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Flexible spectrum management for mobile broadband services: How does it vary across advanced and emerging markets?

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ABSTRACT

Demand for wireless data and Internet services are expected to grow exponentially, both in advanced and emerging markets in the near future. While advanced countries have often used centralized planning and coordination methodology to forecast and allocate the associated spectrum blocks to wireless operators for meeting the demand, it is often ad-hoc in emerging markets dictated by market forces. In this paper, Finland and India are taken to represent advanced and emerging markets, respectively. Different policy options and the policy environment in these two countries for spectrum management are explored. A causal model is constructed to represent the different variables that affect spectrum management practices and possible paths forward in these two extreme cases are highlighted. Using the causal model structure, it is hypothesized that (i) the matured markets such as Finland that practice centralized and harmonized spectrum planning are likely to continue their ex-ante policies and opt for the release of digital dividend spectrum and use of spectrally efficient technologies; (ii) the emerging market in India that is characterized by a market oriented ex-poste regulation is a good candidate to introduce secondary markets including flexible opportunistic spectrum access as exemplified by the wide spread adoption of multi-SIM handsets and the practice of national roaming by 3G service providers. Introductions of policies and regulations in these markets to break away from the extant paths are also highlighted.

1. Introduction

In a recent research study by Cisco (2010), it has been pointed out that Mobile data traffic will grow at a compound annual growth rate (CAGR) of 92% from 2010 to 2015, reaching 6.3 exabytes per month by 2015. The study also points out that mobile-only Internet population will grow 56-fold from 14 million at the end of 2010 to 788 million by the end of 2015. These trends clearly indicate the possible exponential growth in the use of mobile devices to access Internet and other related bandwidth intensive applications and services.

The potential increase in demand for wireless data and Internet services is likely to put stress on the wireless networks and hence the need for better spectrum management. Paucity of spectrum for commercial mobile services in emerging

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markets has been highlighted by many researchers (Hazlett, 2006). For example, the formulation of spectrum policy in India began under conditions of very limited availability of spectrum, due to huge spectrum holdings by Defense as indicated in Prasad and Sridhar (2009). There is the obvious trade-off before the policy maker, between the number of operators to be allocated spectrum and spectrum block allocated to each operator. In emerging countries such as India, the decision is made in favor of competition and hence the associated maximal usage of allotted spectrum. Even if many operators are present, the huge population and hence the potential user base for mobile services, is expected to provide each operator with the critical mass required for sustainable operation. However, typically in advanced countries, the user base is not large enough to warrant many operators. Hence the policies are always in favor of a limited number of operators with more spectrum blocks for each operator. Given this disparity in spectrum policies and market structure in emerging and advanced markets, it is interesting to analyze the future evolution path for spectrum management in these two extreme scenarios.

In this paper the authors provide a detailed analysis of the issues in spectrum management, for India and Finland that represent, respectively, emerging and developed countries in telecommunications. Basic telecom characteristics of these two countries are presented in Table 1.

A quick look at the above table indicates that apart from cellular mobile services, India lags behind Finland in all the parameters. Apart from the density parameters, the absolute number of mobile subscriber numbers in emerging countries such as India (about 850 million, largest in the world second only to China) give the required economies of scale and scope of operation for operators, device vendors, original equipment manufacturers, and content providers alike.

The demographic indicators point to a large number of working population (about 750 million) in India who are potential adopters of Smartphones, tablets and associated wireless broadband services. Though the GDP per capita is much less in India compared to Finland, the availability of latest technologies in India is not far behind that of Finland, which indicates the possibility of a section of the population actively using and adopting latest technologies. It is estimated that Smartphone sales in India is expected to increase from the current 21 million per year to 100 million per year by 2015, mainly due to adoption by the population in the age group of 15–64.

Sridhar and Hämmäinen (2011) indicate that the mobile Internet users in India have jumped from 8 million last year to 25 million and that about 49% of Internet users use Mobile only for accessing the Internet. Hence, on the demand side, the large number of mobile subscribers who can potentially access Internet and other broadband services using mobile only increases the demand.

This poses stress on appropriate spectrum management practices. In emerging countries such as India, spectrum management challenges are due to (i) lack of alternative wired access network infrastructure for broadband service; (ii) deeper penetration of mobile phones and hence the associated demand for wireless broadband (iii) inadequate allocation of spectrum for mobile services. In developed countries such as Finland, challenges are due to (i) increase in demand for

Table 1
Comparison of economic, technology and network readiness indicators (source: Dutta and Mia (2011), World Bank (2010)).

Indicator	India	Finland
Network readiness		
Overall network readiness index	4.0 (48th rank)	5.4 (3rd rank)
No. of landlines per 100 population	3.1	26.9
No. of mobile subscriptions (in millions)	630 (June 2011)	7.8
No. of mobile subscription per 100 population	43.8	144.6
Mobile network coverage (% population covered)	83.0	99.5
Cellular subscriptions with data (% of total)	About 4	100
Mobile cellular tariff (in PPP $)	0.06	0.17
No. of Internet users per 100 population	5.1	82.5
No. of broadband Internet subscribers per 100 population	0.6	28.8
International Internet bandwidth per 10,000 population in Mbps	2.2	172.2
Internet and telephony competition (0–6; 6 best)	6.0	6.0
Availability of latest technologies (1–7; 7 most)	5.6	6.6
Economic and demographics		
GDP per capita (constant US$ 2000)	823	27,314
Population (millions)	1,171	5.3
Population ages 15–64 (% of total)	64.5	66.2
Rural population (% of total)	69.9	36.1
Annual population growth (%)	1.34	0.46
Population density (people per sq.km of land area)	394	17.65
Population in the largest city (in million)	22	1.1
ICT services export (current US $ billion)	58	6.8
Government characteristics relating to ICT		
Government prioritization of ICT (1–7; 7 best)	5.3	6.1
E-participation in government (0–1; 1 best)	0.2	0.41
ICT use and government efficiency (1–7; 7 best)	4.7	5.3