Working Paper
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MOBILE PHONE MANUFACTURING IN INDIA: A STUDY OF FEW CHARACTERISTICS

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February 2021

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(Under the aegis of Govt. of Kerala & Indian Council of Social Science Research)
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This paper was funded by the Ford Foundation-IGIDR project 'Industrialization for Jobs and Growth'. I thank Prof. R. Nagaraj, Prof. Rakesh Basant, and Dr. Madhuri Saripelle for their comments on an earlier version. Their comments have made the analysis sharper and focussed. I am thankful to Mr. Pankaj Mahindroo, Chairman, ICEA for his support and agreeing to share contacts of ICEA members for the primary survey. I also would like to thank the anonymous referee and Prof. Sunil Mani for their comments which has benefitted this paper. The usual disclaimer applies.

ABSTRACT

In FY 19, India produced around 29 crore units of mobile phones, which comes to an investment of around Rs 2,780 crores, at 2017 prices. These investment figures turn out to be much lower than those reported in popular press. Original Equipment Manufacturers and Electronic Manufacturing Service firms dominate the Indian manufacturing scene. Analysis of the five digit ASI data for 2016-17 & 2017-18 makes it apparent that the impetus towards domestic assembly of mobile phones through various policy measures has made a positive impact on the growth of investments particularly in plant & machinery assets. As a result the direct employment generated per unit fixed asset has decreased in 2017-18. Value addition for a majority of the firms at the five digit level was less than ten per cent in 2017-18. As per our primary survey, electronics import under ITA-1 is another reason for such low value addition in the country. Ratio of imported vis-a-vis indigenous raw materials at the five digit level clearly prove the reliance of all producers on imported inputs. If India intends to become a major mobile manufacturing hub then in addition to existing policies it should encourage global brands to co-locate in India with their supply systems. The study suggests that we also need a parallel policy to improve local capabilities by creating domestic champions in manufacturing and R&D.

Keywords: Mobile manufacturing, India, Phased Manufacturing policy, Assembly, Component manufacturing.

JEL Classification: L96, N65, O38

1. Introduction

The growth of the telecom services in India has been nothing but spectacular. Given the lower share of manufacturing in India's GDP, it is natural that our policy makers are keen on capitalizing this growth to develop manufacturing capabilities. The National Policy on Electronics (NPE) 2011 was written with an aim to create a globally competitive Electronic System Design and Manufacturing (ESDM) industry in India, so as to meet the country's needs as well as serve the international market. The current 'Make in India' initiative also wants to use India's burgeoning demand for mobile phones and create a manufacturing ecosystem for mobile phones in the country. To promote indigenous manufacturing of cellular mobile phone handset the central government in the budget of 2015-16 announced the Phased manufacturing Programme (PMP) for mobile phones. PMP was notified with the objective of progressively increasing the domestic value addition for establishment of a robust cellular mobile handsets manufacturing ecosystem in India. In addition to PMP numerous state governments have come up with incentives for manufacture of mobiles. Economic literature is clear that policy measures alone are not enough to create a manufacturing ecosystem; on the contrary the creation of ecosystem depends on a variety of factors some of which are global while others are local. Now that these policies have been in place for a few years, there is a dearth of studies that try to understand the nature and extent of mobile manufacturing in this country. There are only media reports which trumpet every investment done by mobile manufacturers, most of which leave the reader with an impression of India being the next major mobile manufacturing powerhouse. But is this true? The facts on the ground

have rarely been placed on record and discussed. This study tries to fill the lacuna by trying to delineate few characteristics of the mobile manufacturing segment in this country. In particular it focusses on mapping the manufacturing landscape in India by outlining the investments, production and trade of mobile phones and its parts in the country. By providing estimates of employment generated as well as the value added by the segment, this study also gives some perspective on this issue. The study then focuses the production and trade scenario for some of the inputs that go into mobile phones. With the help of established databases and a primary survey, our analysis clearly show that we have a long way to go in mobile manufacturing and that we may have few policy lessons to learn from the latest South East Asian country to enter electronics manufacturing – Vietnam, couple of aspects of which have been discussed in the paper.

The contribution of this study to the literature is as follows: through its secondary and primary research this study confirms the finding of low value addition in the mobile segment. It also empirically shows that imports of few inputs rose though the import tariffs for these inputs were raised through policy. These inputs are forms of plastic, rubber, screws, nuts and bolts; which establish that manufacturers are yet to co-locate their supply chains in the country. Import duty exemption for capital equipments in September 2018 seems to have worked as the sum of imports of 11 types of capital equipments has seen a sharp spike in FY19. This has happened for the first time in the decade of 2009-2019. The primary survey of a charger manufacturer brings out the fact that India has now become competitive in the manufacture of battery chargers with value of exports being more than three times the value of imports in FY19. The study also presents evidence that this charger manufacturer has developed local capabilities to manufacture transformers required for mobile chargers. It tries to add nuance to the literature, in the sense that, though electronics imports continue unabated, capabilities seem to be developing in non-ITA sectors.

The layout of the paper is as follows, we begin by outlining the path global mobile phone industry has taken leading to the current global industry structure. In order to understand the investments flowing into developing countries it is important to chart out the industry structure. This is then followed by an attempt to summarize the studies on the Indian electronics and mobile manufacturing segment and available government incentives, which given the global industry structure have a bearing on the investments entering the country. Section four presents the methodology of the study. The mobile manufacturing landscape in the country is analysed in section five. To understand the experience of recent 'latecomer' countries, in section six we briefly review the Vietnamese experience. Finally, in section seven, given India's history in electronics manufacturing, we contextualize our findings from the mobile manufacturing happening in the country so as to come up with few policy pointers.

2. Global Mobile Phone Industry

2.1 Evolution of the Industry

One of the industries that has been completely been transformed by technological change in the past three decades has been the telecommunications industry. For example, in the early 1980s, since most of the communication was through fixed or wired telephones, value chain consisted of three layers – equipments, network, and services. With the arrival of the first analogue systems, mobile phones were commercially introduced in the United States in early 1980, and were mainly mounted on cars. Each country had its own standards primarily to allow inter-state roaming and handset compatibility (Giachetti & Marchi, 2010). During these early stages there were only two actors in the industry: Original Equipment Manufacturers (OEM),which produced handsets and telecom service providers or network operators. OEM's manufactured the handsets through a vertically integrated supply chain with very few outsourced activities; it then sold these handsets directly

to consumers. The acceptance of the Groupe Speciale Mobile (GSM) standards in Europe, which used digital signals, led to the introduction of second generation (2G) mobile phones. The transition to the digital standard required a specific set of new competencies for mobile phone vendors; Nokia moved quickly and focused investments on 2G mobile phones. For the diffusion of the new digital standards, vendors had to develop competences to supply the telecommunication infrastructure needed to make the handsets work with the new standard. Also, since new technologies installed in digital mobile phones were often introduced to improve the handset software performance, handset vendors were forced both to increase their in-house software development capabilities and build strategic relationships with software component suppliers. Since digital technology offered better performance and additional functionalities, 2G mobile phones diffused rather rapidly, which made the industry realize that only with greater usability and excellent design could mobile phones become mass consumer products rather than mere network terminals. Companies that invested in digital reaped the gains, while those that did not, lost out. As handsets became consumer goods, the race to add more features and applications began, this increased R&D expenditures of OEMs. In order to focus on more value-added activities and benefit from economies of scale, most of the OEMs then began to outsource the manufacturing of components and applications to contract manufacturers. These contract manufacturers, also known as electronic manufacturing services (EMS) providers, assembled electronic components and devices on behalf of their OEMs. EMS providers originated mainly from the computer industry or from computer peripherals; with manufacturing process technology, especially at the circuit board level being quite generic, as a result, EMS contract manufacturers were able to aggregate business from lead firms in many electronics subsectors. This led to a fragmented market of EMS providers, as a result of which OEMs were able to exercise strong bargaining power. Though contract manufacturers now purchase the

bulk of the world's electronic components their market power and profitability has generally remained low. In fact, the electronics contract manufacturing sector even as it has experienced rapid growth, has been characterized by intense competition, low profitability, and dramatic consolidation. This resulted in very low prices of outsourced components and assembling activities (Giachetti & Marchi, 2010). Despite this, since the late 1980s, this trend of use of contract manufacturers has been strong and growing (Sturgeon and Zylberberg, 2016).

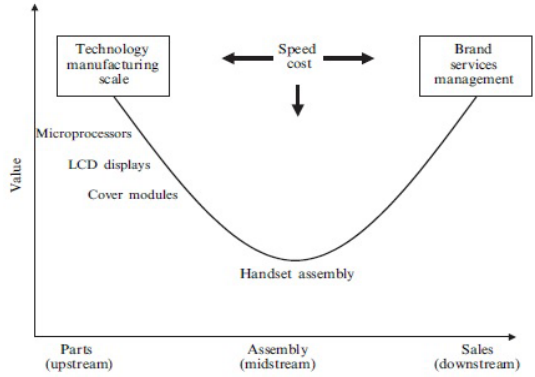
Weakened consumer purchasing power in 2001 shifted demand towards low-price handsets. OEMs in order to respond to the sales slowdown started aggressively pricing their entry-level phones. This shift to lower-end phones hastened the exit of firms i.e. many of the minor European players exited production either through sale or closure, which dramatically lowered barriers to market entry and new players from Asia ventured in. The rush of some OEMs to design new models with enhanced capabilities further pushed down the margins as R&D expenditure was rising. This gave birth to a new entity in the supply chain, the original design manufacturers (ODM). Unlike in the EMS model, where OEMs develop and retain the handset intellectual property rights, ODMs are independent contractors who develop prototype handsets and sell them to established OEMs who in turn market them under their brand names. The advantage of outsourcing to ODMs was that it allowed the OEM to reduce design and R&D expenses. However, the growing importance of ODMs also quickly became a threat to established OEMs (Giachetti & Marchi, 2010). Most large ODM contract manufacturers these days are based in Chinese Taipei, with manufacturing now concentrated in China. These firms have historically focused on producing for lead firms in the personal computer (PC) industry, and more recently in the mobile phone handsets industry. In both of these industries design is driven at the component level by platform leaders – for example, Intel in case of PCs and Qualcomm in case of mobile phones. Platform leaders play a crucial role and can capture the bulk of industry

profits and retain tight control over the innovative trajectory of the industry (Sturgeon and Zylberberg, 2016).

2.2 Value Chain in Mobile Manufacturing

The industry has evolved in such a way that cost of assembly is very low compared to the cost of certain components, a point that needs to be kept in mind by policy makers who want such assembly to take place in their countries. Thus, the value capture in the mobile phone industry is not in the manufacturing or assembly of it. Hess & Coe (2006) made this argument some time back when they argued that the value added in telecommunication manufacturing systems was highest at both ends of the production chain, described as the 'smile curve'. This curve is shown below.

Figure 1: Value addition in Telecommunication manufacturing systems



Source: Hess & Coe (2006)

No wonder that lead firms locate the highest value activities in their home countries, the table below gives the details for three leading firms in the smartphone segment.

Table 1: Location of activities in the global value chain of the smartphone segment

Activity	R&D, Design, Sourcing	Development & Engg	Manufacture of key components (production)	Final Assembly (production)
Apple	US	US/Taiwan	US/Japan/ Korea/ Taiwan/ China	China, India (as of 2017)
Samsung	Korea	Korea	Korea/Japan/ US/ China	Korea, Vietnam, China, India, Brazil, Indonesia
Huawei	China	China	China/Korea	China, India

Source: Dedrick & Kraemer (2017)

Key activities such as R&D and design generally occur in the home countries of lead firms, key markets and locations with ample talent. Depending on individual firms, design and development may be distributed between the home country and the location of contract manufacturer's development team. Development and engineering are done jointly by the lead firm and engineers from contract manufacturer at facilities close to the location of final assembly. Location is driven by short product life cycles and need to design for manufacturability, which includes doing pilot production in plants where mass production will occur. The location of manufacturing and final assembly is partly driven by market access but mostly by labour cost and proximity to the supply chain. A large labour pool and the ability to scale up or down in response to market demand are important for final assembly. Local government tax incentives and help with import/export processing also shape location decisions. Since, growth is occurring in developing economies of Asia, Africa and Latin America; their governments provide incentives

and exert pressure on lead firms to locate some activity locally in exchange for market access. In response to such forces, Samsung, Huawei and Xiaomi already have set up assembly facilities in these places. Apple's recent decision to set up production in India (through one of its Taiwanese contract manufacturers) was in response to market demand and government incentives (Dedrick & Kraemer, 2017).

