Developing India's Mobile Phone Manufacturing Industry

SUNIL MANI

In the absence of any major domestic mobile phone manufacturers, increased imports of mobile phones have contributed to a widening of India's trade deficit. An analysis of the policy instruments put in place to incentivise the domestic manufacturing of mobile phones reveals a spike in domestic manufacturing, leading to significant reductions in the imports of mobile phones. However, domestically manufactured phones are dependent on imports of parts. This high import dependence itself is an outcome of the weak innovation capability in the domestic industry.

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Sunil Mani (*mani@cds.edu*) teaches at the Centre for Development Studies, Thiruvananthapuram.

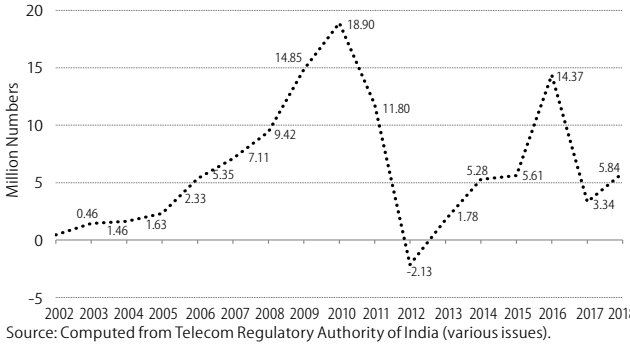
Over the last several years, the country has been concerned with increasing the size of its manufacturing sector to at least a quarter of its gross domestic product (GDP). This was sought to be accomplished first, through a manufacturing strategy and, specifically, since 2014 through the "Make in India" programme. Nagaraj (2019) has shown that the latter programme, while improving India's ranking in the World Bank's Ease of Doing Business index, has failed to improve the performance of the manufacturing sector or the technological capability as a whole. The widening trade deficit in manufactured good and in technology payments are enough empirical proof to show that the programme is yet to deliver. Further, manufacturing employment has also been a casualty. Our dependence on both multinational corporations (MNCs) and on imported components and parts have increased in the recent past. In fact, since the liberalisation of India's industrial sector, import dependence of the sector has been on the rise (Mani 1991; Chaudhuri 2013). A manufacturing industry where this is clearly evident is in the domestic manufacture of mobile phones. Misra and Shankar (2019) have done an empirical analysis to show that India's consumption-driven imports of fully assembled mobile phones have been transformed to production-induced imports of parts for manufacturing mobile phones domestically. This transformation is then hailed as a desirable outcome of the recent policy attempts to increase the size and content of India's domestic manufacturing industry, especially in electronics products and telecommunications equipment in particular.

Telecom Market in India

India has become one of the largest markets for telecommunications equipment in the world. The total number of telecom subscribers in the country is 1.16 billion (as on March 31 2019) (TRAI 2019). During 2017–18, on an average, nearly 6 million subscribers were added per month (Figure 1).

This implies that there is a growing demand for telecommunications equipment of various types, such as mobile handsets, transmission towers, Internet gear, etc, in the country. Although India has sought to build manufacturing and innovation capability in telecom equipment domestically, studies have shown that these capabilities are largely in the arena of fixed-line telephones and not in mobile communication equipment (Mani 2012). For the latter, the country has been relying on imports, primarily from China, which have been increasing significantly. Imports of telecom equipment have been rising

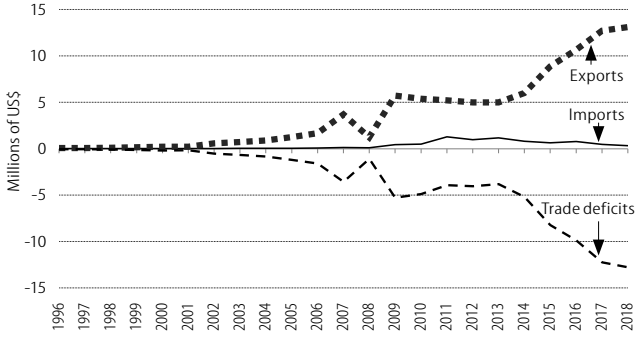
Figure 1: Average Number of Subscribers per Month for 2002–2018



Source: Computed from Telecom Regulatory Authority of India (various issues).

since early 2000 and resulting in an ever-increasing trade deficit (Figure 2). In fact, the trade deficit is almost equivalent to the imports, implying that the country hardly exports any telecom equipment. The growing imports of telecom equipment, especially at a time when demand for it has been growing, reveal two important implications:

Figure 2: Growing Trade Deficit in Telecommunications Equipment for 1996–2018



Source: Computed from United Nations Comtrade database.

First, telecom equipment is one of those industries that has been targeted for import substitution right through the period since independence. This policy of import substitution manifested itself in reserving telecom equipment to the exclusive preserve of public sector enterprises. In fact, the state-owned undertaking, Indian Telephone Industries (ITI), was one of the first public sector enterprises established by independent India. This policy received a fillip when the government set up a dedicated stand-alone public laboratory called the Centre for Development of Telematics (C-DOT) to develop a family of digital switching equipment, which was consistent with the usage pattern. This policy of extreme government intervention resulted in some technological capability building in telecom equipment of the fixed-line variety. However, no capability was developed or evolved in mobile communication technology, which took the telecom market like a storm from the late 1990s onwards. The Indian case is in sharp contrast to other Asian countries, such as Korea and now China, both of which have effectively transformed their innovation capability in fixed-line telecom technology to mobile communication technology. Subsequently, both the countries have become important manufacturers of mobile phones in the world.

