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Study on the Growth of Indian Telecom Sector: Evidence from Post-Liberalization Period

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Abstract: The Indian government has taken major steps towards privatization and liberalization of the telecom sector since 1991. As a result, this sector has made tremendous progress by adopting advanced technology and allowing the participation of private telecom operators. The present study highlights the current scenario of Indian telecom sector and examines its growth in the last three decades from 1991 to 2020. For the study, secondary data is used from various sources and descriptive statistical tools are used for the analysis- annual growth rates, compound annual growth rates and percentage shares. The study concludes that there has been a continuous increase in the subscriber base, overall teledensity in both rural and urban areas, number of broadband subscribers and internet subscribers. The share of the public sector has come down, while the share of the private sector has increased remarkably. It is recommended that the Indian government should make the regulatory and policy framework more adaptable to the fast-changing needs of the telecom sector.

1. Introduction

The Indian telecom industry is called as "sunrise industry". It has contributed 6.5% of India's GDP and provided 2.2 million direct jobs and 1.8 million indirect jobs to the people across both organized and unorganized sectors (GSMA 2016). The Indian telecom market has the second-largest subscriber base and has the second-highest number of internet users in the world after China. This spectacular growth of the Indian telecom sector is due to many factors such as affordable tariffs, wider service availability, roll out of new services such as Mobile Number Portability (MNP), 3G and 4G services, evolving consumption patterns of subscribers and conducive regulatory environment (TRAI).

Today telecom tariff in India is one of the lowest in the world, which has immensely benefited Indian customers. In the modern era, services like banking, health, education, governance, infotainment, etc. are becoming increasingly linked through mobile phones. The digital payments ecosystem is also

growing as India is becoming a digital economy. Social networking (such as WhatsApp and Facebook) and e-commerce services are gaining popularity. With upcoming advancements in technology to 4G mobile data services, the average data consumption per user per month has increased from 239 MB in 2016 to 11 GB in 2020 (TRAI 2020).

Since independence, the Indian telecom sector was a regulated sector and until 1990, the government was reluctant to allow private investment in it. In 1990s, the Indian telecom market was perceived as a promising market, so the government decided to open the value-added services such as cellular, paging, e-mail, video conferencing and data communication services etc. to private sector participation and provided easy market access for telecom equipment and a fair regulatory framework for offering telecom services. Subsequently, foreign direct investment was also liberalized considerably and even the basic telecom services were opened to foreign companies. In 2005, the government allowed 74% FDI into the telecom sector. In 2013, the government further allowed 100% foreign investment. Thus, liberalization and privatization of the Indian telecom market have resulted in huge inflows of FDI and increased competition with the participation of international telecom operators. The present study investigates the impact of liberalization and privatization on the growth and structure of the Indian telecom sector.

2. Review of Literature

Clark and Petrazzini (1996) observe that both deregulation and privatization policies adopted by 26 developing countries in their telecom sector have brought marked improvements in the level and growth of teledensity and increased employment opportunities. Vittal (1997) describes that in India, there is a paradigm shift in the financing of telecom infrastructure from the public sector to private and foreign sectors, from a culture of state monopoly and scarce telecommunication services to a culture of competition and plenty of telecommunication services. Fink *et al.* (2001) examine the liberalization of the telecom sector in 12 developing Asian countries over the period 1985-1999. The econometric analysis carried out in the study supports the positive contribution of liberal policy to the performance of telecommunication services in developing Asian countries. Gupta (2002) discusses that the overall liberalisation trend of the telecom sector shows the changed mind-set of the government from a closed regime to a pro-competitive regime. Kathuria (2004) observes that the introduction of competition along with the new forms of institutional and regulatory policy design has brought significant improvement in the telecom services in India. Ramachandran (2005)analyses that several socio-demographic factors are responsible for the exponential growth of Indian telecom sector such as high GDP growth, booming knowledge sector, increasing income levels and growing urbanization. Shanthi (2005) highlights that the various initiatives taken by the government namely liberalization, privatization and de-monopolization have intensified the competition among the various telecom players. Arindham (2006) examines the rising interest of foreigners for investment in the Indian telecom industry by conducting several case studies like Vodafone, Maxis, Telekom Malaysia, Tata tele etc.

According to Chhiber (2008), the mobile telephony is rapidly evolving in the world as more and more people demand mobile services with longer bandwidth and innovative services with features like T.V., multimedia, interoperability, and seamless connectivity with all types of protocols and standards. Preetha (2011) observes that liberal policies of the government, transparent regulatory framework and

participation of both public and private sectors have encouraged FDI inflows in the Indian telecom sector and this sector is growing at the rate of 45% in the recent years. Fathima *et al.* (2013) reveal that the telecom operators, academic institutes, and the Government of India are making continuous efforts by setting the Telecom Centres of Excellence (COE) to strengthen R&D in telecom infrastructure and bridge the digital divide between urban and rural areas of the country. Muthusamy *et al.* (2015) observe that the Indian telecom industry is growing at a rapid rate due to the adoption of liberalization policies and consequently increased participation of the private sector since 1991. Gourav (2017) observes that due to favourable regulatory policies adopted by the government and 4G services hitting the market, the Indian telecom sector is expected to transform from being an import-centric industry to a global telecom equipment manufacturing hub in the next few years.

