

1. BACKGROUND AND INTRODUCTION

The rapid growth of mobile telephony in India in the recent past has been the major driver of the growth in teledensity¹. *Table 1.1* indicates the increase in India's teledensity since 2004. The Compound Annual Growth Rate (CAGR) of total telephone lines in India for the period between March 2004 and December 2008 is about 54 %. Seen in the context of the overall growth pattern since independence (see *Figure 1.1*), this recent spurt represents a significant change in the trajectory of expansion of the market for telecom services. While differential rates of growth in the rural and urban teledensity² have also been observed, there is general agreement that the phenomenal growth in the recent past is the result of sectoral reform that started around 1997 with the establishment of Telecom Regulatory Authority of India (TRAI) and the subsequent fillip given by policy initiatives under the framework of the New Telecom Policy 1999 (NTP 99). The growth rate has resulted in already exceeding the NTP 99 target of achieving a teledensity of 15 by 2010.

Table 1.1: Teledensity Growth in Past 5 Years

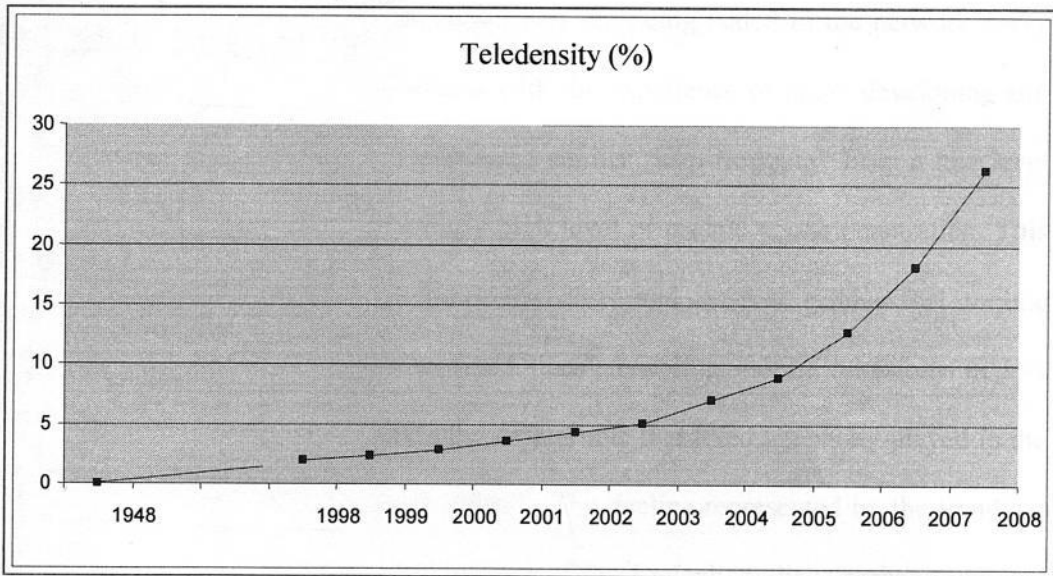
March 2004	March 2005	March 2006	March 2007	March 2008	Dec 2008*
7.08	8.95	12.76	18.22	26.22	33.23

*Source: Department of Telecom, Network Statistics on Website, (*TRAI Website, Press Release)*

¹ Teledensity is taken to be the number of telephone lines per 100 population.

² According to the *Annual Report 2007-08* of the Department of Telecommunications, the urban and rural teledensities in December 2007 were 61.25 and 8.35 respectively. TRAI, in its study paper on *Measures to Improve Telecom Penetration in Rural India – The Next 100 Million Subscribers* (No. 1/2008, December, 2008) indicates that in September, 2008, the figures are 72.47 and 12.72 respectively.

Figure 1.1: Long Term Teledensity Growth



Data source: Telecom Regulatory Authority of India (TRAI), Website

1.2 The growth of teledensity is viewed as being constituted of three distinct phases³: the first phase during the initial reform period of 1998-2003, the second, “take-off” phase of mobile-phone-led growth between 2003 and 2005, and the present Phase III post-2005 that has witnessed exponential growth rates.