Second, as could be seen from Figure 1, this was also the time when the market for mobile communications equipment increased quite significantly. Consequent to the lack of technological capability, especially in the conceptualisation, design and manufacture of mobile communication equipment, was the excessive reliance on imports (from China) to meet this ever-growing domestic demand. In fact, the import of telecommunications equipment is an important item in the overall import of electronic equipment to India that has been responsible for the burgeoning trade deficit of the country. This has necessitated the government to put in place an important policy of hastening domestic manufacturing of electronics hardware, in general, and telecommunications equipment, in particular.

In order to capitalise on this growing market for telecommunications equipment, the government has been trying to establish a domestic hub for manufacturing of mobile phones and parts. The most direct policy towards this end was the National Telecom Policy of 2012, which stated that India should be made a global hub for telecom equipment manufacturing and a centre for converged communication services. Following this, a wide range of explicit and implicit policies were put in place to achieve this goal. The earlier policy on manufacturing strategy and the Make in India programme put in place since 2014 may have resulted in increased domestic manufacturing.

In this context, the purpose of the paper is to study the extent to which the country has become a hub for manufacturing telecom equipment. In the process, we also analyse the policies that were implemented to enable the country to become one.

Policies Promoting Domestic Manufacturing

In the more recent period, serious attempts at promoting a domestic telecommunications equipment manufacturing industry in the country could be traced to two broad sets of policies. First, is the general policy of liberalising foreign direct investments (FDI) in the telecommunications sector, which seem to have encouraged—among other favourable factors such as the growing domestic market for telecom equipment—a number of leading telecom equipment MNCs to set up manufacturing facilities in the country. Examples of this are Ericsson, Samsung, LG, and contract manufacturers like Foxconn, Flextronics and Elcoteq. Second, are two policy instruments specifically targeted at domestic manufacturing and simultaneously reducing the import content of what is being manufactured domestically. These two are contained in the National Telecom Policy, 2012 and the National Manufacturing Policy, 2012. The recently announced National Policy on Electronics, 2019 has further emphasised this aspect. We will briefly survey these policies.

Liberalisation of FDI with respect to telecommunications equipment: Although this policy was directed more towards the firms that distribute telecommunications services, the general policy of incentivising investments by MNCs in India was helpful for a number of telecom equipment MNCs to set up manufacturing facilities in India. MNCs turn their attention to India on account of two reasons: markets elsewhere are nearing saturation, and India has a significant growing market for telecommunications equipment in general and mobile handsets in particular.

The Preferential Market Access Policy of October 2012 for domestically manufactured telecom equipment: The policy in its raw form reads,

> Any Ministry or Department will procure minimum percentage of their telecom product requirement fulfilling minimum value addition prescribed against each item. For all the Ministries or Departments (except the Ministry of Defence) of Government and the agencies under their administrative control and for all Government funded telecom projects (e g, and projects funded by Universal Service Obligation Fund like National Optical Fibre Network etc), the list of telecom products indicating preferential market access and criteria to qualify as domestically manufactured product year-wise is has been made. The Preferential Market Access (PMA) and Value Addition (VA) indicated against each year are the minimum and efforts should be made by domestic manufacturers to achieve higher value addition" The formula for calculation of value addition for telecom products shall also be as notified by Department of Electronics and Information Technology from time to time. All the telecom products which do not meet the minimum value addition criterion for that year shall be treated as imported telecom products and dealt accordingly. Further, wherever the domestically manufactured telecom products are procured under this policy by a Government Ministry or Department or an agency thereof or for telecom products, such procurement shall be subject to matching of L1 price and on satisfying technical specifications of the tender. In case of the domestic manufacturer is not lowest bidder (L1), the specified part of the tender would be awarded to the lowest technically qualified domestic manufacturer, subject to matching with L1 price, if such bidder is available. The remaining part will be awarded to Ll bidder. (MCIT 2012)

It is, of course, not clear whether public procurement will work for mobile handsets as these are not usually purchased by government departments, but by private individuals and institutions. In any case, as Mani (2005a) has shown, the way public technology has been applied to the telecom arena in the past, this policy may not have significant effect in driving domestic manufacturing.

Phased Manufacturing Programme: This programme for the manufacture of mobile handsets and related sub-assemblies/components has been implemented with the objective of progressively increasing the domestic value addition for establishment of a robust cellular mobile handsets manufacturing ecosystem (MEIT 2017). Hitherto, local sourcing of components, which account for over 90% of the bill of materials, is very low (Table 1). This means that despite the existence of the Phased Manufacturing Programme (PMP), dependence on imported parts is still quite significant.

Increased customs duty on imported mobile phones: In the union budget speech of 2018–19, the customs duty on mobile phones has been raised again from 15% to 20% (Jaitely 2018: 32, para 60). The rationale for this hike is the increasing local manufacturing of mobile phones in India, as those devices do not come under this duty and can therefore be sold much more cheaply. The government had first announced a duty of 10% in July 2017. Subsequently, it was raised to 15% in December 2017.

National Digital Communications Policy, 2018: The policy has a number of provisions for incentivising domestic manufacturing by focusing on technology and innovation. This is to be achieved by encouraging the insertion of India into the global value chain for mobile phones. The specific policy provisions for achieving this objective are as follows.

