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India report

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The World Dialogue on Regulation for Network Economies (WDR) facilitates an international dialogue to generate and disseminate new knowledge on frontier issues in regulation and governance to support the development of network economies.

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An Analysis of the Reform of India's Telecommunications Industry: Policy, Regulation and Indicators

INDIA COUNTRY REPORT: LIRNEASIA SIX COUNTRY MULTI-COMPONENT STUDY 2006-2007

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List of Acronym

ADC	Access Deficit Charge
AGR	Adjusted Gross Revenues
ARPU	Average Revenue Per User
BSOs	Basic Service Operators
BSNL	Bharat Sanchar Nigam Limited
BPO	Business Process Outsourcing
CLS	Cable Landing Stations
CPP	Calling Party Pays
COAI	Cellular Operator's Association of India
CDMA	Code Division Multiple Access
DoD	Department of Defence
DTO	Department of Telecom Operation
DTS	Department of Telecom Services
DoT	Department of Telecommunications
DTEs	Developing and Transitional Economies
DOI	Digital Opportunity Index
EBITDA	Earning before Interest Tax and Depreciation allowance
FDI	Foreign Direct Investment
GAIL	Gas Authority of India Limited
GSM	Global System of Mobile
GDP	Gross Domestic Product
GoT	Group on Telecom
HHI	Herfindahl-Hirschman Index
IMPCS	India Mobile Personal Communication System
ICTs	Information Communication Technologies
IUC	Interconnection Usage Charges
ILD	International Long Distance
ISD	International Subscriber Dialing
ITU	International Telecommunication Union
ISPs	Internet Service Providers
IT	Internet Telephony
IP II	Infrastructure Provider
ITeS	Information Technology enabled Services
LLU	Local Loop Unbundling
MTNL	Mahanagar Telephone Nigam Limited
MHz	Mega Hertz
NIXI	National Internet Exchange of India
NLD	National Long Distance
NRAs	National Regulatory Authorities
NTP	National Telecom Policy
NGN	Next Generation Networks
NLDOs	National Long Distance Operators
PGCL	Power Grid Corporation
RTIT	Rail Telecom & Information Technology
RoCE	Return on Capital Employed
RIO	Reference Interconnect Order
RDELs	Rural Direct Exchange Lines
SSAs	Secondary switching Areas
SDCA	Short Distance Charging Area
TDSAT	Telecom Dispute Settlement Appellate Tribunal
TRAI	Telecom Regulatory Authority of India
TRE	Telecom Regulatory Environment
TTO	Telecommunication Tariff Order
UNE-P	Unbundled Network Elements
UALR	Unified Access Licensing Regime
USO	Universal Service Obligation
VSNL	Videsh Sanchar Nigam Limited
VOIP	Voice over Internet Protoco;
VPTs	Village Public Telephones
VSAT	Very small Aperture Terminal
WLL	Wireless Local Loop
WPCC	Wireless Planning Coordination Committee
WISR	World Information Society Report
WPC	Wireless Planning Commission

An Analysis of the Reform of India's Telecommunications Industry: Policy, Regulation and Indicators

1. Introduction

Infrastructure industries, including telecommunications (telecom), underwent massive structural changes during the 1990s. During that decade, hundreds of privatization transactions worth billions of dollars were completed in the telecom sector in Developing and Transitional Economies (DTEs). The percentage of countries that allowed private participation into their incumbent telecommunication operator rose from 2% in 1980 to 56% in 2001 (International Telecommunication Union, ITU 2002). Simultaneously, there has been a worldwide market opening to new entrants in the mobile and the Internet segments. In the mobile market, 87% of the 201 countries included in ITU database had adopted in 2005 some degree of competition; in the Internet market, the proportion was 93%

Worldwide the privatization aspect of reforms has received considerable attention in both the popular and academic literature. Reforms in India saw very little privatization and much more of market liberalization accompanied with the introduction of new laws and regulations. Regulatory agencies and regulation have become integral components of the telecom reform process, in order to protect consumers, reassure investors and, in theory, help advance competition.

Regulations, regulators and regulated industries interact in complicated ways that in turn affect the development of the industry. In a country like India the role of the regulator is much beyond regulation of segments that are potentially monopolistic but its performance should also be measured in terms of its ability to foster competition. Studies have shown a close relationship between the nature of a regulatory regime and the investment behavior of the firms subject to that regime. Changes in regulation have often been followed by changes in investment behavior (Graeme Guthrie 2005). This aspect of the reform process requires considerable research and careful scrutiny.

This study is an attempt to fill this research lacuna and proposes to provide a comprehensive analysis of telecom sector reform in India by documenting the reform process in its institutional context, especially the role of the regulator. However, some earlier studies on the Indian telecom reform process (Chowdary 1999, 2000; Jain and Sanghi 2002; Dossani 2003) do provide a detailed coverage of the unfolding of the events in the Indian telecom industry.

This study takes the literature forward in another important respect by providing a consistent set of indicators that allow insights into the industry performance over time (from a regulatory, investment and industry point of view)[1].

The report is organized as follows. Section 2 of the report documents past policy and regulatory developments that have shaped the outcomes of the industry in terms of hard indicators for the industry. In order to monitor the performance of the Indian

[1] This report contains a subset of the indicators that will finally appear in the Six-Country Indicators Manual proposed as an output for the LIRNEasia Six-Country Multi Component Study.

telecommunications industry, it is important that a systematic set of economic indicators on this sector giving information on the number of licensed operators by type of services provided, infrastructure and investments, subscriber base, state of competition, degree of concentration of the market, broadband connectivity, tariffs, quality of service etc. are available. In this section, the description of the reform process is supported with objective data that quantify the outcomes of reform in its various dimensions.

This objective data (teledensity, market shares, level of competition in fixed as well as mobile, number of internet and broadband subscribers, price of leased line, tariffs, revenue, etc.) which are an objective measure of the impact of the regulatory process are supplemented by subjective data collected through a perception survey from a representative and informed group of respondents on the prevailing Telecom Regulatory Environment (TRE).

Section 3 of the report discusses the reform process in the context of the TRE parameters We analyze the role of the Indian regulator[2] on six broad parameters: (a) market entry; (b) access to scarce resources, mainly spectrum; (c) interconnection; (d) tariff regulation; (e) regulation of anti competitive practices; and (f) universal service obligations (USO).

Did the Indian telecom regulatory intervention inhibit or encourage investment? Was the regulatory framework adequate for the effective development of competition? In other words, how successful was regulation during the transitional stages of liberalisation in diluting the inherited strength of the incumbent, so as to mitigate potential abuse of market power and ensure that effective competition emerged? These are some of the issues that are discussed in this section in the context of the key TRE parameters identified earlier. This analysis aims at providing a perspective to the analytical description of reforms carried out in Section 2 with the help of indicators of performance.

Since the objective data is mute on the policy and regulatory environment, TRE analysis, in conjunction with analysis of indicators, provides useful insights into the driving forces of regulatory outcome. Results of the TRE survey carried over a spectrum of stakeholders of the industry are presented in this section.

We conclude this country report in Section 4, where we attempt to outline the current state of regulation and the challenges it has to overcome in creating effective competition for the new economy benefits to percolate to the population at large. There has been some discontent with the nature of the Indian telecom reform, as the gap between the urban and rural teledensity has risen. Thus, this part of the study also discusses the current policy and regulatory issues that are impinging upon competition and creating barriers to inclusive growth and replication of the urban success story in rural areas.

[2] This analysis is based on the "Telecom Regulatory Environment" (TRE) framework proposed by Samarajiva and Dokeniya (2004).

2. Performance of Indian Telecom Industry

In India, as in many other developing countries, the abysmal performance of the state-owned telecommunications service provider and the increasing need to attract capital to the upgrade the sector were the major drivers for the liberalisation of the sector. The first phase of service liberalization took place after the announcement of the National Telecom Policy-94 (NTP-94). The policy statement made it very clear that private investment will be used only to complement the department's efforts to raise additional resources. Privatization as such was clearly ruled out. Moreover, technological changes in this industry made arguments that telecom is a natural monopoly less tenable.

The end of the Indian planned economic development, lead to across-the board policy changes; the most important of which was the liberalisation of the industrial policy, in parallel with a State commitment to introduce competition in some industries that had been previously provided by government-owned monopolies. Telecom was one of them. By the early 1990s, it was clear that the problems of government failure in most infrastructure industries made the prospect of State ownership worse than the risk of market failure. Simultaneously, there emerged renewed faith in the forces of competition and the market. It was realised that, given the correct institutional foundations and properly designed mechanisms, greater reliance on competition and private investment need not be inconsistent with more equitable access. A more nuanced modern view gained acceptance to allow private provision of these services, subject to independent regulation, so as to maximize social welfare, howsoever the political process framed it.

Liberalization in telecom came to be viewed as necessary to overcome organizational inertia and to attract new investment. The transformation of the telecommunication markets in India, as elsewhere, took several dimensions- in the changing structure of demand, in the convergence of services and in the evolving structure of the industry. The two key elements defining the change in the market structure were (i) the restructuring of the government operator and (ii) the entry of private operators. Thus, there was a shift from a static, monopolistic industry that provided a single product (telephone service) to a dynamic, multi-product, multi-operator industry (see Annex 1 for the Chronology of India's Telecommunication Industry Reform: List of Policy and Regulatory Developments).

It should, however, be noted that this change in market structure took place without the privatization of the domestic incumbent service providers, BSNL and MTNL. The privatization of the overseas carrier Videsh Sanchar Nigam Limited (VSNL) in April 2002, through the strategic sale of a stake of 45% to Tatas and the government and employees retaining a stake of 26.13% and 1.97% respectively, represents the first and only instance of the government transferring control of a telecom undertaking to the private sector (Malik 2005).

The results of liberalisation have been impressive. Teledensity has increased from merely 2 percent or so in 1999 to around 12.80 percent in 2006, and is set to cross 20 percent in the next five years, beating the government's target by three years. As in many developing countries, telecom growth in India has been fuelled by wireless growth. The wireless

subscriber base has grown from 1.6 million in 1999 to 90.14 million in March 2006 and is nearly double the subscriber base of 50.18 million of fixed service users. The mobile sector grew at 72.6 percent in comparison to 8.6 percent growth in the fixed sector over the year between March 2005-06.

Figure 1: Growth of Teledensity

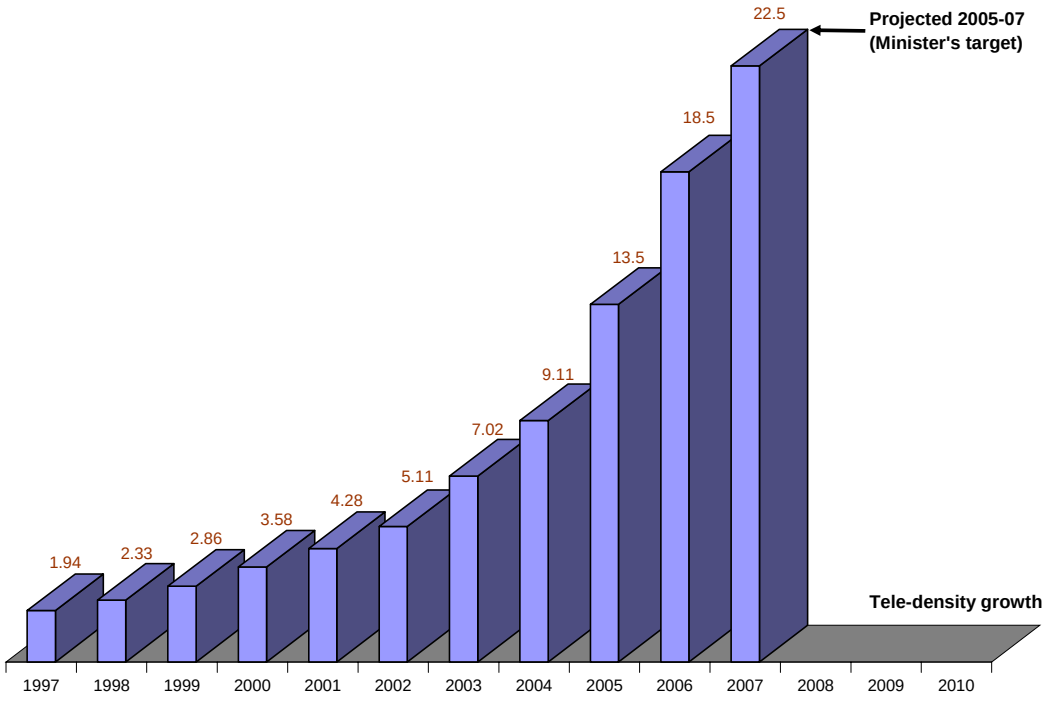
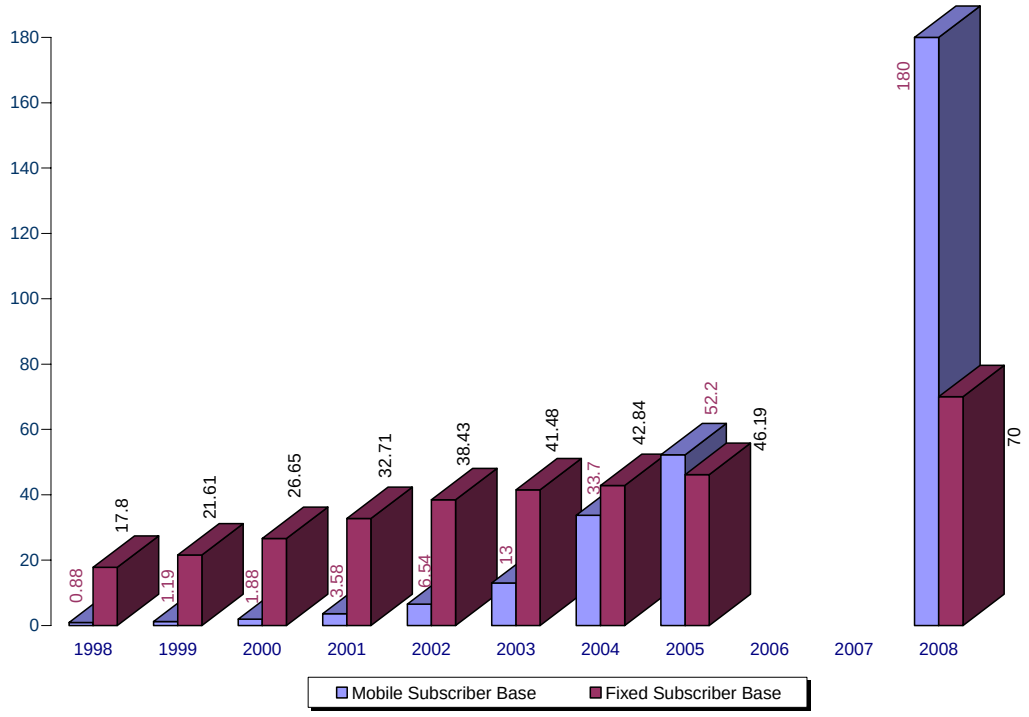


Figure 2: Subscriber Base: Fixed and Mobile



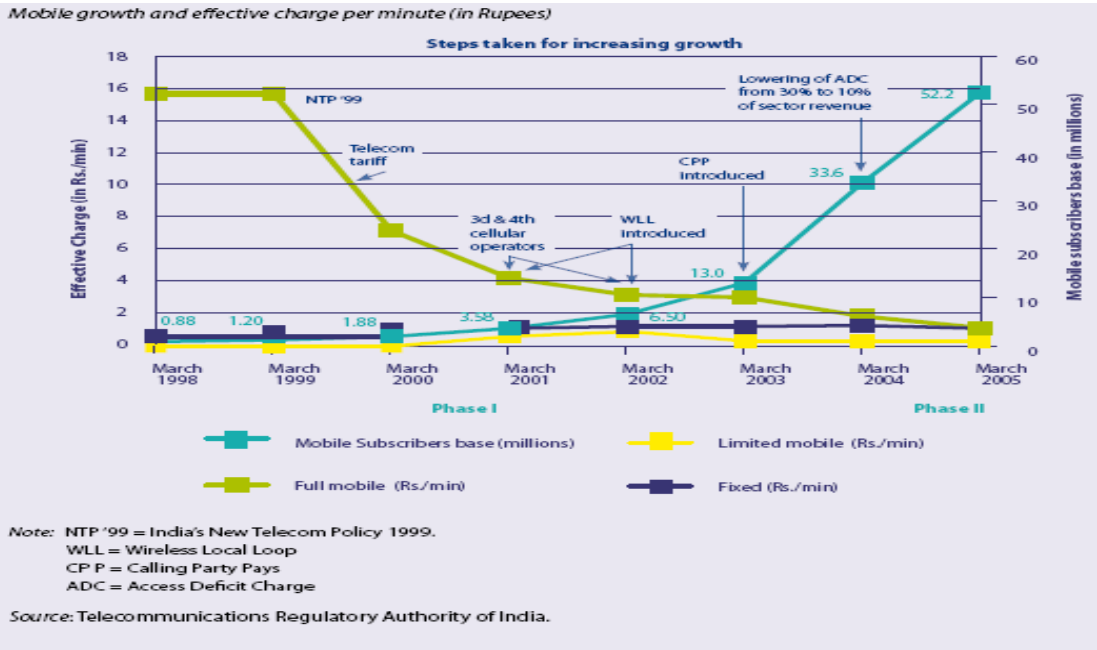
Note: For 2008, the figures are DoT projections

Figure 3 below clearly shows that the growth picked up substantially after 2003 i.e. when the mobile tariffs first started to approach fixed tariffs. Competition was the key factor driving the tariffs down, as TRAI had forborne from any tariff regulation from as early as 2003. The measures taken by TRAI to reduce tariffs through encouraging increased competition included: introduction of a Unified Access Licensing Regime; introduction of the Calling Party Pays regime; lowering of the Access Deficit Charge (ADC) from 30 percent to 10 percent of the sectoral revenue; allowing cheaper handsets to be sold at the time of delivery (with the rest of the money charged in instalments); and allowing cheaper intra-network calls, among others. The Government encouraged the process by changing high entry fee with revenue share and reducing the revenue share further in 2001 and 2003 accepting the recommendations of the regulator in this regard. (see Annex 2 for the revenue mobilised through the shift in the regime to a revenue share).