1.3 *Figure 1.2* places in perspective the role of mobile telephony in the growth story that has panned out in the last three years. While the ratio of landline subscribers to mobile subscribers in July 2005 was about 45:55, mobiles contribute more than 90% of the total subscriber base of about 385 million as at the end of December, 2008. Of the approximately 347 million mobile telephones out of these, about 258

³ Source: Telecom Regulatory Authority of India Study Paper No. 2/2005 on Indicators for Telecom Growth

million are on GSM platform (67%) and about 89 million on CDMA platform⁴. More than 10 million mobile telephone subscribers are being added to the network every month. This growth trend is consistent with the experience of many developing and low-income countries⁵ that have witnessed similar “leap-frogging” from a low level of fixed/landline penetration to a fairly high level of mobile phone penetration. This process could be attributed to the lower costs and quicker rollout that mobile telephony offers in comparison to fixed lines⁶, enabling mobile telephony in less developed economies to “play the same crucial role that fixed telephony played in the richer economies in the 1970s and 1980s”⁷. The decline represented by the trendline of LL in *Figure 1.2* of the absolute number of fixed telephone lines perhaps captures this commercial disincentive succinctly. The number of landlines has reduced from about 49 million in January, 2006 to about 38 million as at the end of December, 2008, coinciding with the fast growth phase of mobile telephony. The decline in number of landline phones however is a market feature that may require further analysis because while high cost of provision and ‘fixed’ nature are competitively disadvantageous for the *growth* of landlines, this alone cannot explain why subscribers are *surrendering*⁸ their landlines. One explanation is the *pre-paid boom* in mobile telephony (more than 85% of mobile subscriptions fall in this category) that allows subscribers to access the telephone network on a relatively low one-time payment without having to pay any periodic subscription charges. A typical landline

⁴ Source: Websites of *Cellular Operators Association of India (COAI)* and *Association of Unified Telecom Service Providers of India (AUSPI)*. *Global System for Mobile (GSM)* and *Code Division Multiple Access (CDMA)* are technological options in the provision of mobile telephone services.

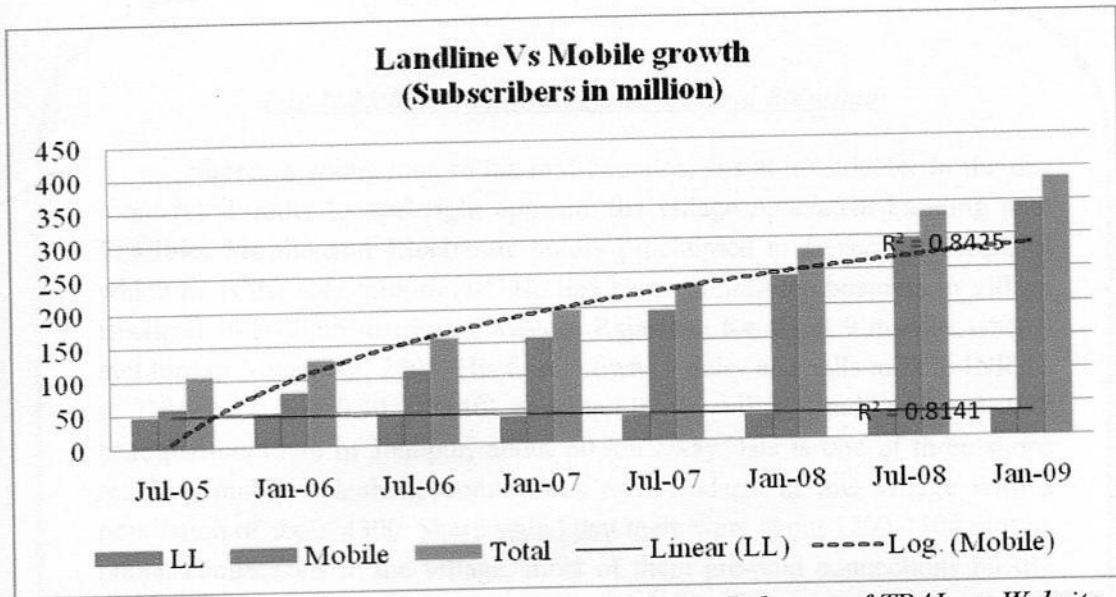
⁵ See for example, *Africa: The Impact of Mobile Phones*: The Vodaphone Policy Paper Series, No. 3, March, 2005

⁶ *Ibid*: *The Impact of Telecoms on Economic Growth in Developing Countries*: Leonard Waverman, Meloria Meschi, and Melvyn Fuss (2005).

