.192753	1.042644	
'8508	0.0851	0.069105	0.04987	0.037622	0.029626	
'8509	1.012461	1.078841	1.055807	0.750517	0.643295	
'8510	0.125868	0.097893	0.02529	0.019675	0.019708	
'8511	3.63049	4.313697	3.971367	2.988028	3.332446	
'8512	0.977011	1.217005	1.254055	0.961712	0.909653	
'8513	0.192133	0.20851	0.174278	0.602441	0.105559	
'8514	4.112628	4.907083	4.62492	3.594504	3.201331	
'8515	0.961803	1.073099	0.949383	0.828896	0.802104	
'8516	0.359172	0.342108	0.301657	0.243409	0.255591	
'8517	0.551565	0.54657	0.817699	1.367734	1.475758	
'8518	0.785569	0.865534	0.619895	0.205373	0.184358	
'8519	0.052134	0.109293	0.0644	0.033419	0.058057	
'8520	0	0	0	0	0	
'8521	0.077825	0.076824	0.238943	0.079642	0.049316	
'8522	0.040712	0.056335	0.073491	0.043508	0.113436	
'8523	1.914328	1.328393	0.957946	0.882946	0.506802	
'8524	0	0	0	0	0	
'8525	0.407961	0.494059	0.46492	0.325216	0.440792	
'8526	0.100812	0.357051	0.44008	0.460998	1.452565	
'8527	0.336178	0.52243	0.626717	0.468565	0.462735	
'8528	0.481942	0.186037	0.118263	0.177708	0.26764	
'8529	0.783484	0.519974	0.463553	0.494594	0.685223	
'8530	1.015993	1.440847	1.952322	1.285214	1.152343	
'8531	0.463954	0.854814	0.695619	0.642797	0.70388	
'8532	1.254152	1.324457	0.94724	0.815065	0.723759	
'8533	0.840359	1.118203	0.72894	0.557227	0.6251	
'8534	0.802387	0.756387	0.571926	0.512942	0.473514	
'8535	6.302555	6.357851	4.557591	4.243517	4.766343	
'8536	1.692699	1.765904	1.520995	1.267007	1.407689	
'8537	2.194025	2.136076	1.739684	1.426902	1.706597	
'8538	4.00581	4.672989	4.087384	3.343131	3.647799	
'8539	2.139662	1.443765	0.98043	0.635018	0.577436	
'8540	1.051657	0.600088	0.429659	0.251663	0.235767	
'8541	0.412177	0.464218	0.32909	0.562885	0.27833	
'8542	0.026087	0.035596	0.072624	0.063883	0.069098	
'8543	1.159	0.767872	0.378858	0.469259	0.524258	
'8544	1.853406	1.958605	1.565212	1.606014	1.727823	
'8545	9.96941	15.45377	22.3543	10.59457	7.365196	
'8546	9.176855	10.43315	9.133538	8.137535	8.523589	
'8547	2.583912	2.252838	1.622934	1.359304	1.487221	
'8548	0.04358	0.059324	0.010912	0.015765	0.017413	

Table 9: Calculating RCA(China) of HS-85

	RCA-China					
Code	2016	2017	2018	2019	2020	Trend
'8501	0.912555	0.873102	0.873463	0.830519	0.826464	
'8502	0.618725	0.723253	0.801825	0.764509	0.835146	
'8503	0.947177	1.04012	1.032008	1.105785	1.027265	
'8504	1.143404	1.148737	1.10022	1.11461	1.116475	
'8505	1.290234	1.351255	1.355659	1.378565	1.342533	
'8506	1.131457	1.109044	1.09918	1.058401	1.093322	
'8507	1.040897	1.02601	1.071314	1.098648	1.10946	
'8508	1.747008	1.820824	1.793124	1.688865	1.777874	
'8509	1.89473	1.973749	1.919248	1.996345	2.232724	
'8510	1.212352	1.186406	1.096754	1.124956	1.240183	
'8511	0.438843	0.454817	0.443743	0.406516	0.449946	
'8512	0.579467	0.550615	0.540315	0.537503	0.573354	
'8513	3.156689	3.119191	2.934567	2.840615	2.892852	
'8514	0.517841	0.484486	0.529933	0.72201	0.602903	
'8515	0.54987	0.568505	0.566095	0.608366	0.755792	
'8516	1.772383	1.777817	1.731156	1.705296	1.728208	
'8517	1.655361	1.696476	1.714922	1.592253	1.586347	
'8518	1.70799	1.680683	1.552762	1.481989	1.610042	
'8519	1.571321	1.542869	1.496812	1.143843	1.354037	
'8520	0	0	0	0	0	
'8521	2.415365	2.5688	2.737436	2.666466	2.606008	
'8522	1.193639	1.212809	1.205721	1.060423	0.891865	
'8523	0.453856	0.350883	0.325242	0.349378	0.267179	
'8524	0	0	0	0	0	
'8525	1.002545	0.990103	1.089296	1.013338	1.116369	
'8526	0.692373	0.497556	0.424008	0.418662	0.5152	
'8527	1.346188	1.3136	1.168671	1.044588	1.286575	
'8528	1.343901	1.443908	1.463338	1.383923	1.377207	
'8529	0.886601	0.938133	0.944706	0.93481	0.969168	
'8530	0.384758	0.411334	0.322986	0.325719	0.389627	
'8531	0.614903	0.8241	0.799476	0.793369	0.826632	
'8532	0.775294	0.66686	0.622804	0.560445	0.680829	
'8533	0.742087	0.618105	0.588848	0.531957	0.876125	
'8534	1.196362	1.196363	1.225894	1.227261	1.222206	
'8535	0.296824	0.336182	0.353918	0.385913	0.384818	
'8536	0.607621	0.621291	0.610709	0.62508	0.666239	
'8537	0.504685	0.52444	0.542611	0.558361	0.537367	
'8538	0.420165	0.434505	0.443022	0.447051	0.431593	
'8539	1.676522	2.247483	2.147622	2.202914	2.339488	
'8540	0.735464	0.505154	0.355035	0.25724	0.203485	
'8541	1.025431	1.038498	1.067882	1.218631	1.174664	
'8542	0.488727	0.451014	0.497131	0.586252	0.578239	
'8543	0.904719	1.048744	1.030375	1.155652	1.340353	
'8544	0.781589	0.780127	0.738442	0.706631	0.743368	
'8545	0.963477	1.493542	1.446429	1.366002	1.211443	
'8546	1.015029	1.062282	1.037604	0.984164	0.990441	
'8547	0.365439	0.383579	0.389094	0.335722	0.351996	
'8548	0.529724	0.292429	0.41066	0.885752	0.8886	