3. Electronics and Mobile Manufacturing in India

3.1 Indian Experience in Electronic and Mobile Manufacturing

Electronics manufacturing in independent India was guided by a highly restrictive policy framework that emphasized self-reliance. High tariffs meant that there was some domestic production of hardware products which included PCs, peripherals, and components. Production of hardware was aided by the general reduction in duty on components and duty-free import of capital goods for component manufacture. India joined ITA-1 in 1997 when its electronics sector was just initializing (Ernst, 2014). Francis (2018) points out that among developing countries, India carried out the highest average tariff reduction on the largest number of tariff lines. By the early 2000s the government realised that output and employment in the domestic electronics industry had been adversely affected by the import surge under ITA-1. This, however, did not stop successive governments from continuing with deep and non-strategic trade liberalisation, such as the free trade agreements (FTA) with ASEAN, Japan, and South Korea. Under the 2010 India–ASEAN FTA, India committed to make 170 electronics tariff lines, which were not covered under the ITA-1, duty-free by 2013. In the case of India's Comprehensive Economic Partnership Agreement (CEPA) with South Korea, which also came into force in 2010, eight non-ITA-1 product lines were made duty-free immediately, with another 60 tariff lines scheduled to become duty-free from January 2014. A further 277 lines became tariff-free from January 2016. FTAs with East and South-East Asian countries were aimed at attracting FDI that would facilitate India's

integration into a GVC (Francis, 2018). Given the huge import of electronic components into the country, neither ITA-1 nor the FTAs with the ASEAN countries and East Asian economies have helped in increasing domestic production of the electronics industry. On the contrary, the inverted tariff structure that ITA-1 brought in left little chance for building up of domestic capabilities or investing in sufficient scale (Ernst, 2014). Despite the liberal FDI policy regime followed by India since 1991, it has been found that large foreign OEMs and EMS firms typically choose to only set up final assembly plants in India (Ernst, 2014; Saripalle, 2015). These final assembly plants depend on their supply chain of their parent firm, as a result of which dependence on imported components increases. Francis (2016) provides evidence that for companies such as Samsung, imports accounted for as much as 95 per cent of their total foreign exchange expenditure. This argument of absence of any backward linkage creation by foreign firms in the electronics manufacturing segment has been provided by other studies as well (Rajakumar, 2014; Saripalle, 2015; Verma, 2015).

Though it has been more than a decade since the first mobile was manufactured or rather assembled in India, the mobile phone manufacturing sector in the country is not averse to this phenomenon. The entry of Nokia with its seven supplier companies in 2005 was seen as the harbinger of electronics hardware manufacturing in the country. It was the largest mobile phone assembly plant globally at that time, and much was made of the growth it was expected to contribute to the electronics manufacturing ecosystem. However, none of the seven Nokia vendors or even Nokia itself manufactured components in India; these components were imported without duties to the factories (Dutta, 2016). Francis (2018) contends that Nokia's story clearly shows that even if India attracts foreign firms, through investment incentives and infrastructural support, to produce large number of low value-added electronics locally; in the absence of developing indigenous

technologies and capabilities, the expected benefits out of such large foreign investments will turn out be temporary.

3.2 Government Policies for Mobile Manufacturing

Given the huge demand for mobiles in the country, it is natural that Government of India has been very keen to attract mobile manufacturing in the country. There are numerous benefits available to manufacturers of mobile handsets which include capex benefits under Modified Special Incentive Package Scheme (M-SIPS), 100 per cent foreign direct investment (FDI) permitted for manufacture of mobile handsets[1], their sub-assemblies and parts, export incentive of four per cent freight on board under the Merchandise Export from India Scheme (MEIS), specified capital goods for manufacture of mobile handsets are permitted for import at nil customs duty. In addition to these, units in SEZ can also avail income tax benefits on export income, exemption from GST on supplies and other levies imposed by respective state governments. Many states also have rolled out numerous incentives for manufacturers to set up mobile manufacturing units in their jurisdiction. Most of the states provide competitive incentives on stamp duty, electricity duty, registration fee, VAT incentives, capital and interest incentives[2]. Despite such incentives, as we shall see later, not all states have been able to attract mobile manufacturing investments in a big way into their states.

In addition, the PMP[3] policy by the central government is also in place for mobile phones, its sub-assemblies and parts. PMP encourages manufacture or assembly of low value accessories initially, then moves

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1 Mani (2020) touches on the finer details of the policy.

2 A snapshot of such incentives can be seen from Pathak et al (2016) and IAMAI (2016).

3 In September 2019, Taiwan has raised a WTO complaint against the duties levied on few goods under the PMP. A panel to look into the complaint has been constituted in September 2020.

on to encouraging manufacture or assembly of higher value components by increasing the basic customs duty on the imports of these accessories or components. The implementation status of PMP for cellular mobile handsets can be seen from table below.

Table 2: Implementation status of PMP for Cellular Mobile Handsets and parts thereof

Year	Sub-Assembly	Implementation status
2016-17	(i) Charger/ Adapter,(ii) Battery Pack, (iii) Wired Headset	Implemented with Basic Customs Duty @15%
2017-18	(iv) Mechanics, (v) Die Cut Parts, (vi) Microphone and Receiver, (vii) Key Pad, (viii) USB Cable	Implemented with Basic Customs Duty @15%
2018-19	(ix) Printed Circuit Board Assembly (PCBA), (x) Camera Module, (xi) Connectors	Implemented with Basic Customs Duty @10%
2019-20	(xii) Display Assembly, (xiii) Touch Panel/ Cover Glass Assembly, (xiv) Vibrator Motor / Ringer	—

* As per Mani (2020) the sub-assembly target for 2019-20 is likely to be deferred.

Source: https://meity.gov.in/writereaddata/files/Implementation_PMP_Cellular_Mobile.pdf, last accessed on 17 Dec 2019.

Mani (2020) argues that the policies of the government have helped domestic manufacturing of mobile phones pick pace leading to significant reductions in its mobile phone imports. However, the domestic manufacture of these phones crucially depends on the imports of parts, which continues unabated. The paper argues that it is the weak innovation capability of the domestic industry that manifests as high

import dependence. Mishra and Shankar (2019) study the impact of government policies on the behaviour of imports of mobile phones and its parts. They find that mobile phones, on average, accounted for about 52.8 per cent of telephone set imports from 2011-12 till 2014-15, however, this share has declined to 16.8 per cent in 2017-18. They argue that this decline in mobile phone imports has been compensated by imports of mobile phone parts such as PCBs. The import share of mobile phone parts increased from 19.8 per cent in 2013-14 to 54.9 per cent in 2017-18. The cause of these import dynamics is traced to the Make-in-India and the PMP. Further, parts of mobile phone imports and domestic production have a linear, positive, and statistically significant relationship, indicating that the increases in domestic production and imports of mobile phone parts have been synchronous. Year on year (y-o-y) changes in imports of mobile phone parts appear to be granger causing y-o-y changes in domestic production indicating that mobile phone parts imports are enabling the expansion of domestic production of mobile phones.

4. Methodology and Data Sources

The findings of this study are based on secondary data sources as well as a primary survey. For primary survey, we were in touch with the Indian Cellular and Electronics Association (ICEA) for industry contacts; while our secondary data sources have been the Annual Survey of Industries (ASI) at the five-digit level, Ministry of Commerce and Industry for the trade data, and Prowess data from the Centre for Monitoring Indian Economy (CMIE) for company level data. ASI database is provided by the Ministry of Statistics and Programme Implementation, Government of India. The five-digit industry that we focus on is 26305 - Manufacture of pagers, cellular phones and other mobile communication equipment as per the National Industrial Classification (NIC) 2008 code.

We started with an ambitious aim of mapping the complete mobile manufacturing ecosystem in the country. To this end, for the primary

survey, individual questionnaires were prepared each for mobile manufacturers, as well as for suppliers to mobile manufacturers and manufacturers of accessories (T1), and suppliers to T1. We first conducted a face to face interview with officials from ICEA to understand their perspective of the industry. We then followed a snowball technique wherein we reached out to contacts from mobile manufacturing firms, as given by ICEA, with request for interviews. It must be mentioned that the contacts given by ICEA did not cover all the firms in the mobile manufacturing scene. To overcome this bias, we contacted the remaining firms, through email (obtained from their respective websites) with request for interviews. Initial requests were then followed up with multiple reminders over a period of six months. As expected, the response to our requests was overwhelmingly poor, none of the firms whom we had contacted through the internet responded. Among the contacts from mobile manufacturing firms given by ICEA, one executive of an Indian mobile firm after an initial introductory call stopped responding to our messages. Another executive from a foreign firm, took almost three months to circulate our questionnaire to his colleagues, and then after six months resigned from his firm and expressed his inability to help in our study. One executive from a well-known multinational contract manufacturer, after some initial delay, was very generous with his time and interacted generously with us over the phone to give us his perspective of the industry. This executive also helped us by sharing the contact of a battery manufacturer, who was kind enough to have a telephonic chat with us. ICEA also had shared a contact of a well-known multinational accessory manufacturer; this executive was kind to arrange a one-on-one telephone chat with the CEO of the Indian subsidiary which proved to be very helpful. The CEO also helped us with contacts of their suppliers, two of whom shared their perspective with us. To sum up, participants in our primary survey involved ICEA, one contract mobile manufacturer, one accessory manufacturer, two suppliers to the accessory manufacturer, and finally one battery manufacturer. In the coming pages it will be obvious

to the reader that the insights from our primary survey helped us better understand the results of our secondary data analysis.

5. Manufacturing Landscape in India

Mobile phone manufacturing in India takes place both in the north as well as the south of the country. As per a 2016 IIM Bangalore working paper (Pathak et al, 2016), in 2016, Noida in the National Capital Region had around 15 facilities to manufacture mobiles, while the states of Uttarakhand and Himachal Pradesh had more than five facilities each. Seven states in northern India i.e. Delhi, Uttar Pradesh, Himachal Pradesh, Uttarakhand, Haryana, Punjab, and West Bengal had mobile manufacturing facilities, while down south five states i.e. Maharashtra, Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu had mobile manufacturing facilities (Pathak et al, 2016).

5.1 Investments

5.1.1 Overall Investments

In the Indian context, total investment in the mobile phone industry is a topic of intense interest. There are numerous articles in newspapers that mention the plant level individual investments for few firms; however, getting an industrial estimate is difficult. A recent report released by ICEA in 2019 mentions that manufacturing facilities for handsets and allied industries have increased from 3 in 2014 to 268 in 2018; 37 per cent of the 268 manufacturing facilities are mobile plants implying around 99 units across the country (ICEA, 2019). However, officially, as per the Government, 127 units manufacture mobiles across the country and all of them operate from the Domestic Tariff Area (DTA); however, recently two firms have been given the letter of approval for manufacture of mobiles in special economic zones (SEZ)[4]. In short, there are multiple estimates of the number of mobile manufacturing

4 https://pib.gov.in/PressReleasePage.aspx?PRID=1563771, last accessed on 17 Dec 2019.

units. As per Electronics & Hardware, Government of Gujarat (2017) an initial investment of Rs 207 crores is required to set up a unit with initial capacity of 1.8 million mobile phones/ month (feature and smartphones) which can be expanded in future. This implies an annual output of 2.16 crore units can be produced from an investment of Rs 207 crores. In FY 19 around 29 crore[5] units of mobile phones were locally manufactured, which comes to an investment of around Rs 2,780 crores, at 2017 prices. As per ICEA officials, production processes are mostly similar across various firms. This implies that the difference on the production side will be due to scale of the plant.

