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Framework for evolving spectrum management regimes: Lessons from India

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ABSTRACT

India has seen a marked change in spectrum policy over the past decade from a legacy administrative regime to a more market oriented one wherein it has adopted auctions in the primary market, trading in the secondary market and has liberalised spectrum to make it technology and service neutral. It has faced numerous challenges, constraints, and legacy issues in its transition, thus providing a rich context for analysis. Using the case study of India, we developed a framework that highlights the various dimensions to be considered while migrating from an administrative to a market regime for spectrum management. The framework also helps to assess the current orientation of a spectrum policy regime and provides a direction for adopting a higher market orientation. We used the framework in the Indian context to show that while India had adopted market mechanisms, it had a low level of market orientation.

1. Evolution of spectrum management regimes

Rapid changes in wireless technologies and their accelerated commercial adoptions have seen an evolution of most national spectrum management regimes from pure administrative command-and-control institutional arrangements to more market oriented ones. This adoption of market based practices has often been a part of a larger deregulation process wherein countries have transitioned from state monopolies to increased private participation in telecom service provision.

Transitioning from an administrative to a market regime for spectrum management is a complex process as it involves intricate planning and foresight coupled with challenging legacy issues in implementation. Such complexities are magnified manifold for emerging economies which have weak institutional structures and capabilities (Horowitz, 1989; Jain, 2014; Thiruvengadam & Joshi, 2012). To deal with the complexities, transition to market regimes is often phased and incremental. However, the transition in emerging economies is fraught with challenges as their response to unforeseen emergent situations is often ad hoc. While there are several case studies of developed countries regarding issues in transition from an administrative to a market regime (Bohlin, Blackman, Forge, & Renda, 2007; Kwerel & Williams, 2002; Minervini, 2014), there are few that cover these issues from an emerging economy perspective (Hazlett, Giancarlo, & Wayne, 2007; Minervini, 2014).

India represents a unique and rich case study in this regard. Its telecom industry is characterized by small fragmented spectrum assignments, high competition, low rural penetration, and heavy dependence on wireless telecommunications by over 97% of its subscribers (TRAI, 2016). It has seen a marked change in spectrum policy over the past decade from a legacy administrative regime to a more market oriented one wherein it has adopted auctions in the primary market, trading in the secondary market and has liberalised spectrum to make it technology and service neutral. It has faced numerous challenges, constraints, and legacy issues in its

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transition, thus providing a rich context for analysis.

2. Objective

We aim to develop a framework that may be used as a theoretical lens for examining the spectrum policy regime in India and its phased transition to a market oriented one. The objective is to provide a structured framework that helps analyse the challenges faced by India and thereby provide useful insights for regulators in other developing countries. This framework may be used as an assessment tool for the current level of market orientation and a guide for future planning.

3. Literature review

Administrative regimes have limited information regarding localised needs and emerging technologies leading to inefficient assignments and allocations (Coase, 1959; Hazlett, 2008; Spiller & Cardilli, 1999; Valletti, 2001) and place high discretionary power in the hands of the administrator sometimes leading to issues of corruption and transparency (Sukhtankar, 2015). A key objective of regulatory reform in the transition to market regimes has been to provide flexibility to operators to make choices regarding spectrum use and technology while balancing concerns of market failures with respect to universal coverage and competition. Market regimes entail assignment of spectrum in the primary market through auctions, development of secondary market for trading, leasing and sharing (Bykowsky, 2003; Crocioni, 2009; Farquhar & Fitzgerald, 2003; Jain, 2010) and keeping spectrum technology neutral while ensuring that interference remains manageable. Auctions ensure that the owner of spectrum does not have any windfall gains while assigning it to operators who value it the most and seek to derive the highest utility. The secondary market allows spectrum to be reorganised according to size and use with evolving market needs and technology.