Table 10 : World Imports of HS-85

	World Imports(000 USD)					
Code	2016	2017	2018	2019	2020	Trend
'8501	49343873	53668474	59858233	59268967	55871312	
'8502	21163137	20757332	23798967	23435897	22877020	
'8503	17167991	18038307	18971160	19337216	17043270	
'8504	89419406	94573800	1.02E+08	1.02E+08	1.04E+08	
'8505	7925763	8755559	9447683	8838912	8562670	
'8506	7882903	8533419	8955486	8757854	8911545	
'8507	37249198	44954213	53895530	58669985	66574386	
'8508	10248972	12183211	14172473	14399463	16361253	
'8509	11173666	11930992	12917559	13130035	14736125	
'8510	4343571	4889381	5227413	5148194	5631001	
'8511	19463147	20438162	21787392	20837506	18236936	
'8512	28542108	31148492	34356960	32797769	29414735	
'8513	2835821	2826344	2947510	2970269	2832069	
'8514	4670992	4845134	5438509	5572751	5162992	
'8515	11046820	11859717	12399664	11754052	10704655	
'8516	42478338	46147192	50846905	52200208	54081098	
'8517	5.44E+08	6.14E+08	6.23E+08	5.95E+08	5.75E+08	
'8518	33632814	38983757	42383044	45559309	46618820	
'8519	3578081	3584921	3623110	3690412	3464421	
'8520	774	5912	584	70		
'8521	5213107	4921476	4365531	4254874	3790846	
'8522	3076589	2736342	2454968	2039476	1604755	
'8523	55369506	62312854	65093375	57815346	63154001	
'8524	46457	247857	829	1428	57	
'8525	43692108	46811724	47210726	45162579	41300719	
'8526	18843054	18639445	19708394	20292569	16630482	
'8527	13689507	13630642	12592258	11461873	9352347	
'8528	83884139	90072402	93395089	90775276	86620478	
'8529	60390852	68604559	66125207	66628335	67741488	
'8530	2353923	2353479	2366056	2440225	2168041	
'8531	17884373	18125809	19040259	19013831	16428292	
'8532	26102534	28814800	38890154	33476027	35118354	
'8533	10463699	10993466	12489997	10935457	12116240	
'8534	44558243	49071910	52014139	49318974	49732597	
'8535	8274524	8457655	8704201	8500358	7894229	
'8536	97331497	1.06E+08	1.13E+08	1.09E+08	1.04E+08	
'8537	55525616	60017056	66591396	67298580	63887528	
'8538	31425379	34747441	37248828	35641026	32606599	
'8539	11674773	16326963	16417997	14727883	13822777	
'8540	1582913	1563273	1626188	1527039	1514259	
'8541	1.12E+08	1.15E+08	1.17E+08	1.19E+08	1.21E+08	
'8542	6.47E+08	7.47E+08	8.62E+08	8.5E+08	9.38E+08	
'8543	42133980	42547316	45765926	46089191	44632215	
'8544	1.09E+08	1.18E+08	1.31E+08	1.27E+08	1.17E+08	
'8545	3698499	5313725	11530002	8663502	5351963	
'8546	2562697	2717187	2764755	2479116	2590767	
'8547	5199630	5863702	6137767	5613667	5295004	
'8548	6764595	7438914	7975387	7793307	8150479	

Table 11: Products selected based on RCA of India and China

Code	Product label
'8503	Parts suitable for use solely or principally with electric motors and generators, electric ...
'8517	Telephone sets, incl. telephones for cellular networks or for other wireless networks; other ...
'8502	Electric generating sets and rotary converters
'8504	Electrical transformers, static converters, e.g. rectifiers, and inductors; parts thereof

Table 12: RCA trends of India and China and World Imports

	RCA- India						RCA-China						World Imports					
Code	2016	2017	2018	2019	2020	Trend	2016	2017	2018	2019	2020	Trend	2016	2017	2018	2019	2020	Trend
'8503	3.791851	4.285735	5.82482	6.416589	8.611805		0.947177	1.04012	1.032008	1.105785	1.027265		17167991	18038307	18971160	19337216	17043270	
'8517	0.551565	0.54657	0.817699	1.367734	1.475758		1.655361	1.696476	1.714922	1.592253	1.586347		5.44E+08	6.14E+08	6.23E+08	5.95E+08	5.75E+08	
'8502	3.837305	4.470375	4.081176	2.802941	4.095018		0.618725	0.723253	0.801825	0.764509	0.835146		21163137	20757332	23798967	23435897	22877020	
'8504	3.799557	3.73463	3.320528	3.430184	3.337985		1.143404	1.148737	1.10022	1.11461	1.116475		89419406	94573800	1.02E+08	1.02E+08	1.04E+08	

From the calculation and trend, it can be seen that for HS-8503 the RCA(India) >1, increasing and RCA(India) > RCA(China) whereas the World Imports have dipped in 2019, mainly because of lockdown restrictions.

For HS-8517, the RCA(India) has crossed 1 in 2019 and increasing, whereas RCA(China) is decreasing in the last 5 years, the world imports only in 2019 mainly because of the pandemic.

For HS-8503 the RCA(India) >1, increasing and RCA(India) > RCA(China) whereas the World Imports have a flat trend.

For HS-8504 the RCA(India) >1, increasing and RCA(India) > RCA(China) and the World Imports have increase despite the effect of Covid-19.

The best exportable product is HS-8504 (Electric transformers and static converters, but we will try to find markets for all the 4 HS codes.

5.7 Selecting Markets

Finding top Balance of Trade (BoT) negative countries - the countries with the positive BOT are importing this product not for domestic consumption in their own market but to re-export it to the third country. Hence it is not advisable for a small start-up to invest his time and energy towards understanding the demand patterns in such markets as they won't be able to cope with the high economies of scale.

For a start-up the best suited market for the identified products will be the one where the imports are not re-exported but are imported for the purpose of domestic consumption. In short, the countries having a negative balance of Trade.