To get a better idea of the trend of investments into mobile phone manufacturing, we looked at the gross value of fixed assets of the firms that were surveyed in 2016-17 and 2017-18 ASI data as a part of NIC code 26305. Details of the analysis can be seen from Appendix 1. The average gross value of fixed asset (GVFA) for one unit in mobile manufacturing for 2016-17 turns out to be Rs 36.5 crores while that for 2017-18 turns out to be Rs 128 crores. Assuming that the units surveyed during these years are representative, the average investment in one year by a representative unit in the industry has been Rs 91.5 crores, which is 250 per cent of the GVFA for 2016-17. The impetus to domestic assembly of mobile phones through PMP seems to have made an impact on the rate of growth of investments in the country. It is also interesting to note that in 2016-17 the average GVFA for a mobile only producing domestic unit turns out to be Rs 10.4 crores, while that in 2017-18 turns out to be Rs 29.3 crores, which is 182 per cent of the GVFA for 2016-17. This clearly implies that foreign entities have invested more than domestic firms during this period.

5 https://www.thehindu.com/business/mobile-phone-export-grows-over-8-fold-icea/article29512004.ece, last accessed 26 September 2019.

5.1.2 Geographical Spread

Pathak et al (2016) note that 'Currently, there are more than 50 facilities from Original Equipment Manufacturers (OEMs) to Original Design Manufacturers (ODMs) to Electronic Manufacturing Services (EMS) to component suppliers involved in manufacturing of mobile phones in India. Furthermore, these facilities have been established across 13 states with a combined capex of close to INR 1700 crore ($267 million) in two years.'A 2018 report released by ICEA estimates that India has around 120 mobile handset and component manufacturing units which have attracted an investment of roughly US$ 1 billion, this includes fixed and working capital investment (ICEA, 2018).

Table 3: Units in the Mobile manufacturing ecosystem for 2017-18

Vertical	No. of Units
Mobile Handsets	59
Adapters/Chargers	27
Battery Packs	20
Wired Handsets	4
USB Cables	3
Mechanical parts	7
Total	120

Source: Exhibit 2, page 20, ICEA, 2018

The state wise distribution of these 120 mobile handsets and other accessories/components manufacturing facilities can be seen from the table below.

Table 4: State wise distribution of units in Mobile manufacturing ecosystem for FY2017-18

State	No. of Factories
Uttar Pradesh	52
Haryana	11

Cont'd.....

Delhi	7
Tamil Nadu	7
Telangana	7
Uttarakhand	7
Andhra Pradesh	6
Himachal Pradesh	6
Maharashtra	6
Karnataka	4
Rajasthan	3
Daman	2
Punjab	1
West Bengal	1
Total	120

Source: Exhibit 2, page 20, ICEA, 2018

Uttar Pradesh has the maximum number of factories followed by Haryana. All the remaining states have less than 10 units in their territories. This is despite all states offering almost similar incentives for manufacturers. As we mention below, Noida in Uttar Pradesh, seems to be emerging as the hub for mobile manufacturing ecosystem in the country. From September 2015 till October 2016 there were as many as 38 new mobile handsets manufacturing facilities that were set up across the country. Eight of these units came up in Noida while four units were located in Delhi. Thus, more than 35 per cent of the units set up during this period were in Noida and Delhi. As per press reports there are two reasons why Noida and Greater Noida are becoming attractive for mobile manufacturers. Proximity to Delhi giving easy access to the government is one; the other is that with corporate offices in Delhi-NCR, transit, distribution and ware housing is relatively easier. Availability of skilled manpower and a component ecosystem thanks to the bigger units like Samsung present in the area is another plus point. In future, it is expected

that a lot of localisation will take place in Noida[6]. Majority of the units came up in North India, indicating the importance of the northern part of India in mobile manufacturing.

5.2 Production, Imports and Exports of Mobile phones

As per ICEA (2019), OEMs constitute around 34 per cent of the mobile manufacturing units in the country while the remaining 66 per cent of manufacturing units are EMS facilities. As per press reports, production of handsets zoomed from 5.8 crore units in 2014-15, valued at 18,900 crore to 29 crore units valued at 1.81 lakh crore in 2018-19[7].

Table 5: Production, Imports and Exports of Mobile Phones in US $ billion

Year	Production	Imports	Exports
2009-10	6.5	3.23	1.28
2010-11	7.8	5.47	2.62
2011-12	8.5	5.82	2.73
2012-13	8.5	4.75	2.66
2013-14	4.4	5.93	1.95
2014-15	3.1	7.95	0.26
2015-16	8.2	6.06	0.22
2016-17	13.4	3.79	0.17
2017-18	20.5	3.54	0.21
2018-19	24.3	1.62	1.61
2019-20	31.7	1.04	3.84

Source: Ministry of Commerce and Industry, Government of India for imports and exports; various annual reports of Ministry of Electronics & Information Technology, Government of India for production.

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6 https://www.dailymail.co.uk/indiahome/indianews/article-4260038/How-NOIDA-mobile-phone-factory-India.html, last accessed 4 June 2020.

7 https://www.thehindu.com/business/mobile-phone-export-grows-over-8-fold-icea/article29512004.ece, last accessed 26 September 2019.

Imports of mobile phones steadily increased from FY10 till FY15, except for FY13. Production dropped precipitously in FY14; however, government push through PMP helped increase the value of mobile phones produced locally from US $ 3.1 billion in FY15 to US $ 31.7 billion in FY20.This is primarily for the local market. Expectedly during the same period, value of imported mobile phones dropped from US $ 7.95 billion to US $ 1.04 billion. Thus, post FY15 local production or assembly of mobile phones and imports of mobile phones are inversely related. Exports, on the other hand, have been oscillating, achieving a high during FY11, FY12, and FY13, while bottoming out during FY15, FY16, FY17, and FY18. Exports from the country are a means to check whether the production in our country is competitive. It has been reported that systemic inefficiencies add to around 10-12 per cent to manufacturing costs[8] in the country. Lower proportion of exports in the backdrop of huge increase in production highlights two important points; first, most of the firms are interested in India for its market; and second, more importantly, production in India currently is not competitive enough. A comparative perspective may help in this context, for the calendar year 2010, Vietnam exported US$ 3.4 billion[9] worth mobile phones, while India exported US$ 2.3 billion. However, in 2018 Vietnam exported US $ 49 billion[10] compared to India's US $ 1.61 billion worth mobile phones in FY19.Thus policies followed by Vietnam may give us useful pointers. However, encouraging signs from exports for FY19& FY20, suggest some improvement. It can be noted that in FY19, mobile exports were just above six per cent the value of production, which jumped to 12 per cent in FY20.Exports data for the coming years will inform whether this is an aberration or an improving trend.

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8 Can India turn into an electronics giant? The Hindu Business Line, 10, July, 2018. Last accessed on 8 January 2019

9 https://www.financialexpress.com/economy/kant-panel-aims-for-vietnam-like-model-for-mobile-phone-exports/1679103/, last accessed on 19 August 2019

10 Ibid

At the micro level, as per the five-digit ASI database for NIC code 26305, for 2017-18[11], cumulative gross sale value of mobile phones for 11 firms from NIC 26305 totalled US$ 8.9 billion. It is important to mention that, for 2016-17 and 2017-18, none of the five digit firms in the ASI database reported exports.

5.3 Employment

One of the primary motives for encouraging investments in the mobile phone manufacturing industry has been to create employment opportunities for India's huge working age population. Dutta (2009) reports that Nokia mobile plant in Tamil Nadu, then among the largest plants of the world, employed only 4,548 people in July 2008. Pathak et al (2016) note that in 2016 mobile manufacturing units employed around 48,000. This was on an investment of Rs. 1,700 crores, which implies that to generate one job; direct investment of just over Rs. 3.5 lakhs was required. Note that this does not include the amount foregone by governments in subsidies and other incentives. ICEA (2018) estimates that the total direct and indirect employment generated based on manufacturing in these 120 manufacturing / assembling units is approximately 4.5 lakhs. ICEA (2019), notes that smartphone production has led to the creation of 5.5 lakh jobs out of 6.7 lakh total jobs due to production of mobile phones in India. In our field interactions, ICEA officials stated the same figure as the direct and indirect jobs generated by the mobile phone manufacturing segment in India.

To improve our understanding, we analysed the employment reported by firms in ASI data for NIC 26305 for the years 2016-17 and 2017-18. Appendix 2 shows the analysis in detail. The average of GVFA per person worked for six units is around Rs 3.28 lakhs in 2016-17. This estimate fits well with numbers from Pathak et al (2016), and hence

11 None of the NIC 26305 firms in the ASI database reported the gross sale value for the year 2016-17.

seems plausible. For 2017-18, the average of GVFA per person worked for the eight mobile firms is Rs 6.63 lakhs. To understand the sudden increase in investment in 2017-18, we separate the fixed asset investments into land, building, and plant & machinery. We find that in 2016-17, for the eight mobile firms of 2016-17, plant & machinery assets averaged only 36.2 per cent of the total GVFA; while in 2017-18 share of plant & machinery assets for the eight mobile firms of 2017-18 averaged 45.5 per cent. Thus it is very much possible that conformance to PMP has pushed many mobile firms to invest further in plant & machinery assets. The average number of persons worked for the six units in 2016-17 is 849,while that for the eight units in 2017-18 is 1619. Though employment has risen, GVFA required for generating one direct job increased from 2.53 lakhs in 2016-17 to 3.17 lakhs in 2017-18. As computed earlier if the total investments in mobile manufacturing have been Rs.2,780 crores then the total number of people directly employed by these facilities will be 87,700.

During this period employment opportunities in domestic firms decreased. For example, in 2016-17, the average number of persons working in domestic mobile only producing units was 586, while the same for 2017-18 was 405; while that for foreign mobile only producing firms was 3565 in 2017-18. Lower employment at mobile only producing Indian firms is also buttressed by market shares among the units in 2017-18 ASI database. Six domestic firms that produced only mobile had a cumulative market share of 5.7 per cent compared to a cumulative market share of 58.8 per cent held by foreign mobile only producing firms. Of the remaining 35.5 per cent market share, 31.7 per cent was held by a multiproduct foreign firm with the remaining 3.8 per cent share being held by four multi product domestic firms. Thus it is clear from the five digit 2017-18 ASI data that with over 90 per cent market share foreign firms were dominating the Indian mobile phone market.

5.4 Value Addition

Since we have not been traditionally strong in electronics it is natural to expect that value addition in the mobile phone manufacturing segment will probably be in single digits. One of the implicit aims of the PMP was to increase local value addition. Pathak et al (2016) note that in 2016, local value addition for mobile manufacturing in India was 5.6 per cent. This has been supported by reports in the popular press. For example, the total value of mobile phones sold in India in 2016 was about $12 billion (cost to manufacturer) on a retail value of $16 billion. Of this, only $650 million worth of value-addition was done locally i.e. around 5.6 per cent[12]. Mani (2020) using ASI data at the five-digit level argues that the ratio of gross value added to gross value of output for mobile phones has actually declined from 0.16 in 2008-09 to 0.07 in 2014-15. This seems to be a part of the larger trend of decrease in the ratio of gross value added to gross value of output of communication equipment from 0.3 in 2008-09 to 0.09 in 2017-18 (Mani, 2020). Under current conditions, as per reports, local assembly of iPhone 6S Plus will allow Apple to bring the price down of the iPhone 6S Plus by 5 to 7 per cent[13] compared to importing from China. This is again in line with the inference of low value addition in the country. Reports in popular press have also highlighted that mobile phone manufacturing in India was primarily through semi knocked down (SKD) units. Because of a loophole in the law — that charges no tax on imported phone components — many handset makers went for this route[14]. This report quotes an executive of Transsion Holdings (China-based mobile phone maker)

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12 https://www.digit.in/mobile-phones/can-india-be-the-global-leader-in-smartphone-manufacturing-42832.html, last accessed on 8 February 2019

13 https://www.indiatoday.in/technology/news/story/apple-iphone-6s-plus-india-manufacturing-soon-price-1212193-2018-04-14, last accessed on 8 February 2019.