3. Objectives of the Study

This study has the following objectives:

- To study the current status of Indian telecom sector.
- To examine the growth and structure of telecom sector in India on various aspects such as subscriber base, teledensity, broadband & internet subscribers, public & private service providers in both wireline and wireless segments from 1991 to 2020.

4. Research Methodology

4.1. Data Sources

For the study, secondary data is collected from the annual reports of Department of Telecommunication, Telecom Regulatory Authority of India (TRAI), Cellular Operators Association of India (COAI), International Telecommunication Union (ITU), Ministry of Statistics and Programme Implementation.

4.2. Methodology

To study the specified objectives, tabular analysis is done and descriptive statistical tools have been used such as year-wise annual growth rates, compound annual growth rates and percentage shares.

The Annual Growth Rate is computed by using the following formula:

$$AGR = [(X_2 - X_1)/ X_1] *100$$

Where X_1 = first value of variable X and X_2 = second value of variable X

Compound Annual Growth Rate is computed by using the following formula:

$$CAGR = [\{(V_n/V_0)^{1/n}\}-1] *100$$

Where V_0: start value;V_n: end value; n: number of years.

The Percentage formula is given as:

$$Percentage = (Value/ Total\ Value) *100$$

5. Data Analysis and Interpretation

This research study gives an insight into the present status of the Indian telecom industry and examines its growth in the last three decades on following aspects-

5.1. Subscriber Base

The telecom services opted by customers constitute the subscriber base. There are two main types of telecom services in India - Wireline/ Fixed-line Telephone Services and Wireless/ Cellular Telephone Services. Wireline communication uses a metal wire or optical fibre for the transmission of information, whereas wireless communication technologies use radio waves for transmission of information Over-the-Air (OTA). Table 1 depicts the telephone network and its growth in India for the period 1991-2020.

Table 1: Telephone Network in India (In millions)

Year	*Wireline Subscribers*	*Annual growth rate of Wireline Subscribers (%)*	*Wireless Subscribers*	*Annual growth rate of Wireless Subscribers (%)*	*Total Subscribers*	*Annual growth rate of Total Subscribers (%)*	*Percentage share of Wireline Subscribers (%)*	*Percentage share of Wireless Subscribers (%)*
1991	5.07	-	0	-	5.07	-	100	0
1992	5.81	14.60	0	-	5.81	14.60	100	0
1993	6.80	17.04	0	-	6.80	17.04	100	0
1994	8.03	18.09	0	-	8.03	18.09	100	0
1995	9.80	22.04	0	-	9.80	22.04	100	0
1996	11.98	22.24	0.08	-	12.06	23.06	99.34	0.66
1997	14.54	21.37	0.34	325.00	14.88	23.38	97.72	2.28
1998	17.80	22.42	0.88	158.82	18.68	25.54	95.29	4.71
1999	21.59	21.29	1.20	36.36	22.79	22.00	94.73	5.27
2000	26.51	22.79	1.88	56.67	28.39	24.57	93.38	6.62
2001	32.45	22.41	3.58	90.43	36.03	26.91	90.06	9.94
2002	38.54	18.77	6.68	86.59	45.22	25.51	85.23	14.77
2003	41.33	7.24	13.30	99.10	54.63	20.81	75.65	24.35
2004	40.09	-3.00	33.69	153.31	73.78	35.05	54.34	45.66
2005	41.42	3.32	52.22	55.00	93.64	26.92	44.23	55.77
2006	41.54	0.29	90.14	72.62	131.68	40.62	31.55	68.45
2007	40.77	-1.85	165.11	83.17	205.88	56.35	19.80	80.20
2008	39.41	-3.34	261.08	58.12	300.49	45.95	13.12	86.88
2009	37.97	-3.65	391.76	50.05	429.73	43.01	8.84	91.16
2010	36.96	-2.66	584.32	49.15	621.28	44.57	5.95	94.05
2011	34.73	-6.03	811.59	38.89	846.32	36.22	4.10	95.90
2012	32.17	-7.37	919.17	13.26	951.34	12.41	3.38	96.62

contd. table 1

Year	Wireline Subscribers	Annual growth rate of Wireline Subscribers (%)	Wireless Subscribers	Annual growth rate of Wireless Subscribers (%)	Total Subscribers	Annual growth rate of Total Subscribers (%)	Percentage share of Wireline Subscribers (%)	Percentage share of Wireless Subscribers (%)
2013	30.21	-6.09	867.81	-5.59	898.02	-5.60	3.36	96.64
2014	28.50	-5.66	904.52	4.23	933.02	3.90	3.05	96.95
2015	26.60	-6.67	969.89	7.23	996.49	6.80	2.67	97.33
2016	25.22	-5.19	1033.63	6.57	1058.85	6.26	2.38	97.62
2017	24.40	-3.25	1170.18	13.21	1194.58	12.82	2.04	97.96
2018	22.81	-6.52	1183.41	1.13	1206.22	0.97	1.89	98.11
2019	21.70	-4.87	1161.71	-1.83	1183.41	-1.89	1.83	98.17
2020	20.22	-6.82	1157.75	-0.34	1177.97	-0.46	1.72	98.28
	CAGR	**4.72%**		**46.70%**		**19.91%**		

Source: Authors' Own Compilation.