In summary, the forces driving the Indian mobile telecom growth story were:

- Tariff reductions of up to 35 percent during 2003-04, driven by fierce competition. India now offers some of the cheapest mobile tariffs in the world. Mobile growth in the years 2003-2005 has been 12 times more than mobile growth in earlier years. Between 1998-2005, while fixed lines subscriber additions amounted to just 5.09 million lines, the mobile subscriber addition was 40.36 million lines.
- The Government and the Regulator facilitated tariff reduction by various measures, such as tariff rebalancing[3] (by removing cross-subsidization of local calls from NLD and ILD rates) and the reduction in licence fee by moving to a revenue-sharing arrangement.
- IPLC charges decreased by 35% for low capacity and 70% for higher capacities.

Figure 3: Growth of the Mobile Sector: Impact of Policy and Regulatory Reforms

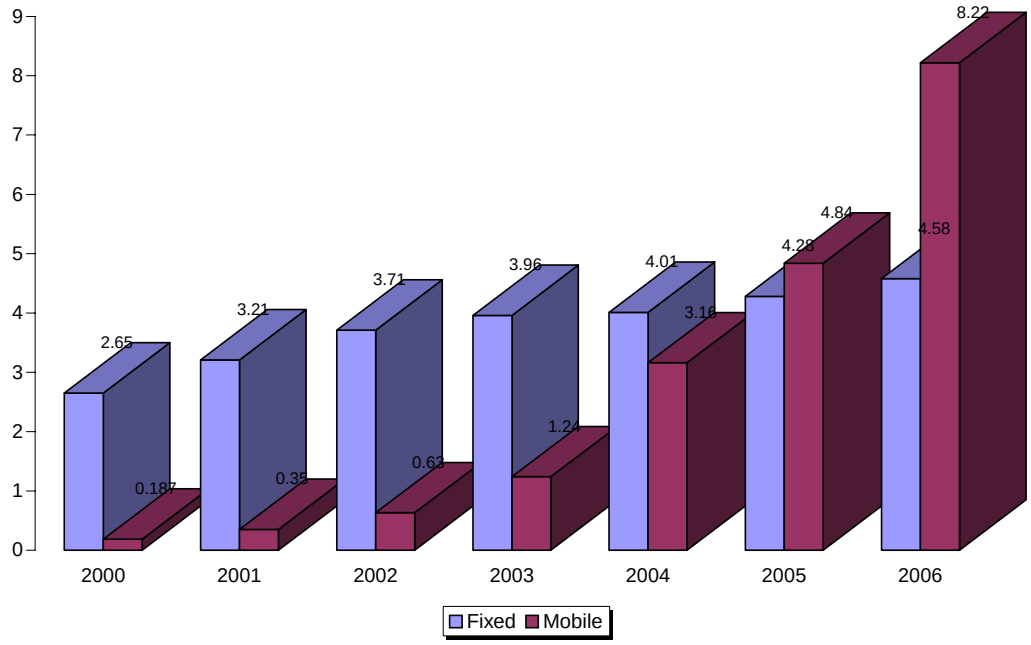


Source: TRAI, 2005 NTP: National Telecom Policy; CPP: Calling Party Pays; ADC: Access Deficit Charge

[3] Tariff rebalancing did not follow the usual RPI-X principle but went for a graded reduction

The brief description above provides a definite pointer for future direction of policy and regulation. While affordability is important what is important is that competition can deliver, and hence should be fostered by regulation and policy. Supply side response to a pro-competitive environment is evident from the fact that India has been able to double its teledensity in a period of three years.

Figure 4: Mobile and Fixed Teledensity



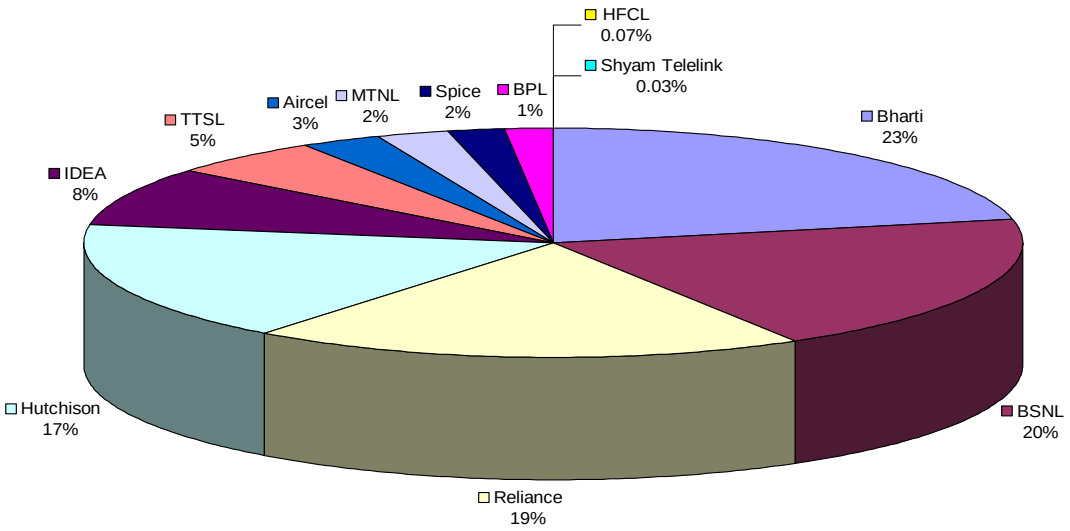
An important aspect of the Indian telecom sector is that the public sector incumbent Bharat Sanchar Nigam Limited (BSNL) still has a major market presence. This had important ramifications for both policy and regulation. Whereas the Department of Telecommunications (DoT) in its capacity of a licensor would manage competition to serve the incumbent's interest regulatory effectiveness would depend upon the monopoly power of the incumbent, and the stronger is this power, the greater is the chance of undermining regulatory independence. On the other hand the mobile industry was also exerting pressures on the regulatory system. Failure to amend policy, laws and regulatory framework to suit competition led to endless litigation between the entrants, incumbents and the regulator.

The first phase of reform was carried out without the creation of an independent regulatory authority. It has to be noted that legal and regulatory regimes were not reformed even after DoT's own committee recommended separation of operating functions from those of policy-making and regulation.[4] So in 1991, the DoT initially allowed entry into "value added" services, and treated private investment as a way to get capital for more advanced services such as cellular. However, little did it realize that its attempt to protect its turf by allowing

[4]DOT, 1992, Report of the Committee Constituted by Government of India for Review of the *Indian Telegraph Act 1885*, New Delhi, September 1992. This Committee, convened to recommend modernization of the statutory framework of telecommunications, recommended separation of operating functions from those of policy-making and regulation: "…when government itself becomes the service provider, it loses objectivity in looking after the interest of the subscribers, and loses its credibility…[as] an impartial arbiter of the quality of the service rendered…".

these marginal and fringe operations by the private players would challenge its core wireline business in due course (on account of declining costs of wireless technology). With the removal of serious constraints on the wireless business beginning from 2000 onwards and picking up in 2003, a diverse mix of public and private ownership in the Indian telecom sector has emerged (Annex 3 provides a list of cellular, fixed and unified access licencees).

Figure 5: Market Shares: Cellular Service Providers (March 31, 2006)



Source: Performance Indicators Report, March 2006, TRAI, www.trai.gov.in

However, if we look at the market shares of fixed service providers, it is quite evident that it is still public sector incumbent-dominated, with BSNL and MTNL accounting for almost 80 percent of the market. Even after so many years, private entry into the fixed services has been largely restricted to the large cities. Ironically, this is despite the fact that India has 670,000 route kms optical fibre network connecting 30,000 exchanges; of which, 27,000 are in rural areas. Backbone Optical fibre covers virtually the entire country. But due to an absence of a policy on infrastructure-sharing, the private basic service operators have resorted to (quite understandably) extending their networks mainly to high-revenue customers. This classic cherry-picking model of entry characterizes the entry process of both the mobile and the fixed sector, but in the mobile segment, competition has been more aggressive, as there was no incumbent presence at the time of entry. The absence of competition in the fixed segment has had an impact not only on voice services, but also on data services. It is not surprising therefore that broadband penetration in India remains lower than the potential (of course PC penetration is also low owing to demand side factors but the proportion of broadband to total internet subscribers is very low).

Figure 6: Market Shares: Fixed Service Providers (March 31, 2006)

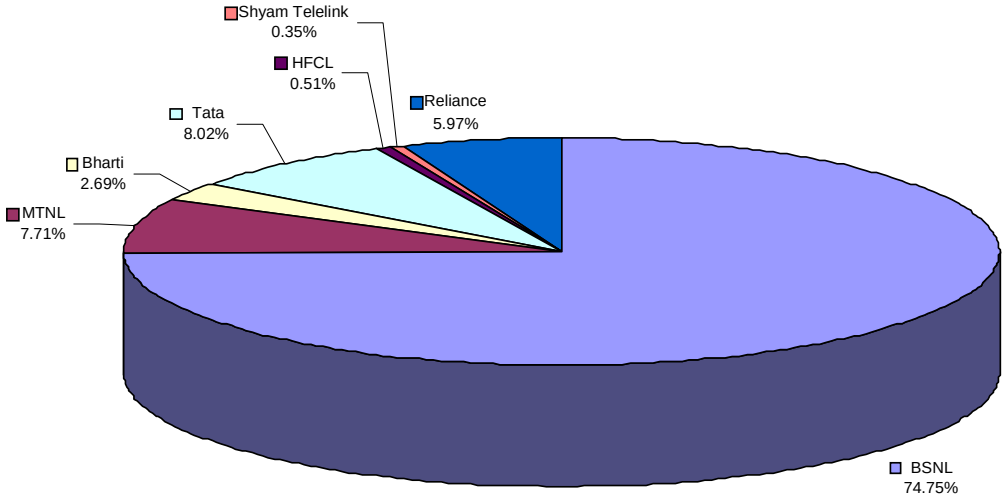


Figure 7: Market Share of Fixed Services - Urban

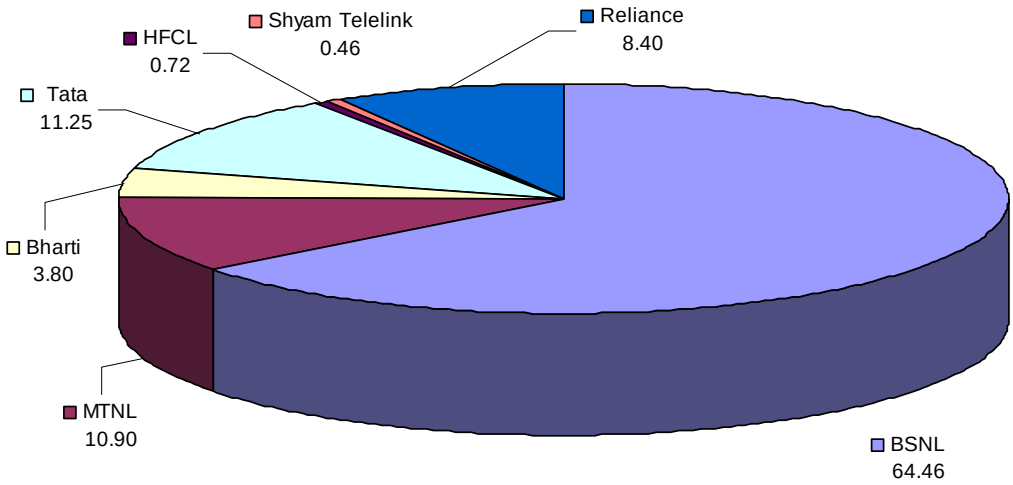


Figure 8: Market Share of Fixed Services - Rural

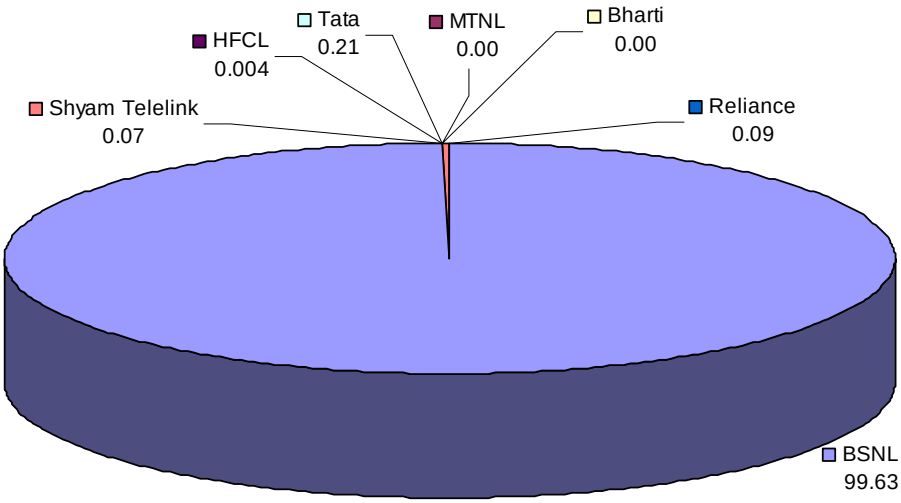
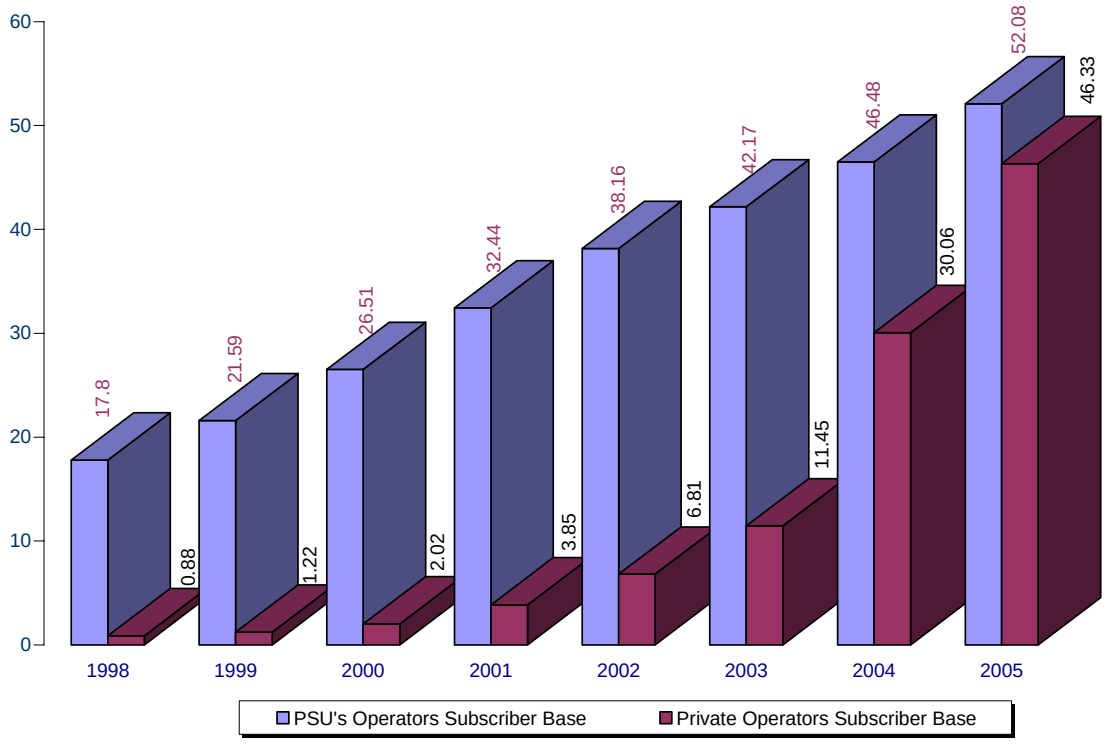


Figure 9: Operators Subscriber Base: Public versus Private



Diffusion of Broadband Telecommunications: Role of Competition

As we have demonstrated earlier, regulatory reform in the telecommunications sector aimed at introducing competition was fairly successful for certain technologies, such as mobile telecommunications as reflected by the HHI index of market concentration, it was much less so for the fixed, or wireline, network (see Annex 6 for the revenue-based HHI for the fixed and the mobile sector in India).

Regulatory and policy neglect of the fixed sector has an impact on the diffusion of broadband services, not only in India, but also in many developed countries[5]. The diffusion of access to broadband services is important due to the positive externalities offered by the adoption of such advanced technology. Broadband access can be provided via different technological platforms or types of networks. An important feature therefore is the role of the legacy telecommunications systems in place and to what extent market power derived from the legacy system can be transferred to the emerging broadband market.

The argument generally made is that competition promotes growth (ITU, 2003). Competition can be enhanced in two ways: first, through service competition on the same network facility through open access provisions; second, through facility-based competition by means of alternative local access modes. Substantial regulatory effort during the last decade has been directed towards creating the conditions for equal access: in particular, through the

[5] An international comparison in the wireline access markets shows that for most OECD countries the market share of the incumbent wireline firm is well above 90 per cent. As wireline access remains key in providing broadband services in most countries, policy-makers have to find ways to address the problem of market dominance.

unbundling of infrastructure elements for local access. Wallsten (2005) examined the impact of regulatory and policy variables, including subsidies, on the diffusion of broadband access. He finds that all measures, apart from access to rights of way, are not statistically significant.

In this section, we make some observations on the broadband policy environment in India, its constraints and policy solutions. Although Indian Government states that:

> ***India recognises '… the potential of ubiquitous broadband service in growth of GDP and enhancement in quality of life…'***

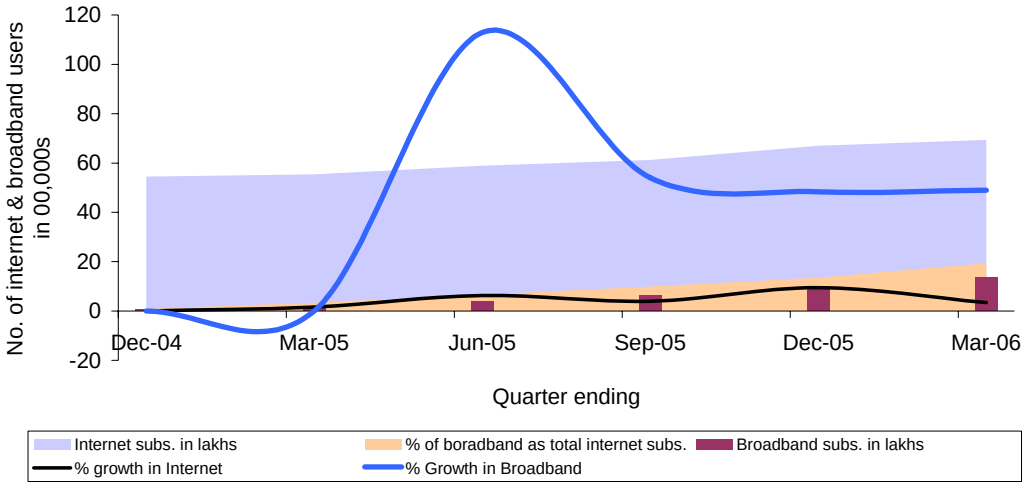
However, there is evidence to suggest that policies are not in line with the stated objective. Due to the strong position of the incumbent, competition is relatively limited and has not resulted in a faster expansion of the broadband. There are about 50 million fixed lines in India; of which, BSNL and MTNL own more than 80 per cent. The current broadband penetration stands at 1.55 million, well short of the Government target of 3 million by 2005. The broadband targets set out in the Broadband Policy 2004 are 3 million for 2005, 9 million for 2007 and 20 million for 2010. Another not so obvious but subtle target therein is that, by the end of 2005, at least 50 percent of all Internet subscribers should have been in the 'Broadband' category. However, as of December 2005 India had just under 0.9 million broadband subscribers and, as of June 2006, 1.55 million.