14 https://www.thehindubusinessline.com/info-tech/chinese-phone-maker-transsion-plans-to-scale-up-noida-unit/article23856585.ece#, last accessed on 18 November 2019.

that by June 2018, the company will move away from SKD kits to completely-knocked-down (CKD) manufacturing at its Noida facility.

The reliance on imported components can be expected for the firms at the five-digit level in the ASI database. These firms may be following a strategy of not only assembling but also importing mobile phones. Needless to mention, value addition in the latter case will be much lower than the former. ASI data for 2017-18 allows us to compute value addition for the units in NIC 26305. This can be seen from the table below.

Table 6: Value addition of units in NIC 26305, 2017-18

Unit	Total Output (Rs million)	Total Input (Rs million)	Ratio of value added to gross value of output (%)	Domestic unit	Market Share (%)
1*	11047.7	10628.9	3.8		1.89
2*	646	606.7	6.1	Y	0.11
3*	5959.2	5743.3	3.6	Y	1.03
4	284056.3	234642.8	17.4		31.71
5*	21861.5	20456.5	6.4	Y	3.79
6	7468.1	7079.6	5.2	Y	1.30
7	3733.8	3673.2	1.6	Y	0.58
8	12572.8	12859.5	-2.3	Y	1.91
9	65.8	57.8	12.2	Y	0.01
10*	205.2	79.2	61.4	Y	0.04
11*	437.2	391.8	10.4	Y	0.08
12*	241358.5	237585.3	1.6		41.21
13*	3946.8	3592	9.0	Y	0.67
14*	92101.2	90099.1	2.2		15.67

* Unit produces only mobile phones. Market share among the units in 2017-18 ASI database, hence adds up to 100.

Source: ASI data for NIC code 26305 for 2017-18.

For purely mobile producing units it can be seen that the ratio of value added to total value of output ranges from a low of 1.6 per cent to a high of 10.4 per cent[15]. As per this data, the average value added by only mobile producing units is 5.4 per cent[16] compared to the average value added of 6.8 per cent by units producing multiple products. Thus economies of scope seem to be in action here.

For domestic firms that produce only mobile phones, leaving the outlier unit 10, maximum value added is 10.4 per cent (unit 11, mkt share 0.08 per cent), while minimum value added is 3.6 per cent (unit 3, mkt share 1.03 per cent). Value added by each of the three foreign mobile only producing firms is less than four per cent. The maximum being 3.8 per cent (unit 1, mkt share 1.89 per cent) while minimum being 1.6 per cent (unit 12, mkt share 41.21 per cent). For mobile only producing firms a probable inference is that unless you have achieved optimum scale firms having higher local value addition are more likely to have lower market share. In a cost conscious market like India this makes sense.

With respect to domestic firms that produce multiple products, including mobile phones, maximum value added is 12.2 per cent (unit 9, mkt share 0.01 per cent), while minimum value added is - 2.3 per cent (unit 8, mkt share 1.91 per cent), implying that this firm's mobile business is in the red. The only foreign firm in the sample to produce multiple products including mobile phones has the highest value addition of 17.4 per cent with a market share of 31.71 per cent. Our interpretation of this would be that this foreign firm has mobile products at numerous price points and the economics of scope it enjoys allows it to have a higher value addition. ASI data for 2016-17 does not give us enough

15 Value addition of 61.4 per cent for unit 10 is an outlier. This is because this unit has a market share of 0.04 per cent among the 14 units sampled in 2017-18, and hence may not be representative.

16 We drop unit 10 from this calculation.

information to compute value addition in case of locally assembled phones.

Our interaction with an executive of a leading contract manufacturer also supported this inference of low value addition in this country. The executive responded that an ecosystem for manufacture of mobile phones is yet to develop in the country for a variety of reasons. First, implementation of PMP has been patchy due to few loopholes that allow companies to import at nil tariffs. For example, Notification No. 57 of the customs[17] allows most of the components that are used in the assembly of mobile phones to be imported without duty. In addition, the free trade agreement with ASEAN (of which Vietnam is a member) allows companies to import components of mobile phones at zero tariffs. Another reason as per the executive was that Chinese mobile brands have outsourced assembly of mobile phones to contract manufacturers but have been careful not to outsource supply chain. For example, Holitech, a major component supplier to Xiaomi inaugurated its first component manufacturing plant in Greater Noida where it plans to manufacture camera and touch screen modules and fingerprint sensors, and then supply to Foxconn that currently produces phones for Xiaomi. From our interaction, we believe that it is very much possible that Holitech may import and assemble components and not manufacture locally. Similarly, the much publicised[18] PCB facilities also import components and assemble the PCB in the country, thereby leading to very little current value addition. The impact of ITA-1 on electronic imports is also another reason for such low value addition in the country. Our analysis clearly shows that PMP[19] has not been able to improve the value addition done in the country.

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17 Notification No. 57/2017-Customs, Ministry of Finance, Government of India.

18 https://www.thehindubusinessline.com/info-tech/mobiles-tablets/xiaomi-sets-up-new-manufacturing-units-in-india-for-smartphones-pcbs/article23479556.ece, last accessed on 19 March 2020.

19 At least till 2017-18.

5.5 Inputs for Production of Mobiles and Manufacturing Facilities for Accessories

A mobile phone has thousands of inputs; for example, number of parts in Apple iPhone7 is 1814, while that in Samsung Galaxy 7 is 1518, and that in Huawei P9 is 1773[20]. Thus, detailed analysis of production of each and every input is well beyond the means of this analysis. There are encouraging reports that mention that small and medium enterprises (SMEs) across India are making their presence felt in the electronics market especially as the mobile manufacturing segment enjoys a rapid pace of growth[21]. However, in the same breath it must be mentioned that there are other reports which note that while the assembly of mobile phones in India has emerged as a bright spot for the economy over the past four years, the manufacturing of parts which is the logical next step in the country's ambition of becoming a smartphone-making hub, is still stuck in uncertainty[22]. This report also mentions that Vivo has invested over Rs 200 crores more to set up a surface-mount technology unit for PCB assembly in the country, which seems to have seen the light of the day[23]. Thus, there are contradictory views if one goes by reports in newspapers.

To identify the trends in input production, we will focus on three fronts. First, at the macro level, we will sketch the trend in imports and comment if the PMP has had an impact. As a part of policy push, on 28th September 2018, the government exempted 36 capital equipments[24]

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20 Dedrick & Kraemer (2017)

21 https://www.rediff.com/business/report/tech-smes-ride-piggyback-on-cellphone-boom/20190219.htm, last accessed on 11 March 2020.

22 https://www.businesstoday.in/technology/news/smartphones-still-not-made-in-india-key-parts-still-imported-from-china/story/303704.html,last accessed on 8 February 2019.

23 https://www.moneycontrol.com/news/technology/a-day-in-the-life-of-a-vivo-phone-herehow-the-smartphone-company-is-making-in-india-2848451.html, last accessed on 12 March 2020.

24 Notification No. 71/2018-Customs, Ministry of Finance, Government of India.

required for the mobile phone industry from import duty. Our imports analysis will also look at the impact of this announcement. Second, we will outline few of the input/accessories manufacturing facilities that have come up in the country. Finally, at the micro level, we will analyse the five digit ASI data for 2016-17 and 2017-18 to bring out patterns, if any, of purchase of domestic inputs vis-a-vis imported inputs.

5.5.1 Trends in Imports

An indicative list of inputs in Mechanics and Die Cut parts in which PMP has been implemented[25] can be seen from Government of India notification[26] (dated 28th April 2017). To understand the impact of PMP, we now look at the trend in imports of these components. The figure below shows the import trends in six selected inputs[27] mentioned in the April 2017 notification. As per data from the Ministry of Commerce and Industry, India's exports of mobile phones increased in FY09; the increasing imports of these inputs before and after FY09 clearly points to the dependence on imports. Though from 2017-18 the import tariffs for these inputs have been raised, it can be seen that imports in FY19 have risen for all but one. Even for the one which has shown a drop i.e. HS 39269099 (articles of plastics); the drop is just about eight per cent. This hints at either lack of competitive or non-existent domestic capacity which has forced manufacturers to import the inputs at higher import tariffs. In other words, manufacturers are yet to co-locate their supply chains. The inputs plotted in the figure are forms of plastic, rubber, screws, nuts and bolts. Given India's manufacturing capabilities in chemicals and plastics, this is indeed surprising.

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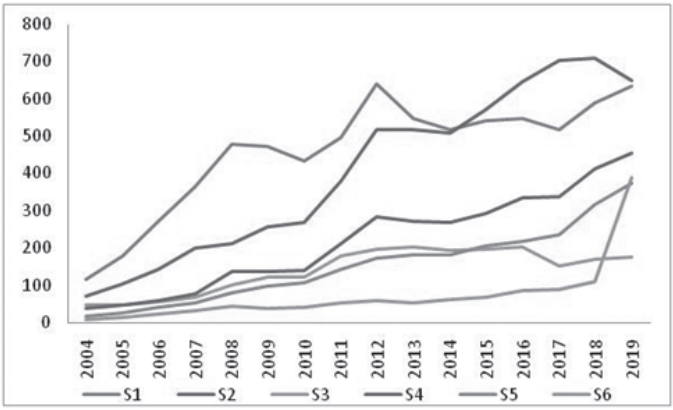
25 See Table 4 of section 3.

26 File No. 4(8)/2016-IPHW, Digital Industry (Hardware) Division, Ministry of Electronics and Information Technology, Government of India.

27 These inputs cover a majority of Mechanics and Die Cut parts mentioned in the Annexure of the April 2017 notification.

Figure 2: Imports of selected Mechanics and Die Cut part inputs to Mobile phone industry (US $ million)



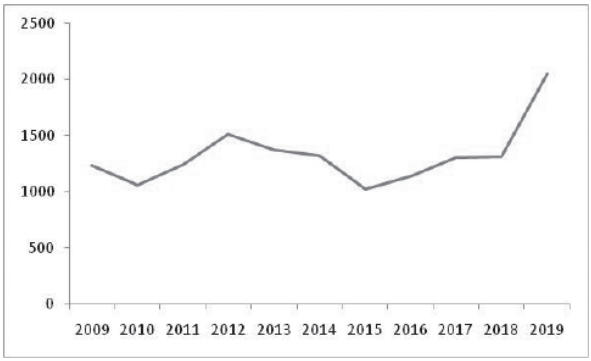
Note: S1 implies HS code 8538900; S2 implies HS code 39269099; S3 implies HS code 40169990; S4 implies HS code 73181500; S5 implies HS code 39199090; S6 implies HS code 39209999. Y axis is millions of US$, while X axis represents fiscal year, for e.g. 2004 implies FY04.

Source: Ministry of Commerce and Industry, Government of India

Exemption of capital equipments in September 2018 also has had an impact, all the 11 HS codes mentioned in the notification together have recorded positive growth in imports. As the figure below shows, the sum of imports of all the 11 lines has seen a sharp spike in FY19. This has happened for the first time in the decade of 2009-2019. This seems to suggest that mobile manufacturing facilities are making use of the exemption.

As per the PMP, domestic assembly/production of PCBs was supposed to start in FY 19. Hence, it will be interesting to understand the import pattern of PCBs in the country. The table below shows the imports of PCBs as well as other parts of mobile phone in country from FY 09 till FY 19.

Figure 3: Imports of exempted capital equipments (US $ million)



Y axis is millions of US$, while X axis represents fiscal year, for e.g. 2009 implies FY09.