First, maximising India's contribution to global value chains by focusing on domestic production, increasing exports, and reducing the import burden by: (i) rationalising taxes, levies and differential duties to incentivise local manufacturing of equipment, networks and devices to the extent of domestic value addition; (ii) introducing a phased manufacturing programme for identified product segments in digital communication technologies; (iii) attracting and incentivising global original equipment manufacturer (OEMs) and generic component players to set up manufacturing bases in India; (iv) ensuring the availability of essential background intellectual property rights (IPRs) in fair, reasonable and non-discriminatory (FRAND) terms required for promoting local manufacturing; (v) promoting design-led manufacturing in India by leveraging indigenous software/research and development (R&D) capabilities; (vi) incentivising fab and/or fab-less design and manufacturing of chips and system on a chip (SOC) for network and devices in emerging technologies; (vii) attracting global talent from Indian diaspora to create best-in-class enterprises; (viii) ensuring strict compliance with preferential market access requirements, which include preferring domestic products and services with domestically owned IPR in the procurement by government agencies, especially for the procurement of security-related products and incentivising private operators to buy domestic telecom products. However, this policy has merely repeated some elements of previous policies.

Recommendations by Telecom Regulatory Authority

According to TRAI (2018), "India should aim to achieve the objective of net-zero imports of telecommunication equipment by 2022." For this purpose, the Telecom Equipment Manufacturing Council (TEMC) should identify and recommend specific areas of priorities. The regulator has also suggested that the Department of Telecommunications (DOT) should monitor the progress of domestic telecom equipment manufacturing and a

Table 1: Progress of the PMP in Mobile Phone Manufacturing

	Component	Duty Structure under Phased Manufacturing Plan	Duty Implementation Status	Percentage Contribution to BoM (Bills of Material	Local Sourcing
2016–17	• Charges/adapter • Battery pack • Wired handset	15%	Implemented	6%	High
2017–18	• Mechanics and die-cut parts • Microphone, receiver • Key pad • USB cable	15%	Implemented	7%	Low for mechanics, rest is high
2018–19	• PCBA • Camera module • Connectors	10%	Implemented	62%	Low
2019–20	• Display assembly • Touch panel/cover glass assembly • Vibrator motor ringer	Likely to be deferred	Likely to be deferred	25%	Not started

Source: Pathak (2019); MEIT (nd).

dedicated unit should be set up for facilitating equipment design and development.

For promoting research, innovation, design, testing and certification of telecom equipment, the telecom research and development fund, with an initial corpus of ₹10 billion, should be created. Subsequently, the TRAI also recommended the creation of two funds, namely the Telecom Entrepreneurship Promotion Fund (TEPF) and Telecom Manufacturing Promotion Fund (TMPF). Further, it also recommended the establishment of a telecommunication equipment development board (TEDB) under the DoT for faster decision-making on funding and incentives. However, there is no evidence to show that any of the recommendations have actually been implemented.

Admittedly, the policies are of recent vintage and, given the lags in project implementation, it may take a number of years before a clear perceptible picture on increased domestic manufacturing of telecommunications equipment is visible. Nevertheless, based on the data for last seven years at least, we can form an assessment of the outcomes.

Policy Outcomes

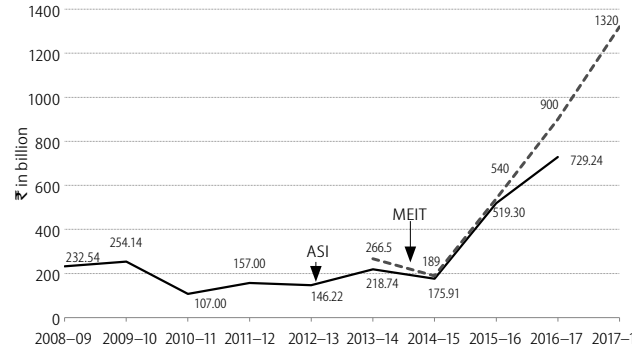
In order to verify whether there is increased domestic manufacturing of telecom equipment, we require data on domestic output of mobile phone handsets and the parts that are used for domestic assembling of these phones. Further, we also require data on imports of mobile handsets and parts. For production data, the most authentic source is the Annual Survey of Industries (ASI), but the data published is only at the 4-digit level (National Industrial Classification [NIC], 2008 Code: 2630) and it refers to the manufacture of communications equipment. For securing data on the manufacture of mobile phones, we require data at the 5-digit level (NIC 2008 Code: 26305), which is not readily available. Data on production of mobile phone is also available for the years 2013–14 through 2017–18 by the Ministry of Electronics and Information Technology (MEIT 2018), although it is not immediately clear as to the original source of this data. In fact, these data are referred to in the new electronics policy of 2019, which stated that,

> In 2017–18, the production of cellular mobile handsets reached approximately ₹1,32,000 crore, compared to ₹18,900 crore in 2014–15. Production of cellular mobile handsets in volume terms reached 225 million (22.5 crore) units in 2017–18, as compared to production of 60 million (6 crore) units in 2014–15. As many as 268 manufacturing units for cellular mobile handsets and their parts/components have been set up in the country during the last 3–4 years, resulting in estimated employment for about 6.7 lakh persons (direct and indirect).