Table 1: Ratio of Fixed Broadband Internet subscribers to total Internet subscribers

Quarter end	Dec-04	Mar-05	Jun-05	Sep-05	Dec-05	Mar-06
Internet subscriber in (00,000s)	54.5	55.4	58.92	61.25	67.03	69.35
Broadband subscribers in (00,000s)	0.49	1.86	3.96	6.1	9.05	13.48
% of broadband of total internet subs	0.90	3.36	6.72	9.96	13.50	19.44
% Growth Q-o-Q in Internet	0	1.65	6.35	3.95	9.44	3.46
% Growth Q-o-Q in Broadband	0	0.0	112.9	54.0	48.4	49.0

Source: ISPAI

Figure 10: Comparison of quarterly growth of Internet and broadband subscribers



One major policy stumbling block in the growth of broadband services is the issue of Local Loop Unbundling (LLU). TRAI had suggested, in April 2004, non-discriminatory LLU so that the access networks of the basic service operators (BSOs) could be shared with internet service providers and other competing operators in order to improve broadband penetration. However, BSNL and MTNL view LLU as infringements on their property rights and have hence prevented the government from implementing LLU. TRAI, in its letter[6] to the Department of Telecommunication (DoT), pointed out that:

While recommending for Broadband Policy, TRAI had made many significant recommendations, a few critical ones which were not accepted which are mentioned below:-

- *Recommendations pertaining to Local Loop Unbundling*
- *Other Fiscal measures like tax concessions for Broadband equipments & services*

While framing the recommendation for Local Loop Unbundling, TRAI had detailed discussions with the incumbents (BSNL & MTNL) as well as other service providers and considered the best international practices. It was suggested in the recommendations that Local Loop owners should be given an opportunity to decide the areas where they would make their own investments for providing the broadband services and also to decide on the type of unbundling, depending on their commercial objectives. Also the local loops which were installed 5 years back only were recommended to be unbundled and those installed in last 5 years were left to be utilized by the owner themselves.

It was also suggested that, in case the broadband target is not achieved in the first year, review of above specified arrangement should be conducted. It can be observed from the current trend that the incumbents (BSNL & MTNL) are not able to make full utilization of their infrastructure themselves and neither through franchisee option provided to them through Broadband policy. Because of this, the existing local loops could not be utilized by incumbents as well as by the private operators.

Although the success rate of LLU in other countries is still under debate, in a competitive basic service market, LLU as a regulatory intervention is an instrument to discipline market power, reduce monopolistic bottlenecks and potentially to provide the way for innovative service offerings such as broadband connectivity. Most of the current broadband connections are in large cities, where private BSOs and cable operators also provide service through their own local loop. However, penetration is poor in smaller cities and outside urban areas where only government operators are providing service.

This is where LLU will have a positive impact. TRAI recommended LLU only for lines installed five years or older. LLU will not be successful if competing operators can share only older lines with longer loop lengths and poor line conditions, as these are not suitable for broadband connectivity. Pricing of unbundled local loops as set by the regulator is crucial. If the price is set too high, loop-sharing may not be attractive for competing operators. If it is too low, investment incentives are destroyed. Ideally, prices should reflect their long-run incremental cost plus a mark-up, to ensure that costs which are common to the line and other services of the incumbent carrier can be recovered.

[6] Letter dated November 3, 2005, available at www.trai.gov.in

LLU gives BSOs, especially BSNL, the opportunity to leverage on its infrastructure of 50 million copper cables. However, it can be successful only if the incumbents do not view it as a threat and competing operators sense opportunity for broadband services. In India besides BSNL/MTNL, GAIL, Rail Telecom & Information Technology & PGCL provide the broadband, optical fibre –based transmission infrastructure which may be leased by service providers at competitive prices. Licensed service providers may put up their national and international gateways and connect them with every other network.

Issues of infrastructure-sharing do not lend themselves to any "cookie-cutter" solutions and the regulator indeed has to tread carefully in these matters. Many trade-offs are involved and the final solution has to preserve the incentive structure that the regulations will produce. Our view is that it all depends on the details and on the presence of alternative infrastructures (such as cable, for example). In the US, mandatory unbundling (UNE-P) did not work as the regulators did "too much", so entrants could just sit on the incumbent's network. The European perspective is that some unbundling is necessary to create competition; however, at some stage, entrants must have their own facilities. This is sometimes referred to as the "ladder of investments", so unbundling can help new entrants move up the ladder. Unbundling is one of several tools in the policy-maker's arsenal of pro-entry policies that should finally result in facilities-based infrastructure competition (on either a wholesale or vertically-integrated basis). Once this demand is realised and facilities-based competition exists, in that case, mandatory asymmetrical unbundling should, in theory, no longer prove necessary[7]. Precautions should be taken that unbundling should not be used to create a static incumbent-centric perpetual resale model, where everybody purchases their primary input from a single monopoly provider. Unbundling can be viewed as a two-stage process. In the first stage, unbundling should be used to stimulate new alternative non-incumbent demand. In the second stage, new facilities-based entry should be encouraged to serve this consolidated demand. Unbundling in the Indian context requires to be seen in the light of its implications on last mile connectivity sharing and opening to the many Internet service providers.

Other Indicators of Performance of the Indian Telecom Industry: Financial, Investment and Employment

In the following tables, we look at the various financial dimensions of the Indian telecom industry. Table 2 outlines the ownership structure of the largest basic and mobile telecom operators in India. Table 3 presents a financial summary of the Indian telecom industry.

[7] From a transaction cost perspective, a more efficient alternative would be to impose mandatory divestiture of the incumbent's loop plant from its marketing arm, rather than imposing stringent price, conduct and structural regulation on the incumbent for infrastructure-sharing. This option may however be politically difficult.

Table 2: Initial Equity of Major Private Telecom Operators*

		Indian investors		Foreign Telecom Operators		Other foreign Investors	
		Promoter	Other	1	2	3	
Bharti	Bharti Telnet	67		33			
Bharti	Bharti Cellular	30		25	20	5	20
Birla	BACL	51		49			
BPL	BPL Mobile	49		39			12
BPL	BPL Cellular	51		49			
Escorts	Escotel Mobile	51		49			
Essar	Essar Commvision	51		10			39
Essar	Aircel Digilink	60		30	10		
HFCL	Fascel	43	11	16			
Hutchison	Hutchison Max	51		24.5	24.5		
Hutchison	Hutchison Essar south	51		49			
Ispat	Hughes Telecom	51		49			
Modi	Spice Communications	51		39	10		
Modi	Modi Telstra	50		50			
Parasrampuria	J.T. Mobile	51		26	13	10	
Jhavar	Koshika Telecom	66		34			
Jhavar	Usha Martin Telecom	61		39			
Reliance	Reliance Infocomm	100					
Reliance	Reliance Telecom	90		10			
RPG	RPG Cellcom	51		49			
RPG	RPG Cellular	50		37			13
Shyam	Hexacom	40	30	10	10		10
Sterling	Sterling Cellular	51		30	10		9
Sterling	Srinivas Cellcom	51		10			39
Tata	Tata Teleservices	51		39			10
Tata	Tata Cellular	51		39			10
Thapar	Skycell	51		24.5			24.5

Notes: * All figures in percent.

a. Bharti Cellular initially had a cellular licence for Delhi metro and did not to have majority Indian equity.

b. PL Cellular initially had a cellular licence for Bombay metro and did not to have majority Indian equity.

Source: India's Telecommunications Industry, Ashok V. Desai, p-93

Table 3: Financial Summary of the Indian Telecom Industry

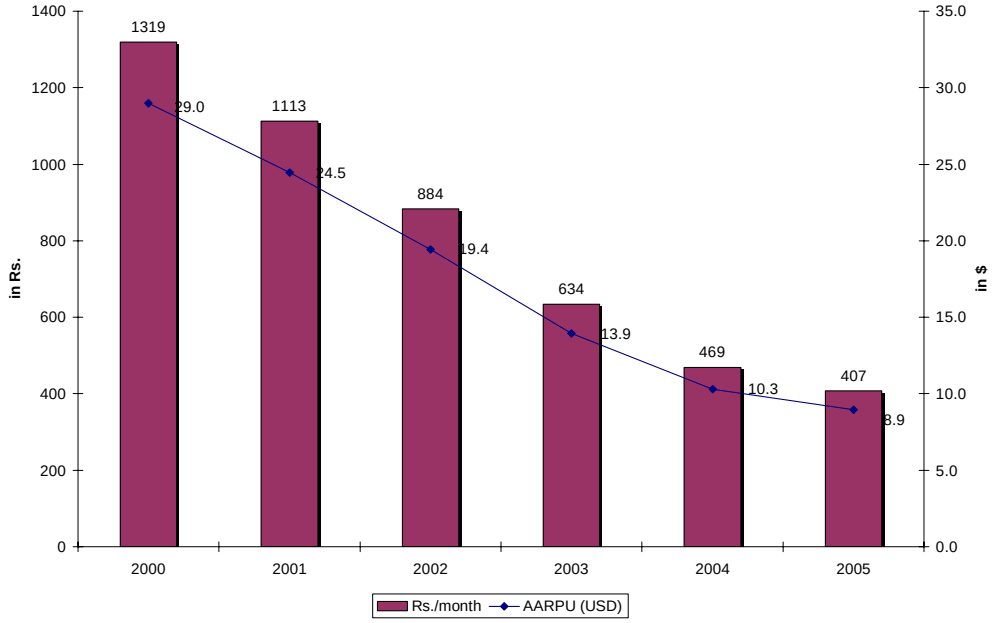
Indicator	2004-05	2005-06
Total Revenue (Rs. billion)	716.7373	867.1955
Contribution of Govt. Companies	421.7420 (59%)	452.3298 (52%)
Contribution of Pvt. Companies	294.9953 (41%)	414. 8657(48%)
Total EBITDA (Rs.billion)	267.8570	301.3792
Govt. Companies EBITDA	186.1320	187.0912
Pvt. Companies EBITDA	81.7249	114.2880
Capital Investment (Gross Block)	1788.31	2006.66
Govt. Companies	66%	64%
Pvt. Companies	34%	36%
Capital employed	1538.64	1700.87
Pvt. Sector		658.56
Return on Capital Employed (RoCE)	599.25	7.82%

Indicator	2004-05	2005-06
Cumulative FDI in Telecom (Rs. Billion till Jan 2006) (Percentage of total FDI)	113.13 (8.3)	122.18 (7.8)
Gross Domestic Product (Rs. billion)at factor cost) Current Prices	28439	32006
Share of Telecom sector to GDP	2.52%	2.71%
Total Employees of Telecom Companies	436891	429400
Govt. Companies	394334	382105
Pvt. Companies	42557	47295
Subscribers per Employee at year end		
Govt. Companies	132	158
Pvt.Companies	1089	1678

Source: TRAI, The Indian Telecom Services Performance Indicators for Financial Year Ending 31st March 2006.

The following figure shows that recently, the ARPU for the mobile operators has continuously declined.

Figure 11: ARPU per subscriber per month (mobile)

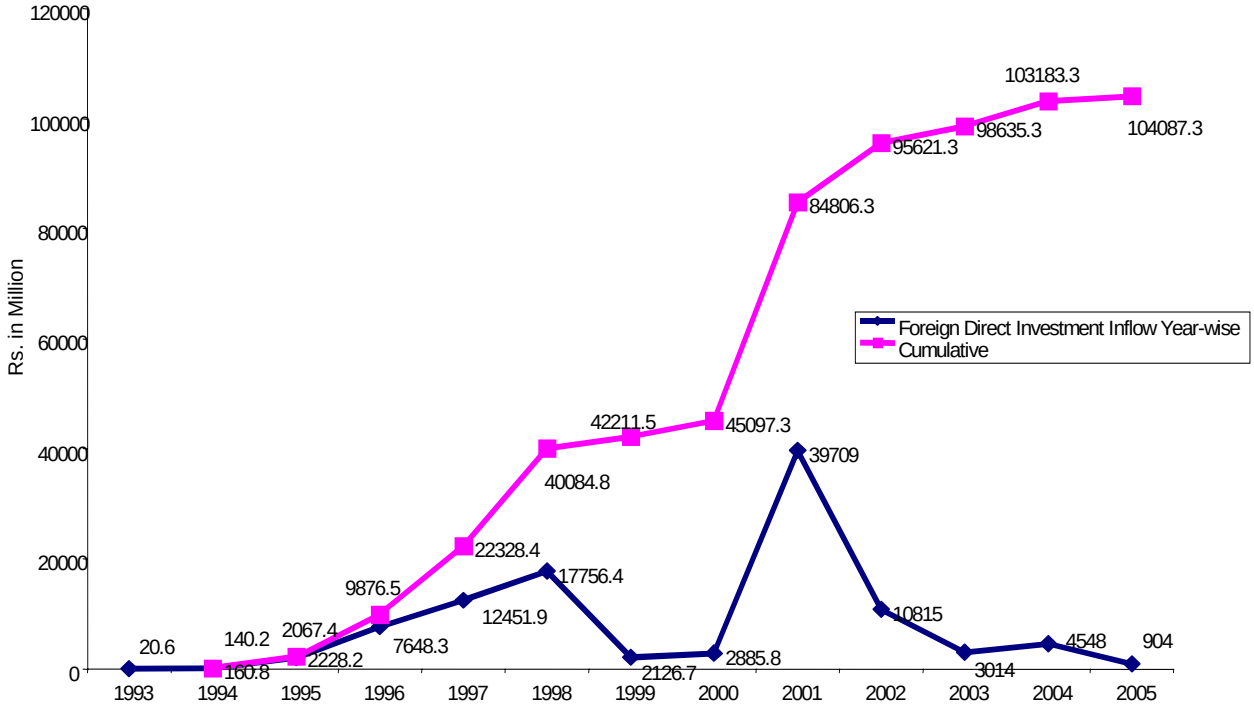


Source: TRAI

The following chart provides the details of yearly and cumulative Foreign Direct Investment (FDI) inflows into the sector. FDI gathered momentum after the introduction of the National Telecom Policy of 1994, when competition was announced in basic telecom services. Investors hoped that the regulatory framework would improve, despite the government's favouritism towards incumbent service providers, and the difficulties associated with the establishment of the Telecom Regulatory Authority of India (TRAI) in 1997. The first severe crisis of investment occurred in 1998, when it became clear that the powers of the Indian regulator (TRAI) were inadequate to check the anti-competitive behaviour of the government-owned service provider, Mahanagar Telephone Nigam Limited (MTNL). The Government responded to this crisis by articulating the New Telecom Policy (NTP) of 1999. It empowered the regulator by enacting the TRAI Act of 2000 and by setting up the Telecom Dispute Settlement Appellate Tribunal (TDSAT). National long distance services were

opened up to competition in 2000 and the Department of Telecom Services was corporatised into the government-owned Bharat Sanchar Nigam Limited (BSNL) in the same year. These institutional and regulatory changes explain the surge in investor confidence between 2000 and 2003 (Athreya, 1996, 11-22; Gupta, 2002, 1779-1780; Dokeniya, 1999, 105-128; Mukherji, 2004, 284-289).

Figure 12: Foreign Direct Investment Inflow (August, 1993 to 2005)



Source: DoT, www.dot.nic.in

Reforms and the Digital Opportunity

The Digital Opportunity Index (DOI) is structured around three categories: opportunity, infrastructure and utilisation. The indicators considered in the opportunity category are (a) percentage of population covered by mobile cellular telephony; (b) internet access tariffs as a percentage of per capita income; (c) mobile cellular tariffs as a percentage of per capita income. In the infrastructure category the indicators are (a) proportion of households with fixed line telephone; (b) proportion of households with computers; (c) proportion of households with internet access at home; (d) mobile cellular subscribers per 100 inhabitants; and (e) mobile internet subscribers per 100 inhabitants. Indicators included in the utilisation category are (a) proportion of individuals that used the internet; (b) ratio of fixed broadband subscribers to total internet subscribers; and (c) ratio of mobile broadband subscribers to total mobile subscribers.

DOI Indicator	DOI Score	Disaggregated DOI
Percentage of population covered by mobile cellular telephony	0.600[8]	**Opportunity Index:** 0.801; Rank: 110 **Infrastructure :** 0.044; Rank: 139 **Utilization:** 0.038; Rank:93 **DOI:** 0.294; Rank: 119.000 **Mopp:** 0.768 **Minfra:** 0.023 Mobile DOI: 0.263; Rank: 124 **Mutilization:** 0.000 **Fopp:** 0.869 **Finfra:** 0.058 Fixed DOI: 0.328; Rank: 112 **Futilization:** 0.056
Mobile cellular tariffs as a percentage of per capita income	0.935	
Internet access tariffs as a percentage of per capita income	0.869	
Proportion of households with a fixed line telephone	0.103	
Mobile cellular subscribers per 100 inhabitants	0.045	
Proportion of households with Internet access at home	0.023	
Mobile Internet subscribers per 100 inhabitants	0.000	
Proportion of households with a computer	0.048	
Internet users per 100 inhabitants	0.023	
Ratio of Fixed Broadband Internet subscribers to total Internet subscribers	0.090	
Ratio of Mobile Broadband Internet subscribers to mobile Internet subscribers	0.000	

Source: ITU data on DOI

As pointed out in the WISR 2006, it is instructive for policy purposes to look at the different components of India's DOI score. A high opportunity sub-index is a result of the policy and regulatory environment that increased mobile coverage and reduced tariffs. However, it is also the same policy and regulatory environment that is impinging upon the Infrastructure component of DOI (where India falls to 139th position). India's low infrastructure component ranking dilutes its gains in the opportunity and utilization sub-indices.

