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THE MOBILE COMMUNICATIONS SERVICES INDUSTRY IN INDIA: HAS IT LED TO INDIA BECOMING A MANUFACTURING HUB FOR TELECOMMUNICATION EQUIPMENTS?

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This is actually a continuation of the arguments set out and the evidence presented in Mani (2008) wherein the implications of the growth in Indian telecommunications services for its domestic telecom equipment industry up to 2007 was explored. An earlier version of this paper was presented at the international workshop, "Celling South Asia: The Mobile Phone's Impact on a Region" at Institute of South Asian Studies, National University of Singapore, Singapore during February 17-18 2011. Thanks are due to the comments received at this workshop. Further I am extremely grateful to R Nagaraj for reading through successive drafts very carefully and alerting me to some errors in the level of Gross Value Added in Communication Equipment as reported in CSO (2010). This alert has rescued the paper from drawing some erroneous conclusions. As usual, I thank,V S Sreekanth for his excellent research assistance. The usual disclaimer holds good.

ABSTRACT

The growth performance of the Indian mobile communications services industry is now reasonably well recorded. It is one of the few industries in India which has travelled significantly from being a monopolistic and somnolent industry from the innovation point of view to an extremely competitive and technologically speaking dynamic industry. This is despite the fact that it's very recent history has been punctuated by a few financial scams of sorts essentially due to the discretionary powers still wielded by the government in allocating the much needed spectrum and so on. Also notwithstanding the very recent distinction that is made between active users and the total number of subscribers (the former is only 70 per cent of the latter); the industry has witnessed a phenomenal increase in the length and indeed breadth of its coverage. There is also quantitative evidence to show that the extent of urban-rural divide too is on the decline. India now has one of the most competitive telecom services in the world and this has positive implications for its outsourcing industry where significant decline in communications costs is tremendously helpful for making this industry too remaining competitive when other factor prices have been showing an increasing trend. While all these augur well, questions had been raised about the ever rising trade balance in telecom equipments as the phenomenal growth of new subscribers that are added per month (in 2010 it averaged 18 million new subscribers per month) was met with equal amount of equipment imports. The increasing share of equipment imports was due to the weak manufacturing base that India possessed; ironic though as telecom equipment production was one of the first manufacturing industries that the Indian state had sought to develop through explicit state participation right after independence. Subsequently the state even attempted to craft a sectoral system of innovation in the telecom equipment industry. However none of these efforts resulted in India being successful in establishing a manufacturing hub. In the context the paper argues that the growth of market for telecom equipments precipitated by the growth of services has jump started an extremely dynamic manufacturing industry, especially over the last five years or so. The dynamism of the industry can be gauged from the fact that for the first time, India has a positive trade balance in mobile handsets facilitated by India emerging as a manufacturing and export base for cheaper handsets. Although the industry is dominated by MNCs, domestic firms have started making an entry into domestic manufacturing and indeed in innovations as well. However there is some evidence to show that most of the manufacturers are now more of assemblers of imported parts and components than manufacturers *per se*. This unique story of growth in services leading to the emergence of a manufacturing industry is the focus of attention and analysis in this paper.

JEL Classification: L96;O25;O38

Key words: telecommunications, fixed, mobile, telecom equipment, India

Introduction

India's telecommunications industry is considered to be one of the more successful stories of Indian liberalisation attempt. This is indicated by the fact that the country has one of the cheapest and state-of-the-art telecom services anywhere in the world. The density of telephones in the country has increased from just 0.60 telephones per 100 people in 1991 to about 66 per 100 in 2010. Although the access to telecom services have actually increased, it has not been across the board, but concentrated largely in urban centres leading to a growing "urban-rural divide" within the country with much of the rural areas being left out of this revolution. There is of course evidence to show that the urban-rural divide is now declining and the industry by its sheer size and rate of growth has become an important contributor to India's GDP growth. The market for telecom services is actually giving rise to a large domestic market for telecom equipments and the market for various types of electronic components and semi conductor devices that go into the production of these equipments. In fact, the Indian telecommunications industry is a unique example of a services industry leading to the growth and emergence of a manufacturing industry. Our argument is that technological changes and reasonably well implemented policies, relatively speaking, and especially regulatory policies have actually contributed to the success of the industry. Both these have reduced the height of entry barriers to the industry and made it extremely competitive. The result has been fast diffusion of new technologies in

the provision of telecom services and through this process significant reduction in prices has been achieved.

Although much has been written on the India telecommunications industry and its evolution, much of it is journalistic in nature. Most of the available studies (Desai, 2006), for instance, provides us with a systematic account of the earlier reforms undertaken in the sector. Singh (2008) however has attempted to model the diffusion of mobile phones in the country. One of the most cited studies on mobile phones in India is by Jensen (2007) which showed using microlevel survey data that the adoption of mobile phones by ûshermen in the southern Indian and wholesalers was associated with a dramatic reduction in price dispersion, the complete elimination of waste, and near-perfect adherence to the Law of One Price. Both consumer and producer welfare increased as a result.

In the context, the purpose of this paper will be to trace the performance of India's telecom services industry and then analyse its impact, potential as well actual on the equipment manufacturing industry. In that process, the paper will also identify those areas where policy measures still have a role to play to improve the state of affairs. The paper is structured into five sections. Section I maps out the growing importance of the telecommunications industry in India's economy. Section II will map out the emergence of a huge domestic market for telecom equipments consequent to the phenomenal growth of services segment of the industry. Section III analyses in detail the role of the government in creating a large domestic market for telecom equipments. Section IV examines in detail the hypothesis whether the country has indeed become a manufacturing hub for telecom equipments. The section pays particular attention to the channels through which the two components of the industry, namely equipments and services are linked to each other. Finally the last section sums up the main findings of the paper.

I. Place of telecommunications in India's economy

Telecommunications industry consists of two separate sectors: manufacturing of telecom equipments and distribution of telecom services. The industry currently (2007-08) accounted for about 3 per cent of India's GDP and contributed 0.75 per cent of the rate of growth of the country's GDP. It is one of the most important industries constituting India's ICT industry and has important linkage effects with rest of the economy. For instance, cheap communication services have been very helpful for especially the country's IT services industry. It is also very employment- intensive and according to CSO (2010), out of the total employment of 3.15 million persons employed in India's ICT industry in 2006-07, almost 2.52 million or so are employed in the telecom services sector or in other words about 80 per cent of those employed in the ICT sector are to found in the distribution of telecom services industry. Manufacturing of telecommunications equipments also has considerable linkages as these equipments are based on assembly of components. A still another way of measuring the growing importance of the industry is by tracking the amount of license fees and spectrum charges which the industry has brought to the exchequer. This has averaged about .26 per cent of India's GDP during the eight year period 2002-03 through 2009-10 and at this level it is almost twice the amount that the government spends on space research in India (government spends about 0.10 per cent of its GDP on space research). See Figure 1. Further, in the most recent budget (2011-12), the government has received Rs 106259.26 crores from the telecom sector mostly by way of proceeds from the auction of 3G and Broadband Wireless Acess (BWA) spectrum charges[1]. This amount has been very helpful to the finance minister towards

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1. The total amount received is Rs 120806 crores. This implies that the balance amount of Rs 14547 crores (Rs 1200806- Rs 106259.26 Crores) must have been the proceeds from spectrum charges and licence fees. See note 6.06, Receipt Budget 2011-12, Government of India, http://indiabudget.nic.in/ub2011-12/rec/ntr.pdf, (Accessed March 5, 2011).

substantially reducing the fiscal deficit. All these evidences point to the growing importance of this sector in India's economy.