• If BOT is +ve then exports>imports meaning the existence of trading companies is high as they are buying for the purpose of selling. They are re- exporting and paying the duties two times as the EOS are high.

• Shortlist BOT –ve Countries and positive growth rate

Need to further delve to find the best market- For markets which makes sense for considering the sustainability of the import demand. To estimate this aspect of an importing countries, we calculate an index termed as "Import Penetration Index" (IPI).

- "High IPI of your product in an importing country indicates high import dependency of localities' on imports to satisfy domestic demand".
- High IPI and -ve Bot combined takes care of the L3 players.
- Meaning: either there in no local production or if its there then its incapable of sustaining the demand.
- Prioritize – Shortlist Countries with high IPI values and arrange them in descending order
- High IPI countries gave us the countries who have no choice but to import – The buying preference must be India

5.8 Trade Intensity Index

High IPI value countries have huge dependency on imports to satisfy local demand due to absence of local manufacturers. So, by shortlisting such markets with high IPI values we take care against L3 players but L2 still exits. This import demands may be satisfied by other competing suppliers.

Solution: use an index termed as "Trade Intensity Index"

A good TII and rising one indicates good value of TII comes from good numerator value which is indicative of Increasing India's exports to the market and Indian products are being accepted in that market and Indian L1 players are finding it lucrative to export to that market.

We also compare the TII values of the largest L2 player, which in case of HS-8502, HS-8503, HS-8504 and HS-8517, is China.

Trade Intensity Index of HS-8517

		India's TII of HS-8517					China's TII of HS-8517				
Country	Trade balance in 2020 (USD thousand)	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Germany	-11843781	0.085714	0.05803	0.106137	0.836837	-	1.771902	1.532483	1.493729	1.366921	1.413178
Netherlands	-3018646	1.257271	1.561684	1.491685	1.891965	1.907992	1.434911	1.691132	1.657166	1.426794	1.438614
United Kingdom	-14816151	0.032352	0.037527	0.05928	0.393593	1.23919	1.208269	1.217213	1.301316	1.429712	1.209774
Canada	-8241323	0.330891	0.423655	0.513183	0.48596	#VALUE!	1.788094	1.690956	1.730292	1.782428	1.41943
Russia	-8998053	0.752033	0.001788	1.969227	2.783798	2.19645	1.274539	1.292469	1.360193	1.400157	1.372799

Table 13: Comparing Trade Intensities of India and China for years 2016-2020 for HS-8517

From table 13, India's TII with Russia is increasing and more than China' TII. The Balance of trade value is $8.9B. The cordial relations of India and Russia can be leveraged upon to push export of HS-8517 into the Russian market. For Germany, Netherlands, UK and Canada, India's TII is lesser than China's TII

Trade Intensity Index of HS-8503

India's TII of HS-8503							China's TII of HS-8503				
Country	Trade balance in 2020 (USD thousand)	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
USA	-1425808	10.4875	13.5745	18.6268	23.0014	22.0762	1.26725	1.09311	1.04526	1.13248	0.85908
Germany	-398881	2.38596	2.00912	2.09162	2.07653	2.37616	1.23495	1.35143	1.40603	1.71642	1.76817
Poland	-19345	3.04694	4.57062	4.96072	2.49749	6.16434	0.97594	1.02885	1.25225	1.01065	0.84362
Sweden	-232911	18.3532	23.8553	27.7895	21.48	12.7223	3.03604	1.76406	7.00182	7.51561	1.4725
Vietnam	-210392	15.7347	8.59643	5.68565	2.52664	11.2407	3.44844	3.32482	2.72883	2.7947	3.66516

Table 14: India Comparing Trade Intensities of India and China for years 2016-2020 for HS-8503

From table 14, considering USA, India's TII is increasing and more than China' TII. The Balance of trade value is $8.9B. For Germany, India's TII is decreasing and hence cannot be picked up as the destination market. For Poland and Sweden, India's TII is increasing while that of China is decreasing. For Vietnam, India's TII is decreasing and less than China's.

Trade Intensity Index of HS-8502

India's TII of HS-8502							China's TII of HS-8502				
Country	Trade balance in 2020 (USD thousand)	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
USA	-575359	7.954523	7.090229	4.216546	6.204695	10.9233	1.351799	1.50851	1.601016	1.13773	1.35393
Chile	-993680	1.429383	4.194962	5.031886	2.232709	0.990616	0.142466	0.518932	0.261138	0.417543	
Vietnam	-764149	10.97271	1.192433	5.974423	1.508744	2.645368	1.159798	0.238169	0.383702	0.340453	0.348908
Canada	-662853	6.879728	4.706551	4.260589	4.20779	4.899364	0.440852	0.421278	0.51075	0.837309	0.580361
Indonesia	-655569	2.033505	0.86659	1.229291	0.929245	1.322606	1.630276	0.72192	0.666257	0.683378	0.620474

Table 15: India Comparing Trade Intensities of India and China for years 2016-2020 for HS-8502

Considering USA and Canada, India's TII is increasing while that of China is witnessing a downward trend. For Chile, India'sTII is showing a decline. For, Vietnam the TII for India is fluctuating and low, hence cannot be trusted as a potential market. For Indonesia, India's TII is diping below 1 and is fluctauting, hence cannot be relied as a sources.

Trade Intensity Index of HS-8504

		India's TII of HS-8504					China's TII of HS-8504				
Country	Trade balance in 2020 (USD thousand)	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
USA	-10471818	3.199939	3.513693	2.870799	3.832936	4.043948	0.992782	0.945963	0.882486	0.816253	0.780264
Mexico	-407567	2.087517	2.337099	1.186976	2.193475	1.044582	1.376158	1.24927	1.156411	1.296316	1.233069
Netherlands	-351384	4.488852	4.933533	5.276538	4.129309	3.600675	0.630101	0.788491	0.862545	0.973325	0.910562
South Korea	-373089	0.061561	0.970002	1.387075	0	-	1.000126	1.009122	1.051582	0.480313	9.607143
Vietnam	-462503	10.94561	15.48215	12.62812	9.082417	5.721148	1.758988	1.525045	1.319661	1.401724	1.428956

Table 16: India Comparing Trade Intensities of India and China for years 2016-2020 for HS-8502

From Table 16, considering USA, India's TII is healthy and increasing whereas that of China is lower. That with Mexico, South Korea and Netherlands, its decreasing. For Vietnam, India's TII is decreasing but is healthier as compared to that of China.