One important indicator of the infrastructure is the mobile teledensity. The mobile network is virtually absent in villages: even in towns, it covered only 275 million people or about two-thirds of the town-residents of 1,700 out of a total 5200. According to TRAI by December 2005, mobile coverage was covering 400 million or less than 40 percent of the population. Some simple calculations reveal that this skewed distribution implies that for a few privileged towns there are almost two mobiles per household. This skewed distribution of telephones makes the figures of teledensity that the government publishes as a policy objective highly misleading. Average teledensity ignores the concentration of telephones in urban areas and averages out their spread across population. Even in urban areas, mobile growth is concentrated in the metropolitan cities and a few states (see Annex 4 for state differences in mobile and fixed teledensity, as well as state differences in rural and urban teledensity).

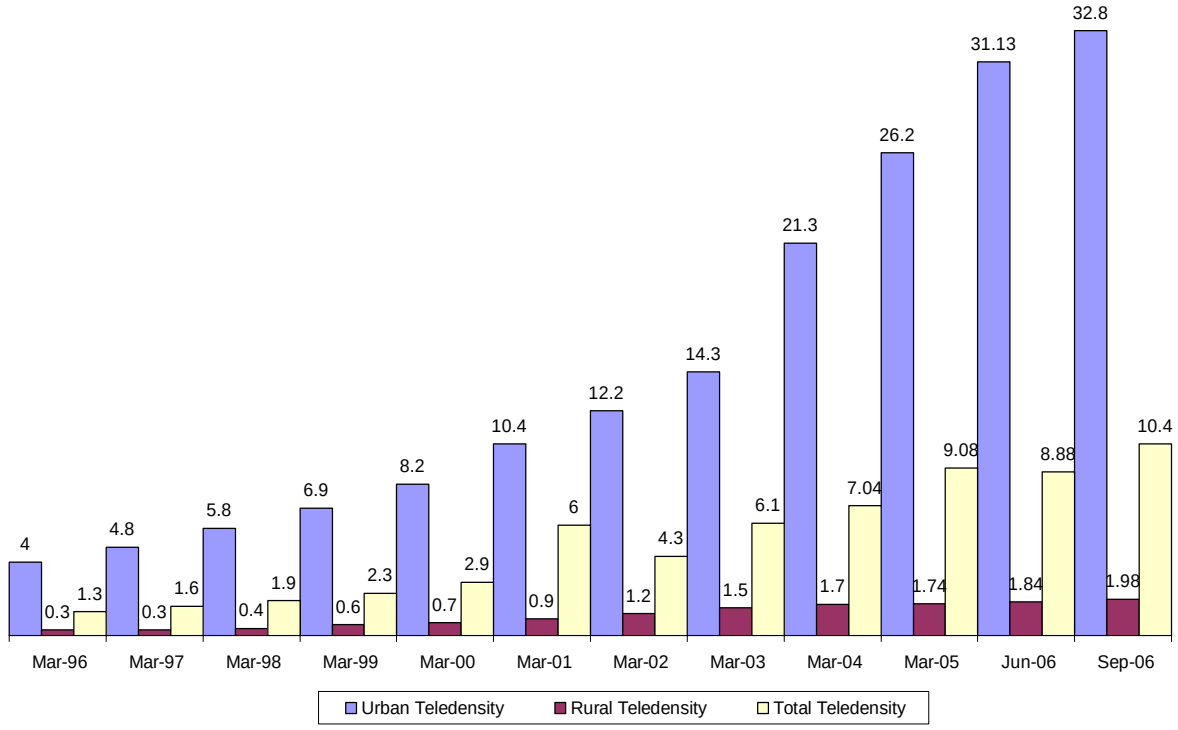
Thus, while China, Brazil and Indonesia are all medium-DOI countries, India is not. Ironically, an inefficient Universal Service Policy is inhibiting the expansion of mobile infrastructure to the unserved rural areas. However, TRAI recognises that corrective policy

[8] TRAI/COAI estimate for this indicator are however much lower. For the year ending 2005, TRAI at the NCAER-NBER conference presented a paper entitled "Chinese Growth-Chinese numbers", which cited the population coverage of cellular mobile in India at 25-30 percent. The present coverage is estimated to be around 40 percent.

measures especially in the Universal Service policy have to be implemented, if growth momentum is to be maintained.

We analyse the policy and regulatory impediments that are preventing India from attaining a higher DOI and that are major constraints to sustained growth in the final section of the report. We have to move beyond aggregate indicators to see what holds India in climbing up the DOI ladder. This analysis provides some pointers to the future course of policy and regulatory reforms. One obvious conclusion is that the mobile success story has yet to move beyond urban clusters to the hinterland.

Figure 13: Widening Gap between the Rural and Urban Tele-density in India



Source: TRAI

3. Analysis of Reform through the Prism of Telecom Regulatory Environment

Worldwide National Regulatory Authorities (NRAs) have been created in order to ensure a successful transition towards competitive markets, to regulate and supervise the relations between incumbents and new entrants, which initially dependent on incumbents' services. To maintain impartiality and credibility in contexts where the incumbent has traditionally been state-owned and state-privileged, the regulator has the job of curtailing anti-competitive practices (such as the abuse of monopoly power through e.g. high interconnection charges to the incumbent's fixed infrastructure), whilst working towards public goals such as universal service provision.

It has been argued that policy-makers need to increase the credibility of regulatory commitments in order to encourage new investors to enter the market (Levy and Spiller, 1996; Majone, 2001). Accordingly, both theoretical and empirical works have emphasised

that the government's commitment not to interfere with property rights is crucial for attracting long term investments and developing sustainable growth levels (Henisz, 2002).

According to the New European Regulatory Framework, one of the main tasks required from the NRAs is to promote efficient investment and innovation in the field. Regarding these features, Nicoletti and Scarpetta (2005) have recently underlined how countries with restricted public ownership in telecom and few barriers to entry have experienced improving productivity, compared with countries where regulation has limited competition and public firms are prevalent. In India, however, public firms play a very important role and hence the most striking feature of the Indian regulatory system is the relationship between the government and the regulator.

Before we examine the TRE on the six broad parameters outlined in the introduction of the report it is insightful to understand the structure of Indian telecom regulation. Desai's (2003) comments on the reform programme are useful in understanding the complex institutional context of the Indian telecom sector:

The reform of the Indian telecom sector has been an amalgam of regulation, administrative intervention and political decision. The interplay of forces has increased regulatory uncertainty, introduced political forms of competition, and favoured or disfavoured particular players. That is not a good legacy if what is looked for is vigorous, fair competition unaffected by arbitrary official interference.

Unlike the European countries, where the setting up of an independent regulator preceded the opening up of the market, in India, there was a reversal of sequence and an independent statutory regulator came into being later[9]. TRAI did not exist during the first three years of operation of private telecom companies. Until TRAI was set up in 1997, DoT was supposed to be the regulator. Thus, the government's reluctance in the first round of reforms to break the dominance of DoT and to overhaul the legal and regulatory regime led to endless litigation, which delayed the effective start of the liberalisation process for almost a decade. Between 1997 and 1999, TRAI's effectiveness was severely constrained by DoT's successful litigation against it. It was only after the New Telecom Policy of 1999 (NTP-99) and the amendments to the TRAI Act of 2000 that TRAI became truly effective. However, effective it may be, it functions within and shares its regulatory function with the judicial and administrative system. Telephone operators use and are subject to the entire regulatory system (Desai 2006).

Regulatory Structure

The Telecom Regulatory Authority of India (TRAI) was established in January 1997 through an Act of Parliament. The creation of TRAI should have led to a redefinition of the role of Telecom commission and DoT, but this was not done satisfactorily. TRAI was neither given power to issue licences nor allowed to set standards and allocate spectrum. Over the

[9] ICICI's *Report on the Telecom Regulatory Body for India* of January 1994 was a competent translation of the regulatory state of the art into the Indian context. The report noted at page 4 that " The existing scenario in India with new private entrants approved … already calls for an independent body to effectively arbitrate crucial operational and techo-commercial issues" and echoed the DOT committee's argument as to the necessary separation of the regulatory separation of the regulatory and operating roles of the government in telecom.

following years, DoT and TRAI became tangled in court cases and the role and credibility of the regulator was seriously undermined in the process.

In January 2000, the government of India issued an amendment ordinance, which led to major changes in the institutional structure of TRAI. TRAI was split into two agencies, a "new" TRAI, divested of all its adjudicatory and dispute-settling powers, and a newly created agency named Telecommunications Dispute Settlement and Appellate Tribunal (TDSAT). This institutional change was brought about by an inter-ministerial group, the Group on Telecom (GoT) .

The successor TRAI has been further strengthened by three specific mandatory powers: that it should deal with tariff fixation; fixing of interconnectivity charges; and laying down standards for service and technology. In addition, it became mandatory for the government to seek the opinion of TRAI on the need for and timing of entry of new service providers, although its recommendations are not binding.

The TDSAT was empowered to adjudicate disputes between the licensor and licencee, between two or more service providers and between a service provider and a group of consumers. It was also an appellate authority with respect to any direction, decisions, and orders of TRAI. However, cases involving questions of monopoly and consumer grievance redress by individual consumers are outside this body's jurisdiction. Decisions of TDSAT can be appealed only to the Supreme Court of India.

Table 4: Regulatory structure of the Indian telecom sector

Regulatory Body	Function	Comment
DOT- Department of Telecom	Licensing, Licence fee, frequency management of telecom sector	Policy-making and enforcing body
Telecom Commission	Executive and policy-making function of ministry	Part of DOT
WPC- Wireless Planning Commission	The national radio regulatory authority responsible for spectrum management, including licensing. Caters for the needs of all wireless users in the country, government or private, security or non security	Country's spectrum management
GOT-IT- Group on Telecom and IT	Decides on ad-hoc issues depending on the immediate needs	Prime Minister's council
TRAI - Telecom Regulatory Authority of India	Regulating, issuing directions and settlement of disputes between various service providers. Mandatory for DOT to seek recommendation of TRAI in respect of specified matters and then setting up separate dispute settlement mechanism. Also has the power to call for any information, conduct investigations and to issue directions (directives)	Day to day management of sector
TDSAT- Telecom Dispute Settlement Appellate Tribunal	To adjudicate any dispute: (1) between a licensor and a Licencee (2) between two or more service providers (3) between a service provider and a group of consumers	Dispute settlement body

Market entry

Prior to 1991, telecommunications services and products were provided by a state-owned monopoly that was a division of the Department of Telecommunications, itself an arm of the Ministry of Communications. When private service provision was first contemplated in July 1992, the policy-maker's goal was not to allow competition in basic services, but instead to supplement basic services by allowing private providers to offer premium services at higher prices (such as mobile services). Telecom licences were auctioned for basic and cellular services by the Department of Telecom (DoT), the incumbent government policy-maker, regulator and service provider until January 1995. The same tired old Indian *Telegraph Act of 1885*, which governed telecommunications services under the colonial PTT model, was left in place to cope with the competitive era. Thus, DOT along with the Ministry of Communications, became responsible for issuing licenses to its own competitors.

Prior to the auction, no ceiling on the number of circles that could be awarded to a single entity had been specified. Subsequent to the receipt of the bids for basic services, it was found that a single firm had overbid and won nine circles. Speculation regarding its ability to pay the licence amount in all the circles led to an offer by the government to "choose" three circles. The government could have settled for re-bidding, but it did not do so, in the fear that it may lead to loss of investor confidence. By allowing the firm to choose and not letting it withdraw on its own, the government lost the minimum reserve price that such withdrawals would have generated as per the bidding conditions. Five circles received extremely low and single bids and subsequently 15 circles were put up for re-bidding with the government specifying a reserve price. There was a poor response and nine circles remained without any service providers. Finally, only six providers signed the licence agreement for the provision of basic services for the service areas of Andhra Pradesh, Gujarat, Madhya Pradesh, Punjab, Rajasthan and Maharashtra.

In cellular services, duopoly was introduced through a bidding process and forty-two licences were awarded. Despite fewer problems with the award of cellular licences, services were slow to take off due to high bids, slow frequency allocation and the lack of a suitable framework for managing interconnection arrangements (Jain, 2001).

The revenue earned by the state through licence fees and other charges on private providers was to be used to fulfil the state-owned incumbent's investment and rollout targets. Licences were issued to those who bid the highest up-front fees. The intention was to create at least two viable service providers in each circle of operation (each circle being contiguous with individual states, in addition to the four metros). However, the concept of private service provision suffered a serious setback when none of the mobile service licencees, as well as private basic service licencees, were able to pay the fees that they had bid, due to overbidding.

In the licence auction system in 1995-96, the mobile operators had bid for high licence fee and the initial peak tariffs were fixed at more than Rs 16 per minute for both incoming and outgoing calls. Thus, one of the major tools of competition (i.e. the price) was preordained on two accounts (a) the operators had bid on licence fees and not on prices and hence in their exuberance to get the licence the bids were unrealistic (b) to recover these high licence

fees, they had to accept the high tariffs as that was the only way that they could recover their costs.

However, very soon, it was realised that with these tariffs, there would be no growth and a number of companies would go bankrupt. Both cellular and basic service operators had committed to unrealistic licence fees and were struggling to survive in the Indian market. They owed almost $873 million to the government towards their outstanding licence fees.

The government issued the New Telecom Policy in 1999 (NTP-99). NTP-99 tried to redress the problems of this false start to liberalisation. The theme of NTP-99 was to usher in full competition through unrestricted private entry in almost all service sectors, unless restricted by spectrum availability, under the aegis of a strong regulator. It provided for a new beginning, with the government at the centre, committed to the implementation of this policy.

A key fallout of NTP-99 was the development of a migration package, according to which, all fixed service providers would pay their licence dues as of 31 July 1999 as a one-time entry fee, as well as a stipulated percentage of their revenue as licence fee over the period of their licencse. Both cellular and basic service operators were required to pay a licence fee at 12% of adjusted gross revenues (AGR) in metropolitan areas and category A circles, 10% in category B circles and 8% in category C circles[10]. So under NTP-99, they were allowed to migrate from the earlier fixed licence regime to revenue-sharing of licencee revenues, while duopoly rights were discontinued. As a result of this policy, the government decided to reduce mobile operators' licence fees from USD 59 billion to USD 1.5 billion and converted the regime onto a revenue-sharing basis. The regulatory intervention in this regard brought some stability and operators (both basic and cellular) agreed to migrate to the new regime.

The licensing of telecom service providers was the instrument of telecom market liberalization in the first phase of Indian telecom reforms. The licences defined the geographical scope and limitations for using technologies and providing services, and required payments to the government for the privileges associated with the licence. Although the licensing process has been a mechanism for liberalising markets, it has also been a key mechanism for controlling and restricting entry and raising large amounts of money through licence fees (See Annex 3 for the licence fee paid by the operators under the old and the new licensing regime).

On 13 August 2000, the government announced the opening up of domestic long distance to the private sector, ending the monopoly of the DoT. Under NTP-99, the private sector was allowed to provide NLD and international long distance ILD voice services, with no limits placed on the number of participants. Wireless-in-local-loop (WLL)-based limited mobility was allowed for private basic service providers. Data services were fully opened to the private sector. Cellular service providers were permitted to carry their own long distance traffic within their service area (earlier operators had to pay charges for carrying calls on the

[10] Further concessions were provided in 2003 at the time of the introduction of the UASL (Unified Access Service Licence), which included a reduction of revenue shares by 2 per cent for all players and a further concession of 2 per cent for those cellular players which had entered the field in the first round of bidding for higher license fees.

DoT network within the same circle too). The duopoly in cellular service was broken to allow for unlimited competition and public sector entities entered as third cellular operator in their respective circles. This essentially meant that BSNL had licences to operate nation-wide other than in the two metros, where MTNL was operating.

In January 2001, the Government announced guidelines for the fourth cellular operator to provide cellular services in the country and the licences were issued in September 2001 through a revised three-round open bidding system, instead of the earlier sealed bid system. Thus, while the initial auctions resulted in perverse outcomes with respect to market entry, the design of the fourth cellular licence was extremely efficient.

The regulatory environment prior to NTP-99 with regards to market entry was extremely ad-hoc and non conducive for the operators to roll out their investment plans. In early 1999, Indian telecommunications reform was on the verge of a disaster. The independent regulator had been declared to have no authority over the prices and entry decisions of the public sector[11] and DoT had made a series of decisions that were bankrupting the private entrants and thereby re-monopolizing the industry. The TRAI Act of 1997 had in principle given clear powers to TRAI to give directions to operators and adjudicate disputes between them. DoT had contested these powers in the court on many occasions and in most of the cases, it won decisions in its favour. All this made initial investors wary, as DoT, with the help of legal intervention, escaped regulatory oversight.

TRAI was not given the responsibility to issue and revoke licenses, but only to recommend them. However, under the NTP-99 framework, assurances were given that TRAI should be consulted on issues of number of competitors and the timing of their entry. It was given responsibility for fixing tariffs and resolving disputes. The DoT surrendered its regulatory role in principle, although it still retained policy-making, licensing, and operative powers within the same organisational boundaries. Nevertheless, DoT was unwilling to relinquish its dominant position and was uneasy with an outside body stemming its arbitrary powers. While the NTP-99 and regulatory recommendations of transferring to a revenue-sharing regime rescued the private operators and restructured their license agreements, it did not succeed in strengthening TRAI.

In 1999, a disagreement between the TRAI and the government led to the reconstitution of TRAI. Independence of regulation requires that the decisions of regulators do not need the approval of elected political officials, and that the regulator cannot be removed from office solely because a decision is unpopular with a minister or the legislature. This is precisely what happened in India.

On the initiative of an interministerial GoT-IT and in the interests of convergence, the government issued an ordinance in January 2000, to amend the TRAI Act. Through this ordinance, it dismissed all the members of the then TRAI, and made way for appointment of new members. It took away the arbitration powers of the TRAI, which was the first arbitrator in telecom disputes. Further, it wiped out the jurisdiction of the Delhi High Court

[11] The November 1997 MTNL decision to start CDMA-based cellular services, without the government seeking recommendation from TRAI on issuing new license. This led to legal battles that seriously undermined the power of the regulator and in October 1999, MTNL went ahead with the cellular service, without even seeking TRAI's approval on tariffs.

in matters relating to telecom. Last, it made it obligatory on the part of the government to consult TRAI on the issue of new licences.

Some analysts (Desai, 2004) argue that this amendment removed the basis of the conflicts between DoT and TRAI. DoT was now under the directive power of TRAI and it could no longer seek the protection of the Delhi High Court in any matter that it was not decided in its favour. The legal recourse by DoT had in many instances undermined the TRAI authority. Despite this rationale, there were suspicions about the government and some loss of credibility. Telecom reforms, however, continued with private entry into domestic long distance (freed up in 2000-1) and into international long distance (freed up in 2002-3).