The total subscriber base in India grew from 5.07 million in 1991 to 1177.97 million in 2020, registering a Compound Annual Growth Rate (CAGR) of 19.91%. The annual growth rate of total subscribers over previous years is always positive, except for the year 2012-13, when the growth rate was -5.6% due to the removal of inactive mobile telephone connections by the service providers on the guidelines issued by TRAI. "Such a phenomenal growth can be attributed primarily to the country's large population, high economic growth, reduced tariffs, affordable handsets, infrastructure sharing among the service providers and the introduction of regulatory reforms by the Indian Government" **(**DoT). The marginal decline in the number of total subscribers is also reported in the recent years 2019 and 2020.

5.1.1. Wireline Telephone Subscribers

The wireline subscriber base has increased from 5.07 million in 1991 to 41.54 million in 2006 but thereafter started declining and reached 20.22 million in 2020. The annual growth rate of wireline subscribers was positive from 1991-2006, but 2007 onwards it became negative showing declining preferences of the people for fixed-line telephones. The CAGR of the wireline subscribers for the period 1991-2020 is 4.72%.

5.1.2. Wireless Telephone Subscribers

Wireless telephone segment has been the key contributor to spectacular growth in the telephone network in India. The number of wireless subscribers has increased from 0.08 million in 1996 to 1157.75 million in 2020, thereby making India the second-largest wireless telecom market in the entire world after China. The highest growth rate has been observed as 325% in 1996-97 and the lowest growth rate as -5.59% in 2012-13 due to the reasons already cited earlier. The CAGR of the wireless subscribers

for the period 1996-2020 is 46.70%. In the present era, wireless telephones are preferred over wireline telephones due to the portability and convenience of wireless telephones.

The percentage share of wireless telephones has grown from 0% in 1991 to 98.28% in 2020, while the share of wireline phones has declined from 100% in 1991 to just 1.72% in 2020. Thus, the dominance of wireline technology in 1991 has been taken over by wireless technology in 2020.

5.2. Teledensity

Teledensity represents the number of telephone connections per hundred individuals living within an area. The analysis of rural teledensity, urban teledensity and overall teledensity of India is depicted in Table 2.

Table 2: Teledensity in India (In percentage)

Year	*Rural Teledensity*	*Annual growth rate of Rural Teledensity*	*Urban Teledensity*	*Annual growth rate of Urban Teledensity*	*Overall Teledensity*	*Annual growth rate of Overall Teledensity*
1991	NA	-	NA	-	0.6	-
1992	NA	-	NA	-	0.67	11.67
1993	NA	-	NA	-	0.77	14.93
1994	NA	-	NA	-	0.89	15.58
1995	NA	-	NA	-	1.07	20.22
1996	0.29	-	3.95	-	1.28	19.63
1997	0.34	17.24	4.76	20.51	1.56	21.88
1998	0.43	26.47	5.78	21.43	1.94	24.36
1999	0.52	20.93	6.87	18.86	2.33	20.1
2000	0.68	30.77	8.23	19.8	2.86	22.75
2001	0.93	36.76	10.37	26	3.58	25.17
2002	1.21	30.11	12.2	17.65	4.29	19.83
2003	1.49	23.14	14.32	17.38	5.11	19.11
2004	1.55	4.03	20.79	45.18	7.02	37.38
2005	1.73	11.61	26.88	29.29	8.95	27.49
2006	2.34	35.26	38.28	42.41	12.74	42.35
2007	5.89	151.71	48.1	25.65	18.22	43.01
2008	9.46	60.61	66.39	38.02	26.22	43.91
2009	15.11	59.73	88.84	33.82	36.98	41.04
2010	24.31	60.89	119.45	34.46	52.74	42.62
2011	33.83	39.16	156.94	31.39	70.89	34.41
2012	39.26	16.05	169.17	7.79	78.66	10.96

contd. table 2

Year	*Rural Teledensity*	*Annual growth rate of Rural Teledensity*	*Urban Teledensity*	*Annual growth rate of Urban Teledensity*	*Overall Teledensity*	*Annual growth rate of Overall Teledensity*
2013	41.05	4.56	146.64	-13.32	73.32	-6.79
2014	44.01	7.21	145.46	-0.8	75.23	2.61
2015	48.37	9.91	148.61	2.17	79.38	5.52
2016	51.26	5.97	154.18	3.75	83.36	5.01
2017	56.98	11.16	171.52	11.25	92.98	11.54
2018	59.05	3.63	165.9	-3.28	92.84	-0.15
2019	57.50	-2.62	159.66	-3.76	90.10	-2.95
2020	58.79	2.24	142.31	-10.87	87.37	-3.03
	CAGR	**23.67%**		**15.42%**		**18.06%**