6. Import-Profile of Indian Electronics

Smart Phones were India's most important electronic import item in 2013-14, followed by its parts (such as displays) and PCs. From 2013-14 to 2014-15, a mirror-image trend in smartphone exports and imports occurred: the former climbed significantly (see previous section), while the latter continued to

fall. Imports of finished smartphones have been dropping since October 2014 (near to Make in India) — PMP exacerbated this by imposing CVD on their imports, followed by a raise in BCD to 20% in February 2018. However, growth has been accompanied by an increase in imports of their P&C, which has been aided by a preferential excise tariff system for domestic mobile phone production under PMP. As a result of these issues, smartphones are no longer among the top ten imported commodities in 2019-20. Aspects of the data storage system are also left off the top ten list. Since 2017-18, imports of memory (ICs) and cameras, as well as phone parts, PCs, and processors, have expanded rapidly.

The following are some key conclusions drawn from the study:

- In contrast to exports, India imports primarily from East and Southeast Asia, indicating that it is not a strong member of GVCs in terms of forward linkages.
- India also imports from the United States, Israel, and a few European countries, including Germany, Sweden, the United Kingdom, the Netherlands, and others.
- ITA-1 covers the majority of popular imported goods. About 169 of the 380 tariff lines are covered by the ITA-1 list. India has preferential trade agreements with ASEAN, Singapore, Japan, and Korea, as well as PTAs with Malaysia. In addition, some of India's allies, such as the U.S. Certain top commodities are also exported globally by the United States, Germany, and other countries.
- The surge in imports of phone parts, data transmission devices, and other cameras from 2016-17 to 2019-20 has been unrelated to increases in regular tariff rates.

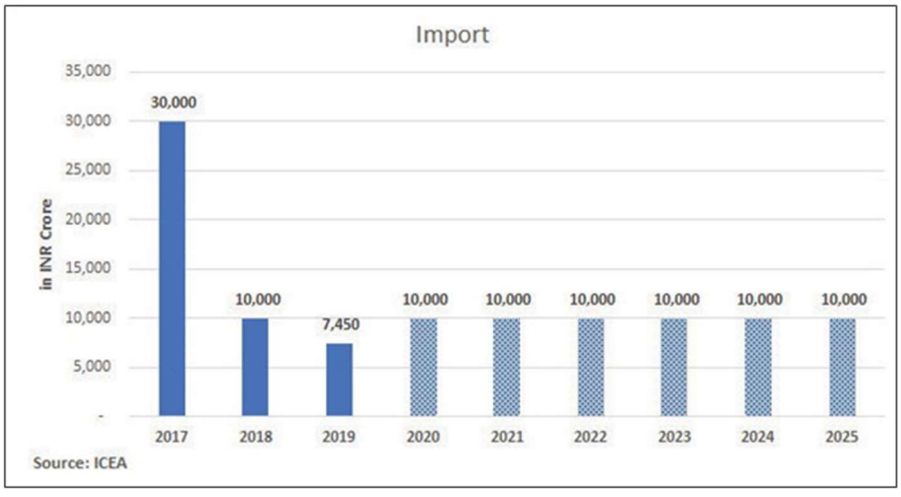


Fig 6: Projected Growth of India’s Imports of Electronics

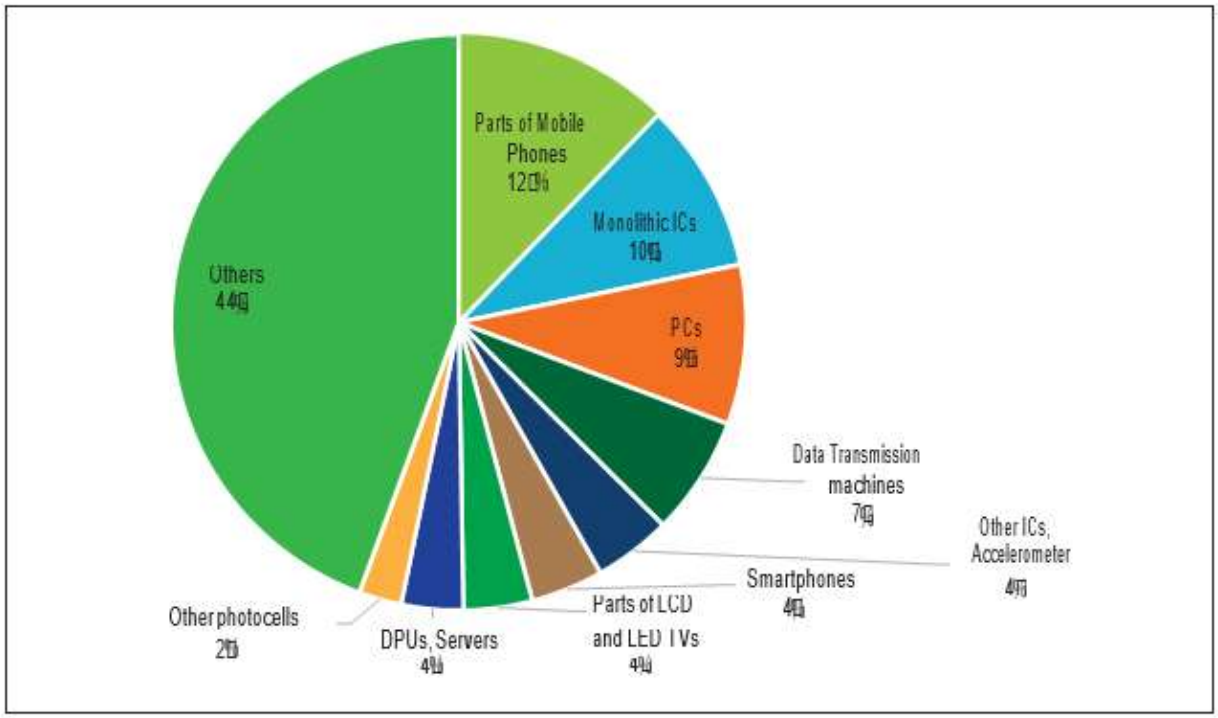
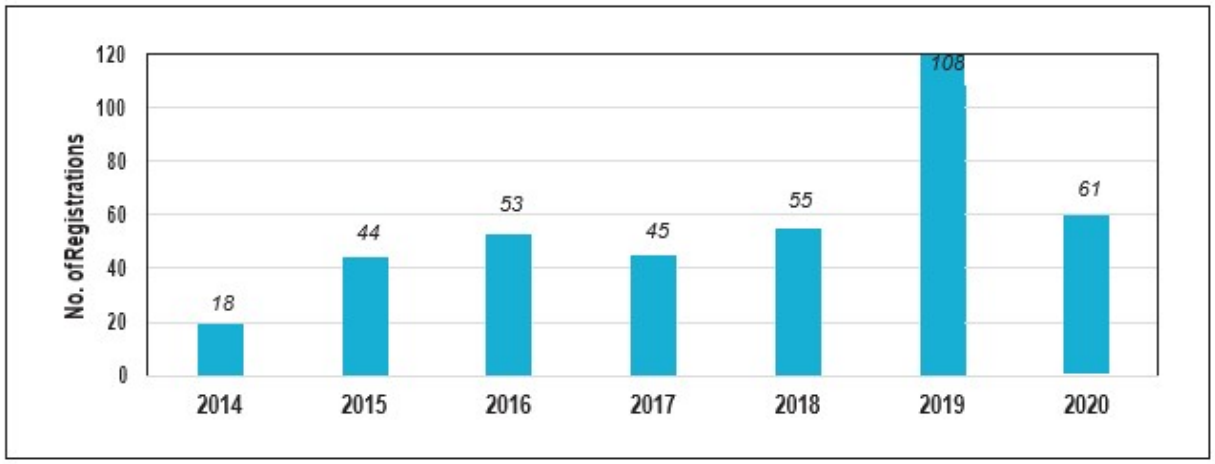