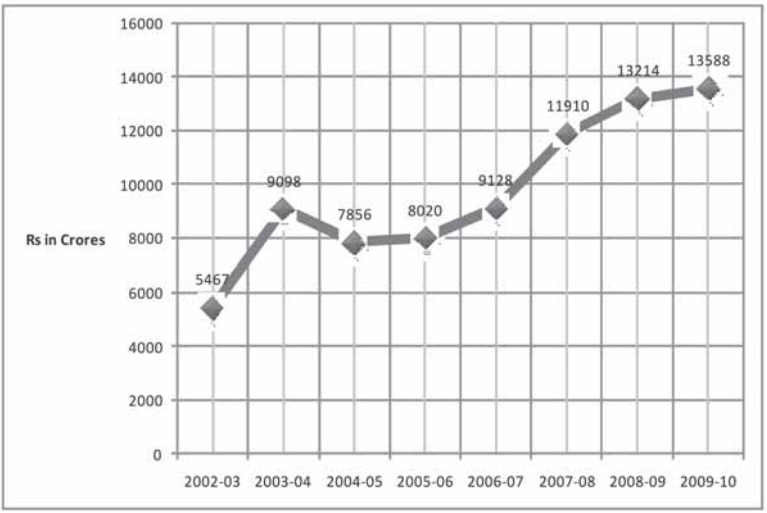

Figure 1: License fee and spectrum charges contributed by India's telecom industry to the exchequer

Source: Comptroller and Auditor General of India (2010)

II. Emergence of a sizeable domestic market for telecom equipments

In 1991, India had a total stock of just 5 million telephones. By October of 2010 this has now grown to 742 million phones. See Table 1. Consequently the tele density has increased from less than 1 per 100 in 1991 to over 60 in 2010. By all accounts the telecommunications industry has been an astounding success. A striking feature of this growth performance is the ratio of mobile to fixed phones which has increased from insignificant amounts to about 20. This domination of wireless technology has important implications for the diffusion of Internet in the country. This issue will be analysed in depth in one of the subsequent sections.

Table 1: Growth of India's telecom services, 1991-2010

(Millions of subscribers; Growth rates are in percentages; Tele density is number telephones per 100 subscribers)

	Fixed	G. Rate	Mobile	G .Rate	Total	G. Rate	Tele density	Ratio of mobile to fixed
1991	5.07				5.07		0.6	
1992	5.81	14.60			5.81	14.60	0.67	
1993	6.8	17.04			6.8	17.04	0.77	
1994	8.03	18.09			8.03	18.09	0.89	
1995	9.8	22.04			9.8	22.04	1.07	
1996	11.98	22.24			11.98	22.24	1.26	
1997	14.54	21.37	0.34		14.88	24.21	1.56	0.02
1998	17.8	22.42	0.88	158.82	18.68	25.54	1.94	0.05
1999	21.59	21.29	1.2	36.36	22.79	22.00	2.33	0.06
2000	26.51	22.79	1.88	56.67	28.39	24.57	2.86	0.07
2001	32.44	22.37	3.58	90.43	36.02	26.88	3.58	0.11
2002	41.48	27.87	13	263.13	54.48	51.25	4.3	0.31
2003	42.58	2.65	33.58	158.31	76.16	39.79	5.1	0.79
2004	45	5.68	50	48.90	95	24.74	7.04	1.11
2005	49	8.89	76	52.00	125	31.58	10.66	1.55
2006	40.43	-17.49	149.5	96.71	189.93	51.94	17.16	3.70
2007	39.25	-2.92	233.63	56.27	272.88	43.67	25	5.95
2008	37.9	-3.44	346.89	48.48	384.79	41.01	33.23	9.15
2009	37.06	-2.22	525.15	51.39	562.21	46.11	46.32	14.17
2010	35.09	-5.32	752.19	43.23	787.28	40.03	66.16	21.44

Source: Telecom Regulatory Authority of India (various issues)

As a corollary of the above, it is seen that there has been a steady increase in the average number of mobile subscribers per month since 2002 (Figure 2). In 2002, on an average 0.46 million new subscribers

were added to the existing stock at the end of every month. This has since increased to approximately 19 million per month in 2010. The very sharp reduction in the number of subscribers in March 2007 was due to a governmental security regulation[2]. These large increases in the number of mobile handsets have strong positive implications for the telecom equipment industry and specifically the mobile handsets industry, which means that close to 19 million handsets are being sold every month. Consequently a huge domestic market for telecom equipments has suddenly emerged in the country spawning the creation of a significant manufacturing base. The South Indian city of Chennai has become a thriving cluster for mobile handsets manufacturing and this has important implications for the downstream industries such as the semiconductor industry.

Recently scepticism has been expressed as to whether all the subscribers reported by a specific service provider are active subscribers. This is because of two reasons. Firstly, a certain number of subscribers have multiple Subscriber Identity Module (SIM) cards and this has the possibility of double counting the same subscriber. Second, even if a subscriber has a new SIM card, she may chose not to be an active subscriber. Since September of 2010, the Telecom Regulatory Authority has been conducting an exercise to find out the active number of subscribers. For this reliance is made on a database called Visitor Location Register (VLR) [3]. Hitherto TRAI has estimated the number of active

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2 Owing to security concerns, the government insisted that the service providers verify the *bonafides* of new subscribers. See Telecom Regulatory Authority of India (2007 a).

3 VLR, the *visitor location register* is a database maintained by a cellular service provider used to track users who are roaming in that mobile service provider's area.

subscribers for two time points, namely as on September 30, 2010 and as on December 30, 2010. Based on this the number of active subscribers are only 529 million out of a total subscriber base of 752 million, thus working out to about 70 per cent of the total. See Table 2. Surprisingly the private service providers have a higher proportion of active subscribers while the two state-owned service providers have a very low proportion of active subscribers. But the important point is that even though the number of active subscribers is less than the total number of subscribers, the market for telecom services in India is larger than the markets in the United States of America and the combined European Union.

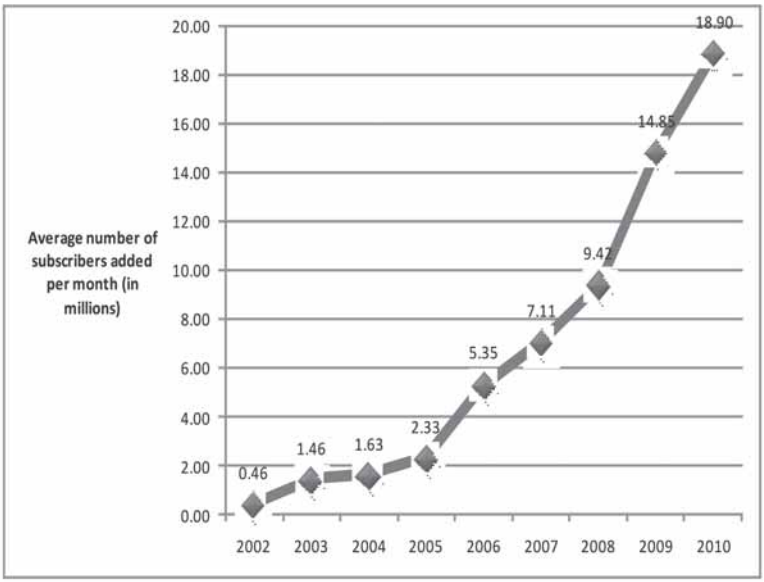

Figure 2: Average number of subscribers added per month: 2002-2010

Source: Telecom Regulatory Authority of India (various issues)

Table 2: Service provider - wide distribution of total and active numbers of telecom subscribers (in millions as on December 31, 2010)

Service Providers	Subscribers		
	Total	Active	Proportion of Active Subscribers
Bharti	152.50	139.98	91.79
Idea	81.78	73.63	90.04
Vodafone	124.26	94.30	75.90
RCL-CDMA	54.10	36.99	68.37
RCL-GSM	48.47	32.21	66.46
RTL	23.08	14.93	64.69
Aircel	50.17	30.15	60.10
BSNL-GSM	81.23	46.25	56.94
Tata-GSM	42.34	21.07	49.76
Sistema	8.43	4.15	49.19
Tata-CDMA	41.89	19.48	46.50
Stel	2.32	1.06	45.84
Uninor	18.51	8.32	44.95
Loop	3.04	1.33	43.81
HFCL-GSM	1.34	0.53	39.75
Videocon	7.32	2.72	37.22
HFCL - CDMA	0.27	0.10	37.08
Etisalat	0.26	0.10	36.04
MTNL-GSM	5.11	1.82	35.57
MTNL - CDMA	0.29	0.08	26.68
BSNL - CDMA	5.47	NA	NA
Total	**752.19**	**529.22**	**70.36**

Source: Telecom Regulatory Authority of India (2011)

III. Role of government in creating a large market for telecom equipments

Historically speaking right through independence in 1947, the government has sought to create a domestic manufacturing base in telecom equipments, although the size of this market was only a minute fraction of what it is now. Over the period from 1947 and up until now, one can identify three broad phases in the extent and nature of government intervention in the telecom equipment industry. The first phase covers the long period of 1947 through 1985, when state intervention took an extreme form of manufacturing being under the exclusive purview of state-owned undertakings but with imported technology. The second phase covers the period 1985 through 1991, when the manufacturing of some of the equipments were deregulated and opened up to private sector participation and the state establishing a public laboratory to generate state-of-the-art technologies domestically. The third phase is the period since 1991, when the market was opened up to private and indeed foreign participation. The main difference between the first two and the third phase is in the size of the market. During the first two phases the market for telecom equipments were extremely small as there was only one technology, namely fixed line and only one service provider which too was owned by the state. Mani (2005) had shown that during this period the main instrument for market creation was public technology procurement as the demand for these equipments emanated from just one state-owned provider. During the third phase there are two technologies, namely fixed and mobile and a large number of private sector service providers. Our argument here is that the state increased the size of the market by first promoting competition between service providers and then by regulating their market conducts through an independent regulatory agency. This increased competition coupled with regulation reduced telecom tariffs significantly to such an extent that India has now the cheapest telecom services anywhere in the world. It is through this affordability angle that

the state has created a large market for telecom services leading in turn to the creation of a large market for equipments. In the following we discuss the nature and extent of competition in the provision of telecom services. This is followed by a discussion of the role of the state with respect to regulating the market conduct of service providers.