Note: Data regarding Rural teledensity and Urban teledensity is not available for the years 1991-95.
Source: Authors' Own Compilation

According to annual reports of DoT, the teledensity of India started at a very low figure of 0.6 in 1991 and has shown a modest rise until 2005. From 2005 onwards, the teledensity of the country gained momentum and increased to 87.37 in March 2020. It is a significant testament to the growth of telecom services in India. The small dip in 2013 can be attributed to the guidelines issued by TRAI to service providers on 'de-activation of inactiveSIMs'. The highest annual growth rate of overall teledensity has been observed as 43.91% in 2007-08 and the lowest growth rate as -6.79% in 2012-13. The CAGR of overall teledensity is 18.06% for the period 1991-2020. Overall, there has been a phenomenalgrowth in the overall teledensity of India.

5.2.1. Rural Teledensity

The teledensity of rural areas in the country, recorded as 0.29% in 1996 has also increased to 58.79% in 2020. The annual growth rate of rural teledensity is positive throughout the study period 1996-2020, though there was a marginal decline in 2018-19. The highest annual growth rate has been observed as 151.71% in 2006-07 and the lowest growth rate as -2.62% in 2018-19. The CAGR of rural teledensity is 23.67%. An increase in rural teledensity is due to several factors such as the introduction of mobile phones in rural areas, measures undertaken by the Indian government under Universal Service Obligation Fund (USOF) for extension of mobile networking in rural areas and new investments made by private service providers in rural areas due to the saturation of urban markets.

5.2.2. Urban Teledensity

The urban teledensity of India has increased from 3.95% in 1996 to 142.31% in 2020. The highest annual growth rate of urban teledensity has been observed as 45.18% in 2003-04 and the lowest growth rate as -13.32% in 2012-13. The CAGR of urban teledensity is 15.42%.

Hence, there has been phenomenal growth in the overall teledensity, urban teledensity and rural teledensity of the country with the advancement of hi-tech wireless technologies. Despite these positive developments, there is a huge gap between urban and rural teledensity. The subscriber base has remained skewed in favour of urban areas and the urban teledensity (142.31) is around three times than that of rural teledensity (58.79). The slow growth of rural teledensity is because rural areas need massive investments, but the revenue prospects are not proportionate to the investments undertaken.

5.3. Broadband and Internet Subscribers

In India, internet services were first launched in 1995 by state-owned company 'Videsh Sanchar Nigam Limited (VSNL)' and later in 1998, these services were opened to the private operators. There are two segments of the internet- Narrowband and Broadband. Narrowband Internet provides internet access with a capacity of less than 512 Kbit/s and Broadband Internet provides access with a minimum capacity of greater or equal 512 Kbit/s (ITU). The broadband policy was first announced by the Government of India in October 2004. The prevalence of broadband network allows people to access new employment opportunities; helps businessmen to discover new markets and improves efficiency and enhances the capacity of the government to provide services such as health, education, banking and commerce in the country. In rural and distant areas, broadband services help in increasing the productivity, provision of better infrastructure and improvement in the quality of life of people.

Table 3 presents a picture of broadband and total internet subscribers in India from 1995 to 2020.

Table 3: Broadband and Internet Subscribers (In millions)

Year	*Broadband Subscribers*	*Annual Growth in Broadband Subscribers (%)*	*Total Internet Subscribers*	*Annual Growth in Total Internet Subscribers (%)*
Aug-95	0.00	-	0.01	-
1996	0.00	-	0.05	400.00
1997	0.00	-	0.09	80.00
1998	0.00	-	0.14	55.56
1999	0.00	-	0.28	100.00
2000	0.00	-	0.95	239.29
2001	0.00	-	3.04	220.00
2002	0.00	-	3.42	12.50
2003	0.00	-	3.64	6.43
2004	0.05	-	4.55	25.00
2005	0.18	260.00	5.54	21.76
2006	1.35	650.00	6.94	25.27
2007	2.34	73.33	9.27	33.57
2008	3.87	65.38	11.10	19.74

contd. table 3

Year	*Broadband Subscribers*	*Annual Growth in Broadband Subscribers (%)*	*Total Internet Subscribers*	*Annual Growth in Total Internet Subscribers (%)*
2009	6.22	60.72	13.54	21.98
2010	8.77	41.00	16.18	19.50
2011	11.89	35.58	19.67	21.57
2012	13.81	16.15	22.86	16.22
2013	15.05	8.98	164.81	620.95
2014	60.87	304.45	251.59	52.65
2015	99.20	62.97	302.35	20.18
2016	149.75	50.96	342.65	13.33
2017	276.52	84.65	422.20	23.22
2018	412.60	49.21	493.96	17.00
2019	563.31	36.53	636.73	28.90
2020	687.44	22.04	743.19	16.72
	CAGR	**75.16%**		**53.94%**