Data on imports and exports of mobile phones are available from the export–import data bank of the Ministry of Commerce and Industry.[1,2]

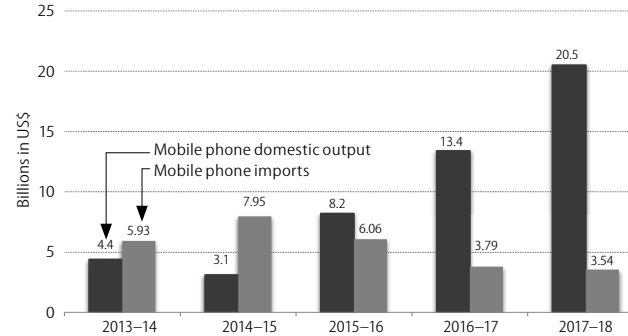
The first step in unravelling the evidence relating to domestic manufacturing of mobile phones is to compare the production data according to the two major data sources, namely the ASI and the MEIT (Figure 3). Both the data are almost exactly similar in both the direction of movement and level. In fact, domestic production has been growing on an average of 69% between 2013–14 and 2017–18. But the leading manufacturers

Figure 3: Comparison of ASI and MEIT Data on Production of Mobile Phones



Production in terms of physical units is provided in Annexure 1.
Source: Central Statistical Organisation and MEIT (2018: 78).

Figure 4: Trends in Domestic Production and Imports of Mobile Phones, 2013–14 through 2017–18



Source: Production data is from MEIT (2018) and import data is from Directorate General of Commercial Intelligence and Statistics data.

of mobile phones are all foreign companies with a few domestic players.

This growth in domestic production has lead to a significant reduction in the import of fully assembled mobile phones (Figure 4). According to the DoT,[3] there are at least 16 foreign telecom equipment manufacturers besides a few domestic ones as well.[4] In the smartphone category, which now accounts for over 50% of the sales of mobile phones, all the top positions are occupied by foreign companies, three of these being Chinese handset manufacturers. In feature phones, the Indian manufacturer, Jio, accounts for about 47% of the market share, while the remaining shares are accounted for by foreign manufacturers such as Samsung and Nokia (Annexure 2).

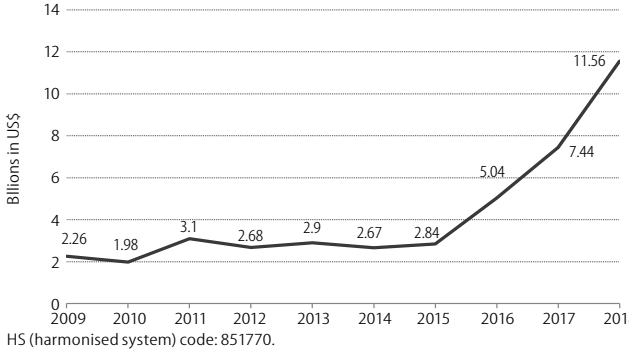
Geographically, mobile phone manufacturing in India is spread across three major clusters. These are Noida near the National Capital Region, Sri City and Sriperumbudur near Chennai (Figure 5, p 54). It appears that most of the phones are manufactured by contract manufacturers like Foxconn and Flext. Samsung is one of the few mobile phone manufacturers having its own manufacturing facility in the country. Incidentally, Samsung's manufacturing facility at Noida near Delhi is the world's largest factory for mobile phones with an installed capacity of about 120 million units per year.

Domestic production has been dependent on parts that were imported from abroad, and these imports have been growing (Figure 6, p 54). Given the fact that production is largely based on imported inputs, the ratio of gross value added (GVA) to gross value of output (GVO) has been declining

Figure 5: Distribution of Mobile Phone Manufacturing Units across India

Source: ICEA (2019).

Figure 6: Imports of Parts of Mobile Phones, 2008–09 through 2017–18



HS (harmonised system) code: 851770.
Source: Compiled from Export–Import Data Bank, Ministry of Commerce and Industry.

sharply, especially during the period when domestic output has been increasing (Figure 7).[5] India has now become the second largest mobile phone manufacturer in the world after China. The fast track task force, a body under the MEIT, has set a target to achieve around 500 million mobile phone production in India by 2019, with a value estimated to be around $46 billion, although this sounds ambitious considering the output during 2017–18 was $20.5 billion.[6]

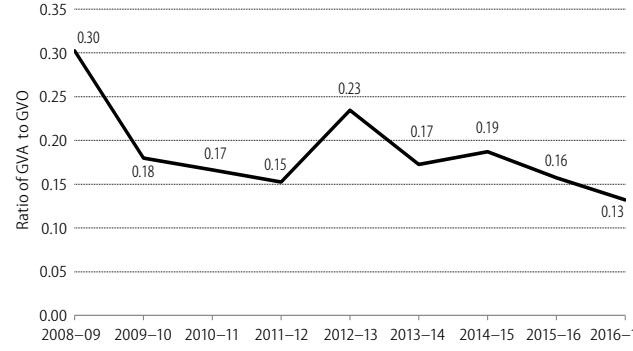
According to the consultancy firm Counterpoint Research, the PMP is running behind schedule as the implementation of customs duties under Phase III, which targets display assembly, touch panel/cover glass assembly and vibrator/motor ringer, have been delayed (Table 1).

High Import Dependence

Countries wanting to have a manufacturing position, especially in high-technology products, need to have the requisite innovation capability in those items that they intend to manufacture domestically. This is because possession of such innovation capability enables the firms in the specific high-technology industry to keep pace with the technological changes in their respective domain. Mobile phone technology has been moving very rapidly. Phones are now used not just for communication but as computing devices to serve educational, health, governance and entertainment purposes. Mobile wireless technology, has now progressed to the fourth generation (4G) technology, and 5G is about to be deployed in the country.