Competition in the telecom service market: Mani (2008) had showed that the way the telecom service providers were licensed ensured that there was intensive competition between them. The national market was divided into several service areas and in each of the service areas a number of providers were licensed. There are at present, at least, 10 service providers in most service areas although four of them are very recent entrants and are too small in size to infuse any competitive pressure on the market. We measure competition interms of the Herfindahl Index (HI). The detailed service area wide HI is presented in Annexure 1 and the HI at the national level is mapped out in Figure 3. Most of the service providers have focused on specific regional markets, with the exception of Bharti (the largest mobile service provider). In fact there are only four service providers who have a presence in all the service areas. It is also interesting to see that the service areas where the state-owned BSNL has a monopoly position are also those with very low revenue potential. In other words, the private sector providers have positioned themselves in the most revenue earning service areas. Also it is seen that it is the circles with high revenue earning potential that one sees an increase in the intensity of competition- the metros of Delhi, Mumbai and Chennai for instance.

The state has intensified the degree of competition further by licensing one more mobile standard, namely Code Division Multiple Access (CDMA) in addition to the earlier standard, Global System for Mobile Communications (GSM) and by introducing Mobile Number Portability (MNP). The latter allows consumers to change their service provider while retaining their original number. Although the scheme

has been introduced only very recently (on January 20 2011), within the very first month of its introduction, the TRAI reported that about 3.8 million subscribers have taken advantage and changed their service providers. MNP and the very existence of a regulatory agency have actually increased the contestability of the market for telecom services. The result has been considerable reductions in the price of telecom services.

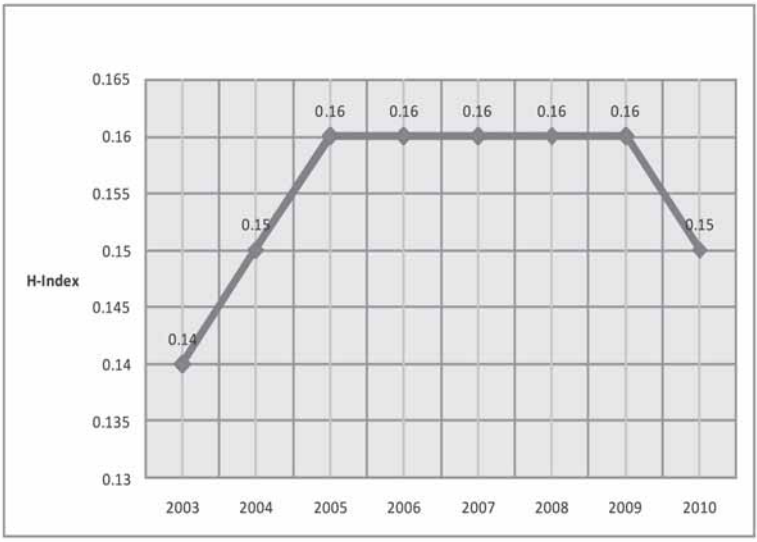

Figure 3: Trends in national level Herfindahl Index for mobile services, 2003-2010

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

Price of telecom services: One of the more direct effects of this competition is lower prices. Before the deregulation of the telecom services industry and indeed the entry of mobile service providers, the telecom consumers were periodically subjected in increases in the tariff.

This has now been effectively checked. Although it is not easy talk about the price of telecom services, basically it follows a two part tariff both in the case of fixed and mobile services, first an activation charge followed by a charge for each type of calls. For mobile communication consumers then there is the additional cost of calls according to whether it is post or prepaid. Based on estimates made by TRAI(2010a), we have obtained Average Revenue Per User for GSM services during the period 2005-2010 (Figure 4). It shows a continuous reduction for every quarter during the period under consideration. The implication of this continuous reduction is that with the price of mobile services falling so rapidly has given rise to an ever increasing number of subscribers. Further this reduction can also give an additional fillip to the growth of the Information and Communications Technology (ICT) industry in the country . Although the above data refers to only tariffs for mobile

Figure 4: Quarterly Average Revenue Per User during 2005-2010

Source: Compiled from ARPU and Revenue Reports, Cellular Operators Association of India, http://www.coai.com/revenue.php (Accessed March 15 2011)

telecommunications services, a similar trend may hold good even for fixed services. If one were to plot the price of telecom services and the number of subscribers, one can see an inverse relationship in the case of mobile services although in the case of fixed services such an inverse relationship is not visible. This is because of the relative advantages which mobile technology can bestow on its user.

The two state-owned service providers, BSNL and MTNL have launched "One India Plan" with effect from 01.03.2006. Under this a three minute local call and a one minute national long distance call (referred to as STD calls) will cost only Re. 1. The "One India" plan, also, for the first time, takes away the distinction between the fixed line tariff and the cellular tariff and thus, makes the tariff "technology independent". A similar plan has also been introduced for the customers of post paid and pre-paid mobile services of BSNL and MTNL.

Reductions in Urban-Rural divide: Several commentators and notably Desai (2006) had referred to the growing inequalities in the availability of telephones especially between states and indeed between the rural and urban areas within a state. This is so severe that the national picture that I presented above is only representative of the urban areas of some of the states. This growing urban-rural divide, as it is usually referred to, is of course a reflection of the growing divides within the country as far as income and wealth is considered. The ratio of urban to rural tele density, which kept falling until 2002 has started rising again since 2003 and in 2006 is much higher than what was in

1996, when the mobile revolution was just about to begin. There after it has started falling almost every year (Table 3). In order to show this decline in the urban-rural availability of telephones, we compute an index of it by taking the ratio of urban to rural teledensity multiplied by 100. The index at its peak in 2006 stood at 1636 has since reduced significantly to 588 in 2009 (up to March).

Table 3: Trends in Urban-Rural Divide, 1999-2010

	Rural tele density	Urban tele density	Overall tele density	Urban-Rural Divide Index
1999	0.52	6.87	2.33	1321
2000	0.68	8.23	2.86	1210
2001	0.93	10.37	3.58	1115
2002	1.21	12.2	4.29	1008
2003	1.49	14.32	5.11	961
2004	1.55	20.79	7.02	1341
2005	1.73	26.88	8.95	1554
2006	2.34	38.28	12.74	1636
2007	5.89	48.1	18.22	817
2008	9.46	66.39	26.22	702
2009	15.11	88.84	36.98	588
2010	31.18	147.88	66.16	474

Source: Department of Telecommunications (2009) and Telecom Regulatory Authority of India (2011)

A still another dimension of the urban-rural divide is the variation in tele density across the various telecom circles (Table 4).Of the 28 telecom circles in the country; we had data for 27 and among these 12 of them had a urban-rural divide higher than the national average. Kerala and Punjab has one of the highest tele densities

This confirms the oft-expressed view that the telecom revolution spearheaded by the mobile phones has remained largely as an urban phenomenon in most states. The government is very much aware of this situation and has put in place an institutional arrangement for bridging the urban-rural divide. Specifically, the National Telecom Policy of 1999 envisaged implementation of Universal Service Obligation Fund (USO Fund) to provide telecom services in rural, remote areas and non-remunerative areas. This fund is raised through a 'universal access levy', which is 5 per cent of the adjusted gross revenue earned by the service