⁷ *Ibid*.

⁸ To use a quaint expression from the rulebook of the erstwhile public sector monopoly provider to describe cancellation of subscription

Figure 1.2: Telephone Subscribers in India: Landlines Vs Mobiles



Data source: Press Releases of TRAI, on Website

telephone subscription costs about INR 180 (roughly USD 3.75) a month, and this is a definite disincentive in the face of availability of ‘free’ access. A second reason could be the availability of cheaper handsets. A detailed comparison of call charges would also yield insight into whether the low mobile airtime rates that are often described as amongst the lowest in the world at about USD 0.01 per minute⁹ have contributed in any significant manner to the decline in the absolute number of landline subscriptions¹⁰. There is in any case no doubt of the formidable growth in importance of the mobile telephone in the social life of the Indian population; if the officially admitted population below poverty line of around 300 million is excluded¹¹ as unable to afford a mobile phone, every second Indian is already an owner of one, and the growth rate does not show any significant slowing down.

⁹ It has been reported by Rajat Kathuria, Mahesh Uppal and Mamta in *An econometric analysis of the impact of mobile in India: The Impact of Mobile Phones, Vodaphone Policy Paper Series, Number 9* (January, 2009) that this tariff is half that of China and Pakistan, and South Africa and Brazil, at USD 0.14 and 0.17 respectively, charge considerably higher tariffs per minute use.

¹⁰ Public sector service provider Bharat Sanchar Nigam Limited has just announced a further reduction of any network mobile to mobile calls and SMS at INR 0.50 (USD 0.01) in its ‘India Golden 50’ Plan, [See *The Hindu*, 23rd February, 2009] that is likely to lead to a rate war.

¹¹ Ankur Sarin and Rekha Jain however report in *A survey of usage of mobile in poor urban areas in Vodaphone (2009) ibid.*, that in their study of mobile usage “[around] 15% user households in our sample would be below the official poverty line”, notwithstanding the acknowledgement that the poverty lines “are generally believed to understate poverty considerably”.

Box 1: Mobile telephone retailer in rural Rajasthan

Sheru, a young man in his mid-twenties, sits at his counter in the one room retail outlet located right opposite the village *panchayat* building with **Pratibha Mobile and Electronic** boldly proclaimed in *Devnagari* script, of which he is the sole 'proprietor'. He had been running the business in village **Bisalpur** in Jodhpur district of western Rajasthan for about 9 months when I met him in November, 2008. His family owns a dairy and sells milk at INR 15 to INR 20 (USD 0.30 – 0.40) per litre in the village and in the district headquarters town of Jodhpur, about 60 km away. His is one of three shops retailing mobile telephone connections and handsets in this village with a population of about 4300. Sheru stated that there were about 1200-1500 mobile phone connections in the village, most of them pre-paid connections mostly from one private sector service provider (Airtel) that is available for INR 100 (about USD 2). This, if true, would roughly translate to a mobile phone in every home in the village! The competition (BSNL, IDEA) suffered because of poor or no coverage. He stated further that all three shops add about 100 activations per month altogether, which again is a very high figure for the given population base. The popular handsets (from Nokia) were basic models in the price range of INR 1250 to INR 1450 (less than USD 30) and between Rs 1750 and Rs 1950 (USD 40) for handsets with FM radio, with the SIM card given free. Interestingly, he stated that there was sale of about 5 memory cards of 1 GB each costing INR 250 (USD 5) every month from his shop, used to store and play back songs (250 can be stored on each such card, and most of these are popular local *Marwari* songs).