The few Indian manufacturers of mobile phones have seen their market shares eroding and the positions vacated by them being taken over by foreign manufacturers, primarily those

Figure 7: Trends in Ratio of Gross Value Added to Gross Value of Output of Communication Equipment



Source: Computed from Annual Survey of Industries.

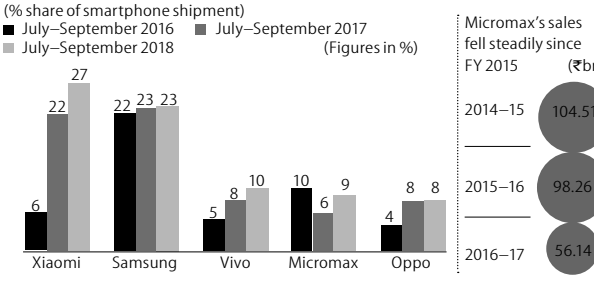
from China. In any case, India did not have any serious manufacturers of mobile phones, except ITI that has not been doing well for quite some time. In fact, ITI, despite its existence for over six decades, has not developed the technological capability to design and manufacture mobile phones, although it does manufacture mobile equipment, such as base transceiver stations (BTS), in one of its manufacturing units. Its technological capability is only in fixed-line telecom equipment, the demand of which has gone down significantly. Even for fixed-line telecom technology, ITI has depended on licencing disembodied technology from abroad and has a poor record of developing domestic capability (Mani 1991). The few domestic manufactures (such as Micromax, Karbonn, Lava, Spice, Intex, etc) that had sprung up, very often assembling mobile phones on the basis of imported parts, have virtually collapsed now (see Box 1).

One of the main reasons for Micromax to lose its market share was its failure to predict and be in command of 4G technologies as over three quarters of its phones were 3G handsets. The firm had virtually no innovation capability in mobile technology and so could not catch up with Chinese manufacturers.

Box 1: Decline of Domestic Handset Manufacturers

[In 2014], Micromax's office in Gurugram was at par with the likes of Google. The multi-storeyed building had open spaces, rooms aplenty, and even balconies and terraces where parties could be thrown. [In November 2018], the company operates out of a single floor in a common office complex in Gurugram. The once-swanky office now has only a few cabins, far fewer employees, and is quite cramped. Incidentally, in 2014, Counterpoint Research put Micromax at the helm of the booming Indian smartphone market. It even surpassed Samsung and shipped more phones than any other brand in India. In fact, home-grown smartphone brands such as Micromax, Lava, and Intex once cornered nearly 54% of the market share. The same brands have a less than 10% market share in 2018.

Gaining Ground



Source: Banerjee (2018), Dutta (2018).

Despite such a long history of manufacturing and R&D in telecommunication equipment, India has failed to develop innovation capability in mobile communication. This failure could be traced back to the establishment and subsequent destabilising of an interesting experiment in technological capability building in the form of a public laboratory called C-DOT.

C-DOT was established in 1985 to develop a family of digital switching equipment for fixed telephones that were consistent with the usage pattern prevailing in the country. The public laboratory was thought of as a knowledge-generating lab for telecommunications equipment, which will then transfer the generated technology to lone public sector ITI, and a host of private sector firms. The laboratory was very successful in developing digital switching equipment for smaller rural exchanges but suffered time overruns for developing switching equipment of a larger capacity. Despite the fact that its presence made the market for switching equipment contestable, eventually leading to a significant fall in the average price of switching equipment, the laboratory was virtually closed down (Mani 2005b).

A consequence of this destabilisation of the laboratory was that it failed to receive strategic direction in deciding on the technologies that it would concentrate on. The laboratory continued to focus on fixed-line telecom technologies, while the technology frontier itself had moved on to mobile communication technologies. This behaviour of C-DOT is in sharp contrast with another public laboratory, the Electronics and Telecommunications Research Institute (ETRI) in Korea, which had successfully moved to mobile communication technologies in close collaboration with leading telecom equipment manufacturers in the country (Mani 2007). What is most impressive is the fact that it did so by taking a huge risk in committing itself to a lesser-diffused mobile communication standard—CDMA (code division multiple access). So, when mobile phones started diffusing fast not just in Korea but also in the world over, Korean manufacturers had a significant lead. In fact, one of the Korean manufacturers has become the lead player in the mobile phone technology arena.

India, on the contrary, did not have a single manufacturer worth the name with any technological capability in mobile communication technologies. So, when mobile phone subscriptions grew exponentially, the country could not boast having any credible manufacturers of mobile phones. The few domestic manufacturers that have sprung up have been relying on imported parts and, as such, are mere "assemblers" of imported parts. This explains the high import dependence of the industry that is expected to continue in the foreseeable future, as the intellectual property right in the form of patents in several mobile communication technologies is held by MNCs that have successfully been able to protect their patents in India. In fact, an examination of the applications for patents in mobile communications technologies before the Indian patent office shows that almost all the applicants are from abroad. (Annexure 3). Of the approximately 23,500 total patents identified by Contreras and Lakshané (2017), a total of only 18 patent applications, but no issued patents, were held by three Indian firms (Spice Digital, HCL, and Videocon). Further, majority of the patent holders in the latest mobile technologies such as 4G and 5G are also either Chinese or Western telecom equipment manufacturers forcing Indian manufacturers to depend on Chinese and Western companies (Table 2).