Fig 7: India's Imports of Electronics during 2020-21

7. Improvement in Design/R&D Activities

With the start of designing operations, the number of R&D centres in the country has increased in recent years. Samsung, Xiaomi, and HP, for example, have R&D centres in Bangalore. However, India's R&D activities are still limited. Nonetheless, with an increase in industrial design registrations, the pace of IP development has accelerated. The Government of India has established Centres of Excellence (5 have already begun operations; another 12 are in the final stages of approval) and set aside an Electronic Development Fund (EDF) for Start-ups to support R&D.



Source: Own findings (data collated from Patent Office, Government of India)[xxx]

Fig 8: Industrial Design Registration of Mobile Phones in India's Patent Office

8. Central Policies and Schemes

Given the assumption of increased demand for electronic items due to income impacts, rising automation, the e-governance process, and other factors, the National Policy on Electronics (NPE)-12 predicted domestic manufacturing turnover to be USD 400 billion by 2020. Even business groups like the International Chamber of Commerce (ICEA) condemned it at the time for making inaccurate estimates and its likely chances of boosting import substitution. For example, with a turnover of USD 45 billion in 2008-09, India's potential was only to meet a demand of USD 100 billion by 2020.

In actuality, India's electronics hardware production reached around USD 75.7 billion in 2019-20, with a CAGR of 23 percent since 2014-15, making the NPE-12 ambitions still look a long way off. However, the NPE-19 document extended the turnover target to 2025

Importantly, industry representatives presented the 'Restart, Restore, and Resurgence' framework in April 2020, building on the success of mobile phone handset production and exports, to capture a larger share of global markets in ESDM. The ease of the lockdown limitation can be used to measure its progress.

8.1 National Policy on Electronics (NPE) 2012

- Local procurement of raw materials and inputs is a game changer for strengthening domestic manufacturing along the whole ESDM value chain, laying the groundwork for global competitiveness.
- Challenges were highlighted, as well as India's expanding importance as a chip design hub, and strategies for capturing these opportunities were proposed.
- At the product development level, success in value chains (viz. creating Semiconductor Wafer Fab)
- Promoting R&D activities and establishing an innovative ecosystem to support the production of key components, sub-assemblies, and finished products, as well as the development of a sound IP system, are all priorities (encouraged in NPE-19)

8.2 NPE 2019

- An eye-opener that raised concerns about competition as a result of the influx of MNCs into India, necessitating the development of key technologies (design and manufacturing, IP/standards development) as well as additional capacity for Semiconductor and Display Fabrication activities.
- Manufacturing and exports of mobile phones are given a high priority in the company's overall strategy: by 2025, it plans to produce 1 billion (100 crore) mobile handsets (worth USD 190 billion), with 600 million handsets (worth USD 110 billion) destined for export and the rest (worth USD 80 billion) for domestic use.
- Industry-led R&D system to be fueled by the industrial revolution and digitalisation, including promoting start-ups and innovations at the grassroots level, even in advanced areas such as 5G, AI, Machine Learning (ML), Virtual Reality, robotics, IoT, additive manufacturing, nanotechnology, and so on.
- Higher DVA and lower import allowances were emphasised, as well as suitable talent, technology, and scalability in the international sphere; the goal was to encourage India's links with GVCs and export-led growth.

Other initiatives included the 2013 Preferential Market Access (PMA) Policy, which gave domestically produced items (desktop, laptop, and tablet computers, Dot Matrix Printers, LED, and so on) more

preference in public procurement. More products, such as Biometric Access Control/ Authentication Devices, Fingerprint Sensors, and Iris Sensors, Servers, and mobile phones, have since been notified under the Public Procurement (Preference to Make in India) Order of 2017.

Dot Matrix Printer, Ink Jet Printer, Ink Cartridges Without Print Head Assembly, Electronic Calculators (Excluding External Pocket-Size), Graphic Printer, Battery Chargers/Rectifier, Line telephone sets-cordless, Smart Phone, Telecom Equipment for Voice Communication, Routers, Loaded or Stuffed PCBs, Coin/Disc-Operated Record Players, Pick-Up Clocks

Even during the pandemic, the Electronics Sector Skills Council of India (ESSCI) has been instrumental in developing more jobs and skills. Training on "Remote Based Customer Care Services" for various CE and IT Hardware Services, Micro entrepreneurship [Digital Home Technician, VLE (WIFI & Broadband services/Solar & LED)], IoT, AI/ML for Hardware Engineers and Smart Manufacturing, provision of online project internships, and so on were some of the initiatives in 2020.