Table 4: The Urban-Rural divide within telecom circles in India (as on March 31, 2009)

	Overall	Urban	Rural	Urban-rural divide index
Andaman & Nicobar	21.24	28.89	16.57	174
Haryana	43.75	75.98	28.1	270
Punjab	58.25	95.85	33.11	289
Gujarat	45.16	75.43	25.21	299
Tamil Nadu	50.46	79.48	25.62	310
Maharashtra	37.9	69.67	21.7	321
Kerala	58.48	125.35	35.43	354
Uttaranchal	11.59	25.97	6.04	430
Himachal Pradesh	55.5	179.81	40.47	444
Jammu & Kashmir	32.76	77.42	16.72	463
West Bengal	22.51	77.86	13.5	577
All-India	36.98	88.84	15.11	588
Rajasthan	37.15	102.56	16.71	614
Orissa	23.3	78.09	12.55	622
Andhra Pradesh	39.59	103.38	15.22	679
Karnataka	45.21	98.73	14.36	688
Madhya Pradesh	30.08	80.36	11.07	726
North East-II	9.21	27.36	3.69	741
UP (EAST)	24.91	77.76	10.24	759
Jharkhand	4.11	13.02	1.44	904
Chhatisgarh	5.15	16.69	1.81	922
Assam	20.65	86.98	9.36	929
North East-I	44.49	139.1	14.67	948
Bihar	22.18	133	9.17	1450
Kolkata	89.68			
Chennai	127.38			
Delhi	140.18			
Mumbai	110.52			

Source: Department of Telecommunications (2010)

providers under various licenses. The Universal Service Support Policy for Implementation of USO has taken effect from April 1 2002. It is administered by the DoT and it has three major components: (i) providing public shared access; (ii) providing individual access; (iii) infrastructure support for mobile service providers. The latter policy is on the anvil and is yet to take shape. The overall performance of the USO Fund is far from satisfactory, as cumulatively speaking only about 13 per cent of the funds accumulated have actually been disbursed (Table 9).

Table 5: Functioning of the Universal Service Fund, 2002-03 through 2009-10 (Rs in Millions)

Fiscal year ending	Opening balance	Funds collected as USL	Total funds collected	Funds disbursed	Disbursement rate (%)
2003	0	16536	16536	3000	18.14
2004	13536	21432	34968	2000	5.72
2005	32968	34577	67545	13146	19.46
2006	54399	35333	89732	17669	19.69
2007	72064	42111	114175	15000	13.14
2008	99175	54055	153230	12900	8.42
2009	140330	57595	197925	16000	8.08
2010	181925		181925	24000	13.19

Source: Department of Telecommunications (2010)

The service providers, excepting for the state-owned BSNL, are rather reluctant to provide shared access. However, the private providers are keen to participate in the provision of individual access in rural areas as it is more profitable than providing shared access.

Hitherto, the USO funds have been utilised only for provision of fixed line connections. Given the fact that the future is in mobile communications, it is prudent to involve mobile service providers too.

Some recent amendments made to the utilization of USO Funds have expanded the scope of the funds to include three more items. In very specific terms the following additional four items were included:

- Creation of infrastructure for provision of mobile services in rural and remote areas;
- Provision of Broadband connectivity to villages in a phased manner;
- Creation of general infrastructure in rural and remote areas for development of telecommunication facilities; and
- Induction of new technological developments in the telecom sector in rural and remote areas

Only the first of four are in the form of some implementation. However it makes a lot of sense to extend the USO funds to provide mobile services in rural areas as increasingly much of the growth in mobile communications have emerged from 'B' and 'C' Circles. In fact the four Metros have ceased to be the major force behind the growth of the mobile connections in the country. Encouraging the growth of mobile communications to the other circles and the rural areas within the circles can increase the tele density in the country. Although such increases in tele density through mobile phones have some negative consequences, which is discussed below. There are also various other proposals for bridging the urban-rural divide and this is an immediate task before the policy makers.

In fact the decreasing urban-rural divide, I argue, is due to the activities of private sector telecom providers. As indicated in Table 6, those service providers that offer only GSM services have a higher share of rural subscribers than those offering only CDMA services.. In fact for one of them, the share of rural subscribers is as much as close to 50 per cent. Two factors have contributed to the spread of mobile phones to

Table 6: Share of rural subscribers in total subscribers of mobile service providers (as on December 31 2010)

(Number of subscribers are in millions; Share is in per cent)

		Rural	Urban	Total	Share of Rural
1	Aircel	17.73	32.44	50.17	35.34
2	Bharati Airtel	60.85	91.65	152.50	39.90
3	Etisalat	0.00	0.26	0.26	0.00
4	HFCL Infotel	0.01	1.61	1.62	0.53
5	Idea	40.67	41.11	81.78	49.73
6	Loop Mobile	0.00	3.04	3.04	0.00
7	Reliance Telecom + Reliance Communication	27.08	98.57	125.65	21.55
8	Sistema Shyam Teleservices	1.94	6.50	8.43	22.95
9	STEL	0.61	1.70	2.32	26.39
10	Tata Teleservices	17.90	66.33	84.23	21.25
11	Uninor	5.56	12.95	18.51	30.04
12	Videocon	0.00	7.32	7.32	0.00
13	Vodafone Essar	47.76	76.49	124.26	38.44
	Private Total(1-13)	**220.11**	**439.98**	**660.09**	**33.35**
14	BSNL	30.79	55.92	86.71	35.51
15	MTNL	0.00	5.40	5.40	0.00
	PSU Total(14-15)	**30.79**	**61.32**	**92.11**	**33.43**
	Total All India (1-15)	**250.90**	**501.30**	**752.20**	**33.36**

Source: Computed from Lok Sabha Unstarred Question no: 303 Answered on 23/02/2011, http://164.100.47.132/Annexture/lsq15/7/au303.htm (accessed March 7, 2011)

rural areas. First is the saturation of markets in urban areas and the low Average Revenue Per User (ARPU) has encouraged the service providers to seek out markets in the hitherto underserved rural areas. In this way given the low ARPU, with a larger and growing market they could maximize their total sales revenue. Second, the increased competition between services providers have, as argued earlier, led to significant reductions in tariffs for telecom services, which made it affordable for rural subscribers. Thus we see that the market itself has corrected the imbalance in service provision between urban and rural areas although it must be added that the government policy of stimulating competition between service providers is at the heart of this policy.

Regulation of the conduct of service providers: An interesting feature of the growth of telecommunications industry in the 1990s and beyond compared to the earlier period is the strong public policy support that the industry has received. It manifested in the form of the following policies:

- *National Telecom Policy of 1994*
- *Telecom Regulatory Authority Act of 1997*
- *New Telecom Policy of 1999*
- *Universal Access Service Licenses 2003*
- *Broadband Policy of 2004*
- *Introduction of dual technologies in 2007-08*

Other policies having an indirect effect are: FDI policy, the Electronic Hardware Policy of 2003, and the Semiconductor Policy of 2007. The most important piece of legislation that is determining the growth performance of the industry is the establishment of a regulatory agency in the name of Telecom Regulatory Authority of India (TRAI)[4]. TRAI's functions can be broadly categorised into two: recommendatory

4 In working out the ideas contained in this subsection, I have relied on my own writings on the topic in Mani (2002), and Desai (2006).

and mandatory. It is seen that in most of the important conduct variables such as the promotion of competition, pricing, technology and quality of service and in the efficient use of spectrum etc, the pronouncements of TRAI are merely recommendatory and the final decision is to be taken by the government. The mandatory powers of TRAI are restricted to a number of technical issues such as fixing the terms and conditions of inter-connectivity between the service providers, laying down the standards of quality of service and to ensuring that these conditions are actually met by the service providers and ensuring the effective compliance of Universal Service Obligation. This shows that the effective space that is available for the TRAI in terms of asserting its real power is very limited.