Licensing affects the nature of competition and the resulting market structure. This was demonstrated in the WLL (Wireless in Local Loop) and cellular licence standoff. Ignoring the technological capability of WLL, it was licensed to provide local mobility. A situation emerged where two types of service providers, licensed under very different licensing regimes, had started to compete with each other in the mobile wireless market. On the one hand, cellular mobile operators held licences that required them to pay substantial licence fees and to use GSM technology. Meanwhile, subsequently licensed classes of service providers called 'Basic Service Operators' were permitted to use copper wireline technologies or CDMA wireless technologies. They were charged much lower licence fees than the original cellular licencees. Yet their licence conditions allowed them to provide 'limited mobility", effectively allowing them to compete with the cellular licencees. Artificial restrictions on full mobility encouraged service providers to find loopholes in the licensing regime and they tended to use technology to bypass such restrictions.

This led to an obvious need for convergence – since two types of service providers competed in the same market, but had very different licence conditions and TRAI facilitated the Unified access regime, so that the licensing regime did not come in the way of technological developments. TRAI provided its recommendations to the Government on 27th October 2003, which were accepted on 11th November 2003. The objective of the Unified Licensing/Authorisation Regime was to be achieved in a two-stage process with the Unified Access Regime for Basic and Cellular Services being implemented in the first phase. This was to be followed up with a process to define the guidelines and rules for a fully Unified Licence/Authorization Regime. For this regime, TRAI identified four categories of licences in its recommendations to the government on January 13, 2005 as follows:

(a) Unified Licence or all-inclusive licence.

(b) Licensing through Authorization, which included provision of passive infrastructure and bandwidth services, like Radio Paging, PMRTS and Internet Services, but not general internet telephony.

(c) Class Licence which include 'niche" operators providing services in SDCAs where rural teledensity is below 1% and all services other than under 'Licensing through Authorization', which do not have both-way connectivity with Public network e.g. VSAT.

(d) All Stand Alone Broadcasting and Cable licences.

However, DoT did not follow the TRAI recommendations on Unified Licensing. Instead, it liberalized the market entry process by reducing the entry fee into the NLD and the ILD from the existing level of USD 21 million (USD 5.5 million for ILD) to USD 0.5. Likewise, the Annual licence fee for NLD licences is to be reduced from the existing level of 15 percent to 6 percent of AGR w.e.f. 1.1.2006.

Moreover, according to the new guidelines, NLD service providers can access the subscribers directly for provision of leased circuits/closed user groups i.e. they can provide last mile connectivity. Access service providers can provide Internet telephony, Internet services and Broadband services. If required, access service providers can also use the network of NLD/ILD service licencee.

The Government has decided to do away with IP II and IPVPN licences. Existing IP-II/ IP-VPN licencees will be allowed to migrate to NLD/ILD service licence. The access providers can provide broadband services including triple play i.e. voice, video & data. ISPs can provide, as per the terms and conditions of their licence, only Internet Access/Internet Content Services whereby the Internet has been defined as a global information system logically linked by a globally unique address based on IP or its subsequent enhancement or upgrade. ISPs are not allowed to provide content services on a managed network (virtual/real) not derived from Internet.

Thus, a host of service licences still exist within the liberalization of the ILD and NLD sector. By allowing for internet services and internet telephony to be provided by the unified access providers, the government has been successful in opening up the sector.

The unification process will be completed only when DoT removes all service-based licenses and brings them under a single umbrella of unified license. The current market entry procedure ignores the technological possibilities opened up due to convergence.

Scarce Resources

While wireless has significantly accelerated the growth of teledensity, it has also raised the requirement for spectrum significantly. This has required governments and regulatory authorities to examine the issues linked with the adequacy of spectrum, the procedure for allocation of this scarce resource and the consequent requirements to build technical and economic frameworks that promote its efficient utilisation. How well was this scarce resource allocated and was the allocation principle efficient? It is the efficiency of this allocation that provides a litmus test for the regulator's performance. This is because, with the liberalization of the telecom sector, regulation of scarce resources such as spectrum has shifted from it being purely an issue of planning and coordination to being an effective tool in the creation of a competitive environment (Falch and Tadayoni, 2004).

As mentioned in the section on market entry, in India, cellular mobile services started with a duopoly in 1994-95. The technology at that point of time was specified as GSM and the licences had a spectrum commitment of 4.5 + 4.5 MHz (later amended in 2001 to 4.4 + 4.4) with a possibility of increase to 6.2 + 6.2. Keeping in view the development of technology, all the licences were made technology-neutral in 1999. Also, the third cellular mobile licence

was granted to the incumbent in 1999. In 2001, the Government auctioned the fourth cellular licence in 1800 MHz band. In the 4th Cellular licence, the committed spectrum was 4.4 + 4.4 MHz and a possibility of increasing it to 6.2+ 6.2 MHz was mentioned. The spectrum charges were earlier based on the number of mobile terminals and allocated spectrum. Since August 1999, the spectrum charges were converted to a percentage of AGR. This varies from 2% to 6%, based on the amount of spectrum allocated. The amount of revenue share increases with the increased allocation, i.e. 3% up to 6.2 + 6.2 MHz, 4% up to 10 + 10 MHz, 5% up to 12.5 + 12.5 MHz and 6% up to 15 + 15 MHz. In the basic services segment, competition was introduced in 1997-98 with the introduction of duopoly in the country. For these service providers also, spectrum was allocated to offer telecom services through wireless access.

Post NTP-99, open competition was introduced in the basic services in 2001 and these licences were available on a first-come-first serve basis. In order to add value to their services, BSOs were permitted to provide 'limited mobility' services. The frequency bands for providing their WLL (M) services included 824-844 MHz paired with 869-889 MHz (FDD) & 1880 – 1900 MHz (Micro-cellular technology based on TDD). Service providers were given an initial 2.5 + 2.5 MHz to start service. The amount of spectrum could be increased to 5 + 5 MHz on meeting certain criteria (largely relating to subscriber base and roll-out), in steps of 1.25 MHz.

Thus, the allocation of the electromagnetic spectrum was carried out through fiat allocation Under this purely administrative mechanism of allocation of spectrum, the government (the government set up the Spectrum Management Committee of the GoT and Wireless Planning Commission on Spectrum Pricing in May 1999) assessed the relative merits of plans proposed by various competing firms and granted a share of the spectrum accordingly.

Some economists (Valletti and Prat, 2001) have argued that bundling the spectrum with a service licence, as has been done in the Indian case, is an inefficient arrangement, because it can lead to an underpricing of the spectrum below its market value. If the spectrum is underpriced (which it is, when bundled with a service license), service providers who have the option of using wired infrastructure will be inclined to use the spectrum, resulting in a crowding out of other services. Further, the arbitrariness inherent in the specification of criteria and consequent evaluation of plans makes this process time-consuming and vulnerable to lobbying and political intervention.

Thus, in India, the regulatory set-up for allocation of a scarce resource such as spectrum has until now ignored the issues of efficient utilisation of spectrum, spectrum allocation procedure, and spectrum pricing. The present spectrum assignment policy is riddled with other anomalies as well. At present, spectrum allocation is linked to subscriber numbers and not usage. There is no policy for spectrum beyond 10 MHz. There is also no provision of a guard band, which results in interference in the signals of contiguous operators. Further, while the licence auction process did not allow companies to bid for a group of contiguous circles, subsequent changes in the ownership patterns show that cellular operators may have preferred to bid for contiguous circles. Several representations have been made to the government in recent times by mobile operators, as well as some others, about the limited amount of spectrum available for services. The delays in frequency allocation are subject to frequent criticism.

Spectrum is a scarce resource and experience to date suggests that India has used it wastefully. The spectrum management is beset with several shortcomings, as a result of which, spectrum availability is rapidly emerging as a major constraint. First, is the use of the non-NATO band by the defence services. All the NATO countries and NATO allies have adopted the NATO band of the spectrum for their defence requirements, while the non-NATO band accommodates most of their commercial requirements. Due to global interconnectivity considerations and the fact that most telecom equipment is manufactured in the NATO country markets, both defence and private users in India end up competing for the same spectrum bands. Due to this, the average frequency allotted to an Indian cellular operator is 6.2 MHz, compared to the world average of 17.18 MHz (Sihag and Singh, 2003).

The growth in cellular mobile has exerted pressure on spectrum. In cities such as Delhi and Mumbai, where operators have been allocated upto 10 MHz, there is already demand for more than 10 MHz. With the 900 MHz GSM band completely occupied, allocation beyond 8 MHz to each operator is possible only in 1800 MHz band. In the 800 MHz CDMA band, some licencees have been allotted up to 3 carriers, out of a total of 4. With the growth of data, there is likely to be demand for more spectrum here too. Internationally, the next band for expansion of GSM and CDMA systems is 1800 MHz / 1900 MHz. Other government users are presently occupying a large part of these bands and refarming of this spectrum is a continuous and long-drawn process. Refarming increases the pressure on the existing spectrum and necessitates more efficient utilisation by all. In areas where demand for spectrum exceeds supply, some criteria would need to be applied for allocation. These could be technical, economic or techno-economic.

The government has recently been making efforts to release up to 45 MHz spectrum from the Department of Defence (DoD) in the interest of increasing mobile services in the country. TRAI has recently come out with its recommendations on the allocation of spectrum for 3G and Broadband Services. These recommendations support the economic mechanism of allocation of spectrum through a well-designed auction, thereby moving away from the previously adopted "beauty contest". In their recommendations, TRAI pointed out that spectrum identified for 3G should be treated as a stand-alone allocation and not as an extension of earlier spectrum allocation of 2G. Their recommendations are based on the following principles: Maximization of consumer interest (including affordability); responsible and efficient use of spectrum; aiding growth of the sector, particularly in rural areas; ensuring technology- and service-neutrality/convergence; recovery of costs and pricing of spectrum; orienting spectrum policy to support future competition; keeping a level playing field; and sharing of infrastructure.

In economic terms, allocative efficiency is maximised when the regulatory mechanism is able to identify and transfer the resource to the firm that values it the most. The TRAI is also concerned about protecting the consumer. The fundamental question here is how to determine a fair and transparent mechanism that decides the allocation and pricing of a scarce national resource. The allocation determines who gets to use the spectrum and the pricing establishes how much they have to pay for getting to use it. Based on prior practice in a host of countries, most have undertaken either an auction or a so-called "beauty contest." In the latter, firms submit business plans and the government identifies which

companies are most suitable. In contrast, in the case of auctions, firms reveal their valuation in a competitive environment.

The expected value of the 3G technology, a future technology, to any firm depends on the nature of applications and services it provides, the perceived value to the consumer of its offering (relative to that of the closest competitor) and its market share (of an estimated 320 million subscribers by 2010). Nobody knows what future 3G services will be offered, by what firms or at what price. The information asymmetry is grossly in the favour of the firms. The regulator has to seek this information to the extent it can, and making sure that the signals it receives are credible.

One sure way to elicit this information in a fair and transparent manner, and protect the consumers' interests, is to carefully design an auction that facilitates price discovery (firms come in with their initial valuation estimates and the mechanism should allow them to observe others' signals and then revise their own), determining an efficient allocation and culminating in a lump-sum payment by winning bidders to the government. A fair and transparent beauty contest cannot be designed, simply by the virtue of the fact that it is almost impossible to hold anyone accountable to the business plans they present. Not only is the establishment of an objective evaluation criteria onerous, enforcement of the allocation decision cannot be assured. An operator promising today to offer the lowest price could, if allocated spectrum tomorrow, pretty much do what it wants three to five years from now.

There are other technical auction design issues that the TRAI will do well to seek expertise on. First, it may not be obvious why high auction prices paid by companies for the spectrum will not be passed onto the consumer. As long as the auction design ensures that there is significant (four to five players) competition in the market, prices for future (and largely uncertain) 3G services in India will depend on what the market forces determine.

Secondly, it may not be obvious why a bid cannot be made on the level of royalty that a company is willing to share with the government, as in the case of, say, airport modernisation. The answer to this lies in the underlying uncertainty of the value of the future services that 3G operators will bring to the market and the objective of determining an efficient allocation at the present time. A lump-sum sunk cost is the only fool-proof way to prevent strategic high bidding by some operator, who can then renege and renegotiate based on political clout in a different political climate.

Interconnection

Refusal on the part of the incumbent to provide access to the network calls for active regulation. The regulator may be required to fix access charges and other interconnection conditions. If the new entrant's coverage is small, the incumbent has an incentive to refuse interconnection since, in the absence of interconnection, it can corner the market at a profitable price. Thus, in the case of free negotiation, the incumbent has an incentive to indefinitely delay an agreement. If an agreement has to be reached, the entrant will tend to over-invest in coverage in order to reduce the incumbent's pre-agreement profit and reach a better deal. However, if interconnection is mandated, but each operator is left free to set its

access charge, the incumbent has an incentive to set its access charge at a prohibitive level, as part of a standard 'raising rival's cost' strategy. In India, interconnection was included in the license agreements, that specified the actual amounts that each party could charge each other. The licence agreement route to setting interconnection terms meant that newcomers were saved most, although not all, of the delays and negotiation to connect to the incumbent's network when they need to get their services off the ground. The disadvantage was of course that the actual charges for interconnection in the licence agreements were, in most cases, arbitrary. In addition, there was a tendency to confuse user tariffs and interconnection charges (Uppal, 2003).

Thus, in an asymmetric situation, the incumbent could use interconnection charges to handicap new entrants. This is what DoT did. In January 1997, after most of the cellular operators had made their minimum investment and started service, DoT raised the interconnection charge for mobile services to Rs 10 (about US$.22) per minute from Rs. 1.25. The pricing action made cellular calls that interconnected with the fixed wire-line network extremely expensive for carriers, especially compared to the ceiling prices that they could charge for service. Moreover, DoT decreed that all calls from one wireless carrier to another had to be interconnected through the state-owned incumbent's network, so only calls within the same network could avoid the interconnection charge.

By late 1999, decisions by the Courts raised serious concerns about the role and powers of TRAI. This was especially true in the context of the role that the regulator could play in ensuring a fair interconnection regime. In 1999, TRAI also attempted to introduce "Calling Party Pays" (CPP) through its Telecommunication Interconnection (Charges and revenue Sharing-First Amendment) Regulation 1999, for interconnection from fixed to wireless. This was to encourage wireless customers to discontinue the practice of not answering their phones but observing the calling number and then returning the call over wire-line telephones. TRAI's attempt to reverse the high interconnection charges charged by DoT and the existing RPP regime was challenged. DoT sued TRAI again, and again TRAI lost. The Court considered that access charge payments, as proposed in the CPP regime, were not under the purview of the regulator. In a Delhi High Court ruling, the Court argued that these charges were part of the licence agreement and the regulator's powers in this regard were only recommendatory and the government was not bound to abide by the proposals (Desai, 2004).

The successful challenge to the CPP regime was also a sign that TRAI lacked powers to enforce technically adequate and fairly-priced interconnection on all players in the market; arguably, the most important function regulators carry out in telecom market. The regulatory environment on interconnection was highly unsatisfactory during this period and high interconnection charges constituted barriers to entry and it is quite possible it induced inefficient bypass.

The amendment ordinance of 2000 restored TRAI's powers relating to tariffs and interconnection, which had earlier been deemed by courts to be limited. Even the government would have no right to overrule the TRAI in these two areas. Other thorny issues regarding interconnection were partly addressed in the NTP-99. Under the old policy, if a private operator's facilities did not enable it to connect two subscribers within the circle

or if its clients wanted to call someone outside the circle, the operators had to use the DoT network. This enabled DoT to monopolise the lucrative long-distance traffic. Under the new policy, long-distance traffic can be carried by any private operator, not necessarily DoT. However, the newly-constituted TRAI retreated on CPP, which was a serious bone of contention between the old TRAI and DoT. Finally, CPP was introduced in 2003 as part of a tariff rebalancing exercise.

Thus, there was certainty of jurisdiction in matters relating to interconnection and a more level playing field had been created. On 12 July 2002, TRAI issued the Telecommunication Interconnection (Reference Interconnect Offer) Regulation, 2002 (2 of 2002). The regulation required service providers with significant market power to publish an RIO "stipulating the various technical and commercial conditions including a basis for Interconnect Usage Charges for Origination, Transit and Termination. Following these, the new entrants can seek Interconnection and agree upon specific usage based charges." All RIOs are to be approved by the regulator. The Telecommunication Interconnection Usage Charges (IUC) Regulation of January 29, 2003 was a comprehensive review of interconnection charges. It provides estimates of the costs of network elements involved in interconnection.

Although the final interconnection rules[12] were not adopted until late 2003 (TRAI 2003), their general form was known by early 2002 and they explain the recent boom in wireless networks. The current regulatory environment with regards to interconnection is fairly stable now and the system eliminates much of the previous unnecessary complexity and unfairness. However, interconnection prices were still far above cost due to the "universal service" plan i.e. the access deficit charges (ADCs), which are incorporated into interconnection charges and are paid directly to the incumbent state-owned enterprise (BSNL) in order to compensate it for providing below-cost service in rural areas.

After much litigation and several iterations, TRAI finally resolved the ADC issue in February 2006. The GSM operators viewed ADC as an anti-competitive tool in the hands of BSNL to squeeze the private operators by forcing them to pay a tax based in the form of ADC, which, as mentioned, was as high as 30 percent of their revenue. The TRAI Notification of 23rd February 2006 was the regulator's first attempt to introduce a revenue-sharing regime. First, ADC was pegged at 1.5% of the annual gross revenue of telecom companies. There would be no ADC on national long distance calls. Second, the ADC on outgoing international calls was reduced from Rupees 2.50 to Rupees 0.80, and the ADC on incoming international calls was reduced from Rupees 3.25 to Rupees 1.60. This reduced opportunities for arbitrage to a considerable extent. Third, the ADC benefit for fixed wireless services was taken off. Almost all the ADC would go to BSNL. The only exception would be the ADC that would accrue to the fixed line connections of non-BSNL fixed services operators owing to their outgoing international calls. This was a neat resolution of the controversy over whether there should be ADC for the fixed wireless connections of the CDMA operators. It was pointed out in the Notification that, while rural operations constituted over 37% of the BSNL's operations, almost all other operators had less than 1%

[12] Termination charge for calls to basic (Fixed, WLL (Fixed), and WLL with limited mobility) and Cellular networks would be uniform @ Rs. 0.30 per minute. The same termination charge would be applicable for all types of calls viz. Local, National Long Distance and International Long Distance.

of their operations in the rural areas. Hence, discrimination in favour of BSNL was justified (TRAI, 23 February 2006). The reduced ADC burden resulted in declines in tariffs and price wars in the cellular market (Financial Times Information, 3 March 2006). This has contributed to the story of India's impressive growth in the mobile telecom subscribers.