Table 2: Major Patent Holders in 4G and 5G Mobile Technology (% shares)

Patent holders	4G	5G
Huawei Technologies (China)	12.54	15.05
Nokia (including Alcatel Lucent) (Finland)	9.47	13.82
Samsung (South Korea)	11.54	12.74
LG Electronics (South Korea)	8.38	12.34
ZTE Corp (China)	4.77	11.70
QUALCOMM (US)	8.65	8.19
Ericsson (Sweden)	6.72	7.93
Intel Corp (US)	2.30	5.34
China Academy of Telecommunications Technology (China)	4.48	5.28
Sharp Corp (Japan)	3.69	4.53
Guangdong Oppo Mobile Telecommunications Corp (China)	0.33	2.00
Fujitsu Limited (Japan)	1.81	0.19
Inter Digital Technology Corp (US)	2.95	0.17
Sony Corporation (Japan)	1.33	0.14
Media Tek (Taiwan)	0.43	0.13
Apple (US)	1.34	0.12

Source: Tanaka (2019).

This lack of internal R&D in mobile communication technologies has forced Indian manufacturers into patent litigation with Western telecom equipment manufacturers, and the existence of numerous patents by Western MNCs in India have acted as a strong barrier for the entry of Indian manufacturers as well. There have been patent infringement cases against three of the leading domestic mobile phone manufacturers by one of the foremost telecom manufacturers in the world, Ericsson of Sweden. The case has finally reached the Competition Commission of India (CCI) as the patent litigation was curtailing the degree of competition in the market for mobile phones.[7] The Indian mobile phone manufacturer Micromax alleged that Ericsson was demanding unfair, discriminatory and exorbitant royalty for its patents regarding GSM (Global System for Mobile communication) technology. The royalty demanded by Ericsson was excessive when compared to royalties charged by other patentees for patents that were similar or comparable to the patents held by Ericsson. The CCI issued a preliminary order finding evidence that Ericsson had abused the dominant position created by its standard essential patents and ordered a full investigation by the director general. Similar competition claims against Ericsson were brought by two other domestic manufacturers, Intex and iBall. The new communications policy of 2018 has a provision to ensure that royalties charged for standard essential patents be on FRAND terms.

Conclusions

There is evidence to show that domestic production of mobile phones has registered some significant increases since 2015–16. However, these are largely by MNCs based on imported parts. As such, no domestic production or innovation capability has been created or is in the offing in the foreseeable future. This dependent development has led to India's technology trade deficit increasing on account of increased royalty and licence

fee payments, besides dividends and profits being repatriated abroad. The findings of this paper reveal that while we have started making mobile phones in India to reverse the growing trade deficit in telecommunications equipment, this is leading to increased imports of parts and a worsening GVA to GVO ratio. So, domestic manufacturing does not seem to be an antidote to reducing the growing trade deficit in the merchandise account of India's balance of payments. The telecommunications revolution is leading to a dependent form of development. A stricter monitoring of the PMP may go some way toward reducing this otherwise undesirable trend.

India's dependence on foreign technology and imported parts for establishing a mobile phone manufacturing industry is the result of the policy failure to strategically direct its dedicated public R&D programme towards developing capability in mobile phones technology. Here, the lesson to be learned is from Korea and China, both of whom assiduously built up much internal innovation capability in mobile phone technology, and when demand for mobile phones grew in their respective domestic markets as well as foreign markets, both countries had telecommunications companies that were able to service not only their domestic markets but also the export markets. In fact, both the countries have telecommunications firms that have become the leading players in the world in mobile phone technology.

Given the state of affairs, what could possibly be the way out? Instruments such as the the PMP may reduce the extent of imports of parts and components, thereby improving the domestic value added to value of output ratio. However, given the lack of innovation capability, the dependent form of development that we are currently forced to follow is likely to continue. The only way that this can be reversed is for the country to make a wholehearted attempt at reviving the public laboratory, C-DOT to focus on recent trends and innovations in mobile communication technology. In fact, a consortium approach should be adopted in order to link the laboratory with domestic manufacturing firms so that the fruits of R&D can immediately be transferred. Without such a strong fillip to domestic R&D efforts, innovation capability can neither be maintained nor improved upon.

NOTES

1 See: https://commerce-app.gov.in/eidb/default.asp.

2 The HS Code 851712 refers to telephone for cellular networks.

3 Please see list of 16 telecom equipment manufacturers listed on the DOT website: http://dot.gov.in/telecom-equipment-manufacturing.

4 In a statement in the Lok Sabha, the government has claimed that there are 127 units manufacturing mobile handsets in the country. See Annexure 1 for details.

5 The unit-level ASI data reports data for 11 mobile phone manufacturing units (NIC 2008 Code: 26305). Based on this dat aset, 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.

6 This claim is made by the Indian Cellular Association (*Economic Times* 2018).

7 Details of this specific case can be found in CCI (2013) and Contreras and Lakshané (2017).

REFERENCES

Banerjee, Prasid (2018): "How Chinese Mobile Phones Took over the Indian Market," *Livemint,* 2 November, viewed on 14 June 2019, https://www.livemint.com/Technology/KsUB8dksllxzBqcUCFfySJ/How-Chinese-mobile-phones-took-over-the-Indian-market.html.