IV. Emergence of India as a manufacturing hub for telecommunications equipment

In the previous section, we have charted out the phenomenal growth of the mobile services industry in India. Although mobile communications stated in the late 1990s, the growth picked up and accelerated over the last five years and to be very specific since 2006 or so. This has led to the demand for a variety of telecommunications equipment; most of which were and especially the handsets were not being domestically manufactured. This is because as Mani (2005) has shown that the domestic manufacturing industry and indeed the sectoral system of innovation that the state had built up over time focused almost entirely on fixed line technology and indeed products. So the initial growth in the services segment was met through imports of equipment leading to very high import dependence in the economy. However with the domestic market becoming sizeable as an at average of 18 million subscribers per month (say in 2011), the monthly demand for telecom equipment in India is almost three or five times the annual demand for such equipment in countries such as Finland, South Korea and the United States of America (homes of some of the largest mobile handset

manufacturers in the world). Such being the case there has been steady increase in the establishment of domestic manufacturing capacities in India by all leading MNCs in the telecommunications equipment industry. This was soon followed by a host of domestic manufacturers as well. As a result the import dependence of the country has shown some dramatic decreases as domestic production started increasing. Simultaneously exports of telecom equipment too have started to increase and it appears that India is now on the sure path to becoming a manufacturing hub of sorts in this industry. In the following we subject this hypothesis to some empirical scrutiny.

Government policy

India had always tried to create a domestic telecom manufacturing industry. Its history can be traced back to 1948, when the very first public sector enterprise created turned out to be the leading telecom equipment manufacturer, ITI, was set up in Bangalore[5]. This was followed by the establishment of a public laboratory in the name of C-DOT in 1985 to enhance the country's domestic technological capability in the area of equipment manufacturing. Mani (1992 and 2005) had shown that the main public policy instrument used for domestic manufacturing was public technology procurement. However with the deregulation and consequent privatisation of the distribution of services, the ability of the state to practice this has been compromised. So during the 1990s, we find two discernible routes adopted by the state for encouraging domestic manufacturing and indeed to translate into reality the new desire of the government to make India a manufacturing hub. The first one is through the provision of variety fiscal incentives including through the creation of Special Economic Zones (SEZs). The second is through opening up the sector to FDI in telecom equipment manufacturing. We discuss each of these two briefly.

5. For a history of ITI, see Subramanian (2010).

Provision of fiscal incentives for domestic manufacturing:

Beginning with the *National Telecom Policy of 1994* and its further elaboration in 1999, the government's stated policy has been to establish India as a hub for telecommunication equipment manufacturing. In order to aid this, the Government has set the targets for making India a hub of telecom manufacturing by facilitating a large number of telecom specific SEZs to achieve exports of 10 billion during 11th Five year plan and doubling the telecom equipment R&D by 2010 The Government has also undertaken steps to encourage the establishment of a supply chain facility through local manufacturers as well as international investment, and has put together incentive schemes like the SEZ and Electronic Hardware Technology Park (EHTP). These special schemes have:

- Income tax exemption for 5 to 15 years;
- Duty free import of components and consumables;
- Duty free import of capital goods ;
- Duty free import of leases, rentals, free of cost transfers and second hand capital goods ;
- Duty exemption on local procurement of components, consumables; and
- Refund of local taxes paid on local procurement of components and consumables.

Further in 2010, a committee headed by a former member (technology) of the Telecom Commission, gave macro-level guidelines to enhance indigenous manufacturing and research and development (R&D) capabilities to the Department of Telecommunications (DoT). The DoT formed yet another committee (in September 2010) to make more specific recommendations based on earlier suggestions to enhance India's telecom manufacturing base and R&D, as well as for developing interception and monitoring technologies. The main recommendations of especially the second panel as reported in the press are:

- The panel has suggested a 5 per cent tax reimbursement to service providers who buy equipment from Indian manufacturers.
- As for the Rs. 5,000 crore corpus, the panel has suggested creating it by levying a 2% R&D and manufacturing cess on the adjusted gross revenue (AGR) of telecom service providers. AGR is the total revenue of a service provider less the revenue that does not accrue to it directly, such as service tax and interconnection charges. This corpus could be used to provide a line of credit to equipment makers at a 5% rate of interest to be repaid in four instalments starting from the third year.
- Another recommendation is for creating telecom manufacturing zones, with the necessary infrastructure and facilities, owned by the government and given on lease.
- The panel also recommends hiring a number of facilitators trained in setting up manufacturing units, on a retainership paid by the government and the entrepreneur involved.
- To ensure that telecom equipment makers treat their staff like any other contract-based employee, the panel has suggested that these firms not be subjected to existing labour laws, except those concerning health and safety and provident fund rules.
- Other recommendations include introducing a mechanism of skill certification and developing an Indian standard for telecom equipment.
- It also proposes requesting the Reserve Bank of India to frame guidelines for Indian banks to extend credit to foreign customers based on their creditworthiness if they buy equipment from Indian manufacturers.

As far as we know these recommendations are not articulated in the form of a law. In fact the regulator, Telecommunications Regulatory Authority of India (TRAI), has come out (on December 28 2010) with a consultation paper on, "Encouraging telecom equipment manufacturing

in India" [6]. The paper repeats these incentive schemes to make India stronger in the R&D and manufacturing of telecom equipments.

Policy on FDI: Since 1991, the government has been taking a very proactive stand with respect to FDI in general and FDI in telecommunications in particular. The policy on FDI wrt telecom is best summarised in Box 1:

Box 1: Government policy wrt to FDI in Telecommunications Industry (Services and Equipment)

- In **Basic, *Cellular Mobile*, Paging and Value Added Service, and Global Mobile Personal Communications by Satellite**, ***Composite FDI permitted is 74%*** (49% under automatic route) subject to grant of license from Department of Telecommunications subject to security and license conditions**.** (para 5.38.1 to 5.38.4 of consolidate FDI Policy circular 1/2010 of DIPP):
- **FDI upto 74% (49% under automatic route) is also permitted for the following**: -
- Radio Paging Service
- Internet Service Providers (ISP's)
- **FDI upto 100% permitted in respect of the following telecom services**: -
- Infrastructure Providers providing dark fibre (IP Category I);
- Electronic Mail; and
- Voice Mail

  Subject to the conditions that such companies would divest 26% of their equity in favor of Indian public in 5 years, if these companies were listed in other parts of the world.
- **In telecom manufacturing sector 100% FDI is permitted under automatic route.**

Source: Department of Telecommunications, http://www.dot.gov.in/osp/Brochure/Brochure.htm#FDI (accessed February 4 2011)

6 See TRAI (2010b)

Policy outcomes

To begin with, in order to check if the growth of the service sector and the manufacturing sector are linked to each other, we plot the gross valued of communications equipments[7] against value added of communications services. See Figure 5. It shows an almost perfect positive correlation (although we have assumed zero lags) between growth in services and in the manufacture of equipments: the zero-order correlation coefficient between the two variables work out +0.96. So it appears from, admittedly this preliminary exercise, that growth in services is leading to domestic manufacturing of equipments. We propose to subject this line of reasoning by first taking a quick excursion to the history of telecom equipment manufacturing in the country and thereafter analyzing the growth and structure of the equipment manufacturing sector in the more recent contemporary period

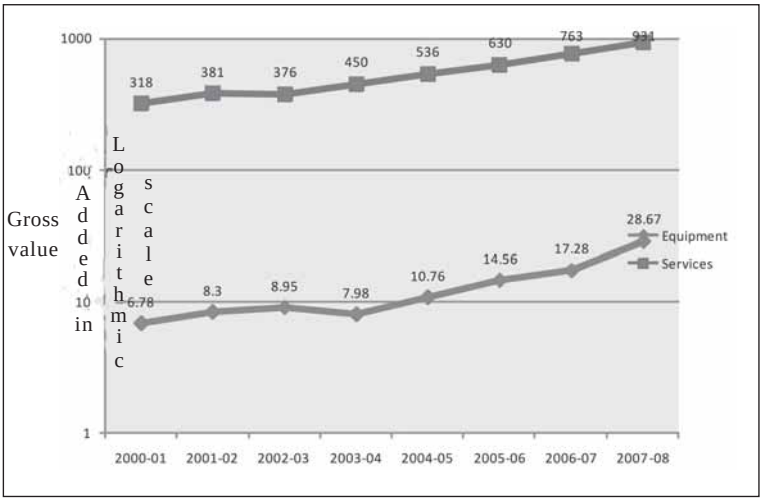

Figure 5: Relationship between manufacturing of telecom equipments and distribution of telecom services

Source: Central Statistical Organisation (2010b), p. 16 and 26

7 The only official source of data on this is from a special report brought by Central Statistical Organization (2010) in which the gross value added of the communications equipment (NIC 2004 Code: 3220 or 2008 code 2630) and services are presented.