Tariff Regulation

The Telecommunication Tariff Order (TTO) 1999, issued by the regulator, began the process of tariff rationalization with an increase in monthly rental and decrease in National Long Distance (NLD) and International Long Distance (ILD) tariffs. This rebalancing exercise was implemented by TTO 1999 in three steps, with the first carried out in May 1999 and the third one implemented on March 14, 2002. This resulted in a reduction of NLD tariffs by about 56 percent and ISD tariffs by about 47 percent. Under the 24th amendment of TTO, 99, issued on 24th January 2003, the regulator has brought down the tariff for domestic long distance calls by imposing a ceiling of Rs. 8.40 a minute for calls beyond 50km. It has been left to the operator's discretion to bring down tariffs further. Some companies have further slashed their rates. The following tables show the steady declines in tariffs.

Table 5: Minimum Effective Charge for Local Calls

	June 03	Jun 04	Sept 04	Mar 05	Mar-06
Fixed (Rs./min.)	1.39	1.00	1.00	1.00	0.85
Mobile (Rs./min.)	2.37	1.90	1.90	1.20	1.20

Source: Annual Report DoT, 2005-06; for an outgoing usage of 250 minutes/month.

Table 6: Trends in long distance charges

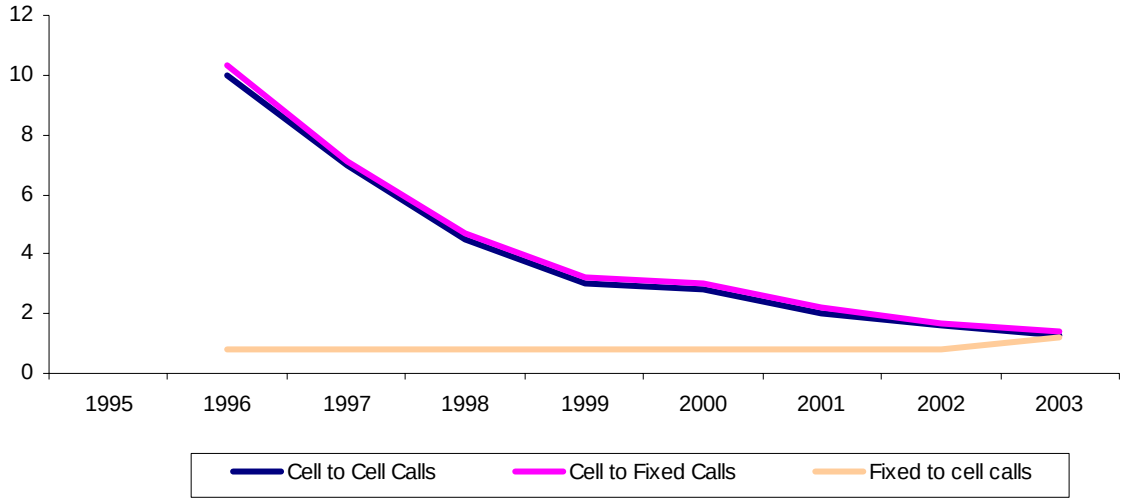
	1999-2000	2001	2002	March 2003 onwards	w.ef. April 2004	w.ef. September 2004
Upto 50 Kms.	1.20	1.20	1.20	1.20	1.20	1.20
Above 50 kms. and upto 200kms.	6.00	4.80	4.80	2.40	2.40	2.40
Above 200 kms. and upto 500 kms.	15.60	12.00	4.80	4.80	3.60	2.40
Above 500 kms. and upto 1000 kms.	21.60	18.00	9.60	4.80	3.60	2.40
Above 1000 kms.	30.00	24.00	9.60	4.80	3.60	2.40

Source: Annual Report DoT, 2005-06; for an outgoing usage of 250 minutes/month.

However, all this progress was not smooth. From 1997 until 1999, when TRAI published its TTO, the DoT strongly defended the complex regime of cross-subsidies on the doubtful basis that the elasticity of demand for long-distance calls was zero! The major reason for putting up a strong resistance to the slashing of the NLD rates was that DoT did not want to lose the revenue with which the government could subsidise individual subscribers by subsidizing their rentals. However, in subsequent tariff orders, TRAI succeeded in reducing free calls and increasing call charges. As rentals were stipulated as ceilings, DoT did not implement the increased rentals.

Attempts were also made to set up a level playing field through the tariff rebalancing exercise. First, TRAI issued an order on telecommunication charges[13] in which maximum tariffs aimed at reducing cross subsidies by DoT were laid down, rentals and call charges were raised and domestic and international trunk charges on which DoT made large profits were lowered. TRAI thus took a small step towards aligning DoT charges to costs. TRAI also proposed a shift to the CPP regime. It proposed that for a wireline-to-cell call, the wireline caller should pay Rs 3.90, of which the cellular operators should get 85 percent. But once the government agreed to replace licence fees by a proportional charge, TRAI realized that cell phone companies' costs would be greatly reduced, and issued another consultation paper[14] in August 1999 in which it made some reductions in the rental and call charges of the cellular operators. However, by 2002, the prepaid revolution and competition in the wireless segment meant a reduction in the gap in the call charges in comparison to the wireline.

Figure 14: Converging Tariffs



The TRAI issued Telecommunication Tariff (Twenty Third Amendment) Order, 2002 (7 of 2002), which forbore from prescribing cellular tariffs and required only integrated operators to seek prior approval for their tariffs from TRAI. In this order, TRAI stated that, in light of the emerging market scenario, it was of the view that a stage had been reached where market forces could effectively regulate cellular tariffs and the regulator could step aside, except for a broad supervision in the interests of consumers.

Despite not having support from the government, the incumbent, or the courts, TRAI proved pro-competitive and was successful to a certain extent in rebalancing telecom rates. This was no small achievement, as tariff restructuring had to be carried out despite the non-transparent and complicated accounting practices of the incumbent, which was the major source of information of the unbundled cost components.

[13] TRAI, The Telecommunications Tariff Order 1999. Delhi.

[14] TRAI (1999): Consultation Paper on Cellular Mobile Service Tariffs Following Migration to an Interim Revenue Share of 15 Per Cent As Licence Fee and Introduction of Calling Party Pays (CPP) Regime for Cellular Mobile. Delhi. Consultation Paper 4 of 1999.

Regulation of Anti Competitive Practices

Due to the unequal entry decisions made by the DoT as a licensor, where the state-owned incumbent had a pan-Indian licence, while the competitors of the private telecom companies had service-specific and circle-wise licences, the basis for the monopoly power of the incumbent was bound to be retained. Thus, at the very out set of the reform process, India's telecom market structure was highly skewed in favour of the state-owned incumbent. Given this initial condition of an unequal arrangement, the old as well as the new TRAI has been unable to create parity between the state-owned incumbent and the private telecom operators. The regulator's attempt to regulate the incumbent asymmetrically has not been very successful. The regulator has accepted the market structure as given, even though this structure carries a huge risk for anti-competitive by the incumbent. The crucial missing link is the insufficient regulatory attention devoted to the design of appropriate market structures. Moreover, the ease with which policy, TRAI membership, and judicial oversight of TRAI decisions were shifted because the government wanted to change policies in its own favour shows the fragility of TRAI's independence (Uppal, 2003).

As has been pointed out in Section 2 of the paper, the regulator's attempts to dilute the inherent strength of the incumbent were met with severe challenges by DoT, on the issue of CPP and on the entry of MTNL/BSNL into the cellular business. Although the interconnection regime promoted by the regulator was pro-competitive, the regulator's inability to do away with the cross-subsidy regime in the form of ADC still leaves much to be desired in the area of controlling anti-competitive practices by the incumbent. The legitimization of cross-subsidies in the favour of the incumbent by the regulator has been criticized on the grounds that it will merely lead to the further enrichment of BSNL, at the expense of the rival private telecom operators. The absence of reliable, separated costs and the regulator's weak attempts in forcing accounting separation mean that cross-subsidies based on the cost information provided by the incumbent are difficult to establish. Therefore, the weak enforcement regime without any sensitization to competition issues is likely to compound an already serious risk and could distort competition in the market place and encourage abuse. It may especially hurt those marginal consumers who do not provide large revenues to operators.

The handling of the WLL controversy by the regulator (which was mainly on account of the alleged anti-competitive behaviour of a few basic service operators wanting to get a toehold in the cellular business) is another instance of a weak regulatory environment. Between 2001 and 2003, a series of litigations on this matter seriously jeopardized the regulatory environment, especially in the context of fostering competition. India's new unified licensing regime for telecommunications is a step in the right direction, since it would reduce - as it already has done- the debilitating litigation and controversy in the sector. But it does present an increased challenge in regulating market power. With larger market size, the scope for anti-competitive subsidy by the integrated players, especially the incumbent, increases substantially. Until now, the general perception is that the regulator has only checked the incumbent's market power in a limited way.

Moreover, by ignoring the recommendations of the regulator on infrastructure-sharing, the DoT is unable to dilute the restrictive and monopolistic practices of the incumbents and

provide a level playing field to new entrants. For instance, the current international long distance (ILD) guidelines discourage sharing and result in higher costs. TRAI has also brought to the minister's notice the fact that, despite the authority issuing recommendations to address these issues in December 2005, the DoT had so far failed to implement them. This issue assumes importance as numerous players such as AT&T, Essar Group, Hutchison Essar, Spice, Sify, and Tulip have secured ILD licences. If TRAI's recommendations are accepted, it could result in a reduction in ILD tariffs, as well as in the operating costs of BPOs and ITeS companies.

Currently, six international cables (owned by BSNL, VSNL, Reliance Communications and Bharti) carry international voice and data to India — these can be accessed from eight cable landing stations (CLS). Procedures need to be put in place for mandatory infrastructure-sharing where "new operators have access to the CLS of existing players".

In addition, TRAI has demanded it must be allowed to fix and regulate cost-based access charges for international bandwidth, in order to ensure that prices are "transparent, non-discriminatory and fair". Currently, international bandwidth, which is monopolised by the four incumbents, costs 40 percent to 60 percent more than international rates.

In its recommendations, TRAI had recommended that current players should be mandated to share CLS to "avoid unnecessary expenditure and delay in setting up stations of new players". TRAI has pointed out bandwidth rates were very high due to "the denial of access to existing international capacity of submarine cables and denial of landing facilities at the existing landing stations to new privately-owned cables".

Many countries, including Singapore, Malaysia, the UK and Hong Kong, have an infrastructure-sharing regime in place "to ensure that access to cable landing stations are fair, transparent and non-discriminatory". According to TRAI:

"Unless ILD licence conditions are amended, as brought out in TRAI's recommendations of '05, the restrictive and monopoly behaviour of few operators would remain and competition would be a major casualty".

Universal Service Obligation (USO)

In India, as elsewhere, the concern has been, first that these instruments would be used as a pretext for delaying competition and/or used strategically by the incumbent to promote its own interests. Second, high USO contributions imposed on entrants could choke off competitors. This has been the case and although the regulator has constantly pointed out the high USO contributions should be reduced over time, the annual contributions to USO continue at 5 percent of the Annual Gross revenues of the operators.

The approach to the selection of the Universal Service provider in India is a transparent multi-layered reverse bidding process (in which the least quoted subsidy below the Reserve Price became the representative rate at which subsidy was disbursed to the successful Universal Service provider). The competitive bid process has led to a significant lowering of the benchmark subsidy rates, bringing it down to 65 to 70% in the case of rural direct

exchange lines (RDELs). Despite these factors, there have been concerns that, in the absence of network competition, the incumbent can leverage its vertically-integrated status even in a transparent disbursement mechanism.

Moreover, restricting participation in the auction to existing phone companies (in the Secondary switching Areas, SSAs) meant that it hugely favoured the incumbent that was already omnipresent. This exclusivity provision meant that the auction largely failed to create competition for the market. Consequently, the provision of the subsidized service mostly by the incumbent, which will receive a large portion of the subsidy will discourage new firms from entering [as they will not be able compete without subsidy] and preclude competition in the market (Malik 2006). The results show that the incumbent won almost 75 percent of the auctions. For the incumbent, which already had a vast network in place, universal service meant only the provision of the last-mile, whereas new entrants had to take into account their additional network costs in formulating the bids. Although they won some SDCAs, new entrants only considered those areas where they were willing to extend the network anyway, because they considered it to be financially viable.

The results provide a clear picture of the limited competition in the auctions. The project covered 274 (SSAs), with competitive bidding in 215 SSAs. BSNL emerged the most successful bidder winning in 171 SSAs across 19 States, Reliance Infocomm emerged the winner in 61 SSAs spread across 15 States, while Tata Teleservices got the project in 42 SSAs across 9 States. This translates into BSNL (1267 SDCAs), Reliance Infocom Ltd (203 SDCAs), Tata Teleservices (172 SDCAs) and Tata Teleservices (Maharashtra 43 SDCAs).

There are many anomalies in the current USO regulatory and policy regime for the provision of rural telephone subsidies and the TRAI has made proposals to address these flaws. It is important to consider (1) whether the current USO scheme created the least possible distortion to an otherwise well-functioning market, and (2) whether it provided a level playing-field for operators bidding in an auction to receive the USO subsidy. These factors are major considerations in evaluating a subsidy mechanism, as the Indian economy is replete with examples of misdirected and market distortionary subsidies. however, given the development linkages and positive externalities of Information Communication Technologies (ICTs), it is especially important to avoid market distortions in the telecom sector. Greater rural connectivity in new technologies such as mobile telephony and VoIP is possible, but a regulatory regime that mandates open access to backbone is crucial. This regulatory design is vital for the effective use of subsidies; in the absence of which, entry into the rural telecom markets will be limited. By restricting entry, universal service may well prove unachievable and become a tool used by the incumbent to serve its own, narrow interests.

TRAI has made progressive recommendations, where it takes subsidy provisions away from VPTs and individual phones links them to the creation of infrastructure. The most important recommendation is that, once this infrastructure is created, then all new and existing infrastructure should be mandated to be shared on reasonable terms, with adequate incentives for sharing put in place. This will ensure that no single operator can exploit its monopoly position as an owner of a large network. This proposed regulatory intervention is mandated by standard economic doctrine, which dictates that sunk costs are irrelevant for

investment decisions at the margin. Moreover, there are no private property rights issues involved as BSNL is a public entity and its infrastructure properly belongs to all citizens.

Moreover, as the scope of the subsidy has been expanded to include "niche" players and not merely the large licensed players, small and medium service providers may also participate in rural telephony markets. This is a step in the right direction in order to make the universal subsidy support more transparent and less distortionary.

Second, the approach towards universal service should be technologically neutral, enabling wireline and wireless technologies to be used to provide services. It is important to maintain incentives for competing networks and/or technologies to provide (part of) the universal service provisions (Hoernig and Valletti 2002). There should be no constraints on the technical means by which the connection is provided, allowing for wired or wireless technologies, nor any constraints on which operators provide part or all of universal service obligations.

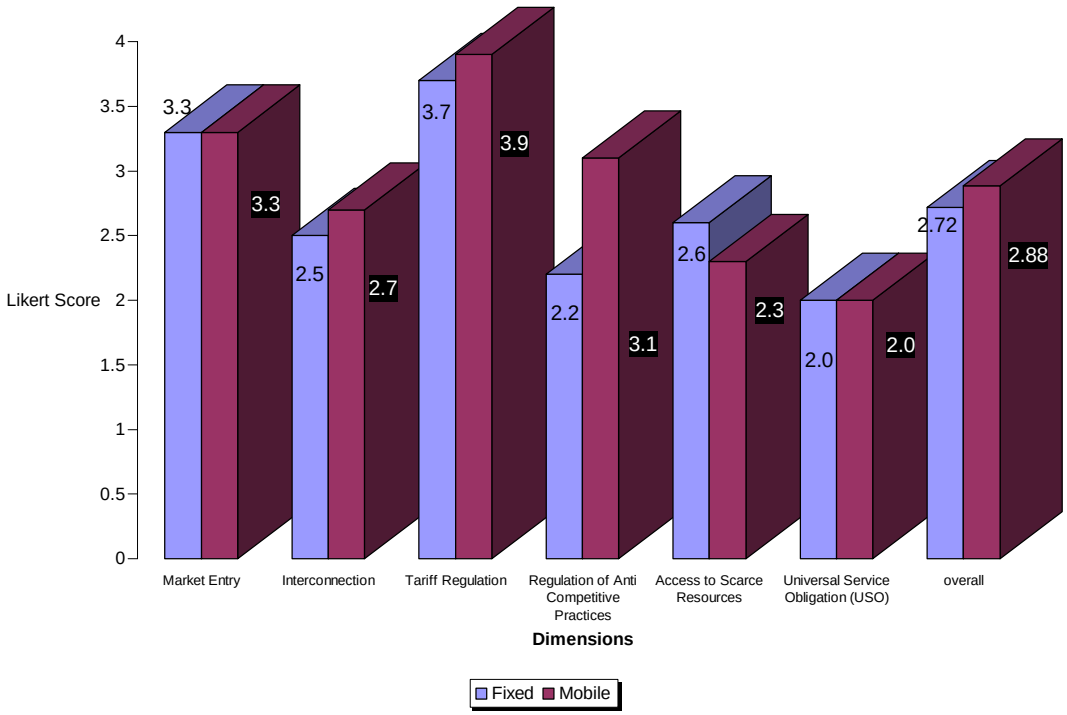
Recently, the Department of Telecommunications (DoT) has announced that it is in the process of amending the Indian Telegraph Act to extend the Universal Service Obligation (USO) fund support to cellular mobile services (both GSM and CDMA). As of today, the government is giving USO fund support only to the fixed line operators offering services in rural areas. Although this expansion in scope has been suggested in view of recent rapid technological change, it is likely that incumbents have accrued significant amounts of rents from previous auctions.

Although TRAI plays a major role in implementing the existing subsidy program, it does not have the powers to change it. Nevertheless, it can research the justification for change and the implications of more appropriate alternative subsidy methods and their impact on the competitiveness of the industry.

Results of the TRE Survey

As part of a Six Country, Multi-component Study being conducted in India, Indonesia, Pakistan, Philippines, Sri Lanka and Thailand, we conducted a Telecom Regulatory Environment Assessment (TRE) perception survey in India. The TRE Assessment, developed by LIRNEasia and already implemented in a number of countries, is a perceptual index which gauges the performance of telecom regulatory agencies on the six parameters discussed above. In this section, we summarize the stakeholders' perspective on the various TRE parameters by reporting an average score on these parameters.