On general enquiry among the people of the village, a clear divide as to the utility of mobile phones was perceptible, with the elderly generally stating that these were a drain on resources, while the younger lot extolled their new found 'connectivity'. There is a significant population from the village (and from the general area) that emigrates for work to the States of Madhya Pradesh and Bihar along with mechanical implements including tractors. The primary impetus for mobile phone usage is from the need to keep in touch with family members and wage earners who have thus gone far from the village in search of work. A secondary reason for use is for audio entertainment, and this aspect is deprecated by the elderly in the village. Fallout of the widespread use of mobile phones has been the decline of business for (landline) Public Call Offices in Bisalpur, as elsewhere in India, and this is reflected in many mobile phone television commercials that celebrate the freedom from long queues especially in late night, 'off-peak' tariff hours.

1.4 *Box 1* describes the reach and depth of mobile phone penetration from the view point of a small trader in rural Rajasthan, the largest State in India with a population of about 56.5 million (2001) ‘characterised by a non-nucleated, dispersed pattern of settlement’¹², and is often seen as mirroring India’s development story.

1.5 As the following paragraphs would show, the phenomenal growth of mobile-phone-led telephony occasioned by massive investments in telecommunications infrastructure has impacted the economic growth of countries including India. The present research proposal seeks to add to the study of the impact of the (growth of) mobile telephony, and consequently of total teledensity, to the development process.

1.6 In their work *Telecommunications and Economic Development*¹³, Saunders *et al* (1983) give the following arguments (other than the economic efficiency aspects of development based on evidence of market forces) to point out the benefits from investment in telecommunications infrastructure:

- a) *Substitution effects*: As investment takes hold, telecom services tend to substitute for other forms of communications in a more efficient and effective manner. For example, by substituting for personal travel, telecommunication can reduce costs incurred on energy.
- b) *Productivity Gains*: Efficiency benefits accrue from telecommunications at organizational, market, and household levels, especially in reducing information asymmetries and transaction costs.

¹² *Rajasthan Human Development Report 2002*, available at <http://planningcommission.nic.in/plans>, accessed on 14th February, 2009

¹³ *Telecommunications and Economic Development* by Robert J. Saunders, Jeremy J. Warford, and Bjorn Wellenius: Published for the World Bank by The Johns Hopkins University Press, 1983

- c) *Cross-sectoral effects*: Investments in telecom infrastructure would have beneficial effects in various other sectors of the economy, as for example, in faster dissemination of prices of commodities leading to improved realizations for a wider community of producers, which could further lead to increases in agricultural productivity.
- d) *Welfare Effects*: Telecommunications development has further beneficial effects on individual and family welfare, and facilitates political, cultural, economic, and social integration of remote areas.

1.7 The role of ‘network externalities’¹⁴ in increasing the value of the telecom network is now well established. Röller and Waverman (2001)¹⁵ have stated that positive network externalities are uniquely present in telecommunications technologies distinct from other types of infrastructure¹⁶, and that these could be expected to lead to higher growth effects than has been found for other types of infrastructures, subject to achievement of a “critical mass”.

Chicken or Egg?

1.8. In the procession of the development of telecom infrastructure as manifested in increased total teledensity on the one hand and economic development on the other, there has been considerable speculation regarding the *two-way causation* between

¹⁴ According to *Nicholas Economides* [in his Paper titled *The Microsoft Antitrust Case: Journal of Industry, Competition and Trade: From Theory to Policy* (August, 2001)], “A market exhibits network effects (or network externalities) when the value to a buyer of an extra unit is higher when more units are sold, everything else being equal. In a traditional network, network externalities arise because a typical subscriber can reach more subscribers in a larger network.”

¹⁵ In *Telecommunications Infrastructure and Economic Development: A Simultaneous Approach* by Lars-Hendrik Röller and Leonard Waverman: *The American Economic Review*, 91(4), September, 2001.