Historically speaking the country had assiduously built up a domestic telecom equipment manufacturing industry in all the three segments of the industry, namely in switching, transmission and terminal equipments. From the beginning until 1985 or so, the manufacture of telecom equipments were exclusively reserved for the public sector, when in that year certain customer premises equipments like the Electronic Private Automatic Branch Exchanges (EPABX) was thrown open to the private sector. In fact the very first public sector enterprise established in independent India, ITI was devoted to the manufacture of telephone switching and terminal equipments. In 1985, the government established the stand-alone laboratory, Centre for Development of Telematics (C-DOT) to develop a family of digital switching technologies, which it licensed to both government and private sector enterprises. In fact Mani (2005) had argued that the C-DOT is credited with the establishment of a modern telecom equipment industry in the country. The Government's policy of public technology procurement practiced through its DoT, which was the only telecom service provider for a very long time until the late 1980s also contributed to the emergence and sustenance of a domestic manufacturing industry in telecom equipment which fitted very well with the overall policy of import substitution that was being followed. The deregulation of both the equipment and services industries, the liberalization of the economy, the virtual abandoning of the public technology procurement policy and above all the growth of the mobile communications industry have virtually put a leash on the growth of a domestic manufacturing industry. This is because both the research and production components of the industry focused only on fixed telephone technologies and with the mobile communications becoming very important, the demand for such equipments had to be increasingly met through imports.

I have attempted to estimate the net self-sufficiency rate for India's telecom equipment industry during four time points: 1992-93, 1997-98, 2002-03 and 2008-09 (Figure 6). Self Sufficiency Rates (SSR) is

defined as the ratio of domestic production to total availability, where total availability is the sum of domestic production and net imports. It is seen from the figure that the SSR was on a declining trend and reached lowest point of about 50 in 2002-03 when the domestic demand for telecom equipment had really started exploding fuelled by the growth of subscribers. However during the period since then there has been a dramatic increase domestic manufacture of telecom equipments. See Table 7.

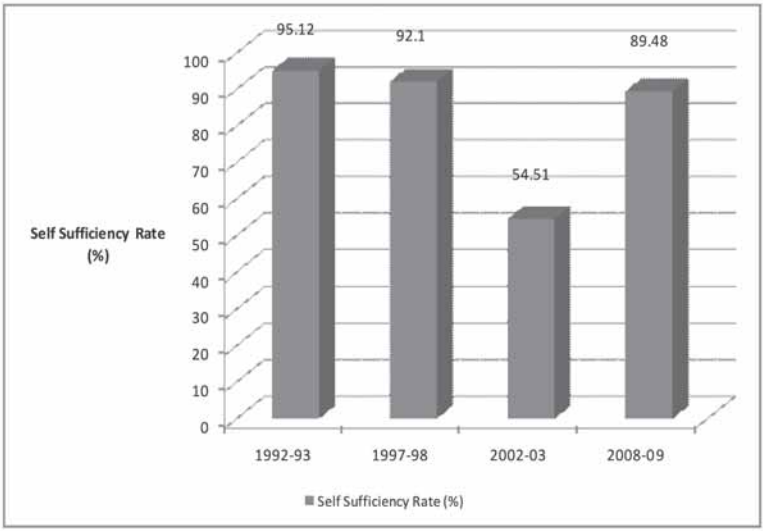

Figure 6: Self-sufficiency rates of Indian telecoms equipment industry, 1992-93 to 2008-09

Source: Computed from Department of Telecommunications (2010) and UN Comtrade

Output growth although showing fluctuations have started registering high growth rates since 2006-07. This is accompanied by growing exports from the country. In fact by 2008-09, export intensity has increased to almost 23 per cent. Thus within a short period of time India has become a gross exporter of telecom equipments. The table has

Table 7: Trends in domestic production of telecommunications equipment in India (Rs in Millions)

	Domestic production	Growth rate (%)	Exports	Export Intensity (%)
1992-93	39850			
1993-94	55000	38.02		
1994-95	70000	27.27		
1995-96	77500	10.71		
1996-97	83000	7.10		
1997-98	99600	20.00		
1998-99	100000	0.40		
1999-00	107600	7.60		
2000-01	122710	14.04		
2001-02	154370	25.80		
2002-03	144000	-6.72	4020	2.79
2003-04	140000	-2.78	2500	1.79
2004-05	160900	14.93	4000	2.49
2005-06	178330	10.83	15000	8.41
2006-07	236560	32.65	18980	8.02
2007-08	412700	74.46	81310	19.70
2008-09	488000	18.25	110000	22.54
2009-10	575840	18.00	132500	23.44

Source: Compiled from Department of Telecommunications (2010), Telecom Equipment and Services Promotion Council, http://www.telecomepc.in/export_performance.php (accessed on February 2, 2011)

given us one clue that the domestic manufacturing and exports of telecom equipments have shown some significant increases over the last four years or so. It is important at this stage to find out the composition of exports. Data on disaggregated export categories are hard to come by. And also most of the recent classifications of export data are not

disaggregated enough to identify the exports of say mobile handsets from the country. The only exception to this the classification is HS 2007 under the UN Commodity Trade Statistics(UN COMTRADE), which clearly identifies mobile handsets[8] and other mobile equipments such as base stations for instance. But the limitation of this dataset is that it available only for just one year, namely 2009. The data (See Table 8) shows an interesting result that India has become a net exporter of mobile handsets in 2009. In fact mobile handsets alone constitute a lion share of telecom equipment exports from the country. Of course some highly priced and technologically speaking sophisticated phones such as smart phones are perhaps imported as well. In fact our discussion with experts in

Table 8: Share of mobile handsets in exports and imports of telecom equipment from India, 2009 (Millions of US $)

	Code	Exports	Imports	Trade Balance
Telecom Equipments	8517	3825.17	8866.62	-5041.45
Mobile handsets	851712	3400.26	3144.13	256.13
Share of Mobile handsets in total (%)		88.89	35.46	

*According to HS 2007 classification

Source: Compiled from UN Commodity Trade Statistics

India is now manufacturing a range of equipments. Again since disaggregated production data are not available from any of the official sources, we have relied on data on sales revenue from a private source, that is now increasingly been cited. Since the numbers have not been validated, it must be used only for forming some broad picture of the structure of the industry. This is presented in Table 9 for two of the more recent years.

8 Code 851712: Telephones for cellular networks/for other wireless networks, other than Line telephone sets with cordless handsets

Table 9: Structure of the Indian telecommunications equipment industry (Based on per centage share in sales revenue)

	2007-08	2008-09
Switching Equipments, Total	**13.85**	**13.31**
Voice solutions	1.81	1.79
Router	1.90	1.75
Switch	2.43	2.05
Modem	0.41	0.31
Audio Video Conferencing	0.15	0.20
WLAN	0.22	0.24
Network Storage	1.54	1.60
Network Security Services	0.48	0.65
Structured Cabling	1.23	1.16
Network Integration	1.69	1.55
Network Management	0.93	0.87
Others	1.07	1.15
Transmission Equipments, Total	**59.70**	**63.41**
Broadband Infrastructure	1.94	1.94
Wireless Infrastructure	29.04	29.04
WiMax	0.28	0.28
Telecom Cables	1.13	1.13
Transmission	2.71	2.71
Test&Measurement	0.63	0.63
Telecom Software	21.96	21.96
Telecom Turnkey	4.21	4.21
VSAT	0.47	0.47
Others	1.02	1.02
Terminal Equipments, Total	**26.40**	**23.29**
Mobile Handsets	25.16	22.62
Fixed Phones	1.26	0.66
Grand Total	**100**	**100.00**

Source: *Voice and Data*, http://voicendata.ciol.com/content/vnd100_2009vol-I/109060601.asp (accessed February 2, 2011)

Our inquiries in the field show that most MNCs are considering India has a hub for their manufacturing of cheaper handsets and within India, the south Indian city of Chennai has become a telecom equipment cluster with Nokia as the hanger firm in this cluster (See Box 2 for the details). In fact the extent of FDI inflows to the sector is sizeable over the years indicating the attractiveness of India as a growing market for telecom equipments. See Figure 7. The MNCs which were hitherto exporting equipmenmts to India has now replaced exports with establishing domestic manufacturing plants at various locations in the country but as noted before mostly at Chennai.