Figure 15: Sector Assessment Results for the period June 2005-06



Likert Score: 1– Highly ineffective; 2-unsatisfactory; 3-neutral; 4-satisfactory; 5-highly effective

Table 7: Profile of the respondents

	No.	%
Senior management of operators	16	32
Educational/Research Organizations/Telecom Consultants/ Law Firms	18	36
Credit Rating Agencies	2	4
Journalists/Telecom User Groups / Civil Society	14	28
Total	**50**	**100**

From Figure 15 above, we can draw some very important conclusions from the TRE in India. First, while the overall TRE performs better for the mobile sector in comparison to the fixed sector, the individual scores for tariff regulation and market entry for both the fixed as well as the mobile sector outperform other parameters. While Universal Service Obligation has the lowest score, it is important to note that the role of the regulator is only recommendatory, as the policy-maker formulates the USO policy. The regulator has given progressive recommendations for the Growth of rural telephony in India (TRAI 2005), but the slow implementation of these has meant that a sound USO policy has not been implemented. Assignment of scarce resources has an important impact on the market microstructure and the level of competition in regard of allocation of spectrum and number portability is crucial. Here too, the TRE score is not very high. Interestingly, stakeholders viewed the TRE as more adverse for the fixed sector than for the mobile sector, when it came

to the regulation of anti-competitive practices. One can conjecture that the ADC controversy might have resulted in a poor score for this particular category.

Interestingly, the TRE research vindicates the analytical description of the reform process. As shown, the success of the regulatory process is limited to tariff regulation. The respondents too have indicated that the USO regulatory environment and regulation of anticompetitive practices (especially in the fixed sector) have been areas of concern and perhaps the most important factors explaining the digital divide of India. So while, tariff regulation recorded a high score of 3.9 and 3.7 for the mobile and the fixed sector respectively, USO had a poor score of 2.0 for the fixed as well mobile sector. For the fixed sector, a poor score of 2.2 on the parameter regulation of anticompetitive practices explains the poor performance of fixed sector dependent services like broadband internet.

4. Conclusion and Challenges Ahead

The future growth of the industry critically depends on how policy confronts the issues of licensing and universal service. Through its licensing powers, Government has full control over the market structure and this does not allow for real competition to emerge. The regulator has to work with a predefined market structure, limiting its ability to foster competition *ex ante*. Moreover, in the absence of an effective Competition Commission, an *ex post* check on anticompetitive behaviour is also weak.

The existence of competing operators is not *per se* an indicator of competition. The test of competition must be contestability or ease of entry into the industry. Contestability naturally means that existing operators should not be able to preclude entry by other operators, but it also means that the government should not be able to stop it either.

The present USO Fund is too narrowly conceived, and confuses objectives. The subsidy does not necessarily have to be given to subscribers, but it should be for infrastructure creation to increase accessibility. As discussed in the section on Universal Service, the Indian Universal Service policy has in fact contributed to the attenuation of competition. This in turn has meant that the mobile revolution has not translated directly into a higher mobile teledensity and has not percolated down.

Certain other steps such as lowering the tax burden on operators can reduce the endogenous costs of telecom business and make rural entry a viable business opportunity. This measure will also encourage smaller private sector operators with fewer resources to provide innovative and cheap solutions for access, as long as they have access to the state-owned incumbents established trunk fiber networks. To encourage such "niche" operators in the market, TRAI has suggested incentives in the form of low licence fees, low spectrum charges etc. in its Unified licensing recommendations.

Furthermore, the regulatory apparatus in India has to meet the challenges of establishing a new regulatory paradigm to address the emergence of new technologies such as VOIP. The new regulatory paradigm must ensure that regulation does not hinder the exploitation of the opportunities that the new technology offers. This implies a change from regulating incumbent firms in vertically-integrated markets across infrastructure and services, to

regulating imperfectly competitive markets that are horizontally-structured. It requires that the practices of licensing be reassessed in the new market environment. In India, a process of conversion from specialized to unified licences will be necessary to remove the inherited licence restrictions, and to avoid intractable regulatory issues.

Already some progressive steps have been taken in the direction of unified licensing with TRAI submitting its recommendation to the policy maker almost a year ago. However, the process is not yet complete. This process needs to be completed and should address the conditions for market participation by potential new players, minimizing the barriers to participation in network infrastructure and services provision by all players, existing and new.

Second, since the new technology requires incumbent operators, including BSNL, to reassess their business models and their strategies in the new, horizontally-integrated market structure, but the policy-maker is dragging its feet in implementing the new unified licensing regime. Narrow ministerial considerations are potentially obstructing moves to a totally converged regime. The 'Communication Convergence Bill' 2001, aimed at bringing licensing and regulation of telecom, information technology and broadcasting under one regulatory body, has been rejected by Parliament. The absence of a Convergence Act has increased discrimination among service providers, based on technology used or services offered. This limits the scope of competition as sector-wise differences in regulation prevent operators from competing directly. TRAI has been encouraging debate on various convergence-related issues (such as the type of changes required in the existing licensing system, development of a comprehensive legal framework and steps needed for efficient utilization of spectrum).

Thus, based on dynamic efficiency, policy must encourage growth of new technologies, end-to-end platforms, market institutions, and packages of services and content. This means policy should encourage multi-platform competition and does not perpetually have to play catch-up with technological progress.

Another important regulatory challenge is the effective management of public resources. This requires that existing regulations relating to rights of way, spectrum, numbers and domain names must be reassessed for more efficient use. Last, but most importantly, virtually all interconnection and access arrangements will need to be renegotiated. Interconnection and access issues may become even more important in the transition to the future converged environment than they were in the early stages of telecom reform.

In this context, the sharing of the backbone, over which the incumbent has monopoly power on a cost basis, is the first important step. In its "Recommendations on Growth of Telecom services in rural India", TRAI has specified that all the operators who have optical fibre connectivity in rural areas should be mandated to provide leased lines to other operators who are rolling out their networks in rural areas.

In conclusion, one can say that the overall impression is that the regulator has not been very successful in proving that it has enough powers over the incumbent. However, it is not clear whether this inability is on account of the limited jurisdiction that TRAI had in the licensing

process or because it is carrying forward the universal access policies of the government. Whatever maybe the case, the point is that the regulator can and must improve its abilities and general public perceptions on this count and should not be seen as subservient to the Government and hence the incumbent. The 'success' of the Indian telecom sector has been mainly limited to the lowering of tariffs and increase in access by lower income households in the urban areas, where new operators have networks, but a restrictive licensing regime and unresolved issues of infrastructure-sharing have not resulted in the replication of the urban competitive model in the rural areas.

Annex

ANNEX 1: Chronology of India's Telecommunication Industry Reform: List of Policy and Regulatory Developments

Date	Event
May, 1994	National Telecom Policy announced
July, 1994	Radio paging, V-SAT data services, electronic mail services, voice – mail and video – text services opened to private providers
September, 1994	DoT guidelines for private sector entry into basic telecom services in the country
October, 1994	Eight cellular licencees for four metros finalized after over two years of litigation
January, 1995	DoT calls for proposal to operate basic, cellular telecom services and public mobile radio trunked (PMRT) services
August, 1995	VSNL began public Internet access in selected cities. DoT receives bids for basic, cellular and PMRT services
December, 1995	DoT announces cap on the number of circles basic operators can roll out services in. Licencees selected for five circles. Most cellular operators in circles sign licence agreements
January, 1996	After setting reserve prices for circles, DoT invites fresh bids for basic services in 13 circles
March, 1996	Five successful bidders short-listed for providing basic services
May, 1996	Poor response to third round of basic telecom bidding. Only on company bids - for Madhya Pradesh.
July, 1996	Selected bidder of first round refuses to extent bank guarantees for its four circles. Challenges in court DoT move to encash guarantees.
Oct. 1996 – Jan. 1997	Three more companies move court against DoT move to encash guarantees.
January, 1997	Telecom regulatory Authority of India (TRAI) formed.
February, 1997	First basic telecom service company signs licence and interconnect agreements with DoT for Madhya Pradesh
March, 1997	Second basic service provider signs basic telecom licence pact for Gujarat
April, 1997	TRAI quashes DoT move to increase tariffs for calls from fixed-line telephone to cellular phones
August, 1997	VSNL calls for global tenders to find a partner for its South Asian regional hub project
September, 1997	Internet Policy cleared; licence agreement for basic services in Maharashtra also becomes operational
November, 1997	Basic service licencees for Andhra Pradesh and Punjab sign basic telecom agreements with DoT.
January, 1998	DoT announces the policy for ISPs; no limit on number of licences. Fee to be Re. 1.
March, 1999	TRAI Issue First Tariff Order. New Telecom Policy approved
May, 1999	Tariffs were restructured with lower rates for long-distance and higher rentals
July, 1999	Conditions for migration to revenue sharing from fixed licence fee regime issued Guidelines for setting up International gateways for Internet announced
October, 1999	Bifurcation of the Department of Telecommunication (DoT) into Department of Telecommunications and the Department of Telecommunication Services
December, 1999	Private ISPs allowed to set up satellite gateways.
1999-2000	An Inter-ministerial Wireless Planning Coordination Committee (WPCC) was created for effective and efficient spectrum management and allocation
January, 2000	TRAI (Amendment) Ordinance 2000 redefines the role of TRAI by splitting it into two, with one acting as a regulator and the other as an arbitration unit in the form of tribunal, named as TDSAT.

Date	Event
August, 2000	Government announces guidelines for opening up domestic long distance telephony for carrying both inter-circle and intra-circle traffic, with no restriction on the number of players.
October, 2000	The second phase of tariff rebalancing was done to reduce the domestic long distance and international long distance tariff. Department of Telecom Operation(DTO) and Department of Telecom Services (DTS) have been corporatised as BSNL
2000-01	BSNL & MTNL permitted to enter as third cellular operator in their respective circles Additional Basic Service operators would also be permitted Termination of monopoly of VSNL for International Long Distance (ILD) service has been preponed to March 31, 2002 from March 31, 2004
January, 2001	The fixed service providers have been permitted to provide limited mobility in the form of Wireless in Local Loop (WLL) on a restricted basis. Private ISPs having satellite gateways formally allowed to sell bandwidth to other ISPs.
July, 2001	Policy for Voice mail/Audiotex service was announced in July 2001 by incorporating a new service called "Unified Messaging Service". Licences for Voice Mail/Audiotex service will be granted, on non-exclusive basis, SDCA (Short Distance Charging Area) wise. Licence fees and entry fee will be nil.
August, 2001	The Communication Convergence Bill'2001 was introduced in Lok Sabha on August 31, 2001, referred to standing committee Opening of National Long Distance service to competition
September/ October, 2001	Fourth cellular operator, one each in four metros and thirteen circles has been permitted. In all, 80 licences (56 private and 22 to BSNL & 2 MTNL) have been issued
2001	TRAI has given its recommendations for opening up of Internet Telephony in 2002, which are under consideration of the government
2002	Three companies have been given licence for ILD and two more companies were granted provisional clearance during 2002-03. So far three licences have been issued for NLDOs
March, 2002	Government issues final guidelines for Internet Telephony (IT) services. ISPs allowed to provide the service on payment of additional licence fees. However, Incoming IP Calls may not be terminated on the phone network which means subscribers can call out but not receive calls directly from the Internet on their own telephones.
April, 2002	Internet or IP Telephony service allowed.
September, 2002	TRAI decides to "forebear" from regulating cellular tariffs
October, 2002	With a view to increase competition in the cellular segment, BSNL launched India Mobile Personal Communication System (IMPCS) project in October, 2002
November, 2002	The Standing Committee on Communications and IT has presented its report on 20th November 2002 on the Communication Convergence Bill 2001. The observations/recommendations made by the committee are under consideration.
March, 2003	The Union Ministry of Communication relaxed the non-transferability clause in telecom service licences in the last week of March.
May, 2003	The Telecommunication Interconnection Usage Charges (IUC) Regulation 2003 has been implemented from 1st May 2003.
July 16, 2003	TRAI issues a Consultation Paper on Unified Licensing for Basic and Cellular services
August 8, 2003	TDSAT allows basic operators to offer WLL limited mobility services
Aug- Nov, 2003	A GoM on telecom is set up TRAI imposes ADC charges on cellular operators with effect from 15 December 2003 GoM releases 25 MHz of spectrum GoM proposes a hike in foreign investment from 49% to 74% The Cabinet approves intra circle mergers, though TRAI is yet to lay down clear guidelines Government allows the issuance of unified licences that will allow local wireline players to provide cellular service and vice-versa DoT amends NTP '99 to recognise unified telecom licence and unified access licence that will allow local wireline players to provide cellular service and vice-versa.

Date	Event
Jan 30, 2004	TRAI provides its recommendations on Intra Circle Mergers & Acquisition Guidelines to the Government
Feb.25, 2004	TRAI makes Reporting on Accounting Separation mandatory
March 13, 2004	TRAI Consultation Paper on Unified Licensing Regime
March 25, 2004	TRAI Facilitates Provision of Additional International Bandwidth on FLAG Cable by VSNL
April 29, 2004	TRAI Releases Recommendations on Broadband India: An Integrated Policy For Accelerating Growth of Internet and Broadband Penetration
April 30,2004	TRAI releases Consultation Paper on `Fixation of Ceiling Tariff for International Private Leased Circuit (Half Circuit).
May 31, 2004	TRAI releases consultation paper on Efficient Utilisation, Spectrum Allocation, and Spectrum Pricing
June 22-23, 2004	TRAI Releases Consultation Paper on Revision of Tariff of Domestic Leased Circuits TRAI Releases Consultation Paper on Review of Access Deficit Charges
August 6, 2004	TRAI issues draft recommendations on Unified Licensing Regime
Jan 6, 2005	TRAI announces a new Access Deficit Regime
Jan 13, 2005	TRAI issues recommendations on Unified Licensing Regime: A licencee shall be able to provide any or all telecom services by acquiring a single licence.
March 11, 2005	TRAI Fixes Ceiling Tariff for International Bandwidth (Ceiling Tariff for higher capacities is reduced by about 70% and for lower capacity by 35%)
April 21,2005	TRAI Revises Ceiling Tariff for Domestic Bandwidth (Revised ceiling tariff for different capacities reduced by 3 to 70% - for higher capacities 70% less than the existing market rate)
May 13, 2005	TRAI issues recommendations on Spectrum Pricing
October 1, 2005	TRAI provides its recommendations on the Growth of telecom Services in Rural Areas
November 3 ,2005	TRAI reiterates its recommendations on Local Loop Unbundling for Broadband
December 14 2005	Entry fee for NLD licences reduced from Rs. 100 crore to Rs. 2.5 crore Entry fee for ILD reduced from Rs. 100 crore to Rs. 2.5 crore
January 1, 2006	Annual licence fee for NLD as well as ILD reduced to 6% of AGR
December 16, 2005	TRAI Releases Recommendations on Promotion of Competition in International Private Lease Circuits (IPLC) segment.
February, 23,2006	TRAI issues amendment to the IUC, moving away from a per minute ADC regime to a revenue share regime. Revenue share fixed at 1.5 percent of AGR to be paid to BSNL
March 2006	TRAI issues recommendations on Number Portability and NGN
May 2006	TRAI recommends steps for Improvement in the effectiveness of National Internet Exchange of India (NIXI)
September 27,2006	TRAI issues Recommendations on 'Allocation and pricing of spectrum for 3G services and Broadband Wireless Access'

Source: Compiled by the Author from various Annual Reports of DOT, NCAER Reports and TRAI Press Releases

ANNEX 2: List of Cellular Fixed and Unified Access Providers

Circle	Operators		
	Mobile		Fixed
	Cellular	Unified	
Delhi	Hutch	Reliance Infocomm	**MTNL**
	MTNL	Tata Teleservices	
	Idea Cellular	Bharti Televentures Ltd	
Mumbai	BPL	Reliance Infocomm	**MTNL**
	Hutch	Tata Teleservices	
	MTNL	Bharti Televentures Ltd	
Chennai	Aircel Cellular	Reliance Infocomm	**BSNL**
	BSNL	Tata Teleservices	
	Hutchison South	Bharti Televentures Ltd	
Kolkata	Hutchison East	Reliance Infocomm	**BSNL**
	BSNL	Tata Teleservices	
	Reliable Internet Services Ltd.	Bharti Televentures Ltd	
Maharashtra	BPL (Hutch)	Reliance Infocomm	**BSNL**
	Idea Cellular	Tata Teleservices	
	BSNL	Bharti Televentures Ltd	
Gujarat	Fascel (Hutch)	Reliance Infocomm	**BSNL**
	Idea Cellular	Tata Teleservices	
	BSNL	Bharti Televentures Ltd	
Andhra Pradesh	Idea Cellular	Reliance Infocomm	**BSNL**
	Hutchison South	Tata Teleservices	
	BSNL	Bharti Televentures Ltd	
Karnataka	BSNL	Spice	
	Hutch South	Reliance Infocomm	**BSNL**
		Tata Teleservices	
		Bharti Televentures Ltd	
Tamil Nadu	BPL	Reliance Infocomm	**BSNL**
	Aircel	Tata Teleservices	
	BSNL	Bharti Televentures Ltd	
Kerala	Idea Communications	Reliance Infocomm	**BSNL**
	BPL (Hutch)	Tata Teleservices	
	BSNL	Bharti Televentures Ltd	
Punjab	BSNL	Reliance Infocomm	**BSNL**
	Hutchinson South	Tata Teleservices	
		Bharti Televentures Ltd.	
		Spice Communications	
Haryana	Idea Communications	Reliance Infocomm	**BSNL**
	ADIL (Hutch)	Tata Teleservices	
	BSNL	Bharti Televentures Ltd.	
Uttar Padesh (W)	Idea Communications	Reliance Infocomm	**BSNL**
	ADIL (Hutch)	Huchinson Essar South Ltd.	
	BSNL	Tata Teleservices	
		Bharti Televentures Ltd	
Uttar Pradesh (E)	ADIL (Hutch)	Reliance Infocomm	**BSNL**
	BSNL	Tata Teleservices	
	Escorts Communications	Bharti Televentures Ltd.	
Rajasthan	ADIL (Hutch)	Reliance Infocomm	**BSNL**
	Bharti Ltd.	Tata Teleservices	
	BSNL	Shyam Telelink	