8.3 Central Schemes for Indian Electronics Industry (2012-21)

MSIPS 2012

- MSIPS 2012 (Microsoft Security Information and Protection System)
- To overcome economic constraints, restricted access to capital, and infrastructural challenges affecting both domestic and foreign investments in industry (specifically for nano-electronics & telecom products, IT hardware, consumer electronics, etc.)
- For the promotion of large-scale manufacturing, a capital subsidy of 20% for investments in SEZs and 25% for non-SEZs is available.
- In 2017, the programme was changed to provide incentives over a five-year period beginning with the project's approval date (instead of 10 years)

Merchandise from India Export Scheme (MEIS) 2015

- Policy for the entire manufacturing sector, using electronics as a focal point to encourage exports and counterbalance the effects of globalisation.
- Export inefficiencies and expenses - Provided incentives in the form of duty scrips (2 percent and 5% of the FOB value of the exports).
- Incentives on mobile phone exports increased from 2% to 4% in 2017; and 2% on component exports such as chargers/adapters, battery packs, and wired headsets; reverted to 2% for mobiles with effect from January 1, 2020.

PMP (notified in April 2017)

- Similar to NMP 2011 and Make in India 2014, but with a stronger focus on increasing mobile phone and component production; more of an import substitution approach.
- PMP forecasts manufacturing of 1200 million mobile devices valued at around USD 230 billion and exports of USD 150 billion by 2025-26, with incentives aimed at promoting indigenous manufacture of cellular phones and parts (which were previously mostly imported).
- Follows a step-by-step production roadmap to gradually boost DVA:
- Chargers, adapters, a battery pack, and a wired headset are all part of the first phase (2016-2017)
- Phase 2: Mechanics, die-cut components, keypad, USB cable, microphone, and receiver (2017-2018)
- PCBA, camera modules, and connectors are all part of the third phase (2018-2019)
- Manufacturing of the touch panel/cover glass assembly, display system, and vibrator motor in the final phase (2019-2020)

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SPECS 2020 (April)

- Aims to be similar to MSIPS but limited to the electronic components and semiconductors segments.
- In order to boost the electronics ecosystem by compensating for disabilities when making these:
- Electronic components, semiconductor manufacturing units, PCBs, ATMP units, and other capital expenditures are eligible for a 25% incentive.

- Specialised subassemblies and capital goods utilised in manufacturing to achieve a high value-added product
- Capital expenditure incentive (including total expenditure on plants, equipment, technology, and R&D) Is valid for 5 years from the date of application acknowledgement.
- States and UTs may contribute in addition to the 25% already supplied by the Centre.

Refund of Duties and Taxes on Exported Products (RoDTEP Notified in January 2021)

As there are no direct incentives on exports, it is treated as WTO compliant (but not as a complete replacement for MEIS); Aims to bring Indian manufacturers/exporters on level with foreign ones.

- To reimburse taxes and duties to exporters not covered by any pre-existing scheme, under GST, or as a refund on exports (viz., VAT on fuel used in transportation of goods for exports, including Central/State taxes on petrol, diesel, coal cess, etc., Mandi tax by APMCs, Duty on electricity utilised while manufacturing items, etc.).

PLI for Large Scale Electronics Manufacturing 2020 (April)

- Export-led growth is preferred over import substitution-based PMP; incentives are based on sales rather than exports, therefore serving as a potential alternative to MEIS; strategy to boost Make in India is preferred over import substitution-based PMP.
- Provide financial incentives to stimulate indigenous production and attract profitable (domestic and foreign) investments:
- SMT, passive components, PCBs, and micro/nano-electronic components (SEC) are used in mobile phones and specified electronic components (SEC).
- Discrete semiconductor devices, electronic components, sensors, and ATMP units
- Incentives ranging from 4% to 6% on incremental sales of items manufactured in India, valid for 5 years after the base fiscal year (2019-20)
- Domestic value addition of mobile phones is expected to rise to 35-40% (from 15-20%) in the domestic market, and to 45-50% in the case of SEC; production is expected to exceed INR 10.5 lakh crores by 2025, with exports around INR 6.5 lakh crores - 22 companies (both Indian and foreign) filed applications by July 2020, with 16 receiving final approval in October 2020.

PLI for IT Hardware 2021 (March)

- PLI's strong investment-based success in the manufacturing of mobile handsets and components inspired the scheme.
- Boost domestic production and attract significant investments in value chains by providing financial incentives

9. India's Challenges in Electronics Industry

With the right rules in place, India's electronics industry has the potential to service both domestic and international markets. However, compared to China and Vietnam, India remains a less appealing destination due to a number of drawbacks (Table 3.9), including infrastructural problems, a lack of focus on upskilling and R&D, high manufacturing costs, and so on.

One of the most significant issues has been India's excessive reliance on imports, which is due to the country's lack of full capability and economies of scale, which is aggravated by OEMs' limited scope of operations to increase manufacturing in India.

Because this business is growing at a rapid pace around the world due to great demand, India may have more difficulty catching up, particularly if obstacles are not addressed quickly. India must understand the strategic implications of its substantial reliance on neighbouring Asian countries, which may have used India as a temporary assembly base. To keep up with global competition and increase exports, domestic efforts must continue with consistent policy execution. This is because India's export potential is estimated to be USD 2.7 trillion, despite the fact that its share of global electronics exports is only 0.3 percent.

9.1 Disabilities Due to Cost

- High logistics costs due to the lack of a logistic subsidy, compared to China and Vietnam, where logistic subsidies contributed to cost reductions of 1% and 0.5 percent, respectively, as of 2019; High electricity costs due to the lack of a logistic subsidy.

- Capital costs for productive operations are high, i.e. Due to the need for the most up-to-date high-volume machinery, mobile phone production is very capital and technology demanding, necessitating large investments.
- Increases in tariffs/BCD on P&C imports risk raising the cost of finished products; additionally, if subsidies are unavailable, a constant increase in BCD is advocated; however, tariffs do not ensure higher revenue generation (as exemplified in Table 3.5)

9.2 Inadequate labour skills and a chronic demand-supply imbalance

- Due to growing technological complications, such as IoT and AI, there is a greater demand for specialised talents; nevertheless, the supply of competent workers and design engineers is still insufficient.
- Continual reliance on other countries, such as China, for technicians who specialise in the setups of complex machinery and technical assistance
- Expenses for reskilling personnel are increasing, which drives up production costs.
- Labour rules that are unfriendly to industry
- There are no specialised design institutes dedicated specifically to the production of skills for this profession.