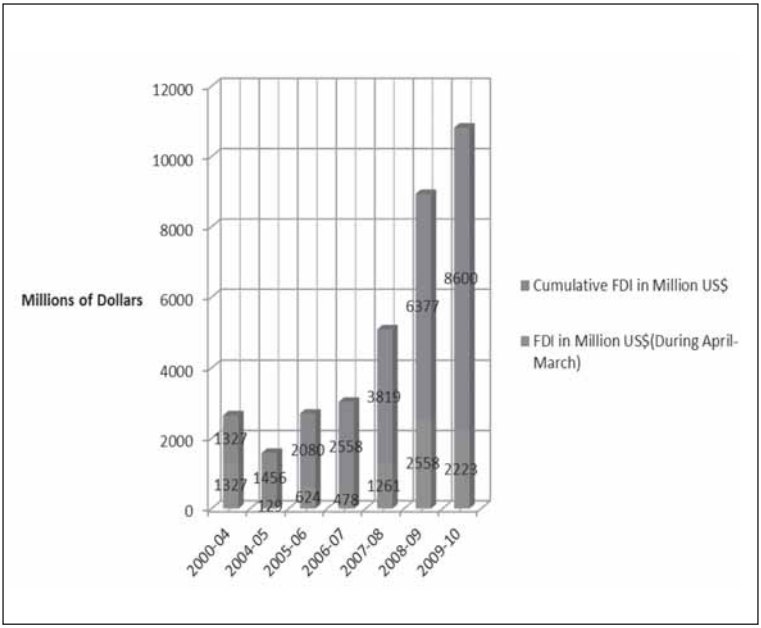

Figure 7: FDI inflows to India's telecommunications industry: Annual and Cumulative since August 1991

Source: Department of Telecommunications (2010), p. 10

The entry of MNCs is best summed up by Department of Telecommunications (2010, p. 26), "Rising demand for a wide range of

telecom equipment, particularly in the area of mobile telecommunication, has provided excellent opportunities to domestic and foreign investors in the manufacturing sector. The last two years (2007-08 and 2008-09) saw many renowned telecom companies setting up their manufacturing base in India. Nokia and Nokia Siemens Networks have set up their manufacturing plant in Chennai. Ericsson has set up GSM radio Base Station Manufacturing facility in Jaipur. Motorola, Foxconn (OEM) has set up large manufacturing plants in Chennai. Elcoteq has set up handset manufacturing facilities in Bangalore. LG Electronics has set up plant of manufacturing GSM mobile phones near Pune. Ericsson has launched their R&D Centre in Chennai. Flextronics has set up an SEZ in Chennai. A large number of companies like Alcatel, Cisco have shown interest in setting up their R&D centers in India. With above initiatives, India is expected to be a manufacturing hub for the telecom equipment".

Box 2: **Nokia Telecom Special Economic Zone**

Nokia started operations in the Nokia Telecom Special Economic Zone (SEZ) in Chennai, India at the beginning of 2006. The park expanded during 2007, with various suppliers opening operations to manufacture phone covers and chargers amongst other components. In 2008 the expansion continued with the employment increasing almost two-fold and currently stands at about 8000. By April 2010, it has produced 350 million handsets and it exports to more than 70 countries throughout the world.

Source: Nokia, http://www.nokia.co.in/about-nokia/environment/we-evolve/whats-the-power-of-we (accessed February 2 2011) and KPMG-FICCI-Department of Telecommunications (2010)

Apart from the MNCs, a number of Indian manufacturers have sprung up. Micromax, Spice, Karbonn, Lava, Lemon and Max are the

Indian manufacturers of mobile handsets[9]. Of late one of the leading service providers, Bharti, is also entering the manufacturing sector. However most of these local manufacturers are mere assemblers, with much of the components etc. are imported from especially from China. But indications are that this is bound to change very soon in favour of local manufacturing. One of oldest and leading telecom equipment manufacturers in the country is the public sector enterprise ITI. The firm's product line was dominated by fixed line telecom equipments and it has failed to reorient itself to manufacturing mobile communication equipments. The reasons for this non diversification into an expanding market can safely be attributed to its parent department, the Department of Telecommunications, failing to strategically reorienting ITI into the manufacture of mobile communications equipments. Consequently the firm has been in the red for a long time, although in the more recent years it has managed to contain its losses by engaging in the manufacture of mobile equipments especially since 2005-06. See Figure 8.

A view that has been often expressed is the fact that much of the telecom equipments that are manufactured within the country are based on imported components and indeed of imported technology. The veracity of the former (dependence on imported components) may be examined through the computation of two ratios: (i) by comparing the ratio of value added (GVA) to value of output(GVO) of communication equipments[10] (Figure 9); and (ii) by comparing the ratio of imports of parts of telecom equipment per unit of GVA (Figure 10).

As regards (i), two such estimates are provided, Estimates 1 and 2. The numerator of the two estimates is the same (namely the Gross Value

9 See IDC India, http://www.idcindia.com/Press/28sep2010.asp (accessed February 4 2011)

10 This class also includes some radio and television equipment.

Added of communication equipments provided in Figure 5). The difference between the two estimates in the denominator and as for the former, it is the Gross Value of Output of Communication Equipmentts (Code 3220) sourced from summary results of the factory sector of Annual Survey of Industries while for the latter the value of output (sourced from the successive annual reports of Department of Telecommunications provided in Table 7) For both the estimates, the ratio shows an increase although the level of it as indicated by the former is much higher than the latter. One may consider the two estimates as high (Estimate 1) and low (Estimate 2) respectively. But the linear projection of the two ratios shows that at current rates of change it is bound to increase further in the near future implying more local value addition. Regarding the second ratio, we have computed the ratio of imports of parts of telecom equipments to GVA of communication equipments (Figure 10) . The fomer data are sourced from the UN Comtrade (HS 1996 classification, Code 851790). A caveat is in order. The import data are in calendar years while the value added data are in calendar years. So one should be more concerned with the trend and not its level. In fact in terms of level , the ratio is greater than unity in four of the 8 years, but the trend is one of declining. Given the measurement errors in this ratio, one may interpret these movements rather cautiously.

From this it may be concluded that it is very likely that the share of imported material inputs in the total material inputs for manufacturing telecom equipments may have reduced only marginally implying thereby that increased domestic manufacturing is more of an assembly of sorts. Regarding dependence on foreign technology, given the way the Intellectual Property Rights (IPRs) are held, domestic manufacturing of mobile telecom equipments even by affiliates of MNCs can actually result in payments for royalty and knowhow fees to parent firms given the fact that this domestic production of handsets is based on imported technology, there is an outgo of foreign exchange in the form of royalty

payments[11]. In short although the country has become a hub for manufacturing of telecom equipments there is actually a rather high reliance on both imported components and indeed technology although, it must be added that domestic value added has shown some impressive increases in 2007-08 (as indicated by a 65 per cent increase in GVA in 2007-08 over 2006-07). The present exercise thus shows that local value addition although low at this stage of development of the equipment is bound to show increases in the future.

So the imperative before policy makers now is on improving the domestic content of not only material production, but also of technology. It is not immediately clear as to what is being done to address this issue as India's own R&D investments in the telecom sector have not shown any increase. See Table 10.

Table 10: Trends in Telecom R&D in India (Values are in Rs Millions)

	Private Sector		Public Sector		GRI	Total
Fiscal year ending	R&D	R&D intensity (%)	R&D	R&D intensity (%)		
1999	30.00	1.07	62.05	0.63	1374	1466.05
2000	30.51	0.72	69.41	0.64	1456	1555.92
2001	69.13	1.27	80.72	0.67	1577	1726.85
2002	76.57	1.25	60.24	1.83	1423	1559.81
2003	55.04	1.41	47.92	2.19	1441	1543.95
2004	92.18	2.21	51.80	3.78	1773	1916.98
2005	81.81	1.51	37.82	2.68	1332	1451.63
2006	98.67	1.37	39.63	2.23	1425	1563.30

Source: Department of Science and Technology (various issues)

11 According to Department of Commerce (2011, p 39), each line of mobile phone capacity added results in an outflow of US$ 15 on account of royalty payments. However the source does not tell us how these estimates were arrived at.