Source: Authors' Own Compilation

The above table reflects that the number of broadband subscribers has increased considerably from 0.05 million in 2004 to 687.44 million in 2020. The highest annual growth rate of 650% is reported in 2005-06 and the lowest growth rate of 8.98% in 2012-13. The CAGR of broadband connections stands at 75.16%. There is a spectacular rise in the number of broadband subscribers in the year 2016 due to 4G connections launched by Reliance Jio. The total number of internet subscribers base has also shown a magnificent rise from just 0.01 million in 1995 to 743.19 million in 2020. The CAGR of internet connections during 1995-2020 stands at 53.94%.

Further, the number of broadband and internet subscribers was very limited in India until 2012. After 2012, the internet subscriber base in India (narrowband and broadband) has experienced significant growth. This growth is being driven by the growing popularity of broadband, increasing user comfort with internet-based applications, continuous fall in prices of mobile phones and cheaper internet access plans on the GSM network.

5.4. Public and Private Telephone Subscribers

Since 1990s, there is a substantial structural transformation in the Indian telecom industry. Earlier this industry was completely state-owned but now the Government of India has taken several initiatives to encourage the private sector participation such as the removal of state monopolies, reduction in entry barriers to new firms, allowing 100% foreign direct investment (FDI) and promotion of competition among the service providers.

Table 4 displays the number of public and private telephone subscribers in India.

Table 4: Public and Private Telephone Subscribers in India (In millions)

Year	*Public Subscribers*	*Annual Growth rate of public subscribers (%)*	*Private Subscribers*	*Annual Growth rate of private subscribers (%)*	*Total Subscribers*	*Percentage share of Public Sector (%)*	*Percentage share of Private Sector (%)*
1997	14.54		0.34		14.88	97.72	2.28
1998	17.8	22.42	0.88	158.82	18.68	95.29	4.71
1999	21.59	21.29	1.22	38.64	22.81	94.65	5.35
2000	26.51	22.79	2.02	65.57	28.53	92.92	7.08
2001	32.44	22.37	3.85	90.59	36.29	89.39	10.61
2002	38.16	17.63	6.81	76.88	44.97	84.86	15.14
2003	43.17	13.13	11.45	68.14	54.62	79.04	20.96
2004	46.98	8.83	30.66	167.77	77.64	60.51	39.49
2005	52.08	10.86	46.33	51.11	98.41	52.92	47.08
2006	61.08	17.28	79.24	71.03	140.32	43.53	56.47
2007	71.4	16.9	134.46	69.69	205.86	34.68	65.32
2008	79.55	11.41	220.94	64.32	300.49	26.47	73.53
2009	89.55	12.57	340.18	53.97	429.73	20.84	79.16
2010	105.87	18.22	515.41	51.51	621.28	17.04	82.96
2011	126	19.01	720.33	39.76	846.33	14.89	85.11
2012	130.27	3.39	821.08	13.99	951.35	13.69	86.31
2013	130.11	-0.12	767.91	-6.48	898.02	14.49	85.51
2014	120.05	-7.73	812.96	5.87	933.01	12.87	87.13
2015	100.34	-16.42	895.79	10.19	996.13	10.07	89.93
2016	108.65	8.28	950.68	6.13	1059.33	10.26	89.74
2017	122.18	12.45	1072.81	12.85	1194.99	10.22	89.78
2018	131.66	7.76	1080.14	0.68	1211.8	10.86	89.14
2019	133.51	1.41	1049.90	-2.80	1183.41	11.28	88.72
2020	135	1.12	1042.97	-0.66	1177.97	11.46	88.54
	CAGR	**9.73%**		**39.73%**			

Source: Authors' Own Compilation

The number of public subscribers has increased from 14.54 million in 1997 to 135 million in 2020, at CAGR of 9.73%. The number of private subscribers has shown a magnificent increase from 0.34 million in 1997 to 1042.97 million in 2020, growing at CAGR of 39.73%. This remarkable increase in the number of private subscribers is due to fierce competition among the private service providers

offering better telecom services at low tariffs. The highest growth rate of private subscribers is registered as 167.77% for the year 2003-04, while the lowest growth rate is registered as -6.48% in 2012-13. The share of the public sector in total connections has come down from 98% in 1997 to 11% in 2020, while the share of the private sector stands at 89% in 2020 as against a meager share of 2% in 1997.

Both public and private service providers share the wireline and wireless segments. There is fierce competition among the major telecom players due to which they have come up with new tariff plans and discount schemes to gain a competitive edge and get more and more subscribers for their services.