9.3 Insufficient focus on the promotion of R&D

- India has a weak R&D base due to a low amount of in-house technology exploration, owing to long gestation periods that act as a deterrent.
- As of 2019, India's government provides low R&D subsidies (0.15 percent) compared to those in other nations, such as China (2 percent) and Vietnam (1 percent).

9.4 Weak Intellectual Property Rights regime

- In terms of development and facilitation, as well as protection of rights, the IP foundation is insufficient.

- Patent expenses are subsidised at a low level in India, which has a negative impact on innovation.
- Limited design activities and the presence of fabs in India are essential for the growth of the Indian electronics industry.
- Despite NPE's concentration on chip design, India lacks competency in chip design due to a scarcity of semiconductor fab facilities.
- The challenge for the Chandigarh-based Semi-Conductor Laboratory (SCL) is that it only has a 28-nanometer fab that needs to be expanded to 65-nanometer and 228-nanometer.
- India is not well-versed in the design of electrical products in GVCs, which are necessary to support the production system.
- India's manufacturing environment is underdeveloped, and its resource allocation mechanism is inefficient.

9.5 Low Foreign Direct Investment (FDI)

- In this industry, FDI inflows are expected to be minimal even in 2019 and (less than 1 percent of total FDI inflows in India)
- Rising BCD and import substitution are intended to boost DVA content in domestic markets; nevertheless, India's production and scale of manufacturing have remained low in comparison to global peers, resulting in little FDI.
- Changes in government policy, as well as the US's challenge to India's export subsidy measures in the WTO, have created uncertainty in the investment environment in India.
- India's FDI regulations have become increasingly stringent; in fact, in April 2020, it set a stipulation for countries sharing India's borders to obtain prior government clearance.

9.6 Challenges faced in R&D

- At the pre-manufacturing stage (R&D & design), India has encountered restricted activity and/or difficulties in strategy implementation
- Although the Indian government, academicians, scientists, and others have made successful attempts to improve research, the government's emphasis on R&D in the electronics industry has

not been appropriate over the years. Although public R&D expenditure on the electricals and electronics industry increased from INR 95.7 crores in 2015-16 to INR 102.3 crores in 2017-18, the reported CAGR was quite low at 3.4 percent (less than the country's overall public R&D: 8.6 percent CAGR).

- Private R&D expenditure was higher than public R&D expenditure in 2017-18, at INR 1,935.5 crores, a CAGR of 5.5 percent over 2015-16
- In 2017-18, India's electrical and electronics industry got only 2% of total public R&D investment (INR 5,253 crores). Défense, fuels, and industrial machinery receive the majority of R&D spending. Furthermore, this industry received only 5.3 percent of overall private R&D expenditure in 2017-18, down from 5.5 percent in 2015-16. As a result of the lack of focus on R&D, private sector spending has remained low.
- The availability of low-cost/competitively priced items on a worldwide scale discourages Indian enterprises from investing in R&D to build their own products. According to polls, global established manufacturers have a very large profit margin, giving them the freedom to drop costs anytime a developing country, such as India, produces a new product.

10. Findings and Conclusion

10.1 Finding 4 digit HS-85 products and the best markets

With the help of indicators, it is found that HS-8502(Electric generating sets and rotary converters), HS-8503(Parts suitable for use solely or principally with electric motors and generators), HS-8504(Electrical transformers, static converters), and HS-8517(Telephone sets, incl. telephones for cellular networks) are the most exportable products. Among the four HS-8517 proves to be the most suitable for export.

Exportable Markets for HS-8502 – USA and Vietnam

Exportable Markets for HS-8503 – USA, Poland and Sweden

Exportable Markets for HS-8504 -USA

Exportable Markets for HS-8517 – Russia

10.2 Divergent Export and Import Trends

After years of stagnation, India's electronic manufacturing industry has resurrected, albeit from a very low basis. India's electronics exports (including electrical appliances) have nearly doubled in the last five years, rising from USD 9 billion in 2014 to USD 15 billion in 2019. India exported electronic items to the United States, the Netherlands, Germany, a few ASEAN and South, East, and Central Asian economies, and the Middle East. For example, India exported smartphones to the UAE and Russia in 2019-20, followed by South Africa, Turkey, and other countries. India, on the other hand, has primarily imported from East and South-East Asian countries, demonstrating the country's lack of integration in the electronics value chain.

10.3 Revamped Policies for Electronics Industry

The revised NPE-2019 aims to reach a turnover of USD 400 billion by 2025, with a focus on the entire ESDM value chain, but particularly mobile phones, semiconductors, R&D, electronic parts, and so on. PLI (where 16 Indian and foreign firms, including Samsung, Wistron, Foxconn, Pegatron, Lava, Micromax, and others, have been given approval during October 2020 in case of mobile phones and specified electronic components), SPECS, EMC 2.0, and RoDTEP were all launched during the pandemic as potential alternatives to MEIS (rates are yet to be announced). These are anticipated to establish India as a worldwide electronics hub, catering to both domestic and export needs. These plans are seen as important moves toward weaning off the country of its reliance on China. These plans are intended to grow electronic manufacturing by INR 15 lakh crores, as well as increase domestic value addition and offer jobs for more than ten lakh people (as obtained from Surveys). Since the beginning of the PMP programme, there has been a shift in sub-assembly assembly from SKD to CKD, indicating an increase in local value-added content. However, according to our analysis, with PLI in place to usher in a new era of mobile phone growth in India, PMP may be unnecessary.

In fact, in the near run, the balance between import substitution strategy and export promotion incentives must be maintained, as they have been proved to be incompatible in today's harsh global climate. With the continual growth in basic customs duty (BCD) rates, caution must be exercised in pushing forward with protectionism measures (as revenue collections from tariffs have declined for the entire economy).

Importantly, study analysis reveals that capital subsidy programmes such as MSIPS would not help this business grow.

The goal must be to improve the economy's competitiveness in order to increase exports. As a result, there must be a shift away from subsidies and toward market-based incentives for export-led growth.