Source: Ministry of Commerce and Industry, Government of India

Table 7: Imports of PCBs and Other parts of Mobile Phones in US $ million

Year	PCBs	Other parts
2008-09	191.4	2069.7
2009-10	137.5	1842.3
2010-11	138.0	2960.5
2011-12	127.9	2554.8
2012-13	121.7	2783.3
2013-14	105.0	2568.2
2014-15	196.5	2641.6
2015-16	541.5	4496.8
2016-17	1180.9	6258.6
2017-18	4855.7	6707.4
2018-19	2120.7	6592.0
2019-20	699.7	7225.3

Source: Ministry of Commerce and Industry, Government of India

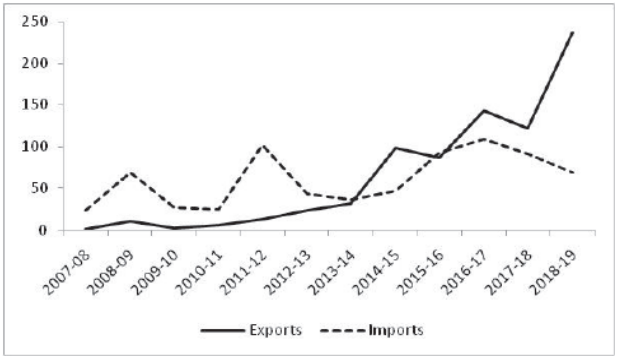
Imports of PCBs from FY09 till FY15 never exceeded US$ 200 million. Probably, because not all manufacturers had plans to assemble phones in India. However, with PMP in place, imports of PCBs started to rise rapidly in FY16. With PMP for PCBs to be implemented from FY19, it is not surprising to note that imports of PCBs increased on a larger base, by a whopping 311 per cent, to peak at US$ 4.86 billion in FY18. Imports of PCBs more than halved in FY19 to US$ 2.1 billion, then to US$ 700 million in FY20. This pattern of imports clearly points out to a strategy at the firm level, where individual firms import as much as PCBs possible before the customs duty kicks in, and reducing their imports as soon as the customs duty is implemented. Imports of other parts also seemed to be range bound below US$ 3 billion till FY15, once again emphasizing lack of plans among quite a few manufacturers to assemble in India. However, with PMP in place, imports of other parts also began to shoot up from FY 16 onwards. Indian brands ruled the roost till FY16, making it very much possible that most of the imports till FY16 may have been for assembly of Indian brand phones. Post FY16 with Chinese brands gaining market share, the increasing imports of parts and PCBs may be for their assembly facilities.

5.5.2 Accessories Production Facilities

5.5.2.1 Adapter/Charger Units

As per ICEA (2018) there were around 61 units that manufactured accessories/inputs for mobile phones, of which adapter or charger facilities numbered 27. However as per ICEA (2019) the number of units producing adapters in 2017-18 was around 102. An executive working for an adapter unit, in our field interview, put this number at 80 plus. Thus, we do not have a definite estimate of the number of adapter units in the country. The figure below gives some idea about the impact of these units on the import and export front.

Figure 4: Imports and Exports of Battery Chargers in US$ Million



Y axis is millions of US$, while X axis represents fiscal year, for e.g. 2009-2010 implies FY10.

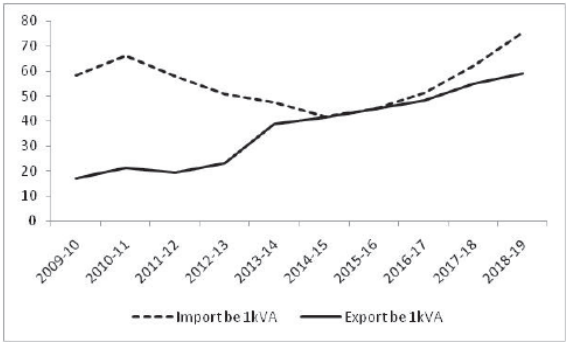
Source: Ministry of Commerce and Industry, Government of India

Imports of battery chargers for the last 12 years have been range bound between US $ 50-100 million, while exports have zoomed from almost close to zero to over US $ 235 million. A significant fraction of these imports and exports, we presume, will necessarily have to be mobile phone battery chargers clearly indicating the contribution of the charger units in the country. We seem to have become competitive in the manufacture of battery chargers with value of exports being more than three times the value of imports in FY19.

The adapter unit mentioned above, a leading multinational firm, set up its plant in mid 2000s, in the Nokia SEZ near Chennai, primarily to supply to Nokia. The shutdown of the Nokia plant in 2014 did not affect this firm as by then they had diversified their supply to multiple producers and were also supplying to Nokia's Vietnam plant. In fact, the firm mentioned that it started exporting chargers from 2008. The firm suggested that the PMP implemented for charger/adapters in 2016-17

helped it ramp up its domestic manufacturing. Currently this firm has two plants in Chennai where it employs altogether around 6,000 and one in Greater Noida where 1000 people are employed. Women comprise almost 85 per cent of their workforce. Almost all their factory labour has completed grade 10 or grade 12. Labour is first trained before they are allowed to work on the production line. They claim that quality of the products of their plant is better than that of products from its other manufacturing plants across the world. The firm claims that since 2008-09, 50 per cent of their inputs (by value) have been localized. The PCBs for adapters are manufactured locally; transformers – most important component for adapters – have been designed by their team and manufactured locally. Remaining 50 per cent of the inputs, most of which are pure electronic components have to be imported. Domestic production of pure electronic components required for chargers is very difficult, as in pure electronics Chinese manufacturers attain very low costs with help from their government. 80 per cent of the capital equipments used in their plants is imported, as domestic capability of manufacturing capital equipments is first generation whereas plants across the world use fifth generation capital equipments. The plastic casing for the adapter is made in India. The general direction one gets from this field interview is supported by few other studies. For example –as per the 2016 IIM Bangalore working paper local value addition in transformers was zero per cent; however, as per our study this scenario seems to be changing. As literature expects (Hobday, 1995) this knowledge will diffuse and we may soon have multiple players to manufacture transformers for chargers. A look at the import and export of transformers below 1 kilovolt amperes (1kVA) will probably give us some insights. The figure below shows imports and exports of transformers below 1kVA.

Figure 5: Indian Imports and Exports of Transformers below 1kVA in US$ Million



Y axis is millions of US$, while X axis represents fiscal year, for e.g. 2009-2010 implies FY10.

Source: Ministry of Commerce and Industry, Government of India

The figure shows that after peaking in FY11, imports dropped till FY15, probably due to the shutdown of the Nokia plant at Chennai as well as development of local transformers. This has also helped exports of transformers, which has substantially picked up after FY 13. This implies that there may be some grain of truth in our field interviews wherein our respondent mentioned about the design and development of transformers at their unit.

In order to understand the supply ecosystem to the charger unit (CU) mentioned above, we also interacted with a couple of firms that supply components to the charger unit. The names of the supplier firms were provided by the charger unit. Our aim was to understand the supply chain ecosystem to mobile charger units that exists in our country. The first firm is an electronic firm (FF) that supplies integrated circuit (IC) devices to charger units. As per this firm, the CU hardly procures anything from FF, this is because the head office of CU has established tie ups, which is initiated from the design phase of any new charger model, with

leading Korean/Chinese/Local firms[28]. These Korean/Chinese/Local firms are competitors of FF. Thus, FF loses out due to lack of established tie-up with the head office of CU. The International Trade Agreement[29] (ITA-1) that Indian signed in 1996 allows the imports of the parts that FF produces at zero duty, as a result of which almost all the electronic components going into chargers are imported. As per FF, ITA-1 is also the main reason for zero investment or new manufacturing in the electronic components space.

This view has been endorsed by the second firm (SF) that has been supplying printed circuit boards (PCB) to CU for quite some time now. SF mentioned that it has benefited from its interactions with CU. SF, however, noted that its business with CU has not grown with time; rather CU has been procuring lesser quantities over time from SF. During the interaction with SF, it was mentioned that though they have capacity to supply PCBs to charger producing units across the country, local procurement is miniscule compared to imports of PCBs, which once again hints at preference of the head office towards established tie-ups.

5.5.2.2 Battery Units

Batteries are important components of mobile phones. With respect to battery manufacturing, Pathak et al (2016) mention that only battery assembly is happening in the country with a majority of the sub-components - in value terms - being imported. Among OEMs, only some have contracted to a supplier who locally assembles the battery, some assemble their batteries in house, while a few OEMs are still importing battery as a full component. They mention that the true localization rate is just eight per cent. Lithium ion (Li-ion) batteries because of their higher energy intensity are now being extensively used

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28 These firms are picked up from the vendor-list at the head office of the CU firm.

29 ITA - 1 - a plurilateral agreement of the WTO - is designed to achieve elimination of all entry barriers on information technology products in computers, telecom equipment, semiconductors, semiconductor manufacturing and testing equipment, software, and scientific instruments.

across all electronic devices including mobiles. Assembly of battery packs as per the implementation status of PMP for cellular mobile handsets should have begun by 2016-17. This seems to have started in the country as the imports of Li-ion rechargeable secondary cells have shown a dramatic increase from 2016-17. The table below shows the imports.

Table 8: Imports of Li-ion rechargeable secondary cells in Rs. Million

Year	Imports
2013-14	12,859.8
2014-15	5,687.6
2015-16	18,072.0
2016-17	22,058.7
2017-18	35,320.1
2018-19	85,740.8

Source: Ministry of Commerce and Industry, Government of India

Imports in 2018-19 have more than doubled that in 2017-18. ICEA (2018) mentions that there were 20 units that assembled battery packs in the country then, while ICEA (2019) reports that around 50 units assemble battery packs now. Given this background, the jump in imports from FY 18 to FY 19 seems understandable.

Our secondary research informs us that there are manufacturers who have invested to produce Li-ion secondary cells for manufacture of mobile phone batteries in the country. For example[30], in June 2018, Munoth Industries Limited planned to set up India's first lithium ion cell production plant by investing Rs 799 crores in three phases in

30 https://economictimes.indiatimes.com/industry/telecom/telecom-news/indias-first-lithium-ioncell-factory-to-come-up-inandhrapradesh/articleshow/64547131.cms, accessed on 3 March 2020.

Tirupati, Andhra Pradesh. In the first phase, Rs 165 crores were planned to be invested to produce Li-ion cells having total storage capacity of 200,000 Ah (Ampere hour) per day, which was supposed to be available for assembly for mobile phone manufacturers from April 2019.

As part of our primary survey we spoke to the Director of one such battery assembly unit. This firm has its factory in Chennai, Tamil Nadu, where it imports Li-ion rechargeable secondary cells and assembles them into battery packs. The firm imports the secondary cells at a basic customs duty of five per cent. The firm uses Chinese technology as well as Chinese capital equipments for assembling the battery packs. The firm believes that policy push to local manufacture of Li-ion secondary cells may remain a dream; this is because available technology now allows import of components of Li-ion secondary cells, which can then be assembled. Flip flops by state governments on incentives has affected investments for manufacture of Li-ion secondary cells. As per this respondent, the Munoth Industries investment in Tirupati, has been put on hold due to lack of clarity in incentives post 2021; this is because these incentives were assured by a previous administration and the current administration is not showing much intent in supporting the previous administration's decisions.

5.5.3 Trends in Inputs at five-digit Level

To get some micro level understanding of input buying decision of firms, we look into the ASI units from 26305 NIC code for 2016-17 and 2017-18. The table below shows indigenous and imported raw materials bought by these units. To account for size, we have computed the share of raw materials bought in the total cost of production. We focus only on primarily mobile producing units.