¹⁶ *Ibid*: Röller and Waverman (2001) state that there could even be significant *negative* externalities present for example in transportation for example as a result of congestion.

them. *Reverse causality*, i.e., whether growth in teledensity leads to economic growth or whether economic growth leads to increases in teledensity, and *spurious correlation* relating to the effects have been subject matter of previous research¹⁷. Röller and Waverman (2001), in their study of evidence from 21 OECD countries over a 20-year period, have found lower levels of growth effects at telecom penetration levels up to 40 % and stronger growth effects for levels of infrastructure above 40 %. Assuming 2-2.5 people per household, they consider above 40% levels to approach universal service¹⁸, and thereby hold that growth effects of telecom infrastructure are significantly higher for countries whose telecom service has approached universal service. Waverman *et al* (2005) report from an analysis of data from 92 high- and low-income countries between 1980 and 2003 that mobile telephony has a positive and significant impact on economic growth, “*and this impact may be twice as large in developing countries compared to developed countries*”. Sridhar and Sridhar¹⁹ (2004) find that there is no doubt that most developing economies have adopted the cellular (mobile) telephony route as a quick and inexpensive way of increasing telecom penetration, and that while this penetration is not a substitute for actual economic growth, it is a “good enabler for economic growth to *trickle down*, once it occurs”. A more nuanced analysis from Kathuria, Uppal, and Mamta (2009) would point to the inevitability of strong mobile telephony growth in a context where ‘the absence or inadequacy of existing telecommunications facilities acts as a barrier or bottleneck to private economic activities, but also when enough

¹⁷ See, for details, Röller and Waverman (2001) and *Telecommunications Infrastructure and Economic Growth: Evidence from Developing Countries* by Kala Seetharam Sridhar and Varadharajan Sridhar: Working Paper No.4, National Institute of Public Finance and Policy, March, 2004.

¹⁸ A simple definition of universal service would be a telephone in every household and firm. At 5.3 people per household in India (Source: Census of India, 2001), the penetration may need to be half this level, i.e., around 20%, to approach universal service. Remember that the present level of penetration in India is already about 29% (Table 1).

¹⁹ *Op. cit.*

other infrastructure exists to permit the effective use of telecommunications'²⁰. There is an element of support for even sub-optimal levels of infrastructure and human capital utilization in this argument, but that however does not detract from the objective reality that suggests that mobile telephones have, in India, been able to unleash hectic economic (not to mention social) activity that has no doubt added to the Gross Domestic Product of the country.

1.9 Thus, a consensus appears to be emerging that growth of telephony, led in large part by increased penetration of mobile telephones, is both a cause and an enabler of economic growth, more so in developing countries. The growth itself has been occasioned by a conscious effort on the part of many countries including India to join the high growth path by recourse to positive policy initiative conducive to induction of technology and spread of competition in service provision.

Reasons for Growth and Differences

1.10 In broad terms, the reasons for rapid growth of mobile telephone penetration could be

- a) *economic*, in terms of lower costs of rollout as compared to fixed telephony for firms, and improved information efficiencies for different actors in the marketplace²¹,

²⁰ Rajat Kathuria, Mahesh Uppal and Mamta in *An econometric analysis of the impact of mobile in India: The Impact of Mobile Phones, Vodaphone Policy Paper Series, Number 9* (January, 2009)

²¹ The very interesting case of increasing market efficiencies for the fisher folk of Kerala has been presented in *Mobile Phones and Economic Development: Evidence From the Fishing Industry in India* by Reuben Abraham: *Information Technologies and International Development*, MIT Press, 4 (1), Fall 2007, 5-17.

- b) *commercial*, as mobile telephony offers an attractive investment opportunity to firms, *policy*, as reflected in the regime put in place by government for investment, licensing, spectrum allocation, and rollout obligations,
- c) *regulatory*, that are manifested in the structure of the market and competition,
- d) *social*, inasmuch as mobile telephones fulfill an important, as yet unmet need for social contact, and
- e) *cultural*, that manifest themselves in the adoption of an exciting new technology that offers better personal control²² over communication.

1.11 What could then be the reason for the observed divergence among countries in adopting mobile telephones? Diane Coyle indicates the following key explanatory factors for the differences in spread of mobile telephony in her *Overview* of the Vodaphone Policy Paper No. 3 (2005):

- a) *Economic Fundamentals*: These include per capita income, relative prices of handsets and calls, macroeconomic stability, and urbanization.
- b) *Policy Differences*: Regulatory structure, competition regime, tariff and non-tariff barriers to imports, structure of universal service obligations, and government attitude.
- c) *Social and Cultural Factors*: Urbanisation, migration, gender-related, and cultural attitudes.
- d) *Natural Differences* such as geography and population density.