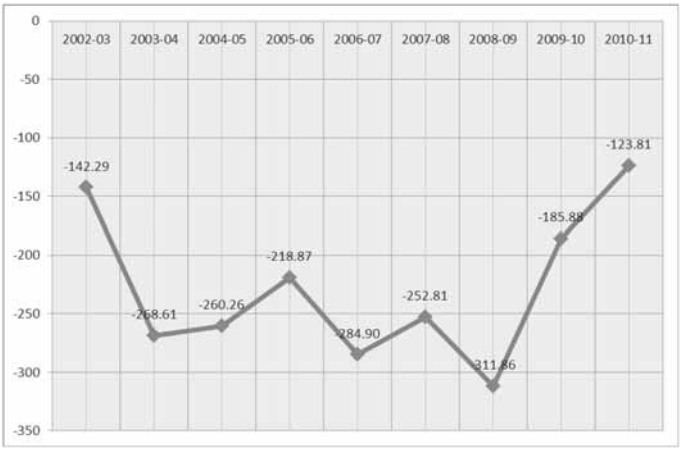

Figure 8: Trends in the losses of state-owned ITI, 2002-03-2009-10

Source: http://www.itiltd-india.com/upload/News%20Events/ITI%20Story%20another.pdf (accessed February 3, 2011)

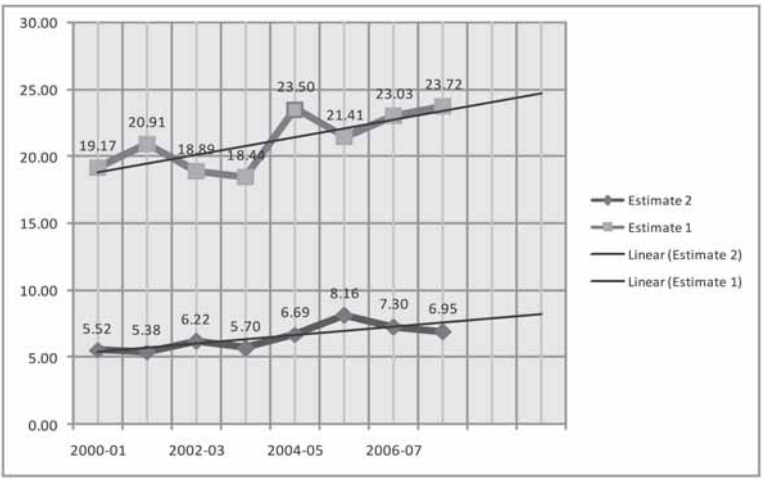

Figure 9: Ratio of Gross Value Added to Gross Value of Output of Communications Equipment

Source: Computed from UN Comtrade and Central Statistical Organization (2010a)

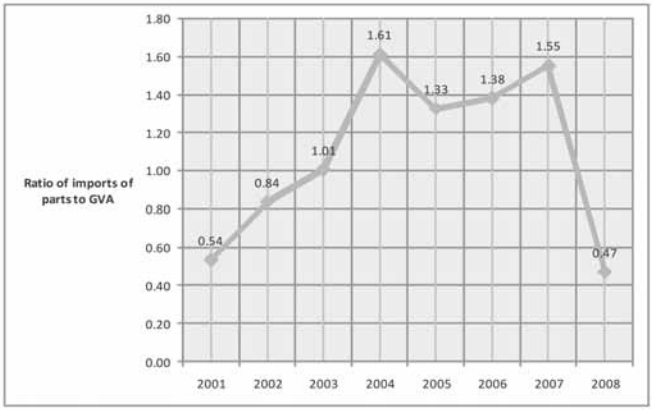

Figure 10: Ratio of imports of telecom parts to GVA

Source: Source: Computed from UN Comtrade and Central Statistical Organization (2010a)

Even the once prestigious, GRI, C-DOT, is maintaining a rather low profile these days. But an area where much dynamism is seen is in the area of R&D outsourcing by MNCs to various Indian entities although precise estimates of this activity are hard to come by. An indirect evidence of the growing R&D outsourcing in the field of telecommunications is the increasing number of patents granted in the field of telecommunications to Indian inventors in the USA. See Table 11.

Table 11: Patents granted in telecommunications technology to Indian inventors at the USPTO (number of patents)

	Multi-plexing	Pulse or digital	Tele-phonic	Telecommu-nications	Total
2001	0	1	0	0	1
2002	2	1	0	1	4
2003	3	1	0	1	5
2004	6	2	1	0	9
2005	7	2	1	3	13
2006	14	2	3	8	27
2007	17	4	4	14	39
2008	37	11	1	10	59
2009	37	24	2	10	73

Source: USPTO

In fact the only Indian telecom firm that has secured some patents is Sasken Communications, a Bangalore-based telecom software manufacturer.

Thus we see that although the domestic manufacturing of telecom equipments have increased, it is largely accounted for by foreign companies. Currently the manufacturing is admittedly based on imported components and parts although this likely to come down over time.

V. Conclusions

Telecommunications services industry is one of the most successful cases of liberlisation in India although the industry is not without its share of problems . Here the liberalization has been opening up of areas hitherto reserved for public sector entities to private sector participation. The market conduct of all players, both public and private was regulated by a reasonably independent regulator. As result competition between services providers intensified leading to significant reductions in prices. This has really improved the access to telephones, first in urban areas but increasingly in rural areas as well. This has increased the demand for telecom equipments on a scale unprecedented in the history of this industry. Although the state had sought to build considerable domestic technological capability in the industry by establishing a number of public sector entities, both in manufacturing and research as well, the failure to strategically reorient the sectoral system of innovation, has now made the equipment industry completely dominated by MNCs. On the positive side the state's desire to make India hub for telecom equipments appear to have fructified in as much as a number of MNCs have established local ventures. But these foreign ventures and the Indian firms which have come up in the industry appear to be more of assemblers of imported parts and components. Therefore an area where public policy has plenty of room for application is in increasing the technological capability of local firms and indeed increasing the local value added of the equipments that are increasingly getting manufactured within the country.

The telecom equipment case thus raises some important pointers for policy making for promoting technology-based manufacturing operations. Although domestic manufacturing may be promoted by creating a large market and then encouraging MNCs to take advantage of these markets, policies are also required for increasing the local content of manufacturing. So the state has still an important role to play in this and the new telecom policy that is currently on the anvil must squarely address this important issue.

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Annexure 1: Degree of competition within various telecom markets in India, 2008-2010

	Jun-08		Jun-09		Jun-10		Dec-10	
	Mobile	Fixed	Mobile	Fixed	Mobile	Fixed	Mobile	Fixed
Andhra Pradesh	0.19	0.81	0.19	0.76	0.17	0.74	0.16	0.72
Assam	0.25	1.00	0.24	1.00	0.22	0.99	0.21	0.99
Bihar	0.30	0.99	0.22	0.99	0.17	0.98	0.15	0.98
Chennai	0.20	0.57	0.20	0.56				
Delhi	0.18	0.50	0.18	0.47	0.17	0.45	0.16	0.44
Gujarat	0.21	0.86	0.21	0.83	0.21	0.80	0.18	0.78
Himachal Pradesh	0.27	0.98	0.25	0.98	0.19	0.97	0.17	0.97
Haryana	0.17	0.93	0.17	0.92	0.16	0.91	0.15	0.89
Jammu & Kashmir	0.39	1.00	0.31	1.00	0.27	1.00	0.26	1.00
Karnataka	0.25	0.66	0.25	0.63	0.19	0.60	0.18	0.59
Kerala	0.19	0.95	0.19	0.94	0.15	0.93	0.15	0.93
Kolkata	0.21	0.84	0.20	0.79	0.16	0.75	0.15	0.74
Madhya Pradesh	0.24	0.69	0.22	0.67	0.20	0.64	0.18	0.62
Maharashtra	0.17	0.89	0.17	0.84	0.17	0.79	0.16	0.77
Mumbai	0.18	0.60	0.16	0.52	0.14	0.47	0.13	0.46
North East-I	0.28	1.00	0.24	1.00	0.23	1.00	0.22	1.00
Orissa	0.25	0.98	0.22	0.98	0.17	0.97	0.15	0.96
Punjab	0.18	0.72	0.17	0.67	0.16	0.65	0.15	0.63
Rajasthan	0.20	0.79	0.20	0.81	0.20	0.87	0.19	0.85
Tamil Nadu	0.20	0.87	0.21	0.85	0.18	0.68	0.17	0.67
UP (EAST)	0.20	0.92	0.20	0.91	0.17	0.88	0.16	0.88
UP (WEST)	0.18	0.93	0.18	0.92	0.16	0.93	0.15	0.92
West Bengal	0.21	0.99	0.21	0.99	0.19	0.99	0.17	0.99

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