Table 9: Raw materials bought as a proportion of Total cost of production for mobile producing units

2016-17			2017-18		
Unit	Indigenous RM	Imported RM	Unit	Indigenous RM	Imported RM
1	0.003	0.953	1	0.023	0.936
2	0.949	0	2	0.922	—
4	0.002	0.946	3	0.112	0.845
6	0.032	0.908	5	0.110	0.866
7	0.013	0.937	10	0.058	0.426
9	0.036	0.011	11	0.931	—
12	0.003	0.969	12	0.002	0.972
14	0.009	0.813	13	0.003	0.864
			14	0.062	0.908

Source: ASI data for NIC code 26305 for 2016-17& 2017-18

For 2016-17, we find that units 1, 4, 6, 7, 12 and 14 rely heavily on imported inputs for their production. The imported raw material numbers vis-a-vis indigenous raw materials numbers clearly prove the reliance on imported inputs. On the contrary, units 9 and 2 rely more on domestic inputs than imported inputs. However, procurement of indigenous raw material for unit 2 accounts for almost 95 per cent of the total cost of production, which seems like a special case; thus, more information is needed on unit 2 before we can use the input pattern of unit2 for our study. Hence, for our current purpose i.e. input pattern, we do not include unit 2. Unit 9 is a very small firm, thus its input pattern i.e. greater reliance on indigenous raw materials may not be representative of the industry.

For 2017-18, the story seems to be similar; all units except 2 and 11 are heavily reliant on imported raw materials. The fact that units 2 and 11 rely heavily on indigenous raw materials must be read with their

low market shares[31] of 0.11 and 0.07 per cent respectively. Whereas, units 1, 12 and 14 which are foreign firms have a market share of 1.9, 41.2, and 15.7 per cent, respectively. Thus firms that seem to doing well in the Indian market primarily depend on imported raw materials. Analysis of the details of the imported as well as indigenous raw materials, informs us that for 2016-17 and 2017-18, electronic components form the majority of the imported raw materials. This supports the argument that due to numerous reasons very little electronic component manufacturing is happening in the country. On the contrary, non-electronic inputs form the majority in locally or domestically procured raw materials. There is some domestic electronic procurement; however, one does not have enough information to confidently state that those are manufactured in India. It is possible that these electronic components are imported through the ITA-1 route and assembled in India. It also has to be noted that for the same year, some components are sourced both locally as well as imported, which imply firm specific supply chain strategies.

5.5.4 Missed Opportunities

There has been at least one instance of an investment in the supply ecosystem that did not fructify. Vedanta group had announced[32] in March 2016 about a proposed liquid crystal display (LCD) manufacturing unit, the first of its kind in India, Twinstar Display Technologies which would be operational by 2018. The Cabinet Committee on Economic Affairs chaired by the Prime Minister had approved Twin Star's Rs 9,000 crore FDI proposal in 2017. However, this US$10 billion project[33] to set up India's first plant to make flat

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31 Market share among the units in 2017-18 ASI database.

32 https://m.economictimes.com/industry/cons-products/electronics/anil-agarwals-10-billion-lcd-plant-to-start-production-in-2018/articleshow/51478695.cms, last accessed on 12 March 2020.

33 https://m.economictimes.com/industry/cons-products/electronics/vedantas-10-billion-lcd-project-may-fall-flat/articleshow/69936365.cms, last accessed on 12 March 2020.

panel displays for televisions and mobile phones from scratch is most likely to be scrapped after failing to obtain subsidies under M-SIPS package. As per reports, this was the only project at an advanced stage of implementation. LG Electronics was supposed to provide technology for the plant under an agreement, which now seems to have lapsed. The Maharashtra government had reserved 200 acres for the project and another 150 acres was earmarked near Nagpur for ecosystem partners. But the land was yet to be transferred to the company since the Maharashtra's policy does not allow allotment of land until the Centre clears any subsidies sought. Vedanta has also disbanded the Twin Star team, which had as many as 75 people at one time.

It has also been reported that Wistron has applied to the government to invest Rs.5,000 crore and Foxconn Rs.2,500 crore under M-SIPS package that will likely give these companies benefits of Rs.1,000 crore and Rs.500 crore, respectively. The government, however, has so far approved only as many as 193 of the 421 applications received under M-SIPS. Foxconn recently flagged its concerns to the government over delays in refunds of about Rs.1,000 crore under the goods and services tax regime, saying one of its key India units has been left cash-starved and this could hurt plans to deepen local production of electronics[34]. One of the prime causes for these missed opportunities may be lack of strong institutions in the country. The recent world development report (WDR, 2020) has emphasized the importance of institutions in attracting investments.

6. Experience of Vietnam

Vietnam's success in integrating itself into the electronics global value chain (GVC) is now being advocated by the World Bank (WDR,

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34 https://m.economictimes.com/industry/telecom/telecom-news/wistron-foxconn-plan-to-investrs-7500-cr-over-five-years-in-india/articleshow/67954262.cms, last accessed on 6 September 2019.

2020). Thus, in order to draw some useful policy lessons for the Indian scenario it may be useful to understand the Vietnam experience.

6.1 Policies

Since it was passed in 2005, the Law on Investment has been an important driver of foreign activity in Vietnam. Incentives for new investors include import duty exemptions for equipment, materials, means of transportation, reduction in corporate tax, an exemption from tax on technology transfer activities, the ability to carry losses for up to five years for tax purposes, accelerated depreciation of fixed assets, and preferential access to and tax reduction on land. The law outlines investor rights and obligations, and reinforces the notion that investments and intellectual property are protected from expropriation and theft. It defines economic zones, industrial zones, high-tech zones and export processing zones, and outlines investment procedures for companies wishing to invest in one of these areas. A government order passed in 2006 defined key areas eligible for investment incentives. These areas include biotechnology, advanced manufacturing, ICT, agriculture, labour intensive factories, infrastructure development and social services, among others (Sturgeon & Zylberberg, 2016).

ICEA (2018) mentions that to earn profits firms enjoyed a tax holiday till four years from their year of starting, if firms earned profits after four years but before nine years then tax was reduced by 50 per cent. There was also a flat 10 per cent tax rate for 30 years for high-tech projects (and 15 years for non–high tech projects). Vietnam also offered an import tax holiday for 5 years for material not yet domestically produced for use in industrial parks (IPs) and export processing zones (EPZs). It also allowed an import tax holiday for the duration of the project for commodities forming part of the fixed assets for all projects in IPs, EPZs and EZs. Manufacturers paid zero per cent VAT for goods imported into EPZs and for means of public transportation in IPs and

EPZs. Goods manufactured and imported to non-tariff area in EZs were exempt from VAT and excise duty. Experts and employees in EZs could also benefit from a 50 per cent personal income tax exemption. The government granted land-use rights through 50 to 70-year leases. Companies were not required to pay resettlement compensation to residents. Investment projects in select sectors such as electronics manufacturing received land and surface water rent exemptions. It also simplified the process of issuing construction permits. The State Bank of Vietnam capped the short-term lending interest rate for companies in hi-tech sector at 7 per cent per annum. The government also offered a capex subsidy of up to 50 per cent on infrastructure development.

6.2 Impact

As a result, Vietnam's FDI stock picked up from around $400 per person in the early 2000s to $500 in 2008 and $880 in 2015. Currently, Vietnam is the second-largest smartphone exporter, producing 40 percent of Samsung's global mobile phone products and employing 35 percent of its global staff. FDI inflows to the electronics sector included mostly large investments from Korea's Samsung Group, which launched Samsung Electronics Vietnam in 2008. Samsung's presence in Vietnam now includes the world's largest smartphone production facility, a smartphone and tablet display assembly facility, an electromechanical assembly operation for camera modules, and the Samsung Vietnam Mobile Research and Development Centre. Samsung has about 160,000 workers in Vietnam, and lead firms LG, Canon, and Panasonic, contract manufacturers Foxconn and Jabil Circuit, and platform leaders Intel and Microsoft also operate there (WDR, 2020). Vietnam has been a member of the Association of Southeast Asian Nations (ASEAN) since 1995, and after entering the World Trade Organization in 2007 its number of preferential trade partners increased from 10 to 16 by 2014. Free trade agreements between ASEAN and third countries (Australia, China, India,

Japan, the Republic of Korea, and New Zealand), benefitted Vietnam. It also signed some bilateral free trade agreements with Chile, Japan, and the European Union. The coverage in Vietnam's trade agreements expanded substantially from 13 in 2007 to 86 core provisions in 2014. Import tariffs in the electronics sector dropped from about 8 percent in 2000 to less than 3 percent by 2015.As a result, Vietnam's backward participation in electronics GVCs increased from 47 percent in 2000 to 67 percent in 2010.

Evidence on the impact of such production capacities on local industrial development in Vietnam, however, is mixed. Tran & Norlund (2015) argue that as a 'latecomer,' integrating into the global markets does not automatically lead to access to knowledge and technology transfer. This further is supported by findings that Vietnamese companies mainly provided labour-intensive and low skilled assembly of components, such as coils, cable assemblies, and mini-motors used in mobile phones and digital cameras (Ohno, 2009 and Vind, 2008). There was no positive spillover, or very limited skills or other technology transfer from foreign to local firms. Local Vietnamese firms could not compete with the high salaries offered by the foreign companies to recruit the best engineers, resulting in limited absorptive capacity and low upgrading of the domestic electronics industry (Vind, 2008). Sturgeon & Zylberberg (2016) point out that to produce intermediate inputs, Samsung relied heavily on its Korean suppliers who co-located with it in Vietnam. Among Samsung's 67 suppliers in Vietnam, only four firms that supply materials related to packaging, the lowest value added input, are Vietnamese. Efforts to increase local content by local firms have largely failed. In 2015, the Ministry of Industry and Trade in Vietnam announced that Samsung would source 91 parts for the Galaxy S4 mobile and 53 parts for tablets from local suppliers. Targeted components included relatively simple parts: batteries, earphones, USB storage devices, insulation tape and parts of data transmission cables among others. Samsung held a workshop with 200 local firms and the

Vietnamese government to see which of these components could be sourced locally. However, none of the 200 local firms was able to meet Samsung's requirements. To support some local production, Sturgeon & Zylberberg (2016) point out that Samsung's next step was to organize a workshop in which its tier 1 suppliers could meet with local firms, to see if they could be integrated at a lower level in the supply chain. The study also points out that Vietnamese government's efforts to create local supply chain have been ineffective, and foreign firms have been forced to develop the local supply base on their own. Recently, however, there seems to be some improvement, WDR (2020) notes that the reliance on imported inputs recently declined slightly as the role of local suppliers increased. For example, Samsung's local suppliers increased to 29 domestic suppliers[35] in 2016, from just four in 2014, all trained by Samsung to meet quality standards.

Masina & Cerimele (2018) in their study on industrialization on Vietnam note that lead firms move labour-intensive operations to countries with lower labour costs; however, they continue to rely on their traditional suppliers rather than include local firms in their supply chains. Intermediate goods are either imported or produced locally by foreign suppliers (often located in the same industrial park as the lead firms). The space for local firms within the production networks controlled by foreign investors is normally very limited as local firms do not have the technology and the experience to produce goods with the required quality at a competitive price. The Vietnamese case confirms this already established pattern of Southeast Asian so-called industrialisation. Quoting a survey conducted by the United Nations Industrial Development Organisation (UNIDO), Masina & Cerimele (2018) point out that foreign-invested enterprises procure only 26.6 per cent of the value of their total inputs from domestic manufacturers (22.5 per cent

35 As pointed out by Sturgeon & Zylberberg (2016) this may be at the lower level of the supply chain i.e. supplying to Samsung's tier 1 suppliers.

for Trans-national corporations (TNC)), while most of the inputs come from abroad or from foreign suppliers based in Vietnam with very limited vertical backward linkages. They argue that this re-internalisation of production within existing supply chains is part of a strategy intentionally developed by TNCs to reduce costs while ensuring total quality manufacturing. As a result, Vietnam, like the other late-comers, faces a rather complex and possibly hostile environment to achieve industrial deepening and industrial upgrading. The study also points out that many industrial parks continued to operate well below capacity or even remained completely empty.