²² As a downside, Abraham (2007) refers for example to the propensity of some market actors to lie about their location to postpone payments, unlike in the case of landlines where location is established by definition.

The downside

1.12.1 The growth story cannot of course be seen merely as the triumphal march of technology delivering humankind from drudgery. Early concerns related to the explosive growth of mobile telephony focused on the following, among other, perceived deleterious effects:

- a) *environmental impact*, as in ‘ugly mobile antennae, which spoil once-pleasant views’, with an acknowledgement that while this is a concern in developed countries, communities ‘in developing countries are, conversely, often so grateful for modern communications infrastructure that they are happy enough.....to turn a blind eye to environmental aesthetics’²³;
- b) *health and safety impact* that has influenced the debate in spite of the fact that present ‘scientific information does not indicate the need for any special precautions for use o mobile phones’²⁴. However, a major issue is the use of mobile phones while driving, when ‘there is a well established increase in the risk of traffic accidents while the driver is using a mobile phone, either a conventional handset or one fitted with a “hands free” device’²⁵. The sight of people driving cars and two-wheelers talking as if to themselves and gesticulating wildly while negotiating chaotic traffic in crowded urban areas across India would be funny if not for the deadly serious potential for death and debility involved.

²³ Both quotations from *The social impact of mobile telephony* on the website of the International Telecommunications Union, www.itu.int/telecom-wt99 , accessed on 10th February, 2009

²⁴ A long term study is currently underway under the auspices of the World Health Organisation

²⁵ From *Electromagnetic fields and public health: mobile telephones and their base stations*, available at <http://www.who.int/mediacentre/factsheets/fs193/en> , accessed on 14th February, 2009

- c) *social change impact* that has made people *permanently contactable*, leading to significant changes in behavior, manners, etiquette, and communication that is increasingly shifting away from face-to-face models.

1.12.2 An additional source of distress is the increase in criminal behavior occasioned by the ease and ubiquity of mobile phones. Even other than terrorist plots using satellite phones and the like, there is evidence of other, more 'day-to-day' criminal applications of mobile telephony as well.

1.13 The social impact of mobile telephony needs to be viewed in the context of growth of *impersonal* communication in the past two decades that has seen computer and electromagnetic media modulated communication gain ascendance. While nostalgia for earlier, more personal modes of interpersonal communication may hold attraction for the 'fading generations', the fact of the matter is that modern communications have enabled hitherto unthinkable speeds of expression and response, and have thereby facilitated commerce, science, and development in general to proceed at a rapid pace. The scope for reduction of information asymmetry is enormous in the given context, and any required intergenerational adjustments in social mores can, on the strength of experiences from cultural history, be assumed to fructify in due course.

1.14 The one remaining cause for concern is therefore that of *differential access* to the improved means of communication. In the field of communications as in other areas such as health, education, and employment, the *rich-poor* divide in terms of access to services is likely to exacerbate unless proactive measures are undertaken to

alleviate sharp differences. While telephony cannot yet be exalted with a place among basic necessities at the individual level, there is hardly any doubt that it plays an increasingly significant role at the *level of the community* in determining the trajectory of growth and development, and in allowing a fuller leverage for individual effort to prosper and flourish. It can be safely asserted from available evidence that while the market in India has so far played the lead role in increasing telephone penetration, the rather glaring differences in rural-urban teledensity for example exemplify the requirement for suitable policy interventions to ensure that the 'growth dividend' is more evenly distributed. The present study tries to appreciate issues from this angle as well so as to offer policy prescriptions that would attenuate untenable divergences. Any study of the impressive (and desirable) growth of telephony and mobile telephony in particular should serve to bring into focus segments of society that are underserved, not just from the point of view of 'bottom of pyramid' marketing analysis, but more importantly from the perspective of social justice and equity.