5.4.1. Wireless Service Providers

There are many mobile/wireless telecom service providers operating in India- Bharti Airtel Ltd., Aircel Group, Reliance Communications Ltd., Vodafone Ltd., Tata Teleservices Ltd., IDEA Cellular Ltd., BSNL, MTNL, Reliance Jio Infocomm Ltd. etc. Out of these service providers, BSNL and MTNL are the only public sector service providers, while the rest of them are the private sector service providers. Table 5 shows the subscribers' base and market share of various mobile operators in India.

Table 5: Growth in Wireless Subscribers and Market Share of major Telecom Companies (In millions)

Year	*BSNL*	*MTNL*	*Bharti Airtel*	*Vodafone / Hutch*	*Reliance Communi-cations*	*Reliance –Jio*	*Idea*	*Tata Docomo*	*Aircel*	*Unitech/ Telenor*	*Others*
2001-02	0.04 (0.6%)	0.22 (3.29%)	1.35 (20.21%)	1.27 (19.01%)	0.38 (5.69%)		0.81 (12.13%)	0.05 (0.75%)	0.54 (8.08%)	0	2.02 (30.24%)
2002-03	2.29 (17.22%)	0.35 (2.63%)	3.07 (23.08%)	2.16 (16.24%)	0.54 (4.06%)		1.28 (9.62%)	0.16 (1.2%)	0.73 (5.49%)	0	2.72 (20.45%)
2003-04	5.53 (16.41%)	0.46 (1.37%)	6.5 (19.29%)	5.15 (15.29%)	7.26 (21.55%)		2.73 (8.1%)	0.63 (1.87%)	1.29 (3.83%)	0	4.14 (12.29%)
2004-05	9.9 (18.95%)	1.08 (2.07%)	10.98 (21.02%)	7.8 (14.93%)	10.45 (20.01%)		5.07 (9.71%)	1.09 (2.09%)	1.76 (3.37%)	0	4.1 (7.85%)
2005-06	17.65 (19.58%)	2.05 (2.27%)	19.58 (21.72%)	15.36 (17.04%)	17.31 (19.2%)		7.37 (8.18%)	4.85 (5.38%)	2.61 (2.9%)	0	3.36 (3.73%)
2006-07	30.99 (18.77%)	2.94 (1.78%)	37.14 (22.49%)	26.44 (16.01%)	28.01 (16.96%)		14.01 (8.49%)	16.02 (9.7%)	5.51 (3.34%)	0	4.05 (2.46%)
2007-08	40.79 (15.62%)	3.53 (1.35%)	61.98 (23.74%)	44.13 (16.9%)	45.79 (17.54%)		24 (9.19%)	24.33 (9.32%)	10.61 (4.06%)	0	5.91 (2.28%)
2008-09	52.15 (13.31%)	4.48 (1.14%)	93.92 (23.97%)	68.77 (17.55%)	72.67 (18.55%)		38.89 (9.93%)	35.12 (8.96%)	18.48 (4.72%)	0	7.28 (1.87%)
2009-10	69.45 (11.89%)	5.09 (0.87%)	127.62 (21.84%)	100.86 (17.26%)	102.42 (17.53%)		63.82 (10.92%)	65.94 (11.29%)	36.86 (6.31%)	4.26 (0.73%)	7.99 (1.36%)
2010-11	91.83 (11.31%)	5.47 (0.67%)	162.2 (19.99%)	134.57 (16.58%)	135.72 (16.72%)		89.5 (11.03%)	89.14 (10.98%)	54.84 (6.76%)	22.79 (2.81%)	19.49 (3.15%)