10.4 Deep-Rooted Disabilities or Challenges Faced by India’s Electronics Industry

While electronic product manufacturing and exports have shown hints of improvement, development has been extraordinarily gradual. Vietnam's electronics exports increased sevenfold in the five years following Samsung's entry (2010 to 2015), while India's electronics exports barely doubled in the five years following the launch of the Make in India initiative (2014 to 2019). Because of four critical factors, India's electronics industry remains significantly less attractive than competing destinations in East Asia, according to our analysis: unfavourable tariff and tax policies; the low scale-high-cost trap; the need for more complementary policies; and growing inconsistencies between industrial and trade policies.

Current tariff and tax policies do not suit the needs of the industry or optimise income. India's high tariff and BCD rates in comparison to East Asian countries continue to hurt the industry's competitiveness. The inverted duty structure — intermediary commodities have higher tariff rates than final products.

In a vicious circle of small-scale production and high expenses. Even by the size of its home market, India's electronics manufacturing industry is small. It also operates at the lowest levels of GVCs, such as in the assembly of cell phones. Limited efforts in the implementation of strategies at the pre-manufacturing stage (R&D and designing) and the lack of fabs have hampered India's value chain participation.

There are no complementary supporting policies in place. Despite India's improved ranking in the World Bank's Ease of Doing Business indicators, the business environment continues to be a barrier to attracting foreign investors, owing to a variety of factors including uncertain and unpredictable compliance requirements, poor infrastructure, and logistics, to name a few. High capital and production expenses worsen the problem. Even from FTA partners, FDI inflows to the Indian electronics industry have been minimal. Furthermore, there is a shortage of skilled workers, particularly specialist technicians, needed to build complicated parts and components, as well as policy uncertainties

surrounding GVC's foreign ecosystem partners. The industry considers intellectual property (IP) policies and institutions to be inadequate for development, facilitation, and protection of rights.

Trade and industrial policies are at odds. Thousands of parts and suppliers are spread around the globe in the global electronics value chain. As a result, in order to make India their production base, investors must be able to rely on reliable imports of essential components in order for their goods to be globally competitive. This means that an open and liberal trading regime is required for the 'Make in India' industrial programme to flourish. However, the latter is incompatible with PMP's policy, which calls for a steady increase in BCD. Similarly, rising anti-China sentiments and requests to halt India's imports from China are unhelpful to India's ambition of becoming a global manufacturing centre. Unlike India, China debuted its "Made in China" campaign in 2015, after it had already surpassed the United States as the world's largest trading nation and pursued a more open trade and investment environment.

Another important intervention is skill development. The substantial association between education and skills and GDP growth is supported by empirical research. In this regard, East Asia is an excellent example. To generate skilled workforce, the Indian government must periodically assess and adapt its skill development programmes, primarily to stimulate the development of semiconductor fabs. To contribute to the overall ecosystem, more scholarships should be offered under the 'Visvesvaraya PhD plan' in areas such as quantum computing, Blockchain, 3D printing, automotive electronics, embedded systems, and so on.

11. Key Policy Interventions

While India is well positioned to develop a globally competitive electronics industry, success is neither certain nor automatic. It necessitates a strong commitment from the top, stable and market-friendly policies from the authorities, and consistent and successful policy implementation. The report specifically recommends the following five broad interventions:

Continuation of the PLI scheme. In the absence of fundamental tariff, tax, and investment climate reforms, India will have to continue to offer incentives to make it a desirable manufacturing destination. Our findings suggest that capital-based subsidies have been ineffective, whereas output-based incentive schemes such as the PLI have had some success in increasing production and exports. Therefore, the continuation of PLI as the leading instrument for export promotion seems appropriate. In addition,

similar to mobile phones and IT hardware rules, the scope of PLI should be expanded to include all consumer electronics and their parts. According to studies, the PLI funds future PLIs, and the increase in exports and forex revenues will outweigh the incentive provided

Alignment of national and subnational policies. Many states have offered land, power, and other subsidies in the past, but these incentives have often not been market-linked and have served primarily to ameliorate existing disadvantages, such as relief from high power tariffs and excessive taxes. Several states, including Andhra Pradesh, Karnataka, and Tamil Nadu, have launched programmes like PLI in 2020-21, which is encouraging. Linking incentives to continual expansion of production, or, better yet, exports, would ensure that the system favours efficient and high-productivity businesses rather than zombies.

Decision to reduce dependency on China needs to be strategic and meticulously planned. In a globalised world, some economic interdependencies between India and China are not only necessary, but beneficial. However, if geopolitical reasons necessitate a reduction in this reliance, such judgments must be based on a thorough examination of the global electronics supply chain ecology. To take a larger portion of the pie in GVCs over time, one method will be to build lead firms in domestic value chains. However,

GVCs established in China should be encouraged to set up base and expand in India in the meanwhile, in order to improve India's electronics manufacturing ecosystem. They have the necessary skills, technological know-how, and experience to quickly expand manufacturing capacity and scale. These leading enterprises, based on past experience, seem to move in lockstep with their ecosystem. Stopping the GVC ecosystems from shifting will not only hinder large-scale production, but it will also have a negative influence on local value addition, since lead enterprises will have to rely on imports for components.

Industrial policy can best succeed in a pro- trade and pro-market environment. In the immediate term, India should aim to maximise the benefits of existing global players (GVCs) and current FTAs, as well as seek out new trade partners and scale up smartphone assembly. All efforts must be focused on improving domestic competitiveness and increasing exports. Linking to GVCs, as well as attracting more FDI, necessitates a liberalised yet stable environment focused on lowering the cost of doing business. Interventions include I shifting away from traditional subsidies and toward production or

export-based incentives, as well as a single-window clearance; (ii) strengthening enforcement mechanisms and the IP system, particularly in the case of high-end mobile phones; (iii) time-bound R&D efforts with high funding options for Fabs; and (iv) an enhanced partnership between academia, government, and the private sector can help to pool right knowledge, strangle grey market operations;

The creation of SEZs, bonded manufacturing zones and clusters with world-class infrastructure, emphasis on flexible labour laws and R&D, and a market-based industrial strategy are some ideas that, while not new to policymakers in India, need to be implemented efficiently.

More investment on data and research. The lack of a disaggregated database for Indian electronics industry (in both value and volume terms) is a key constraint to doing accurate analysis. Empirically, there is also a scarcity of studies on value chain analysis for essential electronic devices in India, such as cell phones, TVs, PCs, and laptops. Data collection and access to researchers should be a priority for MeitY and MoPSI, in collaboration with other policy think tanks in the country, in order to fill up the gaps.

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