Pham et al (2020) note that the arrival of large electronic MNCs in Vietnam has created segregation between the FDI and the domestic firms in the electronics sector, leading to the 'enclave economy' for the FDI firms, primarily due to the inability of the local firms to integrate into global electronics value chains. Lack of skilled labour was the main barrier preventing local firms meeting production capacity and organisation capability required by MNCs. Intense competition among local firms and the resulting low margins dissuaded local firms from investing in upgrading their technological capability. Local firms also realised that working with large MNCs involves taking on more work and increased risks. They could see that specific incentives awaited MNCs that established linkages with local firms; however, local firms had no such incentive, and due to their small size without government support could not attract capital investment and skilled labour. Frustrated by the inability of local firms to meet standards, MNCs went back to imports from their other subsidiaries in other countries. By 2017, there were around 600 foreign electronics firms located in Vietnam, of which around 52 per cent were the component and part producers. However, a majority of the local firms still operate in low-end segments of the electronics value chain.

7. Summary and Policy Implications

7.1 Summary

In FY 19, India produced around 29 crore units of mobile phones, which comes to an investment of around Rs 2,780 crores, at 2017 prices. These investment figures turn out to be much lower than those reported in popular press. OEM and EMS dominate the Indian manufacturing scene. Analysis of the five digit ASI data for 2016-17 & 2017-18 makes it apparent that the impetus towards domestic assembly of mobile phones through various policy measures has made a positive impact on the growth of investments in the country. Comparison of GVFA between the two years shows that foreign firms seem to have invested more than domestic firms. The scale of an average foreign firm seems to be much larger than a domestic firm. Currently, local production and imports of mobile phones are inversely related. Exports from the country are improving. The doubling of average GVFA in 2017-18 compared to that in 2016-17 indicates that conformance to PMP has pushed many mobile firms to invest further in plant & machinery assets. As a result the direct employment generated per unit GVFA decreased in 2017-18. Being a capital-intensive industry, the share of wages, as expected, is low. Lower market share for Indian also showed up in the form lower employment generated by domestic firms in 2017-18 than that in 2016-17. It is clear from the five digit 2017-18 ASI data that with over 90 per cent market share foreign firms are dominating the Indian mobile phone market. In 2017-18, value addition for a majority of the firms at the five digit level was less than ten per cent. Electronics import under ITA-1 is another reason for such low value addition in the country. Ratio of imported vis-a-vis indigenous raw materials at the five digit level clearly prove the reliance of all producers on imported inputs. As in 2006, firms that seem to doing well in the Indian market primarily depend on imported inputs. This also implies that we have not been able to build a domestic supply ecosystem all these years.

Analysis on an input class i.e. Mechanics and Die Cut parts, for which PMP has been implemented, showed that though from 2017-18 the import tariffs for this input class has been raised, imports in FY19 have risen. This hints at non-existent domestic capacity and seems to be the case for most of the inputs listed under the PMP. There has been some development in accessories manufacturing, mobile chargers are being exported from the country and there seems to be a pick-up in domestic production of transformers used in mobile chargers. These transformers fall in the non ITA-1 category. This clearly implies that there is scope for domestic production in inputs that are in the non ITA-1 category and manufacturers seem to be promoting it. With respect to mobile batteries, policy push to local manufacture of Li-ion secondary cells may remain a dream. This is because flip flops by state governments on incentives has affected investments for manufacture of Li-ion secondary cells. Moreover, technology has advanced so much that it is possible to import components of Li-ion secondary cells and assemble them locally.

The only backward linkage that our study picked up was the pick-up in exports of transformers used in chargers or adapters. It is useful to note two points here, first, the charger firm that created the backward linkage was a part of the supply ecosystem that co-located to India with Nokia, and second, transformers fall in the non ITA-1 category. Thus, domestic or local industry procurement is not a given if MNCs invest hugely in India. This resonates with the view of one of our primary survey respondents who mentioned that headquarters of MNCs do design and development with their chosen suppliers leaving very little scope for host country subsidiaries for local procurement, as a result of which local capabilities may not develop.

7.2 Why have Existing Policies not had the Desired Effect?

Lead firms under pressure from host governments open up the least value adding activity i.e. assembly plants in growing markets.

India experienced this in the previous decade when the Nokia plant was set up, and seems to be re-experiencing the same phenomenon. Domestic backward linkages seem to be lacking in recent latecomer countries such as India and Vietnam. ICEA (2018) notes, mobile handset ecosystems are largely based on the concept of motherships, which essentially combines brands and their unique supply ecosystems. The bulk of investment as well as employment generation potential lies with these ecosystems. These motherships account for more than 80 percent of the global mobile handset sales revenue. Additionally, India fails to attract huge investments in the supply ecosystem as it is not among the largest market in value terms. For example, in 2016, globally, OEMs sold approximately 1.47 billion smartphones for US$ 415.2 billion (Galevotic et al, 2018), whereas the Indian market for smartphones in 2017 was around US$ 22 billion (ICEA, 2019). Though India may have the volume in terms of units[36], it does not have the value which attracts major OEMs. Most of the assembly happening in the economy is to satisfy local demand[37]. Lack of exports from these assembly plants indicates lack of cost competitiveness; this implies that we have to offer an environment where manufacturers can achieve lowest cost. This may be difficult for India as systemic inefficiencies add to around 10-12 per cent to manufacturing costs[38]. Without massive manufacturing volume & value commitments, which India lacks, it is not possible to attract these MNC ecosystems to shift from their well-established manufacturing bases in China, Japan, Korea, Taiwan, etc. India also has signed FTAs with countries in our neighbourhood that have global scale supply ecosystem from where these ecosystems can easily serve the Indian market.

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36 India is the second largest mobile phone market (in terms of units) after China and the biggest feature phone market globally (ICEA, 2019).

37 This was also the case with the Nokia plant that started operations in 2006 (Dutta, 2016).

38 Can India turn into an electronics giant? The Hindu Business Line, 10, July, 2018. Last accessed on 8 January 2019.

Instances of investment by foreign firms such as Qualcomm and One Plus in R&D centres in the country are welcome; however, they may not help in India become a hub of mobile manufacturing. This is because similar R&D investments in the information technology sector by MNC's in India have been to tap Indian talent and integrate that talent into multinational R&D systems in which a significant amount of the intellectual leadership and direction still came from outside India (Branstetter et al, 2018). Though these R&D investments have generated jobs the patents generated due to these investments in India constitute a small fraction of the MNC's global patents (Mrinalini et al, 2013). Francis (2018) points out that India currently has a well-developed integrated circuit (IC) design sector located within MNCs – which, we believe, Qualcomm wants to benefit from. Indian chip design engineers, however, lack the capabilities required for semiconductor fabrication and component manufacturing, as well as in system design and systems manufacturing further up the chain. The design work done in India is transferred to the headquarters of the MNCs and many a times ends up getting manufactured in Shenzhen, China (Ernst, 2014). Thus, the investment by Qualcomm and One Plus is very much with the trend and is probably with an aim to tap Indian talent to maintain their leadership, which though beneficial to the country may not directly benefit mobile manufacturing in the country.

With the PMP not providing the desired results, recently on 1st April 2020, the Production Linked Incentive Scheme[39] (PLI) was notified by the Government of India. PLI incentivizes incremental sales for foreign and domestic firms, and specified electronic components that are used in the manufacture of mobile phones. It offers an incentive of four per cent to six per cent for goods manufactured in India to eligible companies on incremental sales over FY20, for a period of five years. Eligibility for the scheme is subject to thresholds of incremental

39 https://meity.gov.in/writereaddata/files/production_linked_incentive_scheme.pdf, last accessed on 18 May 2020.

investment and incremental sales of only manufactured goods; these thresholds vary for foreign mobile firms and domestic mobile firms. For example, incremental investment over four years for domestic firms is Rs. 200 crores, while that for foreign mobile firms is Rs. 1,000 crores. Additionally, the threshold for incremental sales of manufactured goods over the base year for domestic mobile firms range from Rs. 500 crores for year 1 to Rs. 5,000 crores for year 5; while that for foreign mobile firms range from Rs. 4,000 crores for year 1 to Rs. 25,000 crores for year 5. Incentives under PLI will be applicable from August 2020. This implies that at the end of four years, a selected domestic mobile firm will increase its production capacity by 2 crore units per year while that for a selected foreign firm will be around 10 crore units per year. This additional 12 crore mobile units at the end of the fourth year will be in addition to the capacity expansion of the non-selected firms. To give some perspective to this capacity expansion, the number of units of mobile phones that were sold in India was 27 crores in 2015, 28 crores in 2016, and 27.5 crores in 2017 (ICEA, 2019). As we have already mentioned, India produced around 29 crore units of mobile phones for the year 2018-19, which is close to yearly sales in the Indian market. Thus a majority of the incremental production and sales under PLI will have to be for the export market. However, it has been recently shown that if the cost of production of a mobile phone is 100 (without subsidies) then the effective cost (with subsidies and other benefits) of manufacturing mobile phone in - China is 79.55, Vietnam is 89.05, and India (including PLI) is 92.51 (ICEA, 2020). In a market with pure price competition Vietnam retains its advantage over India. Hence, under current incentive structure exporting large volumes of commoditized mobile phones from India may not take off. The ability of our domestic firms to take advantage of PLI and grab a sizeable domestic market share also seems difficult. However, domestic firms may have the route of exporting cheaper mobile phones to other lower income countries. In these circumstances it is hard to imagine investments in component manufacturing in the country,

component manufacturers may choose to serve these assembly plants in the country through imports.

7.3 Policy Implications

Given the complex WTO rules, India's options for the type of national support policies earlier available to Japan, Korea, and Taiwan are constrained (Ernst, 2014).

7.3.1 Continuing Current Policy

India currently has various schemes under National Electronics Policy, state government incentives and PLI for manufacture of mobile phones to invite leading MNCs to invest in manufacturing facilities in the country. The policy of PMP intends to increase the value addition that is being done in these facilities. Our analysis has also clearly shown that with the introduction of PMP most of the firms have moved from importing SKD kits to CKD kits[40]. Thus, PMP has worked to some extent but has also been ineffectual in many cases. Co-location of suppliers with the brands, however, seems not be happening in India[41], it remains to be seen if PLI succeeds in changing this. Thus, under the PLI, India should encourage major MNCs to co-locate their supply ecosystems in the country. This will also help increase local value addition. Further increase in value addition can be through local procurement by each of the firms in the supply ecosystems, which though not automatic can go a long way in aiding industrial development. Evidence on the impact of MNC capacities on local industrial development in Vietnam has been mixed. However, compared to

40 This has come out in other analysis as well, for example, https://gadgets.ndtv.com/mobiles/news/over-150-mobile-manufacturing-units-set-up-in-india-in-past-4-years-cmr-1994275, last accessed 4 May 2020.

41 Samsung, it was pointed to us by one of our primary survey respondent, though invested hugely in India, has not co-located its supply chain in the country.

Vietnam, the advantage in India's favour will be its strong absorptive capacity supported by its scientific and technological human capital.

7.3.2 Focus on Local Capabilities

We have already argued that it may be difficult for PLI to succeed; however, in case the PLI succeeds and we become a dominant exporter of mobile phones, it may be worthwhile to note the following from the Chinese experience. Chuang (2016) points out that the export led industrial development followed in China has been criticized by its central government in its regional planning scheme as "unsustainable development, low value added, low technology input, labour and resource-intensive, over dependent on exports and TNCs, and environmentally and socially unsound".