Contreras, Jorge L and Rohini Lakshané (2017): "Patents and Mobile Devices in India: An Empirical Survey," *Vanderbilt Journal of Transnational Law*, Vol 50, No 1, pp1–44.

CCI (2013): *Micromax Informatics Limited vs Telefonaktiebolaget LM Ericsson (Publ),* Order No 50 of 2013, Competition Commission of India.

Chaudhuri, Sudip (2013): "Manufacturing Trade Deficit and Industrial Policy in India," *Economic & Political Weekly*, Vol 48, No 8, pp 41–50.

Dutta, Arnab (2018): "Micromax Returns to Top 5 In Smartphone Sales," *Business Standard*, 23 October 23, viewed on 9 July 2019, https://www.business-standard.com/article/technology/after-almost-drowning-micromax-returns-to-top-5-in-smartphone-sales-118102301069_1.html.

Economic Times (2018): "India is Now World's Second Largest Mobile Phone Producer: ICA," 1 April, viewed on 21 June 2019, https://economictimes.indiatimes.com/tech/hardware/india-is-now-worlds-second-largest-mobile-phone-producer-ica/articleshow/63566172.cms?from=mdr.

ICEA (2019): "Impact Assessment of Open OS Ecosystem for Devices in India," Indian Celleluar and Electronics Association, viewed on 21 June 2019, https://icea.org.in/wp-content/uploads/2019/05/Impact-Assessment-of-Open-OS-Ecosystem-for-Devices-in-India.pdf.

Jaitely, Arun (2018): "Union Budget 2018–2019," Speech, New Delhi, 1 February, viewed on 8 June 2019, https://www.indiabudget.gov.in/budget2018-2019/ub2018-19/bs/bs.pdf.

Mani, Sunil (1991): "External Liberalisation and Import-Dependence: A Note," *Economic & Political Weekly*, Vol 26, Nos 27–28, pp 1693–96.

— (2005a): "The Dragon vs the Elephant: Comparative Analysis of Innovation Capability in the Telecom Industry of China and India," *Economic & Political Weekly*, Vol 40, No 39, pp 4271–83.

— (2005b): "Innovation Capability in India's Telecommunications Equipment Industry," *ICT's and Indian Economic Development*, A Saith and M Vijayabaskar (eds), New Delhi: Sage Publications, pp 265–322.

— (2007): "Keeping Pace with Globalisation: Innovation Capability in Korea's Telecommunications Industry," *Innovation and Technology in Korea*, Jörg Mahlich and Werner Pascha (eds), New York: Physica–Verlag, pp 254–86.

— (2012): "The Mobile Communications Services Industry in India: Has it Led to India Becoming a Manufacturing Hub for Telecommunication Equipment?" *Pacific Affairs,* Vol 85, No 3, pp 511–30.

— (2018): "What Is Happening to India's R&D Funding?" *Economic & Political Weekly,* Vol 53, No 14, pp 12–14.

MCIT (2012): Notification on Policy for Preference to Domestically Manufactured Telecom Products in Procurement due to Security Considerations and in Government Procurement: Notifying Telecom Products for Government Procurement in Furtherance of the Policy," Department of Telecommunications, Ministry of Communications and Information Technology, Government of India, viewed on 31 May 2019, http://dot.gov.in/sites/default/files/policy_for_preference_to_domestically_managed_telecom_products_in_government_procurement.PDF.

MEIT (2017): Notification on Phased Manufacturing Programme (PMP) to Promote Indigenous Manufacturing of Cellular Mobile Handsets, its Sub Assemblies and Parts/Sub Parts/Inputs Of Sub Assemblies Thereof," Ministry of Electronics and Information Technology, Government of India, viewed on 14 June 2019, https://www.meity.gov.in/writereaddata/files/Notification_PMP_Cellular%20Mobile%20Handsets_28.04.2017.pdf.

— (2018): "Annual Report 2017–18," Ministry of Electronics and Information Technology, Delhi: Government of India, https://meity.gov.in/writereaddata/files/Annual_Report_2017%E2%80%9318.pdf.

— (nd): "Implementation Status of PMP for Cellular Mobile Handsets and Parts thereof," Ministry of Electronics and Information Technology, Government of India, viewed on 14 June 2019, https://meity.gov.in/writereaddata/files/Implementation_PMP_Cellular_Mobile.pdf."

Misra, Rekha and Anand Shankar (2019): "India Connected: Transforming India's Import Profile," *Reserve Bank of India Bulletin,* Vol 73, No 4, pp 107–115.

Nagaraj, R (2019): "Make in India: Why Didn't the Lion Roar?" *India Forum*, May 16, viewed on 8 June 2019, https://www.theindiaforum.in/article/make-india-why-didnt-lion-roar.

Pathak, (2019): "India Imported $13 Billion Worth of Mobile Phone Components in 2018," 22 February, https://www.counterpointresearch.com/india-imported-13-billion-worth-mobile-phone-components-2018/.

PIB (2019): "Manufacturing of Mobile Handsets," Press Information Bureau, 11 February, viewed on 14 June 2019, http://pib.nic.in/newsite/PrintRelease.aspx?relid=188323.

Tanaka, Akio (2019): "China in Pole Position For 5G Era with A Third of Key Patents," *Nikkei Asian Review,* 3 May, https://Asia.Nikkei.Com/Spotlight/5G-Networks/China-In-Pole-Position-For-5G-Era-With-A-Third-Of-Key-Patents.