contd. table 5

Year	*BSNL*	*MTNL*	*Bharti Airtel*	*Vodafone / Hutch*	*Reliance Communi-cations*	*Reliance –Jio*	*Idea*	*Tata Docomo*	*Aircel*	*Unitech/ Telenor*	*Others*
2011-12	98.57 (10.72%)	5.83 (0.63%)	181.28 (19.72%)	150.47 (16.37%)	153.05 (16.65%)		112.72 (12.26%)	81.75 (8.9%)	62.57 (6.81%)	42.43 (4.62%)	19.66 (3.32%)
2012-13	101.21 (11.66%)	5 (0.58%)	188.2 (21.69%)	152.35 (17.56%)	122.97 (14.17%)		121.61 (14.01%)	66.42 (7.65%)	60.07 (6.92%)	31.68 (3.65%)	18.3 (2.11%)
2013-14	94.65 (10.46%)	3.37 (0.37%)	205.39 (22.71%)	166.56 (18.41%)	110.89 (12.26%)		135.79 (15.01%)	63 (6.97%)	70.15 (7.76%)	35.61 (3.94%)	19.1 (2.11%)
2014-15	77.22 (7.96%)	3.51 (0.36%)	226.02 (23.3%)	183.8 (18.95%)	109.47 (11.29%)		157.81 (16.27%)	66.32 (6.84%)	81.4 (8.39%)	45.62 (4.7%)	18.72 (1.94%)
2015-16	86.35 (8.35%)	3.56 (0.34%)	251.24 (24.31%)	197.95 (19.15%)	102.41 (9.91%)		175.07 (16.94%)	60.1 (5.81%)	87.09 (8.43%)	52.45 (5.07%)	17.41 (1.68%)
2016-17	100.99 (8.63%)	3.63 (0.31%)	273.65 (23.39%)	209.06 (17.86%)	83.5 (7.14%)	108.68 (9.28%)	195.37 (16.7%)	48.99 (4.18%)	90.9 (7.76%)	50.49 (4.31%)	4.91 (0.42%)
2017-18	111.68 (9.44%)	3.56 (0.3%)	304.19 (25.7%)	222.7 (18.82%)	0.19 (0.02%)	186.56 (15.76%)	211.21 (17.85%)	31.19 (2.64%)	74.15 (6.26%)	37.98 (3.21%)	0 (0%)
2018-19	115.74 (9.96%)	3.45 (0.3%)	325.18 (27.99%)	Merged with Idea	0.019 (0.00%)	306.72 (26.4%)	394.84 (33.98%)	15.85 (1.36%)	0 (0%)	0 (0%)	0 (0%)
2019-20	119.87 (10.35%)	3.36 (0.29%)	327.81 (28.31%)	Merged with Idea	0.018 (0.00%)	387.52 (33.47%)	319.17 (27.57%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
CAGR	52.40%	15.43%	33.52%	-	-14.86%	37.46%	36.96%	37.70%	33.58%	27.52%	5.71%

Source: Authors' Own Compilation

According to the TRAI database, the private sector telecom operators dominate the delivery of wireless services in India, though their total market share has decreased from 96.11% in 2001 to 89.36% in 2020. The two public sector telecom companies BSNL and MTNL entered the wireless segment in 2001 and their market share has increased from 3.89% in 2001 to 10.64% in 2020. Still, the wireless telecom market in India is mainly dominated by private sector operators.

In 2001-02, the top five companies of the telecom sector in the wireless segment were: Bharti Airtel, Vodafone, Idea Cellular, Aircel and Reliance Communications. In 2019-20, the top wireless telecom companies are- Reliance Jio, Bharti Airtel, Vodafone Idea Limited and BSNL. Reliance Jio entered the market in 2016 and has captured a market share of 37.46% in just four years and is giving a tough competition to the top wireless service providers.

Table 5 also shows the CAGR of wireless subscribers of all the telecom operators for the period 2001-2020. The highest CAGR is registered by BSNL which is 52.4%. Other operators like Tata Docomo, Reliance Jio, Vodafone Idea Limited, Aircel and Bharti Airtel have also experienced high CAGR except Reliance Communications that registered negative CAGR (-14.86%).

The Indian telecom market is getting consolidated. Many small service providers were operating in 2001-02, having a market share of 30.24%. However, their share has declined to 0% in 2020. Now, there are only 4-5 major telecom players left in the market. This happened due to fierce competition

among the mobile operators in terms of tariff wars, cheaper data plans, and improved services to attract customers, which made it difficult for the small operators to survive in the market.

5.4.2. Wireline Service Providers

The major wireline telecom service providers operating in India are- BSNL, MTNL, Bharti Airtel Ltd., Reliance Communications Ltd., Tata Teleservices Ltd. etc.

Table 6: Growth in Wireline Subscribers and Market Share of major Telecom Companies (In millions)

Year	*BSNL*	*MTNL*	*Bharti Airtel*	*Reliance Communications*	*Tata Teleservices*	*Others*
2001-02	33.22 (86.44%)	4.63 (12.05%)	0.18 (0.47%)	0	0.31 (0.81%)	0.09 (0.23%)
2002-03	35.9 (86.55%)	4.63 (11.16%)	0.37 (0.89%)	0	0.45 (1.08%)	0.13 (0.31%)
2003-04	36.11 (84.29%)	4.37 (10.2%)	0.64 (1.49%)	0.5 (1.17%)	1 (2.33%)	0.22 (0.51%)
2004-05	37.04 (80.19%)	4.06 (8.79%)	0.86 (1.86%)	1.31 (2.84%)	2.58 (5.59%)	0.34 (0.74%)
2005-06	35.42 (85.27%)	3.82 (9.2%)	1.33 (3.2%)	0.23 (0.55%)	0.42 (1.01%)	0.32 (0.77%)
2006-07	33.74 (82.76%)	3.73 (9.15%)	1.87 (4.59%)	0.57 (1.39%)	0.53 (1.3%)	0.32 (0.78%)
2007-08	31.55 (80.06%)	3.68 (9.34%)	2.28 (5.78%)	0.87 (2.21%)	0.72 (1.83%)	0.31 (0.79%)
2008-09	29.34 (77.27%)	3.57 (9.4%)	2.73 (7.19%)	1.11 (2.92%)	0.92 (2.42%)	0.29 (0.76%)
2009-10	27.83 (75.3%)	3.5 (9.5%)	3.07 (8.31%)	1.18 (3.19%)	1.16 (3.14%)	0.22 (0.6%)
2010-11	25.22 (72.62%)	3.46 (9.96%)	3.3 (9.5%)	1.23 (3.54%)	1.28 (3.69%)	0.24 (0.69%)
2011-12	22.45 (69.79%)	3.46 (10.76%)	3.27 (10.16%)	1.23 (3.82%)	1.44 (4.48%)	0.27 (0.84%)
2012-13	20.45 (67.69%)	3.46 (11.45%)	3.28 (10.86%)	1.24 (4.1%)	1.51 (5%)	0.27 (0.89%)
2013-14	18.49 (64.88%)	3.53 (12.39%)	3.36 (11.79%)	1.24 (4.35%)	1.55 (5.44%)	0.33 (1.16%)
2014-15	16.41 (61.69%)	3.55 (13.34%)	3.41 (12.82%)	1.18 (4.44%)	1.67 (6.28%)	0.37 (1.39%)