Thus depending only on PLI to make us a mobile manufacturing powerhouse may not be the right strategy; we also need a parallel policy to improve local capabilities by creating domestic champions in manufacturing and R&D. Our domestic firms did not use the boom time of their business to develop design capabilities that may have helped them withstand fierce competition from foreign firms later. The government should hand hold at least one domestic player till the time it is able to face the competition in the market. Mani (2020) underlining the weak innovation capability, emphasizes the importance of a dedicated public R&D programme to develop innovation capability in mobile phones, and urges the need for pioneering public laboratory focussing on mobile communication technology. Thus nurturing one domestic champion firm in mobile manufacturing and one champion laboratory in R&D on mobile communication technology should form the first steps of our parallel policy in mobile manufacturing. Interactions of the two domestic champions with each other as well as with other mobile MNCs and their supply ecosystems, has the potential to multiply our capabilities in the mobile manufacturing space drastically.

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Appendix 1

Table A1: Gross value of fixed assets of mobile manufacturing units in 2016-17 and 2017-18 (Rs. Million)

2016-17		2017-18	
Unit	GVFA	Unit	GVFA
1	603.12	1	254.65
2	226.83	2	5.66
3	—	3	679.96**
4	27.93	4	34760.9
5	26968.14	5	231.57
6	223.73	6	167.2
7	158.34	7	151.66**
8	3064.87	8	3064.87
9	47.22	9	5.53
10	0	10	282.50
11	361.61	11	88.68
12	1630.12	12	7414.67
13	—	13	469.15
14	6.88	14	2093.93
15	1259.05		
16	1399.89		
17	0		
Total	35977.72*	Total	49670.92*

Source: ASI data for NIC code 26305 for 2016-17& 2018-18.

* Figures rounded off, may not add up,

** Net value of fixed assets.

There are 17 units that have been surveyed for the year 2016-17. As can be seen from the table, GVFA for the ASI units in 2016-17 is close to Rs 3,600 crores. Before we proceed further, it is important to keep the following three riders in mind. First, a unit has been placed in NIC code 26305 as per the maximum ex-factory value of the major product from the multiple outputs manufactured by the unit. Thus, it is very much possible that many units listed in the table may be manufacturing multiple products including mobile phones. For example, unit 5 in the table not only produces mobile phones but also colour television sets, refrigerator, freezer and other products. It can be seen from the table that unit 5 accounts for 75 per cent of the total gross value of fixed assets. Since unit 5 produces multiple products allocating its fixed assets to the mobile phone industry will over estimate the total. Second, unit 15 and 16 did not operate even for a single month during the financial year 2016-17. If one goes by the product list of the surveyed ASI units, units 8, 10, 11, and 17 do not seem to be mobile phone producing units; thus if one excludes fixed assets of 5, 8, 10, 11, 15, 16, and 17 then we arrive at an estimate of Rs 292 crores as the gross value of fixed assets for 8 units in mobile manufacturing, which implies an average of Rs 36.5 crores for each unit.

The total number of units surveyed in 2017-18 is 19, however, five units had zero working days during the year, hence we analyse only the remaining 14 units. GVFA for these14 ASI units in 2017-18 is Rs 4,967 crores. Units 4, 6, 7, 8, and 9 have multiple products including mobiles, hence we drop them from our fixed assets estimation. The total GVFA for the remaining nine only mobile units comes to around Rs 1152.1 crores, which implies an average of Rs 128 crores.

Appendix 2

The table shows the employment numbers for the firms surveyed at the five-digit level in 2016-17 and 2017-18.

Table A2: Employment at five-digit level firms

2016-17				2017-18			
Unit	Persons worked	GVFA per person worked (Rs.)	Wages share of total cost of production (%)	Unit	Persons worked	GVFA per person worked (Rs.)	Wages share of total cost of production (%)
1	2020	2,98,574	1.76	1	1335	190746.2	2.1
2	1245	1,82,190	3.05	2	145	39027.6	3.9
3	—	—	—	3	641	1060773.1**	2.2
4	87	3,21,062	2.20	4	5887	5904686.6	4.8
5	5606	48,10,585	5.38	5	820	282400.8	1.3
6	784	2,85,366	1.22	6	776	215463.9	1.3
7	888	1,78,308	1.65	7	178	852058.1**	0.8
8	3241	9,45,656	2.76	8	3241	945656.3	2.8
9	67	7,04,801	23.44	9	92	60077.7	10.7
10	35	0	3.79	10	153	1846436.8	19.4
11	630	5,73,978	1.35	11	82	1081490.8	3.3
12	298	54,70,197	0.02	12	409	18128765.3	0.3
13	—	—	—	13	824	569352.7	6.5
14	109	63,096	9.36	14	8951	233933.1	0.9
15	3	41,96,84,406	7.26				
16	0	—	—				
17	45	0	6.13				

** Computed from net value of fixed assets.

Source: ASI data for NIC code 26305 for 2016-17 and 2017-18. GVFA – Gross Value of Fixed Assets.

For 2016-17, for reasons mentioned in Appendix 1 we do not include units 5, 8, 10, 11, 15, 16, and 17. Among the remaining eight units, it can be seen that unit 14 has the least amount of fixed assets per person employed; in other words, units 14 has the highest employment generated per rupee of fixed asset. Unit 12 at Rs 54.7 lakhs has the highest amount of fixed assets per person employed. The average of fixed asset per person worked turns out to be around Rs 3.28 lakhs (if one does not include unit 12 and 14) i.e. for six units. Similarly, the wages share of total cost of production for the units 1, 2, 4, 6 and 7[42] does not exceed 3.05 per cent. The capital-intensive nature of the industry is thus clearly apparent.

For 2017-18, as mentioned earlier the number of only mobile firms is nine, the average of fixed asset per person worked turns out to be around Rs 26.03 lakhs, which seems to be very high. This may be because one of the mobile units has an exceptionally high GVFA per person worked of Rs 1.81 crore. To remove the bias from this probably outlier, we drop this firm and compute the average of fixed asset per person worked for the remaining eight firms, this turns out to be Rs 6.63 lakhs. To understand the sudden increase in investment we separate the fixed asset investments into land, building, and plant & machinery. We find that in 2016-17, for the eight mobile firms of 2016-17, plant & machinery assets averaged only 36.2 per cent of the total GVFA; while in 2017-18 share of plant & machinery assets for the eight mobile firms of 2017-18 averaged 45.5 per cent. This clearly implies that PMP has pushed many mobile firms into investment further on plant & machinery assets.

42 Unit 9 is a small firm, and hence probably has a large wage share.

References

Branstetter, L.G., Glennon, B.M., and Jensen, J.B. 2018. 'The IT Revolution and the Globalization of R&D,' NBER Working Paper 24707, Cambridge.

Chuang, Ya-Shiou. 2016. 'Electronics and Global Value Chains,' in Weiss, J., and Tribe, M. (eds). Routledge *Handbook of Industry and Development*. Routledge.

Dedrick, J. & Kraemer, K. L. 2017. 'Intangible Assets and Value Capture in Global Value Chains: The Smartphone Industry,' Economic Research Working Paper No. 41, WIPO.

Dutta, M. 2009. 'Nokia SEZ: Public Price of Success,' *Economic and Political Weekly,* 44(40), 23-25.

Dutta, M. 2016. 'The Nokia SEZ Story: Economy of Disappearances,' *Economic & Political Weekly*, 51(51), 43–51.

Electronics & Hardware, Government of Gujarat. 2017. Manufacturing/ Assembly of Mobile Phones. 8th Global Summit, Vibrant Gujarat, 10-13 January 2017.

Ernst, D. 2014. Upgrading India's Electronics Manufacturing Industry: Regulatory Reform and Industrial Policy, East-West Centre: Honolulu, Hawaii.

Francis, S. 2016. 'Understanding the Impact of Trade Liberalisation on Industrial Development: A Case Study of the Indian Electronics Industry,' Working Paper 192, Institute for Studies in Industrial Development, New Delhi.

Francis, S. 2018. 'India's Electronics Manufacturing Sector: Getting the Diagnosis Right,' *Economic & Political Weekly*, 53(34), 112–17.

Galetovic, A., Haber, S., and Zaretzki L. 2018. 'An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results,' *Telecommuni - cations Policy*, 42, 263–276.

Giachetti, C. & Marchi, G. 2010. 'Evolution of Firms' Product Strategy over the Life Cycle of Technology-Based Industries: A Case Study of the Global Mobile Phone Industry, 1980–2009,' *Business History,* 52:7, 1123-1150.

Giachetti, C. & Marchi G. 2017. 'Successive Changes in Leadership in the Worldwide Mobile Phone Industry: The Role of Windows of Opportunity and Firms' Competitive Action,' *Research Policy,* 46, 352–364.

Hess, M. & Coe, N.M. 2006. 'Making Connections: Global Production Networks, Standards, and Embeddedness in the Mobile-Telecommunications Industry,' *Environment and Planning A: Economy and Space*. 38. 1205-27.

Hobday, M. 1995. 'East Asian Latecomer Firms: Learning the Technology of Electronics,' *World Development*, 23(7), 1171-93.

IAMAI. 2016. Indian Mobile Phone Market: Emerging Opportunities for Fulfilling India's Digital Economy Dream. Internet and Mobil Association of India. New Delhi

ICEA. 2020. Mobile Manufacturing in a Post COVID-19 World. Ernst & Young LLP and India Cellular & Electronics Association, ICEA, New Delhi.

ICEA. 2019. Impact Assessment of Open OS Ecosystem for Devices in India: A Study by KPMG in India and India Cellular & Electronics Association. ICEA. New Delhi.

ICEA. 2018. Making India the Global Manufacturing Powerhouse for Mobile Handsets and Components. ICEA. New Delhi.

Mani, S. 2020. 'Developing India's Mobile Phone Manufacturing Industry,' *Economic & Political Weekly,* 55 (19), 50-57.

Masina, P.P. & Cerimele, M. 2018. 'Patterns of Industrialisation and the State of Industrial Labour in Post-WTO-Accession Vietnam,' *European Journal of East Asian Studies,* 17(2), 289-323.

Misra, R. & Shankar, A. 2019. 'India Connected: Transforming India's Import Profile,' *Reserve Bank of India Bulletin,* Vol. LXXIII, No.4, 107-115.

Mrinalini, N., Nath, P., and Sandhya, G.D. 2013. 'Foreign Direct Investment in R&D in India,' *Current Science*, 105(6), 767-73.

Ohno, K. 2009. 'Avoiding the Middle-Income Trap: Renovating Industrial Policy Formulation in Vietnam,' *ASEAN Economic Bulletin*, 26 (1), 25-43.

Pathak, T., Chatterjee, C., and Shah, N. 2016. 'Maximizing Local Value Addition in Indian Mobile Phone Manufacturing: A Practical Phased Approach,' IIMB-WP No. 528, Bangalore.

Pham, H. S. T., Nguyen, A. N., and Johnston, A. 2020. 'Economic Policies and Technological Development of Vietnam's Electronics Industry,' *Journal of the Asia Pacific Economy,* doi: 10.1080/13547860.2020.1809055.

Rajakumar, D. J. 2014. 'Foreign Exchange Spending and Earning of Corporates in India,' *Economic & Political Weekly*, 49(45), 75–78.

Saripalle, M. 2015. 'Tamil Nadu's Electronics Industry: Lessons for 'Make in India'. *Economic & Political Weekly*, 50 (26 & 27), 99–103.

Sturgeon, T. & Zylberberg E. 2016. 'The Global Information and Communications Technology Industry: Where Vietnam Fits in Global Value Chains.' Policy Research Working Paper No. 7916, World Bank, Washington DC.

Tran, A.N., & Norlund, I. 2015. 'Globalization, Industrialization, and Labor Markets in Vietnam,' *Journal of the Asia Pacific Economy,* 20(1), 143-163.

Verma, S. 2015. 'Current Account Fallout of FDI in Post-reform India: Evidence from Manufacturing Sector,' *Economic & Political Weekly*, 50(39), 45–53.

Vind, I. 2008. 'Transnational Companies as a Source of Skill Upgrading: The Electronics Industry in Ho Chi Minh City,' *Geoforum*, 39, 1480-1493.

WDR. 2020. World Development Report 2020: Trading for Development in the Age of Global Value Chains. World Bank, Washington DC.

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