TRAI (2018): "Information Note to the Press: Press Release No 87/ 2018," Telecom Regulatory Authority of India, viewed on 14 June 2019, https://main.trai.gov.in/sites/default/files/PR_No.87of2018.pdf.

— (2019): "Annual Report 2018–2019," Telecom Regulatory Authority of India, New Delhi, https://www.trai.gov.in/sites/default/files/Annual_Report_15012020_0.pdf.

Annexure 1: Manufacturing of Mobile Handsets in India

According to the government, 127 units are manufacturing mobile handsets in the country, and all of them are operating from the domestic tariff area (DTA). As per information received from the Department of Commerce, Flextronics Technologies (India) Pvt Ltd and Pertech Exports Pvt Ltd have been granted letter of approval for manufacture of mobile handsets in special economic zones (SEZs).

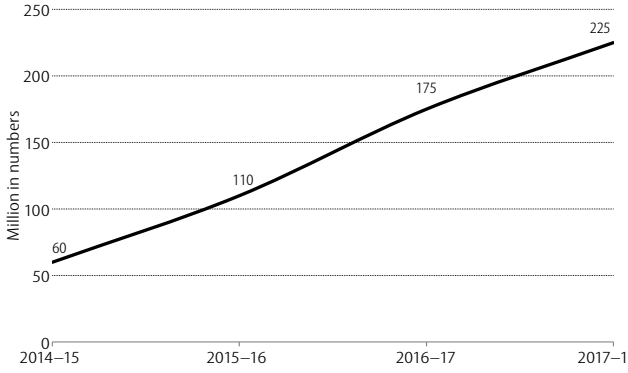
As per information received from the MEIT, the mobile handset manufacturing operations in DTA are governed by the applicable duty structure. The benefits available to manufacturers of mobile handsets include rationalised tariff structure and a PMP and their sub-assemblies, parts, availing capital expenditure benefits under the modified special incentive package scheme (M-SIPS), 100% FDI permitted for manufacture of mobile handsets and their sub-assemblies, parts, export incentive of 4% of FoB value of export under the merchandise export from india scheme (MEIS), and specified capital goods for manufacture of mobile handsets are permitted for import at "nil" basic customs duty (BCD).

Benefits available to the units under the SEZ Act, 2005 and SEZ Rules, 2006 include duty free import and domestic procurement of goods for development, operation and maintenance of SEZ units, 100% income tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for the first five years, 50% for next five years thereafter and 50% of the ploughed back export profit for next five years, exemption from the goods and service tax, and supplies to SEZs are zero rated under Integrated Goods and Services Tax Act, 2017 and exemption from other levies as imposed by the respective state governments.

The MEIT has received representations from industry, industry associations, including Samsung India Electronics Pvt Ltd in respect of the PMP for 2019–20. The MEIT has informed that its proposal to defer PMP for cellular mobile handsets, its sub-assemblies and parts, sub-parts, inputs of the sub-assemblies thereof has been accepted by the department of revenue, Ministry of Finance.

Source: PIB (2019).

Figure A1: Mobile Phone Production in Numbers

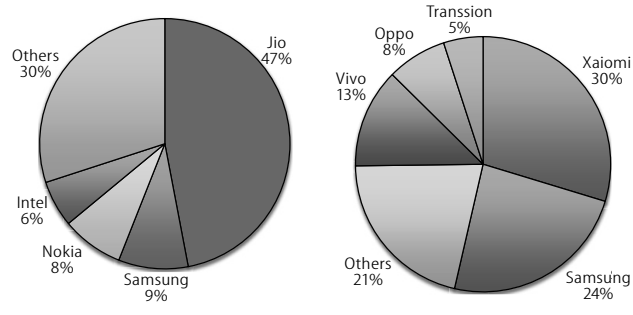


Source: ibef.org based on MEIT data.

Annexure 2: Market Shares of Feature and Smartphone Manufacturers

(a) Market Share of Feature Phones, Quarter 2 of 2018

(b) Market Share of Smartphone Manufacturers, Quarter 2 of 2018



Source: ICEA (2018: 19).

Annexure 3: Cumulative Number of Patents Issued to Foreign and Indian Manufacturers in Mobile Technology, 2000–15

Assignee	Nationality	Patents applied
Qualcomm	United States	5,954
Ericsson	Sweden	1,843
Samsung	South Korea	1,827
Nokia	Finland	1,744
Microsoft	United States	1,557
Philips	Netherlands	1,460
Sony	Japan	1,235
Alcatel Lucent	France	971
Motorola	United States	842
LG	South Korea	791
RIM/Blackberry	Canada	782
Panasonic	Japan	537
NTT Docomo	Japan	523
Huawei	Japan	470
Siemens	Germany	366
Intel	United States	331
ZTE	China	303
InterDigital	United States	288
Apple	United States	256
Hewlett-Packard	United States	225
NEC	Japan	209
IBM	United States	203
Cisco	United States	165
Google	United States	132
Fujitsu	Japan	89
Canon	Japan	87
Hitachi	Japan	84
Yahoo	United States	70
Oracle	United States	59
Toshiba	Japan	36
AT&T	United States	23
SAP	Germany	22
ETRI	South Korea	21
Broadcom	United States	17
Nortel	Canada	17
Texas Instruments	United States	12
HCL	India	11
Spice Digital	India	6
Videocon	India	1

Source: Contreras and Lakshané (2019).