Circle	Operators		
	Mobile		Fixed
	Cellular	Unified	
	Escorts Communications		
Madhya Pradesh	Idea	Reliance Infocomm	**BSNL**
	BSNL	Tata Teleservices	
	Reliance Telecom	Bharti Televentures Ltd.	
WB&A&N	BSNL	Reliance Infocomm	**BSNL**
	Reliance Telecom	Tata Teleservices	
		Bharti Televentures Ltd.	
		Huchinson Essar South Ltd.	
		Dishnet Wireless Ltd.	
Himachal Pradesh	BSNL	Reliance Infocomm	**BSNL**
	Reliance Telecom	Tata Teleservices	
	Escorts Communications	Dishnet Wireless Ltd.	
		Bharti Televentures Ltd.	
Bihar	BSNL	Reliance Infocomm	**BSNL**
	Reliance Telecom	Tata Teleservices	
		Bharti Televentures Ltd.	
		Dishnet Wireless Ltd.	
Orissa	BSNL	Reliance Infocomm	**BSNL**
	Reliance Telecom	Tata Teleservices	
		Bharti Televentures Ltd.	
		Dishnet Wireless Ltd.	
Assam	BSNL	Dishnet Wireless Ltd.	**BSNL**
	Reliance Telecom	Bharti Televentures Ltd.	
North East	Reliance Telecom	Dishnet Wireless Ltd.	**BSNL**
	BSNL		
	Bharti Hexacom Ltd.		
Jammu & Kashmir	BSNL	Dishnet Wireless Ltd.	**BSNL**
		Bharti Televentures Ltd.	
		Reliance Infocomm	

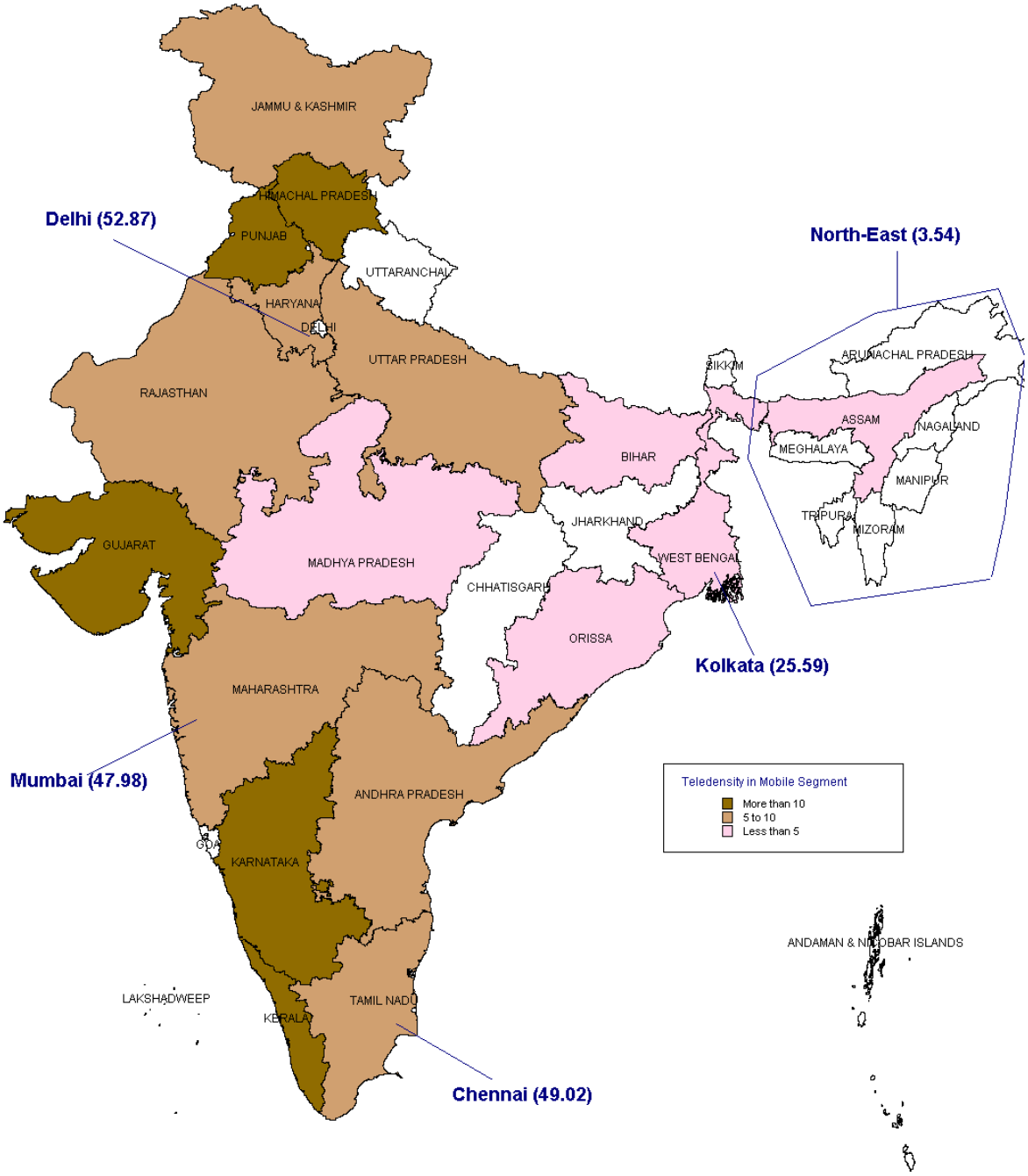
Source: TRAI, Performance Indicators, March 2006

ANNEX 3: Increased Revenues of Government after revenue share was introduced due to higher growth rate in mobile services

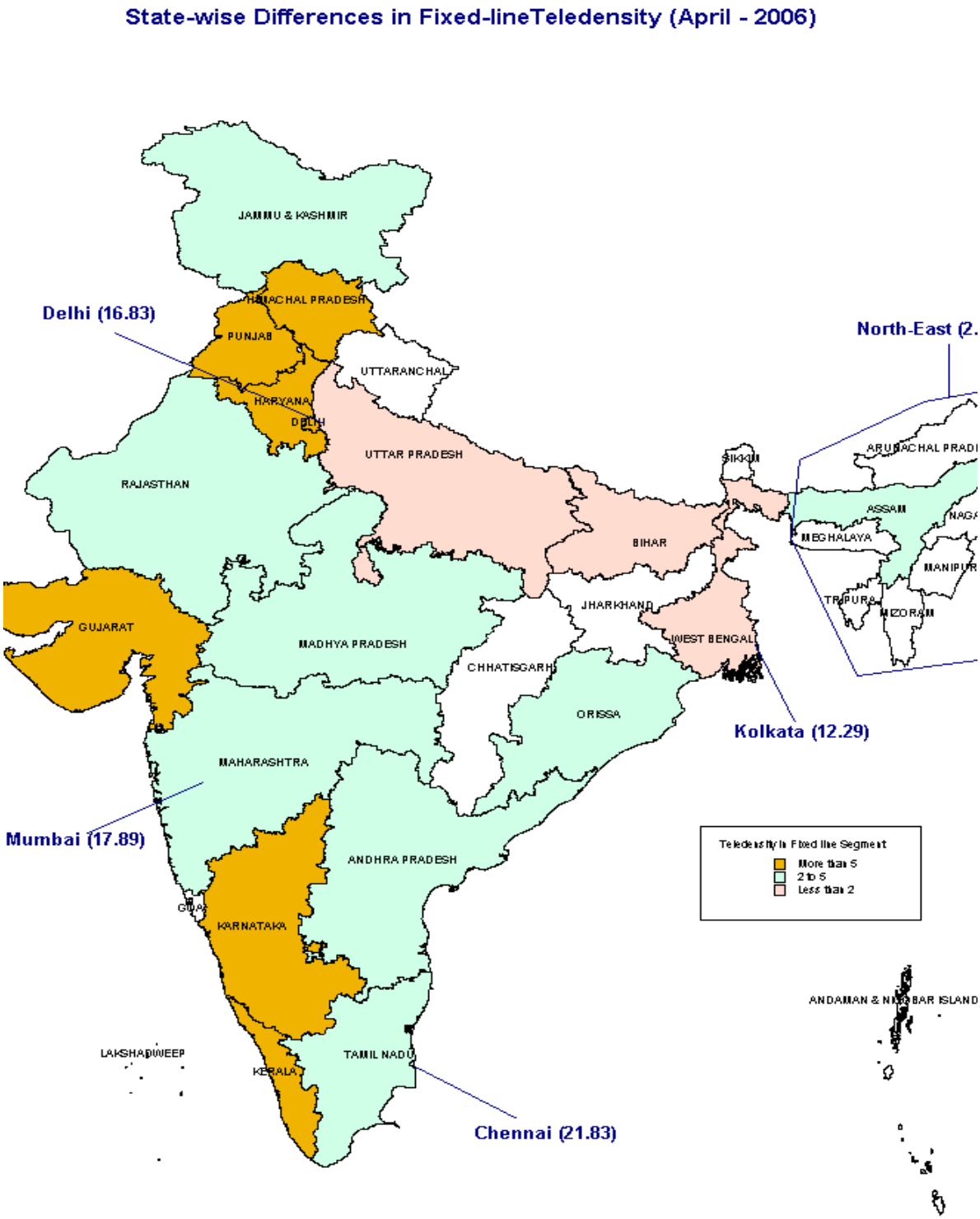
Statement of Revenue to be received by Central Government							
		1	2	3	4	5	6
	Year	Licence fee under old regime	Licence fee under new regime (Post II TP 99)	Licence Fee as per 2001 Regime	Licence Fee as per 2003 Regime	Service tax (Estimated)*	Licence Fee + Service Tax
1	1999-00	1603	275	209		110	319
2	2000-01	2270	619	468		248	716
3	2001-02	2734	793	602		317	919
4	2002-03	2455	872	657		349	1006
5	2003-04	2470	1727	1296		1105	2402
6	2004-05	2511	2698		1666	1727	3392
7	2005-06	2591	4586		2831	2935	5766
8	2006-07	2680	7796		4813	4989	9802
		19314	19366	3234	9309	11780	24323
				12543			

Note: Rate of Service Tax taken as 5% up to 13.5.2003 & 8% thereafter (presently 10%)*Estimated Service Tax (based on Estimated Gross Revenue).
Source: TRAI

ANNEX 4: State-wise Differences in Mobile and Fixed Teldensity

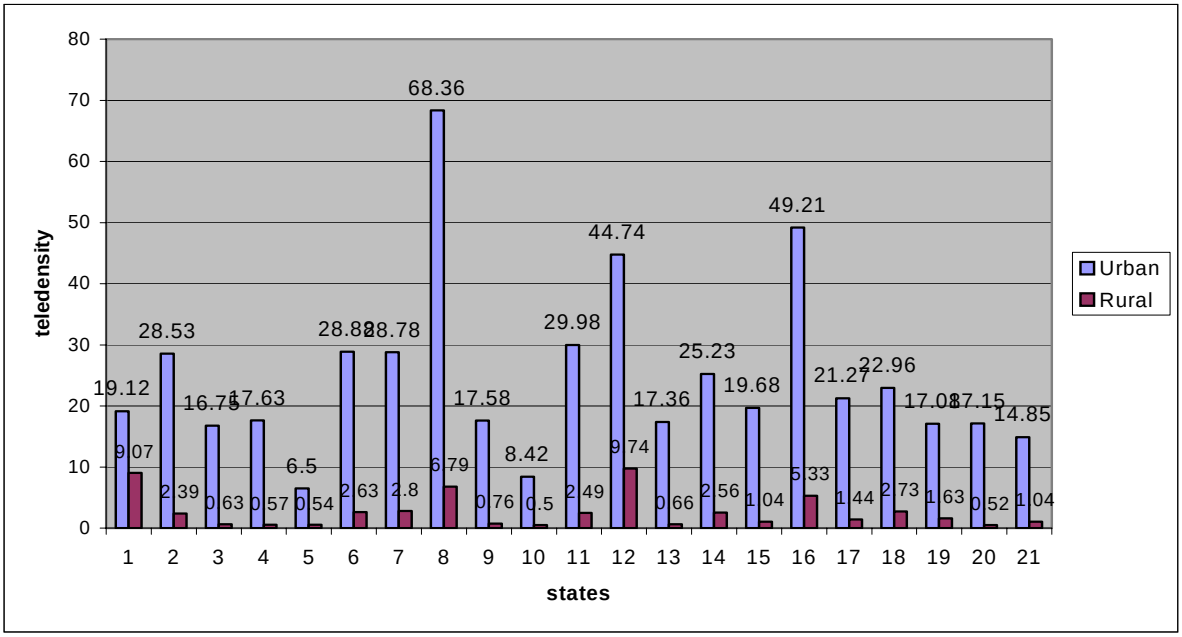


Source: COAI


State-wise Differences in Fixed-lineTeledensity (April - 2006)
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
UTTARANCHAL
HARYANA
DELHI
UTTAR PRADESH
RAJASTHAN
BIHAR
SIKKIM
ARUNACHAL PRADE
ASSAM
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
JHARKHAND
WEST BENGAL
GUJARAT
MADHYA PRADESH
CHHATISGARH
ORISSA
MAHARASHTRA
ANDHRA PRADESH
GOA
KARNATAKA
KERALA
TAMIL NADU
LAKSHADWEEP
ANDAMAN & NICOBAR ISLAND
Delhi (16.83)
North-East (2.
Kolkata (12.29)
Mumbai (17.89)
Chennai (21.83)
Teledensity in Fixed line Segment
More than 5
2 to 5
Less than 2

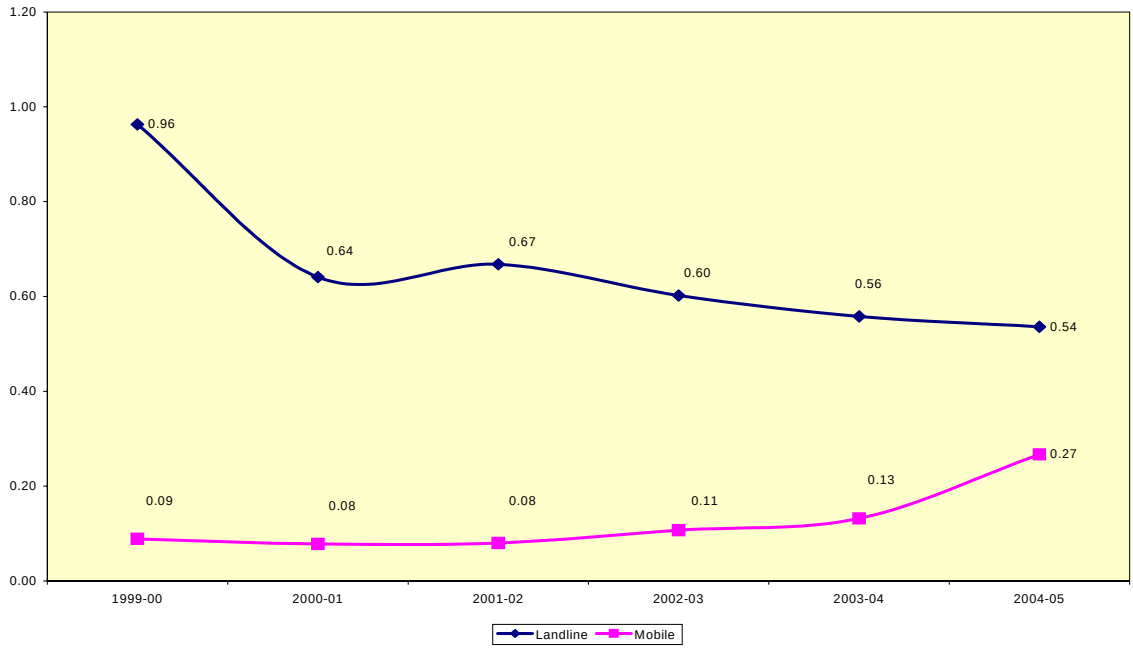
Source: COAI

ANNEX 5: State-wise Differences Rural-Urban Teledensity in India



Source: Lok Sabha Starred Question No. 244, dated 10.8.2005.

ANNEX 6: Herfindahl Index of Concentration



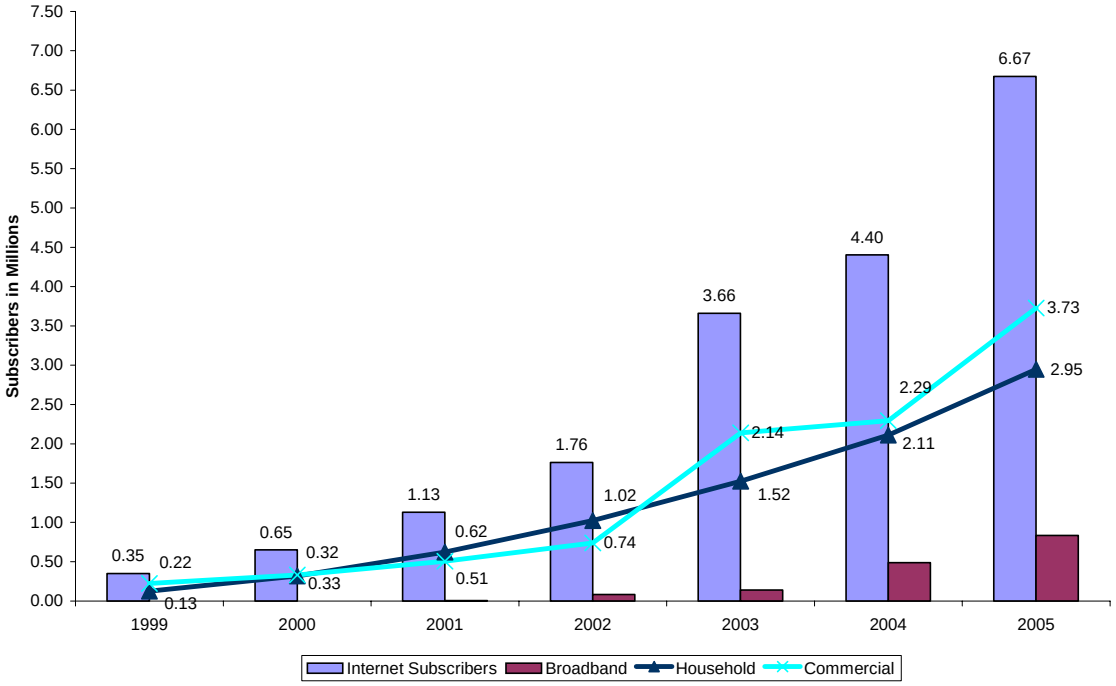
Note: This HHI is calculated on the basis of revenue.
Source: Centre for Monitoring the Indian Economy

The following table provides the HHI for the fixed and mobile services on the basis of subscriber market share

Fiscal Year	2004-05	2005-06
HHI Fixed Service	**0.67**	0.58
HHI in Mobile Service	0.16	0.15

Source: TRAI

ANNEX 7: Internet and Broadband subscribers in India



Source: National Association of Software and Service Companies, Strategic Review, 2005

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