However, market regimes suffer from market failures (Cave & Pratt, 2016; Freyens, 2009; Peha, 2007) such as inability to internalise positive externalities, high transaction costs, uncertainty, coordination failures, information asymmetry and risk aversion (Freyens, 2009). As an example of a positive externality, the European Union's administrative harmonisation of GSM across the 900 MHz and 1800 MHz band allowed operators to internalise network effects of large scale adoption leading to lower costs and inter-operator and inter-country portability (Sutherland, 2006). In comparison, USA did not harmonise spectrum during the same time period leading to fragmentation of its market as a result of which devices were not as affordable, and could not roam on foreign networks in the early period of mobile services (Bach, 2000; Pelkmans, 2001). There have also been administrative interventions at harmonisation that have failed in case of technologies with little demand. For example there has been limited success for TETRA mobile services in Europe that were harmonised in the 870–876/915–921 MHz band (Cave, Minervini, & Mfuh, 2008).

3.1. Migration to market regimes

Studies that have examined the transition from command and control to market regimes have largely focused on deregulation of assignment and allocation (Jain, 2010; Kwerel & Williams, 2002; Minervini, 2014). The literature on deregulation of assignment covers introduction of auctions in the primary market and trading in the secondary market (Cramton & Ockenfels, 2014; Jain, 2010; TRAI, 2012). The literature on deregulation of allocation covers a variety of instruments to bring in flexibility in technology and service provision (Pahl, 2006; Pratt & Bellis, 2006; Ramsdale, 2005).

Several countries have adopted auctions for assignment including US, UK, Canada, Germany, France and India (Cave & Webb, 2015; Cramton & Ockenfels, 2014; Jain, 1999; Prasad & Sridhar, 2014; Taylor, 2015). A number of studies have examined different aspects of auctions and their design including reserve price, total supply and block size, and examined how these factors influenced policy outcomes and strategies of operators in their countries (Bichler, Goeree, Mayer, & Shabalin, 2014; Cramton & Ockenfels, 2014; Cramton, 2013; Prasad, Kathuria et al., 2014).

Deregulation of assignments has been accompanied by creation of secondary markets in several countries (Bohlin, Preissel, Weber, Xavier, & Ypsilanti, 2006; Crocioni, 2009; Farquhar & Fitzgerald, 2003). For example, UK permitted trading in 2004, gradually increasing the number of licenses that could trade their spectrum (Akalu & Diaz Arias, 2012; Minervini, 2014). USA has promoted a variety of instruments such as leasing, sub-licensing, easement (Force, 2002). Australia introduced Standard Trading Units that define the geographic area and band that may be traded (Commission, 2003). The scope of trading varies across different countries in terms of amount of spectrum, geographic area, life of license, and permitted buyers (Bykowsky, 2003; Crocioni, 2009; Farquhar & Fitzgerald, 2003; Minervini, 2014).

For bringing flexibility in allocation, a variety of instruments have been analysed in literature. UK introduced technology flexibility using Spectrum Usage Rights (SUR) that specify the levels of interference that a licensee may cause, without specifying the levels of transmitted power (Cave & Webb, 2012; Minervini, 2014; Webb, 2009). Notably, while Ofcom has been studying SUR for many years, the actual issue of licenses with such SUR has been limited (Cave & Webb, 2015). On the other hand, USA specifies the limits of power radiated, thus limiting the technology choices available (Hazlett, 2008; Kwerel & Williams, 2002). The EU has recommended facilitating the coexistence of different types of licensing models and review of the use of government and military spectrum for commercial purpose (Delaere, 2007; RSPG, 2010). In several other countries, the type of service that may be offered is tied to the specific band. For example, Indian operators were required to provide GSM voice services in the 900 and 1800 MHz band (Jain, 1999, 2010; Sridhar & Prasad, 2011). With advances in technology, and mobile services, especially 3 G and LTE becoming available in various bands, a number of regulators have switched to more service and technology neutral licensing (Pahl, 2006; Pratt & Bellis, 2006).