contd. table 6

Year	*BSNL*	*MTNL*	*Bharti Airtel*	*Reliance Communications*	*Tata Teleservices*	*Others*
2015-16	14.76 (58.52%)	3.5 (13.88%)	3.66 (14.51%)	1.17 (4.64%)	1.72 (6.82%)	0.4 (1.58%)
2016-17	13.69 (56.1%)	3.46 (14.18%)	3.87 (15.86%)	1.17 (4.8%)	1.75 (7.17%)	0.46 (1.88%)
2017-18	12.27 (53.79%)	3.35 (14.68%)	3.93 (17.23%)	0.92 (4.03%)	1.88 (8.24%)	0.46 (2.02%)
2018-19	11.17 (51.47%)	3.24 (14.95%)	4.17 (19.24%)	0.73 (3.37%)	1.83 (8.42%)	0.55 (2.55%)
2019-20	8.73 (43.16%)	3.09 (15.30%)	4.39 (21.73%)	0.51 (2.50%)	1.77 (8.76%)	1.73 (8.55%)
CAGR	-6.79%	-2.11%	18.31%	0.12%	9.6%	16.83%

Source: Authors' Own Compilation

The number of wireline service providers is very limited compared to the wireless service providers due to an increased preference of subscribers for wireless phones.The wireline market is always dominated by public sector operators though their share has declined from 98.49% in 2001 to 58.46% in 2020, while the share of private sector operators has increased from a mere 1.51% to 41.54%. Only two public sector operators (DoT and MTNL) were providing wireline services in India till 2000. After 2000, BSNL was established to provide these services all over India in place of DoT. The share of BSNL is much larger in comparison to MTNL because it covers the whole of India whereas MTNL operates only in Delhi and Mumbai. In 2019-20, among private sector operators, Airtel Bharti has the largest market share (21.73%) followed by Tata Teleservices (8.76%) and Reliance Communications (2.50%).

All the private sector operators have recorded positive CAGR which means that their wireline subscribers have increased during the period 2001-2020. The highest CAGR is registered by Bharti Airtel (18.31%), followed by Tata Teleservices (9.6%) and Reliance Communications (0.12%). While BSNL and MTNL have registered negative CAGR -6.79% and -2.11% respectively implying that the number of their wireline subscribers has decreased during 2001-2020.

6. Conclusion

Over the last three decades, the Indian telecom sector has experienced substantial growth in terms of technology, penetration, as well as policy and has emerged as one of the two large growing telecom markets of Asia, next to China. This telecom revolution has led to increased demand for basic and value-added services, increased subscriber base, network expansion, growing teledensity in urban as well as rural areas, increased number of broadband and internet subscribers and higher participation of the private sector in the industry. Still, there are huge disparities in the distribution of telecom access between rural and urban areas of the country. Further, the Indian telecom market is getting

consolidated due to fierce competition among the mobile operators and now, only 4-5 major telecom players are left in the market.

Given that telecom services generate several externalities in the economy, the government should take initiatives to augment the sectoral growth and increased penetration. It should establish investor-friendly business policies and make the regulatory framework more adaptable to the fast-changing needs of the telecom sector. There is a need to create an ecosystem that encourages foreign investors to view the rural markets as an opportunity for future expansion with immense potential for sustainable revenues. Tax holidays can be given to foreign investors for establishing telecom infrastructure and providing telecom services in rural and remote areas. Special efforts through awareness programs, customized value addition, innovative marketing and pricing are required in rural areas. Also, users should view the telephone as not only a tool for communication but also a tool to impart education, entertainment and as a means to promote common interests, ideas and goals. To achieve this dream, all the stakeholders, viz. the government, telecom operators, equipment vendors and various local bodies would need to collaborate and work closely, so that the attractiveness of the Indian telecom sector to foreign firms could be maintained further and the country could benefit from the latest technological developments and attract essential finance needed for the development of the telecom industry.

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